CAMBRIDGE SYSTEMATICS

Accounting for Commercial Vehicles in Urban Transportation Models

Task 3: Magnitude and Distribution

final

report

prepared for

Federal Highway Administration

prepared by

Cambridge Systematics, Inc.

with

Dr. Harry Cohen
Dr. Arun Chatterjee

November 2003

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Executive Summary

In October, 2003, the Federal Highway Administration began a research project to evaluate the magnitude and distribution of commercial vehicles in urban transportation planning models. The research was designed to look at all travel that is not adequately represented by the current state of the practice for urban transportation planning models, which are developed from household travel surveys. Household travel surveys are designed only to capture household-related personal travel. Trips made for commercial purposes or using commercial vehicles are not captured. Some household travel surveys may inadvertently capture commercial trips such as realtors or tradesman making door-to-door visits but this does not represent a comprehensive assessment of this type of commercial vehicle travel.

This project is the first phase of a two-phase project to develop methods for forecasting commercial vehicles in urban transportation planning models. The goal of the first phase is to research, evaluate and identify methods for forecasting commercial vehicles in urban transportation planning models. The goal of the second phase is to develop these methods and estimate parameters that can be used in urban transportation planning models across the country.

The first phase has three primary work tasks:

- The first is to assess recent and current literature for different types of commercial vehicles relevant to the treatment of commercial vehicles in urban transportation models. As part of this work, a set of commercial vehicle categories was established.
- The second is to compile available data and information and estimate the magnitude and spatial/temporal distribution of different types of commercial vehicles. As part of this work, the commercial vehicle categories were refined and prioritized.
- The third is to evaluate methods and data sources that can be used to forecast commercial vehicles in urban transportation planning models.

The focus of this report is on the second work task to estimate the magnitude and spatial and temporal distribution of different types of commercial vehicles.

As part of this work, we defined a commercial vehicle as one that is used primarily for commercial purposes. Many commercial vehicles will be registered as commercial vehicles. Commercial vehicles include autos, trucks and buses and are operated by both public and private sector agencies.

TYPES OF COMMERCIAL VEHICLES

Trips made by commercial vehicles are organized in three groups, based on what is being carried and what economic, demographic and land use factors influence the magnitude and distribution of these trips. The three groups are commercial vehicles: moving people, moving goods and providing services.

These three groups are further subdivided into 12 specific categories of commercial vehicles, based again on what is being carried and what economic, demographic and land use factors influence the magnitude and distribution of these trips. These 12 categories of commercial vehicles are:

- School bus;
- Shuttle services at airports, rail stations;
- Private transportation, such as taxis and limousines;
- Paratransit, such as social service vans and church buses;
- Rental cars;
- Package, product and mail delivery, such as USPS, FedEx, UPS, etc.;
- Urban freight distribution and warehouse deliveries;
- Construction transport;
- Safety vehicles, including police, fire, building inspections, etc.;
- Utility vehicles, including garbage pickup, meter readers, maintenance, plumbers and electricians, etc.;
- Public service vehicles, including Federal, state, city and local government; and
- Business and personal services, including realtors, door-to-door sales, and vehicles used for professional or personal services. These vehicles are primarily vans, pickups, and autos.

These 12 categories of commercial vehicles are direct subsets of the three commercial vehicle groups, as follows: school bus, shuttle services, taxis, paratransit and rental cars are vehicles moving people; package delivery, urban freight distribution and construction transport are vehicles moving goods; and safety, utility and public service vehicles and business and personal services are vehicles providing services.

One additional category of commercial vehicles is public and private buses. These vehicles were not evaluated in this study because some metropolitan transportation agencies are already modeling public and private buses as part of the multimodal demand forecasting process. These would be modeled as part of the development of the transit network; bus vehicle miles traveled can be estimated from the bus services coded in the transit network. Private buses are not as frequently modeled in urban transportation planning models, because they

are primarily intercity trips and would be modeled using an intercity or statewide model.

DATA SOURCES

The effort to quantify the magnitude and distribution of commercial vehicle travel relied on a series of data sources that provided data on vehicles, trips, trip lengths and/or vehicle miles traveled in each of 12 commercial vehicle categories. Based on these data, commercial vehicle travel was estimated for 13 urban areas in the U.S. Most of the data sources provided data for multiple categories of commercial vehicles (such as the registration data and the commercial vehicle surveys) but some data sources were category-specific (such as the school bus fleet data, the taxi fact book, the FTA Section 15 data on transit. The primary data sources and the urban areas available in each are provided below:

- Commercial vehicle survey data was available in Detroit, Atlanta, Denver and the Piedmont-Triad area (Winston-Salem, Greensboro, and High Point).
- California Department of Motor Vehicle data was available for Los Angeles, San Francisco, San Diego and Sacramento.
- The National Transit Database for paratransit vehicles was available for 198 cities in the U.S., including all 13 urban areas in our study (Los Angeles, San Francisco, Detroit, Atlanta, San Diego, Houston, Denver, Portland, Sacramento, Orlando, Winston-Salem, Greensboro, and High Point).
- United States Postal Service data was obtained for seven urban areas (Atlanta, Denver, Detroit, Houston, Greensboro, Orlando, and Portland).
- School bus fleet surveys were available for the largest 100 school districts, including 10 of the urban areas in our study (Los Angeles, Detroit, Atlanta, San Diego, Houston, Denver, Portland, Winston-Salem, and Greensboro).
- The Taxi Fact Book was available for all major cities in the U.S., including all 13 urban areas in our study (Los Angeles, San Francisco, Detroit, Atlanta, San Diego, Houston, Denver, Portland, Sacramento, Orlando, Winston-Salem, Greensboro, and High Point).
- The Airport Ground Access Planning Guide was available for 27 cities in the U.S., including five cities in our study (Los Angeles, San Francisco, Houston, Portland and Orlando).

There were many other data sources reviewed and used to support the estimation of the magnitude and distribution of commercial vehicles. One significant contributor was the Vehicle Inventory and Use Survey (VIUS), which was used to estimate average miles traveled per day for the 12 vehicle categories in our study, but these data were not specific to an urban area only to all urban areas in a state.

MAGNITUDE AND DISTRIBUTION

The magnitude and distribution of commercial vehicles in each of 12 commercial vehicle categories were estimated from available data sources. The magnitude was estimated using the total fleet size and fleet size per capita. The distribution was estimated using the vehicle miles traveled, the percentage of total vehicle miles traveled and the average vehicle miles traveled per day.

The magnitude of commercial vehicles ranged from two to 89 fleet size per thousand population for all categories. This was highest for vehicles providing services, based on the fleet size per capita rates across all 13 urban areas (average of 26 vehicles per thousand population). While we feel that average among groups of commercial vehicles are reasonable to report for comparison, the maximum statistics are used to evaluate individual categories because of the missing data in many cities. Among the specific categories within the services group, business and personal service vehicles (38 vehicles per thousand population) and public service vehicles (26 vehicles per thousand population) had the highest rates. Urban freight vehicles (35 vehicles per thousand population) and rental cars (22 vehicles per thousand population) also had a high average rates of fleet size per capita. Package delivery (13 vehicles per thousand population) had a lower maximum fleet size per capita rate and all other categories had less than 10 vehicles per thousand population maximum fleet sizes.

Distribution of commercial vehicles ranged from seven to 18 percent of total vehicle miles traveled, across all categories. This was highest for vehicles providing services (five percent), based on the percent of total vehicle miles traveled. Again, the maximum percent of total vehicle miles traveled was used to evaluate the individual categories. Urban freight distribution and business and personal services (both at eight percent) had the highest percent of total vehicle miles traveled, next highest was rental cars (four percent) and public service vehicles (three percent). All other categories had less than two percent of total vehicle miles traveled (maximum).

The magnitude and distribution was also evaluated across time periods and facility types, but these data were not sufficient to stratify the data by urban area or commercial vehicle category. Based on data from the commercial vehicle surveys, the majority of commercial vehicles operate in the off-peak hours (58 percent). The a.m. peak period of three hours (31 percent) has quite a bit more travel than the p.m. peak period of three hours (11 percent). The distribution of commercial vehicles by facility type is based on data in the Freight Analysis Framework. This shows that freight and non-freight trucks have higher allocation of vehicle miles traveled on interstates and lower allocation of vehicle miles traveled on arterials than autos.

NEXT STEPS

The analysis of the magnitude and distribution of commercial vehicle travel uncovered a number of gaps in the data that made comparison of data across categories of vehicles and across different urban areas more challenging. The most comprehensive data sources were the department of motor vehicles data, which included all vehicle types but did not contain any data on miles traveled, and the commercial vehicle survey data, which included all data necessary for the analysis, but did not include all vehicle types. There was limited data on shuttle services, rental cars and public service vehicles. These data gaps will be identified as areas for future research in the next task of the work.

The overall impact of commercial vehicles ranges from six to 18 percent vehicle miles traveled for the urban areas in our evaluation. This is reasonable compared to ballpark estimates of commercial vehicle travel in urban areas. The next step in the overall evaluation is to identify methods, parameters and data sources that can be used to estimate and forecast commercial vehicles in urban transportation planning models. The data sources contained herein will be used as a basis for this evaluation, combined with additional data sources needed for forecasting purposes.

1.0 Introduction

This is the first phase of a two-phase project to account for commercial vehicles in urban transportation models. The objectives of this first phase, are as follows:

- To assess recent and current literature relevant to the treatment of commercial vehicles in urban transportation models;
- To use available data and information to develop an improved understanding of the magnitude and spatial/temporal distribution of different types of commercial travel; and
- To identify potential data and methodological improvements and conduct prototype testing.

Based on the results of this first phase, a decision will then be made by the FHWA whether or not to proceed with full development of one or more improved methods and preparation of the associated technical guidance.

This report addresses the second objective to understand the magnitude and distribution of commercial vehicle travel. This is one of three reports to address each of the three objectives listed above, and there is a final report for this phase of the project. The final report covers all aspects of the project, but does not contain the same level of detail as the individual reports.

1.1 PURPOSE

The purpose of this report is to use available data and information to develop an improved understanding of the magnitude and spatial/temporal distribution of different types of commercial vehicle travel. In this study, a commercial vehicle is defined as one that is used for commercial purposes. Most, but not necessarily all, commercial vehicles will be registered as commercial vehicles. The objective of the Magnitude and Distribution task in the work scope is to answer the following specific questions:

- How much of the traffic in a metropolitan area is attributable to commercial vehicle movements?
- How are commercial vehicle trips distributed geographically, temporally, and by type of transportation facility?
- Can commercial vehicle trips be classified into meaningful types or categories, amenable to modeling and forecasting?

In the process of collecting data to answer these three questions, we discovered the following:

- There are significant discrepancies among the available data sources due primarily to differences in the purposes and uses of the various data sources.
- There are similarities in data collected for the same purpose and use, even though they were conducted in different cities by different agencies/firms.
- Some data sources are useful to answer one of the above questions, but other sources were needed to answer more than one question.

1.2 APPROACH

In order to answer the questions posed, data sources identified in the literature review (which is documented in the first report of this study) were reviewed and evaluated for 13 metropolitan areas in the United States. These 13 urban areas were chosen on the basis of the available datasets to represent a cross-section of population ranges and regions of the country. The 13 urban areas are shown in Table 1.1.

Table 1.1 Urban Areas Used in the Evaluation of Commercial Vehicle Travel

	Region	Population
Los Angeles	West	12,384,000
San Francisco	West	4,022,000
Detroit	Midwest	3,836,000
Atlanta	South	2,977,000
San Diego	West	2,653,000
Houston	South	2,487,000
Denver	Midwest	1,993,000
Portland	West	1,552,000
Sacramento	West	1,394,000
Orlando	South	1,160,000
Winston-Salem	South	233,000
Greensboro	South	223,000
High Point	South	125,000

The data were summarized for the 13 categories of commercial vehicles identified in the literature review. As described in Section 2.2, these categories were revised, yielding a final set of 12 categories for analysis in this task. While it may be useful to eventually combine categories for modeling purposes, the 12 categories are reported separately in this document to provide full information. The

definition of a commercial vehicle also was debated and refined as part of this work.

Primary and secondary data sources were obtained and analyzed for each category of commercial vehicle. Each of these data sources is described separately in this report. The purpose and use of each data source was considered; in some cases, data sources were not deemed useful for this study.

Following the data analysis, summaries of the fleet size, vehicle miles traveled, and average trip length were evaluated for each urban area and commercial vehicle category. These data also were analyzed as a function of total vehicle miles traveled and metropolitan area population to understand relationships across categories and metropolitan areas. Additional summaries by time period and facility type also were prepared.

1.3 OUTLINE OF REPORT

This report contains five sections and four technical appendices, which were added to report on data that were too voluminous to be presented in the report. Section 2.0 presents a detailed definition of the term "commercial vehicle" for the purposes of this study and summarizes the commercial vehicle categories established for this review. This section also includes definitions of commercial vehicle categories that are contained in some of the data sources being analyzed.

Section 3.0 describes the data sources evaluated to provide information on the spatial and temporal distribution of commercial vehicles in urban areas. There are five general types of data reviewed for this study: commercial vehicle surveys, vehicle registration data, vehicle count data, category-specific data sources, and data from individual contacts.

Section 4.0 presents the results of the process to quantify the magnitude and distribution of commercial vehicles. The results of the analysis from the combined data sources are analyzed by category, urban area, time period, and facility type. Relationships among the data are identified by scaling the data in individual categories or cities by population and vehicle miles traveled. The variability and similarity among the summary results are discussed.

Section 5.0 of this report summarizes the findings of the study. The availability of the different data sources and gaps in the available data are presented and discussed. Considerations for aggregating categories of commercial vehicles are provided and related to discussions of the priorities for modeling commercial vehicles.

Appendix A presents paratransit data from 300 cities. These data were extracted from the Federal Transit Administration Section 15 transit database. Appendix B includes school bus statistics for about 65 school districts. These data were extracted from the "School Bus Fleet Survey" annual report. Taxicab data from a taxicab fleet survey are included in Appendix C, and airport taxi and rental car data are presented in Appendix D.

2.0 Types of Commercial Vehicles

This section presents a detailed definition of the term "commercial vehicle" for the purposes of this study and summarizes the commercial vehicle categories established for this review. This section also includes definitions of commercial vehicle categories that are contained in some of the data sources being analyzed.

2.1 DEFINITIONS

"Commercial vehicles" include a broad range of vehicle types that are used for commercial, rental, educational, and government services. Examples of the uses for such vehicles include: transportation of persons, package and mail delivery, urban freight distribution, utilities, trades and services, landscaping services, outside sales, product delivery, vehicle rental, transportation of school children, construction activity, and paratransit services.

Commercial vehicles demonstrate temporal and geographic distributions which differ from those of personal vehicles. In traditional transportation planning studies estimates of household vehicle trips are factored to correct for underreporting and underpredicting of commercial vehicle trips in traditional transportation planning data sources. While traditional travel models are adequate for some basic analyses, improved methods for estimating commercial vehicle trips would provide capabilities for more accurate analysis of additional transportation planning functions and for the analysis of a wider range of transportation policies.

The overall objective of this task is to develop an improved understanding of the magnitude and the spatial and temporal distribution of commercial vehicle trips within urban areas, other than those trips that represent intercity freight movements. A better understanding of commercial vehicle travel will improve the accuracy of travel demand forecasting procedures, thereby leading to more effective means of managing transportation facilities. Equally important, improved estimates of commercial vehicle travel also will enable transportation planners to make better estimates of congestion and environmental impacts, including mobile source emissions and transportation air quality.

"Commercial Vehicle" Definition for This Study

Commercial vehicle trips are primarily organized into three groups, based on what is being carried and the economic, demographic, and land use factors influencing the magnitude and distribution of commercial vehicle trips in a metropolitan area. The three groups are:

1. Movement of people;
2. Movement of goods; and
3. Services.

The **movement of people** category includes school buses, shuttle services, rental cars, taxis, and paratransit vehicles. In general, growth of this category of commercial vehicles tends to depend on the growth of population and employment in a metropolitan area.

The **movement of goods** category includes mail delivery, trash collection, warehouse delivery, parcel pickup and delivery, and construction vehicles. In recent years, much attention has been paid to this category of commercial vehicle trips. In metropolitan areas, goods movement trips, similar to longer-haul freight movements, are becoming a larger share of the total on-road vehicle load.

Finally the **services** category includes household/building services such as plumbers and cleaning services as well as public safety, utility maintenance, and retail support functions. Due to the shift in the United States from a manufacturing-oriented economy to a service-oriented economy, the number of service-related commercial vehicle trips is growing faster than the number of trips for other purposes.

The objective is to account for all three categories of commercial vehicles. Many vehicles registered as commercial vehicles can be defined as commercial vehicles based on the above definitions, but other vehicles falling into these categories are registered as private vehicles. For example, a realtor may register his automobile as a private vehicle but often use it for business purposes. On the other hand, many vehicles are registered as commercial but also are used for personal non-commercial purposes. Any vehicle used for commercial purposes is considered in this study as a commercial vehicle, regardless of how it is registered. It should be noted that vehicle registration rules and practices with respect to commercial vehicles differ by state, further complicating the separate identification of commercial vehicle usage patterns.

Vehicle Registration Definition

The contents of vehicle registration databases vary from state to state as well as by the department collecting the data. State departments of revenue collect vehicle registration data for tax purposes. These databases typically include data related to how the vehicle is taxed and how registration fees are determined, e.g., vehicle age, engine displacement and/or weight class, as well as transaction data. State departments of motor vehicles (DMV) collect vehicle data for safety and/or registration purposes. These databases tend to include more activity information, such as odometer readings, violations, and county of residence. Vehicle data also may be collected at the county or municipality level and consolidated at the state level by a state public service agency. Even within a state, county/municipality data records typically are not uniform.

Vehicle classification counts and commercial vehicle surveys often are used to develop the fleet mix information that is required to carry out air quality analyses. Two additional databases, vehicle registration and emissions inspection and maintenance (I/M) program databases, also contain vehicle information and, on occasion, are used to develop information on the magnitude of commercial vehicle travel.

Freight Analysis Framework/Highway Performance Monitoring System Definition

The Freight Analysis Framework (FAF) is a policy and systems methodology developed by the Federal Highway Administration (FHWA) to estimate freight flows on the nation's highways and other transportation infrastructure. This analysis tool seeks to aid in understanding the geographic relationships between local flows and the nation's overall transportation system. As part of the methodology, information has been developed on truck flows carrying intercity freight, as well as truck volumes that serve purposes other than carrying intercity freight.

The total truck volumes currently used in the FAF are primarily from the Highway Performance Monitoring System (HPMS). The HPMS is a national-level highway information system maintained by FHWA that includes data on the extent, condition, performance, use, and operating characteristics of the nation's highways. The HPMS contains administrative and system information on all public roads, some physical characteristics of arterial and collector functional systems and more detailed characteristics on a sample of different facility types. The sampled data is developed so that it may be expanded to represent all public roads. The FAF provides detail on freight trucks and on non-freight trucks using the FHWA vehicle classification count determination. The total truck volumes used in the FAF can only be compared to commercial vehicles in this study once they have been converted into various vehicles types (autos, buses, trucks, etc.).

Commercial Vehicle Survey Definition

Commercial vehicle survey data was received and processed for the Atlanta, Denver, Detroit and Greensboro/High Point/Winston-Salem metropolitan areas. Each survey was conducted independently, mainly for the purposes of refining or developing a "truck" model (as opposed to a "commercial vehicle" model). The definition of "truck" varies among these surveys. As discussed above, commercial vehicle trips constitute a much broader category of total metropolitan area travel than truck trips.

Each survey was generally performed in two steps. In the first step, a random sample of firms was contacted to participate in the survey and to report information about all of their commercial vehicles. The list of firms from which the sample was generated typically represented all firms known to operate commercial vehicles (usually trucks). In the second step of the survey, the drivers of

participant vehicles were given a travel log and instructions on how to record all trips taken during the survey day.

It is important to note that in some surveys, certain types of vehicle were excluded. For example, the Denver commercial vehicle survey excluded auto and truck rental businesses, as well as police, fire, taxi, and U.S. Postal Service operations.

2.2 CATEGORIES

Categories for This Study

In the literature review,[1] commercial vehicles were grouped into 13 categories, according to the type of service (fixed-route, demand-responsive, or other) and by the type of load (people, goods, services, or other). The literature review was performed for each of these categories separately and summarized.

In this task, while collecting and analyzing data from different sources, we reevaluated these 13 categories and made several changes. It was realized that category 6, "Package and Mail Delivery," and category 8, "Product and Package Delivery," are similar in characteristics and trip patterns. These two categories were combined into one category, "Package, Product, and Mail Delivery." It also was evident from the California DMV data that Federal, state, city, and local government vehicles comprise a significant number of commercial vehicles and that these vehicles should be in a separate category. This category is named as the "Public Service" category. In addition, "garbage trucks, meter readers, maintenance vehicles" and "electricians, plumbers" include similar types of vehicles, and their trip patterns also are similar. Thus, we combined these two categories into a new category named "Utility Vehicles." The "Public Safety" category also is renamed as "Safety Vehicles," since this category includes both public and private vehicles. Finally we introduced a new category called "Business and Personal Services," which includes the previous "Outside Sales" vehicles.

To summarize, two pairs of original categories were combined into single categories while one new category was created, resulting in a total of 12 categories. The original and new categories are shown in Table 2.1.

[1] Accounting for Commercial Vehicles in Urban Transportation Models, Task 2, Literature Review, prepared for FHWA by Cambridge Systematics. January 2003. http://tmip.fhwa.dot.gov/clearninghouse/docs/accounting/.

Table 2.1 Old and New Categories

Categories in Literature Review Task	Categories in Magnitude and Distribution Task
1. School Bus	1. School Bus (Same as previous #1)
2. Fixed Shuttle Services at Airports, Stations, etc.	2. Fixed Shuttle Services at Airports, Stations, etc. (Same as previous #2)
3. Private Transportation: Taxi, Limos, Shuttles	3. Private Transportation: Taxi, Limos, Shuttles (Same as previous #3)
4. Paratransit: Social Services, Church Buses	4. Paratransit: Social Services, Church Buses (Same as previous #4)
5. Rental Cars	5. Rental Cars (Same as previous #5)
6. *Package and Mail Delivery; USPS, UPS, FedEx*	6. *Package, Product, and Mail Delivery (USPS, UPS, FedEx, etc.). (Combined #s 6 and 8)*
7. Urban Freight Distribution, Warehouse Deliveries	7. Urban Freight Distribution, Warehouse Deliveries (Same as previous #7)
8. *Product and Package Deliveries*	8. Construction Transport (Same as previous #9)
9. Construction Transport	9. Safety Vehicles: Police, Fire, Building Inspections, Tow Trucks (Same as previous #11)
10. *Public Utilities: Trash, Meter Readers, Maintenance*	10. *Utility Vehicles: Trash, Meter Readers, Maintenance, Plumbers, Electricians (combined #s 10 and 12)*
11. Public Safety: Police, Fire, Building Inspections, Tow Trucks	11. *Public Service: Federal, State, City, Local Government (new category)*
12. *Trades and Services: Plumbers, Electricians, etc.*	12. *Business* and *Personal Services: Personal transportation, Realtors, Door-to-Door Sales*
13. *Outside Sales: Realtors, Door-to-Door Sales, Public Relations*	

Source: Cambridge Systematics, Inc.

Other Categorizations

Various other sources of commercial vehicle information use different categorization schemes. These are summarized below.

Vehicle Inventory and Use Survey Categories

The Vehicle Inventory and Use Survey (VIUS) provides data on the physical and operational characteristics of the nation's truck population. This survey is conducted every five years as part of the economic census. Title 13 of the United States Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every five years, in years ending in 2 and 7.

VIUS data can be extracted by body type, products carried, and major use. The body type is defined as the type of body that is permanently attached to the power unit. The body type in the VIUS was cross tabulated with the "product carried" and "major use" categories in the VIUS database. Based on the results of this cross tabulation, each "product carried" category and "major use" category was assigned to the 12 categories given in Table 2.1. Table 2.2 shows the matching of the body type to the 12 categories that correspond to the "products carried" and "major use" categories in the VIUS. When the categorization based on "product carried" and "major use" categories conflicted, the "major use" category was selected for use in this study.

Table 2.2 VIUS Body Type by 12 Categories

Body Type	Products Carried	Major Use
Auto Transport	Urban Freight	Urban Freight
Basic Enclosed Van	Urban Freight	Urban Freight
Basic Platform	Construction	Construction
Beverage	Urban Freight	Urban Freight
Concrete Mixer	Construction	Construction
Drop-frame Van	Urban Freight	Business and Personal
Dump Truck	Construction	Construction
Garbage Hauler	Utilities	Utilities
Grain Body	Urban Freight	Urban Freight
Insulated Non-refrigerated Van	Urban Freight	Urban Freight
Insulated Refrigerated Van	Urban Freight	Urban Freight
Livestock Truck	Urban Freight	Urban Freight
Low Boy or Depressed Center	Urban Freight	Construction
Minivan	Business and Personal	Business and Personal
Multi-stop or Step Van	Urban Freight	Business And Personal
Oilfield Truck	Trades And Services	Trades And Services
Open-top Van	Urban Freight	Urban Freight
Other	Urban Freight	Urban Freight
Panel or Van	Business and Personal	Business and Personal
Pickup	Business and Personal Services	Business and Personal Services
Platform with Added Devices	Construction	Construction
Pole or Logging	Urban Freight	Urban Freight
Public Utility	Trades and Services	Utilities
Service Truck	Trades and Services	Trades and Services
Sport Utility	Business and Personal	Business and Personal

Table 2.2 VIUS Body Type by 12 Categories (continued)

Body Type	Products Carried	Major Use
Station Wagon	Business and Personal	Business and Personal
Tank Truck (Dry Bulk)	Urban Freight	Urban Freight
Tank Truck (Liquids or Gases)[2]	Urban Freight/Utilities	Urban Freight/Utilities
Winch or Crane	Construction	Construction
Wrecker3	Safety	Safety
Yard Tractor	Urban Freight	Urban Freight

Source: Cambridge Systematics, Inc.

In addition, the following vehicle sizes also are available. The vehicle size is determined by the average weight (defined as empty weight of the vehicle plus the average weight of the load carried):

- **Light –** Average weight is 10,000 pounds or less;
- **Medium –** Average weight between 10,001 pounds and 19,500 pounds;
- **Light-Heavy –** Average weight between 19,501 pounds and 26,000 pounds; and
- **Heavy-Heavy –** Average weight greater than 26,000 pounds.

Vehicle Registration Categories

State registration databases often, but not always, identify whether or not the vehicle is used for commercial purposes. Data typically are available on vehicle weight classes, but not service use. Many states' data do not include odometer readings. Some state databases could be used to infer the type of service use (as was done in California by the California Energy Commission), based on vehicle make/model, weight class, owner, and possibly other data. However, this requires a considerable amount of data processing and may need to be done by the agency owning the data due to privacy concerns associated with releasing detailed data on ownership. For example, the California Energy Commission reportedly has been working in cooperation with other California state agencies for more than five years in cleaning, organizing, and analyzing their state vehicle data. They categorized vehicles into two main groups:

1. Light Vehicles; and
2. Medium and Heavy Vehicles.

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[2] Classified as Utilities if carrying Industrial 'waste' water or Hazardous waste (EPA manifest) and as Urban Freight otherwise.

[3] For motor vehicle towing or lifting.

The light duty vehicles are categorized by body type and use categories, as shown in Table 2.3. Medium and heavy duty vehicles are categorized by body type only, as shown in Table 2.4.

Table 2.3 Light Duty Categories in California DMV Database

Body Type Categories	Use Categories
• Car Mini	• Personal
• Car Subcompact	• Other Commercial
• Car Compact	• Daily Rental
• Car Midsize	• Govt. – City
• Car Large	• Govt. – County
• Car Sport	• Govt. – State
• Pickup Compact	• Govt. – Federal
• Pickup Std	• Govt. – District – School
• Pickup 8,501 – 10,000	• Govt. – District – College
• Van Compact	• Govt. – District – Transit
• Van Standard	• Govt. – District – Fire
• Van 8,501 – 10,000	• Govt. – District – Police
• Sport/Utility Compact	• Govt. – District – Utility
• Sport/Utility Standard	• Govt. – District – Water/Irrigation
• Sport/Utility Mini	• Govt. – District – Other

Source: California Department of Motor Vehicles registration data processed by the California Energy Commission.

Table 2.4 Medium and Heavy Duty Categories in California DMV Database

Body Type Categories	Body Type Categories	Body Type Categories
• Ambulance	• Dump	• Refrigerated
• Armored Truck	• Fire Truck	• Stake Or Rack
• Auto Carrier	• Flat Bed/Platform	• Step Van
• Beverage	• Forward Control	• Tandem
• Boom	• Garbage	• Tank
• Bus	• Gliders	• Tilt Cab
• Cargo Cutaway	• Incomplete Chassis	• Tilt Tandem
• Chassis and Cab	• Logger	• Tow Truck Wrecker
• Concrete Mixer	• Motorized Cutaway	• Tractor Truck Diesel
• Conventional Cab	• Multiple Bodies	• Tractor Truck Gas
• Crane	• Panel	• Unknown
• Cutaway	• Parcel Delivery	• Utility
• Dromedary	• Pickup	• Van

Source: California Department of Motor Vehicles registration data processed by the California Energy Commission.

Freight Analysis Framework/Highway Performance Monitoring System Categories

Vehicle classification counts are required to support the truck percentages submitted as part of the HPMS. The HPMS truck percentages, as applied to the HPMS Average Annualized Daily Traffic (AADT) information, provide the values for the Average Annualized Truck Traffic (AADTT) volumes used for 23 states in the FAF.[4] For the remaining states the FAF uses the state's traffic count database, which is more expansive than the required HPMS data, and the HPMS LRSKEY (Linear Referencing System Key) to directly map truck volumes collected as part of a vehicle classification program to the FAF network. The FAF also includes the development of an "intercity" freight truck trip table. This table was assigned to the FAF network. The resulting FAF truck volumes were subtracted from the AADTT total truck counts to produce "Non-freight" truck volumes for links on the FAF network.

The definition of trucks, as used in traffic counting programs in support of pavement design, the HPMS, and the FAF, excludes four-tire, two-axle vehicles, including pickup trucks, panel trucks and vans, ambulances and many other vehicles that are commonly considered as commercial vehicles. It also excludes all passenger cars. A significant number of commercial vehicles are passenger cars or four-tire trucks. The vehicle classification counts, and the datasets derived from these vehicle counts, can provide information about the larger commercial vehicles, but can provide no information on four-tire commercial vehicles.

Commercial Vehicle Survey Categories

Commercial vehicle categories varied among the surveys examined as part of this project. Generally, vehicles were categorized as "light duty," "medium duty," or "heavy duty." In some cases, the "light duty" category was further subdivided into autos and pickups. The survey data typically contained some information on the body type of the vehicle and in some cases including the make and year of the vehicle.

Data gathered in the surveys from the vehicle trip logs generally gave a better insight to the commercial vehicle type than the data gathered about the vehicle itself. For example that a vehicle is known to be a minivan does not provide enough information to categorize it into one of the commercial vehicle type categories, but knowing that the vehicle's cargo was "tools" and that the purpose of the trip was "service call" and the destination of the trip was "residential" indicates that the vehicle should be categorized as a utility vehicle.

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[4] Battelle, Freight Analysis Framework Highway Capacity Analysis: Draft Methodology Report, U.S. Department of Transportation, Office of Freight Management and Operations, Washington, D.C., April 18, 2002, Table 4.1.

While each survey is unique, there is commonality among them, with each survey asking the type of cargo the vehicle was transporting (Cargo), the land use of the destination of the trip (Land Use), and the purpose of the trip (Purpose). It is from these three primary questions that each trip was categorized into one of the commercial vehicle groups. In some cases, additional survey data could be used to determine the vehicle category.

3.0 Data Sources

This section describes the data sources evaluated to provide information on the spatial and temporal distribution of commercial vehicles in urban areas. There are five general types of data reviewed for this study: commercial vehicle surveys, vehicle registration data, vehicle count data, category-specific data sources, and data from individual contacts.

3.1 COMMERCIAL VEHICLE SURVEYS

Vehicle Inventory and Use Survey

The 1997 Vehicle Inventory and Use Survey (VIUS) is a probability sample of private and commercial trucks registered (or licensed) in the United States as of July 1, 1997. This survey excludes vehicles owned by Federal, state, or local governments; ambulances; buses; motor homes; farm tractors; unpowered trailer units; and trucks reported to have been sold, junked, or wrecked by the respondents prior to July 1, 1996. A sample of about 131,000 trucks was surveyed to measure the characteristics of nearly 75 million trucks registered in the United States.

Many states allow pickups, small vans, and sport utility vehicles to be registered as either cars or commercial vehicles. Therefore, during the development of the VIUS sampling frame, passenger car registration files were searched and appropriate vehicles were included. Some vehicles, such as "off-highway" trucks used exclusively on private property, do not have to be registered. These vehicles were not included in the sampling frame.

The following information is available from VIUS for each vehicle:

- Number of miles driven during 1997;
- Number of miles driven since the vehicle was manufactured;
- Weighted annual miles;
- How the vehicle was most often operated (business use, personal transportation, for-hire, daily rental, or mixed);
- If usage is mixed, the percentages of mixed use, business use, and personal use; and
- The principal product carried by the vehicle.

Table 3.1 shows the number of vehicles in the VIUS database by body type and vehicle size. Table 3.2 gives the number of vehicles located within metropolitan statistical areas (MSA) in the eight states considered for this study.

Table 3.1 Number of Vehicles by Body Type and Vehicle Size

	Number of Vehicles by Vehicle Size				
Body Type	**Total**	**Light**	**Medium**	**Light-Heavy**	**Heavy-Heavy**
Pickup	36,191,818	36,009,449	182,369	-	-
Panel or Van	5,572,678	5,547,280	25,396	2	-
Multi-stop or Step Van	560,420	313,216	222,705	19,372	5,128
Platform with Added Devices	308,176	58,156	84,959	67,953	97,109
Low Boy or Depressed Center	111,054	4,401	6,329	8,892	91,432
Basic Platform	1,176,066	409,246	290,540	154,914	321,365
Livestock Truck	39,069	3,661	11,153	5,725	18,530
Insulated Non-refrigerated Van	34,520	2,079	2,199	3,698	26,544
Insulated Refrigerated Van	233,977	8,613	23,807	19,070	182,487
Drop-frame Van	54,858	3,834	8,586	8,996	33,442
Open-top Van	20,781	1,527	1,690	1,580	15,984
Basic Enclosed Van	1,008,959	98,205	134,562	135,173	641,019
Beverage	70,233	2,403	8,017	15,284	44,529
Public Utility	151,950	44,441	43,599	31,434	32,475
Winch or Crane	55,017	6,157	12,167	9,209	27,485
Wrecker	111,899	38,925	56,898	9,005	7,071
Pole or Logging	55,705	1,312	2,625	5,713	46,055
Auto Transport	20,103	2,182	4,779	924	12,218
Service Truck	168,620	97,658	51,926	12,062	6,973
Yard Tractor	10,798	478	2,384	505	7,431
Sport Utility	13,762,470	13,739,880	22,591	-	-
Station Wagon	1,770,676	1,765,985	4,691	-	-
Minivan	9,837,926	9,828,651	9,275	-	-
Oilfield Truck	26,106	3,453	2,787	3,035	16,831
Grain Body	299,078	13,197	46,231	59,631	180,019
Garbage Hauler	91,633	2,129	8,506	6,921	74,078
Dump Truck	670,821	83,654	129,067	95,876	362,224
Tank Truck (Liquids or Gases)	249,382	6,273	29,320	45,538	168,250
Tank Truck (Dry Bulk)	39,724	649	2,190	4,003	32,882
Concrete Mixer	73,092	201	362	1,963	70,566
Other	22,642	2,616	3,819	2,787	13,421
TOTAL	**72,800,252**	**68,099,912**	**1,435,528**	**729,263**	**2,535,549**

Source: Vehicle Inventory and Use Survey (1997).

Table 3.2 Number of Vehicles within MSAs in Selected States

State	Number of Vehicles
California	8,087,382
Colorado	1,032,943
Florida	2,870,581
Georgia	1,333,548
Michigan	1,980,215
North Carolina	1,124,455
Oregon	816,205
Texas	3,206,313

Source: Vehicle Inventory and Use Survey (1997).

The VIUS data set was modified for use in this project so that average daily vehicle miles traveled (VMT) and average daily VMT per vehicle could be estimated. Vehicles whose home bases were outside MSAs or had more than 50 percent of their miles driven more than 50 miles away from their home bases were excluded. After trimming the dataset, it was decided to exclude observations that listed the following as their major use:

- Daily rental;
- Not in use;
- For hire transportation; and
- One-way rental.

The daily rental categories were excluded because they have been captured separately elsewhere. "For hire transportation" and "not in use" were not included because of the difficulty in categorizing them.

Table 3.3 shows the daily VMT for six categories available in VIUS data. While VIUS data can be reported either for an entire state or for all MSAs in a state, data cannot be reported separately for a specific city or urban area. As a result, VIUS data for the 12 urban areas used in this project (see Table 1.1) cannot be reported separately. However, for this study VMT per vehicle data have been calculated using VIUS data and used with other data for estimating the total VMT by category. Table 3.4 shows daily VMT per vehicle.

Table 3.3 Daily Vehicle Miles Traveled in MSAs by Commercial Vehicle Category

	Business and Personal Services	Construction Transport	Public Safety	Public Utilities	Trades and Services	Urban Freight Distribution
California	191,184,016	5,770,580	331,941	905,218	574,938	2,905,847
Colorado	24,330,116	702,068	49,231	138,096	157,911	397,717
Florida	75,437,337	2,549,107	89,078	640,260	383,978	1,315,266
Georgia	34,710,330	1,196,564	174,992	265,348	99,270	550,991
Michigan	48,700,595	1,608,217	56,396	278,389	44,522	739,032
North Carolina	25,927,200	1,703,922	103,516	191,591	181,445	754,688
Oregon	18,975,350	428,885	27,210	34,656	38,807	364,341
Texas	91,799,636	2,279,053	119,408	296,610	345,972	1,275,083
National	**1,174,389,225**	**41,163,792**	**2,311,391**	**7,377,819**	**4,534,727**	**19,583,562**

Source: Vehicle Inventory and Use Survey (1997).

Table 3.4 Average Daily VMT per Vehicle in MSAs by Commercial Vehicle Category

	Daily VMT/Vehicle by CS Classification					
	Business and Personal Services	Construction Transport	Public Safety	Public Utilities	Trades and Services	Urban Freight Distribution
California	41.3	45.7	52.6	60.0	34.3	74.5
Colorado	38.6	57.2	44.3	56.4	35.3	47.2
Florida	45.9	62.2	49.4	68.6	57.6	66.6
Georgia	43.5	49.2	70.2	64.3	62.6	61.7
Michigan	44.0	44.1	56.3	58.4	42.8	57.3
North Carolina	41.1	51.1	45.4	50.7	83.8	52.6
Oregon	38.3	38.9	68.1	38.9	54.8	63.3
Texas	47.4	62.2	47.0	68.7	84.3	60.3
National	**40.7**	**46.0**	**46.7**	**58.4**	**51.8**	**53.4**

Source: Vehicle Inventory and Use Survey (1997).

VIUS reports annual VMT. The daily VMT was calculated based on the number of days in a year that vehicles in a specific category operate. The number of days used for estimating daily VMT was developed by Cambridge Systematics based on average number of days per year that each category was open for business. These estimates are shown in Table 3.5.

Table 3.5 Number of Days in a Year Used for VMT Calculations

Commercial Vehicle Categories	Number of Days in Year
Urban Freight Distribution, Warehouse Deliveries	306
Construction Transport	260
Public Safety	365
Public Utilities	260
Trades and Services	260
Business and Personal Services	306

Source: Cambridge Systematics, Inc.

Atlanta Area Commercial Vehicle Survey

The Atlanta Area Commercial Vehicle Survey was conducted by NuStats International for the Atlanta Regional Commission (ARC) in the spring of 1996.[5] The primary objective of the survey was to provide insight into truck movements in the Atlanta region. Specifically, the goals of the study were to determine the number of trips per truck and the average truck trip length, and to develop a truck trip table that would provide critical information for the regional travel demand model.

The Atlanta Area Commercial Vehicle survey was conducted in two phases. First a "recruitment interview" was performed to identify suitable businesses that were willing to participate in the survey. Firms were randomly selected from a 1993 commercial vehicle listing from the Georgia Department of Environmental Regulation. Participating businesses were assigned a 24-hour period (the travel day). All trips made using the selected vehicle(s) were recorded for the travel day. If the business maintained detailed vehicle manifest information, the travel data could generally be obtained from the manifest.

The survey sample was expanded based on the fleet size of the survey firm. Table 3.6 lists the vehicle groupings and the expansion factor for each group.

[5] *Atlanta Area Commercial Vehicle Survey*. Draft Final Report. NuStats International, 1996.

Table 3.6 Atlanta Expansion Factors

Fleet Size	Universe	Sample Size	Factors
1	10,808	35	308.8
2	15,560	44	353.6
3-5	19,580	108	181.6
6-10	14,060	208	67.6
11-20	10,950	153	71.6
21-50	12,280	164	74.9
51+	32,840	31	1,059.4
TOTAL	**116,078**	**743**	

Source: Atlanta Area Commercial Vehicle Survey.

Commercial Vehicle Category Groupings

Table 3.7 illustrates how the various commercial vehicle types are defined in the survey. The top portion of the table lists the descending order of precedence in which the vehicle types are defined. For example, if a vehicle meets the criteria to be defined as both Package Delivery and Business and Personal Services, the vehicle is classified as Package Delivery.

Table 3.7 Atlanta Commercial Vehicle Categories

Code	Vehicle Type	Selection
1	School Bus	L = 1 and P = 1 or 2
6	Package Delivery	C = 27 and P = 1 or 2
8	Construct Transport	C = 24 or 37
10	Utilities	C = 36 and L = 4 or P = 3
12	Out Sales	P = 5 or L = 4
7	Urban Freight	P = Any and L = Any and C = 1 or 13 or 20 or 23 or 25 or 28 or 30-42 or 98 or 99

Code	Cargo – C
1	Farm products
13	Crude petro/natural gas
20	Food
23	Apparel
24	Lumber or wood
25	Furniture fixtures
26	Pulp, paper
27	Printed matter
28	Chemicals
30	Rubber/plastic
31	Leather
32	Clay, concrete, glass or stone
33	Primary metal products
34	Fabricated metal
35	Machinery
36	Electrical
37	Transport equipment
38	Instrument: cameras/optical, watches
39	Miscellaneous manufacturing products
40	Waste, scrap
41	Miscellaneous freight
42	Containers
98	Miscellaneous
99	Empty

Code	Purpose – P
1	Delivery
2	Pick-up
3	Maintenance
4	Work-related
5	Driver need
6	Return to base
7	Other
99	Start of day

Code	Land Use – L
1	Educational
2	Industrial
3	Medical
4	Office/government
5	Residential
6	Retail
7	Home base

Summary of Survey Results

The results from the survey are summarized in Table 3.8. These data may differ from those presented in the survey report due differences in the vehicle type groupings. The "urban freight" category is the largest category in this survey (62 percent of the total), and "business and personal services" contains a large percentage as well (23 percent of the total). The longest average trip length is for urban freight vehicles, and the shortest average trip length is for school buses.

Table 3.8 Atlanta Expanded Survey Data

Vehicle Type	Vehicles	Average Daily Trips	Total Daily Vehicle Miles Traveled	Trips per Vehicle	Average Daily Miles Traveled
School Bus	2,212	2,414	40,177	1.09	18.17
Package/Product/Mail	4,681	12,644	155,215	2.70	33.16
Urban Freight	66,239	280,589	4,901,560	4.24	74.00
Construction Transport	8,267	31,596	481,804	3.82	58.28
Utility Vehicles	1,420	3,835	58,043	2.70	40.88
Business and Personal Services	24,463	44,721	660,730	1.83	27.01
TOTAL	**107,282**	**373,385**	**6,297,528**	**3.48**	**58.70**

Source: Atlanta Area Commercial Vehicle Survey.

Denver Commercial Vehicle Survey

The Denver Regional Council of Governments (DRCOG), in partnership with the Regional Transportation District, the Colorado Department of Transportation, and the Regional Air Quality Council, initiated the Regional Travel Behavior Inventory (TBI) in 1996. The TBI was undertaken to provide a snapshot of travel patterns and characteristics of travelers in the Denver region and to collect the data needed to develop and "freshen" traditional travel models, while providing for the possible development of new modeling techniques. The Denver Commercial Vehicle Survey was one of four surveys conducted as part of TBI.

The Denver survey was designed as a two-stage survey – a business and vehicle survey and a vehicle travel survey. Numerous businesses were surveyed to verify or correct business characteristics listed for the business and to determine the number and types of commercial vehicles garaged at these businesses. The list of businesses included all businesses listed within the Denver area in 1996 (90,558 entries) and was obtained from DRCOG. This first stage of the survey was completed prior to the selection of any vehicles for the second stage.

Commercial vehicles selected for the second stage survey were selected from vehicles listed in the first stage survey based on designated sampling procedures. The sampling procedure allowed a single business to have multiple vehicles included in the travel survey. A travel diary was collected for the selected vehicles.

It is important to note that the Denver commercial vehicle survey specifically excluded auto and truck rental businesses and police, fire, taxi, and U.S. Postal Service operations. These exclusions demonstrate the typical practice of not including certain types of commercial vehicles in regional surveys conducted by transportation planning agencies. Table 3.9 shows the excluded business and vehicle types.

Table 3.9 Denver Survey Excluded Businesses and Vehicle Types

Excluded Businesses	Excluded Vehicle Types
• Auto and Truck Rental	• Rental Cars
• Police and Fire Departments	• Safety Vehicles
• Taxi	• Private Transportation
• U.S. Postal Service	• Package, Product and Mail Delivery

Commercial Vehicle Category Groupings

Table 3.10 illustrates how the various commercial vehicle type are defined in the survey. The top portion of the table lists the descending order of precedence in which the vehicle types are defined. For example, it a vehicle meets the criteria to be defined as both Package Delivery and Business and Personal Services, the vehicle is classified as Package Delivery.

Table 3.10 Denver Commercial Vehicle Categories

Code	Vehicle Type	Selection
6	Package Delivery	C = 6 and P = 1
2	Shuttle Services	P = 3
10	Utilities	P = 2
8	Construct Transport	L = 3 or 5
12	Out Sales	P = 4 or 5 or L = 14
7	Urban Freight	C = Any and L = Any and P = 1 or 7 or 8 or 9

Code	Cargo – C
1	Clay
2	Farm
3	Food
4	Fuel
5	Machine
6	Mail
7	Other
8	Textiles
9	Waste

Code	Purpose – P
1	Pick-up/deliver a load
2	Fuel/service vehicle
3	Drop-off/pick-up people
4	Service call
5	Business meeting
6	Personal business
7	Return to base
8	Other
9	Return home/end day

Code	Land Use – L
0	Residential
1	Agriculture
2	Mining
3	Construction
4	Manufacturing
5	Trans/comm
6	Wholesale
7	Retail
10	Public building
11	Unknown
12	Open space
13	Other
14	Services

Summary of Survey Results

The results from the survey are summarized in Table 3.11. These data may differ from those presented in the survey report due differences in the vehicle type groupings. The urban freight category is the largest category in this survey (45 percent of the total), and business and personal services comprise a large percentage as well (30 percent of the total). The longest average trip length is for urban freight vehicles, and the shortest average trip length is for package, product, and mail delivery.

Table 3.11 Denver Expanded Survey Data

Vehicle Type	Vehicles	Average Daily Trips	Total Daily Vehicle Miles Traveled	Trips per Vehicle	Average Daily Miles Traveled
Shuttle Service	2,204	8,098	47,819	3.67	21.70
Package/Product/Mail	5,907	12,095	57,014	2.05	9.65
Urban Freight	29,614	103,944	1,915,760	3.51	64.69
Construction/Transport	8,411	18,521	257,192	2.20	30.58
Utility Vehicles	4,935	5,038	52,881	1.02	10.72
Business and Personal Services	12,485	25,310	969,020	2.03	77.62
TOTAL	**63,556**	**173,005**	**3,299,686**	**2.72**	**51.92**

Source: Denver Commercial Vehicle Survey.

Detroit Commercial Vehicle Survey

The Southeast Michigan Council of Governments (SEMCOG) Commercial Vehicle Survey (CVS) collected detailed information on truck travel within the seven-county area of Southeast Michigan, for use in SEMCOG's Regional Travel Forecast Model. The information also will assist with other intermodal and freight planning activities. The universe for the commercial vehicles is from a data file from the Michigan Secretary of State containing the universe of commercial vehicles registered within the region. A supplemental business survey was conducted to determine the proportion of businesses located within the region that have commercial vehicles, registered at locations outside the region, but which operate within the region for business purposes on a regular basis. These trucks would not have been included in the main survey because the CVS sampling frame was limited to vehicles registered to locations within the region.

Businesses with vehicles operating in the Detroit region were contacted randomly for participation in the activity log portion of the survey. For participating businesses, a travel day was assigned and a trip diary was mailed.

Commercial Vehicle Category Groupings

Table 3.12 illustrates how the various commercial vehicle type are defined in the survey. The top portion of the table lists the descending order of precedence in which the vehicle types are defined. For example, it a vehicle meets the criteria to be defined as both Package Delivery and Business and Personal Services, the vehicle is classified as Package Delivery. The Detroit survey uses an Industry code on the destination end of the trip to define the vehicle type in addition to the cargo, purpose and land use.

Table 3.12 Detroit Commercial Vehicle Categories

Code	Vehicle Type	Selection
1	School Bus	L = 6
6	Package Delivery	C = 1
9	Safety Vehicles	P = 3 or 4
8	Construct Transport	L = 11 or I = 2 and C = 8 or 18
10	Utilities	I = 6 and C = 10
12	Business and Personal	I = 12 or 13 or 18
7	Urban Freight	C = Any and L = Any and P = 1 or 7 or 8 or 9

Code	Cargo – C
1	Mail/small parcels/packages
2	Food/produce/farm products
3	Machinery/appliances
4	Minerals, ore, coal
5	Chemicals, petroleum
6	Metals and metal products
7	Textiles and apparel
8	Lumber, wood products, other building materials
9	Vehicles/vehicle parts
10	Tools, other materials
11	Other consumer goods
12	Furniture
13	Plants/flowers/trees
14	Equipment
15	Janitorial supplies
16	Hay/straw/grass
17	Debris/trash
18	Sand/gravel
19	Containers/boxes
20	Electrical supplies
21	Glass/windshields

Code	Purpose – P
1	Hauling heavy material
2	Delivery/pick-up/running errands
3	Plowing/snow removal
4	Towing/road service
5	Construction/job surveyors
6	Farming
7	Sales/service/maintenance work
8	Landscaping
9	Transports people/transportation
10	Hauling light material
11	Auto transport
12	Business/contract jobs
13	Catering
14	Fuel oil/propane/gas
15	Drilling water wells
16	Support vehicle
17	Installation
18	Hauling waste material
19	Everything
20	All other miscellaneous responses
21	None/nothing
22	Don't know
23	Refused/No response

Table 3.12 Detroit Commercial Vehicle Categories (continued)

Code	Land Use – L
1	Home base
2	Transportation/utilities
3	Industrial
4	Commercial
5	Offices, including government offices
6	School
7	Other institutional
8	Medical facility
9	Residential
10	Farm/orchard
11	Construction site/job site

Code	Industry – I
1	Agriculture, forestry, mining
2	Construction
3	Manufacturing
4	Transportation
5	Communications
6	Utilities
7	Wholesale trade
8	Eating and drinking places
9	Other retail trade
10	Finance, insurance and real estate
11	Hotels, motels

Summary of Survey Results

The results from the survey are summarized in Table 3.13. These data may differ from those presented in the survey report due differences in the vehicle type groupings. The urban freight category is the largest category in this survey (52 percent of the total); construction transport contains a large percent as well (22 percent of the total). The longest average trip length is for package/product and mail delivery, which is unique to Detroit since the other surveys have shorter than average trip lengths for this category. The shortest average trip length is for school buses, which is consistent with the other surveys.

Table 3.13 Detroit Expanded Survey Data

Vehicle Type	Vehicles	Average Daily Trips	Total Daily Vehicle Miles Traveled	Trips per Vehicle	Average Daily Miles Traveled
School Bus	6,467	10,345	87,189	1.60	13.48
Package/Product/Mail	5,322	38,211	456,477	7.18	85.77
Urban Freight	41,338	215,984	2,074,750	5.22	50.19
Construction Transport	5,501	22,118	279,301	4.02	50.78
Safety Vehicles	3,492	19,606	127,247	5.62	36.44
Utility Vehicles	1,380	3,301	32,094	2.39	23.26
Business and Personal Services	15,740	78,748	790,250	5.00	50.21
TOTAL	**79,239**	**388,314**	**3,847,307**	**4.90**	**48.55**

Source: Detroit Commercial Vehicle Survey.

Piedmont-Triad Commercial Vehicle Survey

The Piedmont-Triad Commercial Vehicle Survey was conducted to estimate truck trips and trips made by commercial cars in the Triad region (Greensboro, High Point, and Winston-Salem) of North Carolina.

A database of employers in the Triad region, including the number of employees and whether or not commercial vehicles are garaged at the employment location, was used as the universe of sampling commercial vehicles in the region. Eligible vehicles were those having a commercial license and being garaged at a non-residential location overnight. The definition of eligible vehicles eliminates company cars that are driven home by employees and effectively eliminates a large share of vehicles that may otherwise have been placed into the personal services commercial vehicle category. Also missing from the survey are non-commercially licensed vehicles that are used for commercial purposes.

Commercial Vehicle Category Groupings

Table 3.14 illustrates how the various commercial vehicle types are defined in the survey. The top portion of the table lists the descending order of precedence in which the vehicle types are defined. For example, if a vehicle meets the criteria to be defined as both Package Delivery and Utilities, the vehicle is classified as Package Delivery. The Piedmont-Triad survey uses a vehicle type field from the survey, in addition to the cargo, purpose and land use fields.

Table 3.14 Piedmont-Triad Commercial Vehicle Categories

Code	Vehicle Type	Selection
6	Package Delivery	C = 4
3	Private transport	V = 3 and Vehicle occupancy greater than 1
10	Utilities	L = 7
7	Urban Freight	C = Any and L = Any and P = 1 or 2 or 6 or 12 or 13 or 14 or 23 or 61 or 62 or 612

Code	Cargo – C
1	Empty
2	Food or kindred product
3	Tobacco, textile, apparel
4	Mail or express traffic/small package freight/printer matter
5	Clay, concrete, glass, or stone products/ furniture/fabricated metal products/ lumber, pulp, paper or allied products
7	Petroleum, natural gas, metallic ores, coal
8	Farm, forest, or marine products
9	Machinery transportation equipment or supplies
10	Waste or scrap material, hazardous material
11	FAK (Freight of all kinds)
12	Other

Code	Purpose – P
1	Pick-up load
2	Drop-off label
3	Fuel/service unit
4	Other business
5	Personal business
6	Return to base
7	Other
12	1 and 2
13	1 and 3
14	1 and 4
23	2 and 3
25	2 and 5
34	3 and 4
47	4 and 7
57	5 and 7
61	6 and 1
62	6 and 2
612	6 and 1 and 2
998	Vehicle not used
999	Unknown

Code	Land Use – L
1	Office building commercial
2	Retail/restaurants/gas station
3	Warehouse/ manufacturing/ wholesale
4	Residential
6	Port/transportation hub
7	Utilities
8	Construction/gravel/ land
9	Other
98	Vehicle not used
99	Unknown

Code	Vehicle Type – V
1	Car
2	Delivery van
3	Passenger van
4	Unknown type of vehicle
5	Single unit pick-up

Table 3.14 Piedmont-Triad Commercial Vehicle Categories (continued)

Code	Cargo – C
98	Not applicable, not truck, or vehicle not used
99	Unknown

Code	Purpose – P

Code	Vehicle Type – V
6	Combine pick-up
7	Unknown type of van
8	Single-unit big truck
9	Combine big truck
10	Unknown type of big truck
99	Unknown type

Summary of Survey Results

The results from the survey are summarized in Table 3.15. These data may differ from those presented in the survey report due differences in the vehicle type groupings. The urban freight category is the majority category in this survey (82 percent of the total). The longest average trip length also is for urban freight, which is consistent with the other surveys. All other categories are well below the overall average trip length, which is dominated by the longer trips in the urban freight category.

Table 3.15 Triad Expanded Survey Data

Vehicle Type	Vehicles	Average Daily Trips	Total Daily Vehicle Miles Traveled	Trips per Vehicle	Average Daily Miles Traveled
Private Transportation	182	542	4,954	2.97	27.19
Package/Mail	920	3,554	25,236	3.86	27.43
Urban Freight	7,836	37,410	438,549	4.77	55.96
Construction/Transport	839	2,760	31,318	3.29	37.32
Utilities	220	394	3,181	1.79	14.47
TOTAL	**9,998**	**44,660**	**503,239**	**4.47**	**50.34**

Source: Piedmont-Triad Commercial Vehicle Survey.

3.2 VEHICLE REGISTRATION

Eight persons were contacted who have either conducted or been responsible for research on vehicle emissions and are familiar with the experience of using state vehicle registration and/or inspection/maintenance (I/M) program data, to determine the degree to which these databases have been useful for identifying commercial vehicle activity patterns. The following people were contacted:

- Professor Randy Guensler, Georgia Institute of Technology;
- Professor Michael Rodgers, Georgia Institute of Technology;
- Professor Matthew Barth, University of California at Riverside;
- Dr. Herb Weinblatt, Cambridge Systematics (worked with West Virginia University on a NCHRP heavy-duty vehicle emissions research project);
- Ms. Coralie Cooper, Northeast States for Coordinated Air Use Management;
- Ms. Megan Beardsley, U.S. Environmental Protection Agency;
- Professor Arun Chatterjee, University of Tennessee; and
- Mr. Chris Saricks, Argonne National Laboratory.

Overall, most people conducting research into emissions modeling have been interested in activity data by vehicle weight class and fuel type, since these are the characteristics by which EPA regulates emissions and which therefore correspond most closely to emission levels. They typically have used national-level sources such as VIUS and data from R.L. Polk & Co. (described below), since they are not as concerned about area-specific fleet distributions or activity data. For example, EPA has used Polk databases to examine the number of vehicles registered and VMT per vehicle for different vehicle weight classes. VIUS also has been used as a source of VMT per vehicle for heavy-duty vehicles by various researchers.

State Motor Vehicle Departments

State environmental agencies often have experience working with state registration data for the purpose of developing vehicle age distributions for the MOBILE emissions model. Prof. Rodgers has examined vehicle databases in 12 to 14 different states and found that there are basically three different organizational approaches for collecting vehicle registration data.

First, the state Departments of Revenue may collect vehicle registration data for tax purposes, with a focus on related data (e.g., vehicle age, engine displacement, weight class). Second, the state Departments of Motor Vehicles may collect vehicle data for safety and/or registration purposes, including odometer readings, violations, and county of residence. Third, vehicle data may be collected at the county or municipality level, and consolidated at the state level by a state public service agency. County/municipality data records typically are not uniform.

At best, state registration databases contain only basic data related to the use of the vehicle (e.g., commercial versus non-commercial, or whether the vehicle is part of a public fleet). Other use information could be inferred by looking at the owner of the vehicle in conjunction with vehicle characteristics, but this level of analysis would require significant effort as well as access to confidential data. As a result, state registration databases were found to have little value for determining the numbers or usage of commercial vehicles by service use.

Many states maintain separate databases for permanent public tag vehicles. State and/or local agencies also are likely to maintain registration data for licensed services such as taxicabs, limos, and shuttle services available through state or local agencies. These databases provide total numbers of vehicles, although they may not provide miles traveled.

California Energy Commission

Vehicle registration databases that are maintained by a state, as evidenced by the experience in California, have the potential to yield useful information on the number of commercial vehicles existing within a particular geographic area. Experience has shown, though that it is time consuming, costly, and difficult to use these vehicle registration databases for reasons other than those for which they originally were developed. Consequently, the only example of a vehicle registration database that has been successfully used to produce information on commercial vehicle travel that was able to be identified was for California. Nonetheless, it is recommended that other states explore and develop the same kind of multi-year cooperative arrangement that exists in California so that, over time, vehicle registration data can be used to support transportation planning, including, but not limited to, the movement of commercial vehicles.

Processed California Department of Motor Vehicles (DMV) data was obtained from the California Energy Commission and extracted for four urban areas: San Francisco, Los Angeles, San Diego, and Sacramento. Summary data for these cities are shown in Tables 3.16 to 3.19. The California DMV data has a large category of "other commercial" light duty vehicles that we have assigned to the business and personal services category. Since not all of the "other commercial vehicles" are being used for commercial purposes, we factored this category to exclude the business and personal services vehicles used for personal activities, based on the VIUS estimates of the use of these vehicles (24 percent of business and personal service vehicles are used for commercial purposes). Regarding school bus category, medium and heavy vehicles were divided into six groups based on their weights, and group "GVWR 6 Truck" was assumed to be the school bus category. This processing also included associating the average trip length for each commercial vehicle category from the VIUS data with the number of vehicles from the DMV data to calculate the VMT. These VIUS data were estimated for MSAs in California only but were not specific to an individual metropolitan area.

To compare the commercial VMT with the total VMT, the total number of personal vehicles was obtained from the DMV. The average number of daily miles traveled for personal vehicles was calculated from the National Highway Travel Survey (NHTS)[6] for MSAs in California. These data were not available for

[6] http://nhts.ornl.gov/2001/index.shtml.

specific cities, and so the calculation was based on MSAs between one and three million population (for Sacramento and San Diego) and MSAs over three million population (for San Francisco and Los Angeles). The total VMT calculation, therefore, was an estimate based not only on local data within each MSA.

The results of this analysis demonstrate that the commercial vehicle miles traveled are a higher percentage of the total than the number of vehicles, ranging from 10.3 to 15.3 percent of the total VMT compared to a range of 6.7 to 10.6 percent of the total vehicles, as shown in Tables 3.16 to 3.19. This is an expected result based on the longer average miles traveled per day for commercial vehicles.

Table 3.16 DMV California Data Summary for the San Francisco MSA

San Francisco Data	Population: 4,022,000				
Commercial Vehicles Categories	**Number of Commercial Vehicles**	**Average Daily Miles per Vehicle**	**Percentage of Total Vehicles**	**VMT**	**Percent of Total VMT**
Business and Personal Services	152,263	41.3	3.01%	6,288,462	6.97%
Construction Transport	22,561	45.7	0.45%	1,031,038	1.14%
Other	55,520	59.95	1.10%	3,328,424	3.69%
Package, Product and Mail Delivery	470	76.1	0.01%	35,767	0.04%
Public Safety	5,090	52.57	0.10%	267,581	0.30%
Public Service	38,094	30	0.75%	1,142,820	1.27%
Public Utilities, Trades and Services	7,552	59.95	0.15%	452,742	0.50%
Rental Cars	89,805	43.11	1.78%	3,871,494	4.29%
School	1,510	36.2	0.03%	54,662	0.06%
Urban Freight Distribution, Warehouse Deliveries	22,484	74.5	0.44%	1,675,058	1.86%
Total Commercial Vehicles	395,349	44.8	7.82%	18,148,048	20.10%
Personal Vehicles	4,662,006	15.47	92.18%	72,121,952	79.90%
TOTAL	**5,057,355**	**17.85**	**100.00%**	**90,270,000**	**100.00%**

Source: California Department of Motor Vehicle registration data processed by the California Energy Commission for number of vehicles and the Vehicle Inventory and Use Survey for average daily miles traveled of trucks and the National Highway Travel Survey for average daily miles traveled of autos.

Table 3.17 DMV California Data Summary for the Los Angeles MSA

Los Angeles Data	Population: 12,384,000				
Commercial Vehicles Categories	**Number of Commercial Vehicles**	**Average of Daily Miles per Vehicle**	**Percentage of Total Vehicles**	**VMT**	**Percent of Total VMT**
Business and Personal Services	321,445	41.3	3.01%	13,275,679	4.73%
Construction Transport	36,318	45.7	0.34%	1,659,733	0.59%
Other	142,950	59.95	1.34%	8,569,853	3.05%
Package, Product and Mail Delivery	449	76.1	0.00%	34,169	0.01%
Public Safety	11,149	52.57	0.10%	586,103	0.21%
Public Service	83,219	30	0.78%	2,496,570	0.89%

Table 3.17 DMV California Data Summary for the Los Angeles MSA (continued)

Los Angeles Data	Population: 12,384,000				
Commercial Vehicles Categories	**Number of Commercial Vehicles**	**Average of Daily Miles per Vehicle**	**Percentage of Total Vehicles**	**VMT**	**Percent of Total VMT**
Public Utilities, Trades and Services	19,488	59.95	0.18%	1,168,306	0.42%
Rental Cars	88,217	43.11	0.83%	3,803,035	1.35%
School	5,259	36.2	0.05%	190,376	0.07%
Urban Freight Distribution, Warehouse Deliveries	69,617	74.5	0.65%	5,186,467	1.85%
Total Commercial Vehicles	778,111	44.8	7.28%	36,970,288	13.17%
Personal Vehicles	9,910,699	24.60	92.72%	243,821,712	86.83%
TOTAL	**10,688,810**	**26.27**	**100.00%**	**280,792,000**	**100.00%**

Source: California Department of Motor Vehicle registration data processed by the California Energy Commission for number of vehicles and the Vehicle Inventory and Use Survey for average daily miles traveled of trucks and the National Highway Travel Survey for average daily miles traveled of autos.

Table 3.18 DMV California Data Summary for the San Diego MSA

San Diego Data	Population: 2,653,000				
Commercial Vehicles Categories	**Number of Commercial Vehicles**	**Average of Daily Miles per Vehicle**	**Percentage of Total Vehicles**	**VMT**	**Percent of Total VMT**
Business and Personal Services	50,488	41.3	2.55%	2,085,154	3.32%
Construction Transport	6,939	45.7	0.35%	317,112	0.50%
Other	33,059	59.95	1.67%	1,981,887	3.16%
Package, Product and Mail Delivery	41	76.1	0.00%	3,120	0.00%
Public Safety	3,364	52.57	0.17%	176,845	0.28%
Public Service	13,111	30	0.66%	393,330	0.63%
Public Utilities, Trades and Services	2,729	59.95	0.14%	163,604	0.26%
Rental Cars	12,107	43.11	0.61%	521,933	0.83%
School	1,267	36.2	0.06%	45,865	0.07%
Urban Freight Distribution, Warehouse Deliveries	8,510	74.5	0.43%	633,995	1.01%
Total Commercial Vehicles	131,615	44.8	6.65%	6,322,846	10.07%
Personal Vehicles	1,846,179	30.60	93.35%	56,486,154	89.93%
TOTAL	**1,977,794**	**31.76**	**100.00%**	**62,809,000**	**100.00%**

Source: California Department of Motor Vehicle registration data processed by the California Energy Commission for number of vehicles and the Vehicle Inventory and Use Survey for average daily miles traveled of trucks and the National Highway Travel Survey for average daily miles traveled of autos.

Table 3.19 DMV California Data Summary for the Sacramento MSA

Sacramento Data	Population: 1,394,000				
Commercial Vehicles Categories	**Number of Commercial Vehicles**	**Average of Daily Miles per Vehicle**	**Percentage of Total Vehicles**	**VMT**	**Percent of Total VMT**
Business and Personal Services	43,984	41.3	3.07%	1,816,539	6.11%
Construction Transport	8,798	45.7	0.61%	402,069	1.35%
Other	28,525	59.95	1.99%	1,710,074	5.75%
Package, Product and Mail Delivery	42	76.1	0.00%	3,196	0.01%
Public Safety	7,090	52.57	0.49%	372,721	1.25%
Public Service	36,710	30	2.56%	1,101,300	3.71%
Public Utilities, Trades and Services	5,108	59.95	0.36%	306,225	1.03%
Rental Cars	9,913	43.11	0.69%	427,349	1.44%
School	1,011	36.2	0.07%	36,598	0.12%
Urban Freight Distribution, Warehouse Deliveries	10,651	74.5	0.74%	793,500	2.67%
Total Commercial Vehicles	151,832	44.8	10.58%	6,969,571	23.45%
Personal Vehicles	1,282,838	17.74	89.42%	22,754,429	76.55%
TOTAL	**1,434,670**	**20.718**	**100.00%**	**29,724,000**	**100.00%**

Source: California Department of Motor Vehicle registration data processed by the California Energy Commission for number of vehicles and the Vehicle Inventory and Use Survey for average daily miles traveled of trucks and the National Highway Travel Survey for average daily miles traveled of autos.

Inspection and Maintenance Programs

Many states collect data for their I/M programs that include the vehicle identification number (VIN) and odometer reading. A VIN decoder is a computer software program that is used to determine the make and model of the vehicle. Other emissions-related data also are collected, such as chassis, engine, emissions control system, fuel control system, etc. Odometer readings from at least two cycles of I/M inspection can be used to get vehicle activity (miles/year). I/M databases often identify whether the vehicle is commercial and include the gross vehicle weight rating (GVWR).

According to Professor Michael Rodgers and others, the following difficulties have been encountered with the use of I/M data for the purposes of classifying commercial vehicle travel:

1. The make and model of the vehicle do not necessarily indicate its type of use (service). For example, a vehicle may be identified as a "medium-duty GMC chassis" or a "Ford F-350" with a certain type of engine. What is on the back of the chassis, though, is not identified. The Ford F-350 could be used as an ambulance, delivery truck, contractor's vehicle, etc.
2. The I/M database may not be a random sample of vehicles registered in the state. For example, most states do not require public vehicles to be tested. (California is an exception). States often will encourage public fleets to test their vehicles, but the actual extent of participation may vary depending upon

the jurisdiction, department, etc. Thus, an I/M database can be expected to underreport public safety, public utilities, or public transit vehicles. Also, the extent of heavy-duty vehicle testing varies. For example, New Jersey's heavy-duty testing program only tests vehicles over 18,000 pounds GVWR.

3. There can be problems with odometer matching as a result of mileage roll-over. While many people have developed algorithms to deal with this, the algorithms (and data) are not perfect. This typically is a minor problem, but caution in using odometer data is required.

4. VIN decoder software may contain errors for several vehicle classifications. As documented by Prof. Guensler following the analysis of two different datasets, these limitations affect the accuracy of the predicted fleet distribution. The effect of these errors could be a bias towards newer vehicles and, therefore, an underestimation of mobile source emissions.

The Northeast States for Coordinated Air Use Management (NESCAUM) has worked with states in the northeast to implement heavy-duty vehicle emissions inspection programs. States that have done so include Massachusetts, New Jersey, and New York. However, these programs do not collect data related to service use of the vehicle, and not all vehicles are included (for example, the testing of only heavy trucks over 18,000 pounds in New Jersey). While the programs can identify the annual mileage per vehicle from this program, they do not have direct information on the use of the vehicle. A program specialist from New Jersey, however, suggested that service use could be inferred from the heavy-duty inspection program data by cross-tabulating U.S. DOT numbers with either company names or business type from the U.S. DOT census extract.

Massachusetts has a commercial vehicle inspection program that includes vehicles over 10,000 pounds or with a passenger capacity of at least 15. New York State's annual heavy-duty inspection program applies to most vehicles over 8,500 pound GVWR in the New York City metropolitan area. While information such as VIN, make, model year, and odometer reading are collected at the time of the test, the information collected is not useful in identifying the service use of the vehicle. Furthermore, it is primarily stored on paper, with limited (and non-centralized) downloading into electronic databases, and would therefore be nearly impossible to analyze.

In summary, the vehicles contained in state I/M databases reflect the characteristics of that state's underlying vehicle emissions inspection program. They rarely include information on the entire vehicle fleet, often covering only light vehicles and do not include information on how vehicles are being used. Consequently, it is recommended that the use of I/M databases should not be pursued further as a source of information on commercial vehicle travel.

R.L. Polk & Co.

R.L. Polk & Co.[7], a privately held consumer marketing information company, started motor vehicle statistics operations in 1922. Polk maintains comprehensive vehicle databases on both new and used vehicles in various formats, some of which are potentially useful for this study. Polk develops custom-built reports for customers and data are available by ZIP code, Metropolitan Statistical Area (MSA), county, state, or entire USA. However, these data are not free; they must be purchased from Polk.

Table 3.20 shows the data available from Polk. The ways in which the data could be used for our purposes are somewhat limited. Non-fleet vehicles owned by firms, which would presumably be commercial vehicles (although they could be used as well for non-commercial purposes) would be the sum of categories (a)4 through (a)6. Rental vehicles would be category (b)1, and other private commercial fleet vehicles would be the sum of categories (b)2 through (b)5. Government fleet vehicles would be category (b)6. However, it should be noted that information on vehicle type or use is not available from this source.

Cambridge Systematics requested Polk to submit a cost estimate for all vehicle registration data, as shown in Table 3.20, for four states: Georgia, Colorado, Michigan, and North Carolina. It was requested that data be provided at the Census Block level. Polk submitted a cost estimate for these four states amounting to $24,500.

Table 3.20 Registration Type Data Available from Polk

(a) Retail

1. Personal
2. Participating Manufacturer Sponsored Lease – Personal
3. Participating Independent Lease – Personal
4. Number of Vehicles in the Fleet – Firm
5. Participating Manufacturers Sponsored Lease – Firm
6. Participating Independent Lease – Firm
7. Undetermined Manufacturer Sponsored Lease
8. Banks and Financial Institutions

[7] R.L. Polk & Co., 26955 Northwestern Highway, Southfield, MI 48034.

Table 3.20 Registration Type Data Available from Polk (continued)

(b) Fleet

1. Rental/Lease
2. Commercial
3. Participating Manufacturer Sponsored Lease – Fleet
4. Participating Independent Lease – Fleet
5. Independent Lease Fleet
6. Government

(c) Dealer/Manufacturer

3.3 VEHICLE COUNT DATA

Highway Performance Monitoring System

The HPMS data as published in *Highway Statistics* were obtained for all metropolitan areas in the United States and summarized to identify the total VMT for all vehicles. Population and VMT data for 13 metropolitan areas are shown in Table 3.21. These data were intended to be used as an estimate of overall VMT so that commercial VMT could be assessed as a percent of the total and compared across different cities.

Table 3.21 Highway Statistics Estimates of Population and VMT for Selected Cities

	Size	Population (in Thousands)	Daily VMT – All Vehicles (in Thousands)	VMT per Capita
Los Angeles	Large	12,384	280,792	22.7
San Francisco	Large	4,022	90,270	22.4
Detroit	Large	3,836	92,359	24.1
Atlanta	Mid	2,977	100,693	33.8
San Diego	Mid	2,653	62,809	23.7
Houston	Mid	2,487	91,883	36.9
Denver	Mid	1,993	43,996	22.1
Portland	Mid/Small	1,552	31,534	20.3
Sacramento	Mid/Small	1,394	29,724	21.3
Orlando	Mid/Small	1,160	32,288	27.8
Winston-Salem	Small	233	7,396	31.7
Greensboro	Small	223	7,654	34.3
High Point	Small	125	4,578	36.6

Source: Highway Statistics.

While it had been hoped that these data would provide a consistent dataset across all cities, it was discovered that there is some variation in these data across cities because the data are collected by individual states using different methods and assumptions. For example, the Air Resources Board (ARB) in California reports VMT in California cities that are quite a bit higher than for HPMS data in the same cities. These data are based on areas of different populations, but the ARB geographic areas are consistent with MPO and air quality planning areas whereas the HPMS areas are much smaller. The previously reported VMT data estimated from DMV records in California MSAs also are higher than the HPMS data, but they are closer to the ARB estimates. This is again most likely a difference in geographic area assumptions for each metropolitan area. Table 3.22 presents a comparison of these data and a calculation of the VMT per population from each data source for three California cities.

Table 3.22 Vehicle Miles Traveled from Different Data Sources

	Los Angeles	San Francisco	San Diego
HPMS Population (in Thousands)	12,384	4,022	2,653
HPMS VMT (in Thousands)	280,792	90,270	62,809
HPMS VMT per Population	22.7	22.4	23.7
ARB Population (in Thousands)	14,900	6,800	2,950
ARB VMT (in Thousands)	349,000	159,642	80,000
ARB VMT per Population	23.4	23.5	27.1
DMV VMT (in Thousands)	371,179	175,722	64,817
DMV VMT per Population (HPMS)	24.9	25.8	22.0
Percent Differences in VMT per Population (ARB versus HPMS)	3.3%	4.6%	14.5%
Percent Differences in VMT per Population (DMV versus HPMS)	10%	15%	-7%

Source: Highway Pavement Management System (HPMS), California Air Resources Board (ARB), and California Department of Motor Vehicles (DMV).

Freight Analysis Framework

The results of the Freight Analysis Framework (FAF) have been made available as a database file on the FHWA's FAF web site. The database file can be mapped to geographic information system (GIS) shape files of highways in the lower 48 states. The shape files allow the specification of highway links within specific urban areas. The database file includes mileage and functional classification information for each link in the FAF network. Because the links in the FAF database do not include all roadways, the FAF VMT does not represent the full universe of VMT although the FAF does include non-freight trucks.

We used this information to develop FAF freight truck and "non-freight truck" VMT and aggregated VMT by functionally classified roads within urban areas.

Table 3.23 presents the FAF network data summarized for auto passenger cars, freight truck, and non-freight truck vehicles. The freight truck percentage of VMT varies from one to six percent by urban area, and the total truck percentage (including non-freight trucks) ranges from five to 18 percent by urban area.

Table 3.23 Vehicle Miles Traveled by Vehicle Type for Selected Urban Areas

		Percent of Total			
Urban Area	Sum of Total VMT	Auto	Freight Truck	Non-Freight Truck	Total Truck
Atlanta, GA	47,868,419	90.7%	2.3%	7.0%	9.3%
Denver-Aurora, CO	17,443,820	94.1%	0.9%	5.1%	5.9%
Detroit, MI	48,426,905	94.3%	1.4%	4.3%	5.7%
Greensboro, NC	2,618,999	84.5%	3.4%	12.1%	15.5%
High Point, NC	864,998	82.5%	5.8%	11.6%	17.5%
Houston, TX	51,005,297	93.4%	2.2%	4.4%	6.6%
Los Angeles-Long Beach, CA	117,063,502	92.8%	1.9%	5.3%	7.2%
Orlando, FL	7,465,590	94.4%	2.0%	3.6%	5.6%
Portland, OR-WA	16,387,653	93.5%	1.7%	4.8%	6.5%
Sacramento, CA	10,254,347	92.1%	2.4%	5.5%	7.9%
San Diego, CA	30,112,972	94.8%	1.2%	4.0%	5.2%
San Francisco-Oakland, CA	29,655,627	94.5%	1.6%	3.9%	5.5%
Winston-Salem, NC	3,792,083	86.8%	3.2%	10.0%	13.2%
GRAND TOTAL	**382,960,214**	**93.1%**	**1.8%**	**5.1%**	**6.9%**

Source: Federal Highway Administration Freight Analysis Framework (FAF).

Table 3.24 presents the same FAF data stratified by functional classification. As expected, the freight truck and total truck percentages of VMT are higher for freeways than other facilities. The one anomaly in these data is the non-freight trucks on minor arterials, which has a very high percentage of VMT compared to expectations.

Table 3.24 Vehicle Miles Traveled by Functional Class for Selected Urban Areas

		Percent of Total			
Functional Class	Sum of Total VMT	Auto	Freight Truck	Non-Freight Truck	Total Truck
Unknown Road	2,771,994	91.7%	2.4%	6.0%	8.3%
Rural Interstate	5,351,753	87.9%	5.0%	7.1%	12.1%
Rural Principal Arterial	3,773,437	91.1%	3.2%	5.7%	8.9%
Rural Minor Arterial	286,332	93.3%	1.5%	5.2%	6.7%
Rural Minor Collector	62,132	92.7%	0.3%	7.0%	7.3%
Urban Interstate	225,084,260	92.7%	2.1%	5.2%	7.3%
Urban Principal Arterial	97,720,514	93.7%	1.3%	5.0%	6.3%
Urban Principal Arterial	47,725,690	94.3%	1.1%	4.6%	5.7%
Urban Minor Arterial	184,100	87.5%	2.2%	10.3%	12.5%
GRAND TOTAL	**382,960,214**	**93.1%**	**1.8%**	**5.1%**	**6.9%**

Source: Federal Highway Administration Freight Analysis Framework (FAF).

Vehicle Classification Counts

Vehicle classification count data, which classifies the vehicles according to FHWA's 13 axle-based classes, are generally available from the state DOTs. Appendix E (Table E.1) contains a description of these FHWA vehicle classifications. Source information was obtained and examined for two states (Georgia and Florida) and summary information was examined on several state DOT web sites (Maine, Ohio, New Jersey, Massachusetts, Virginia, Pennsylvania, Delaware, and Indiana).

The source information includes counts by location for the 13 FHWA vehicle classes, by hour of the day and by date. This information is sufficient to develop hourly, daily, and seasonal distributions of traffic by vehicle type. In summary format this information generally presents truck volumes (defined as FHWA classes 5 through 13, six tires and above) and occasionally also includes buses (FHWA class 4). Four-tire pickup trucks, vans and SUVs (FHWA class 3), are almost always included with passenger cars.

Given that the format and derivation of these vehicle classification count data are inconsistent with our definition of commercial vehicles and their categories, we were unable to use these data for the evaluation of the magnitude and distribution of commercial vehicle travel. These data was given further consideration in the evaluation of methods to estimate commercial vehicle travel (and is documented in this task report).

3.4 OTHER DATA SOURCES

National Transit Database for Paratransit Systems

Transportation systems that provide services mostly to disabled people are called paratransit systems. The Federal Transit Administration (FTA) collects and disseminates data on the state of mass transportation via the National Transit Database (NTD) program. Over 600 of the nation's transportation providers submit data to the NTD annually. Both the public and private sectors use these data to access the current state of mass transit and plan for the future. During the last two decades, large increases in the number of paratransit systems across the United States have been noticed. For example, across 198 cities with populations less than 400,000 in 1980, person trips by paratransit increased from six million in 1984 to 16.9 million in 1995.

However there are not many studies available which are based on both public and private paratransit data. The only comprehensive data source found is from the FTA NTD database and Steven Stern[8] at the University of Virginia, who processed the Section 15 data for his research. Dr. Stern processed NTD data and reported paratransit buses, vehicles miles, and other data. Table 3.25 shows a sample of transit operating statistics for 11 urban areas. Complete data for about 300 cities are shown in Appendix A. However, it may be pointed out here that the FTA data include only those systems which reported their data to FTA. While all FTA-funded paratransit systems are required to submit their statistics, other paratransit systems, such as church service buses, which do not receive FTA funds, are not required to submit their data.

[8] Steven Stern, Department of Economics, Rouss Hall, University of Virginia, Charlottesville, VA 22903. http://www.People.Virginia.edu/nsns500/sect15stf/Sect15.html.

Table 3.25 Paratransit Trips Statistics

State	Transit Agency Name	Mode[1,2]	1995 Annual Data in Thousands: VMT	Unlined Passenger Trips	Passenger Miles	2000 Population	Annual VMT (all Vehicles) in Millions (HPMS)	Percentage Paratransit VMT	Fleet Size	Average Trip Length in Miles per Vehicle per Day
CA	City of Los Angeles	DRp	4,027	1,208	4,622	11,789,487	102,489	0.004%	95	139
CA	LA-Access	DRp	10,907	2,581	13,944	11,789,487	102,489	0.011%	658	54
CA	SF-CalTrain	CRp	1,632	187	1,311	3,228,605	32,951	0.005%	86	62
CA	Sacramento-RT	DRp	2,563	318	2,755	1,393,498	10,849	0.024%	80	105
CA	San Diego Transit	DRp	779	269	781	2,674,436	22,925	0.003%	27	94
CO	Denver-RTD	DR	2,719	313	3,737	1,984,889	16,059	0.017%	111	80
FL	Orlando-LYNX	DRp	4,136	484	5,111	1,157,431	11,785	0.035%	120	113
GA	Atlanta-CCT	DRp	1,811	87	959	3,499,840	36,753	0.005%	60	99
NC	Greensboro-GTA	DRp	340	66	575	267,884	2,794	0.012%	19	58
NC	High Point-Hitran	DR	134	50	150	132,844	1,671	0.008%	6	73
NC	Winston-Salem-WSTA	DR	404	164	999	299,920	2,700	0.015%	19	69
TX	Houston-Metro	DRp	9,404	888	9,155	3,822,509	33,537	0.028%	448	69

[1] DR – Demand Responsive.

[2] DRp – Demand Responsive – Purchased.

Source: Federal Transit Administration Section 15 data, Transit Operating Statistics: Service Supplied and Consumed: Details by Transit Agency, Directly Operated and Purchased Transportation Service.

United States Postal Service Data

United States Postal Service vehicles and VMT data for seven urban areas (Atlanta, Denver, Detroit, Houston, Greensboro, Orlando, and Portland) were obtained from the United States Postal Service (USPS), as shown in Table 3.26. In these cities, postal service vehicles' total VMT as a percentage of the total VMT in the region varies from 0.05 to 0.63. The average daily VMT per vehicle is about 25 miles although it is much lower in urbanized areas (about five to six miles) and higher in suburban areas. In urbanized areas, daily postal delivery vehicles typically stop every block, after which the postal worker walks to deliver the mail.

Table 3.26 Public Package, Product and Mail Delivery Statistics

Service Area Location	Three-Digit Zip Code Range	Total VMT – All Vehicles (HPMS)	Total Number of Postal Vehicles	Daily Postal Vehicle VMT	Percent Postal Vehicle VMT
Atlanta, GA District	300-306, 311, 399	100,693,000	2,728	67,082	0.067%
Denver, CO District	800-807, 813-816, 820-831	43,999,000	3,380	57,937	0.132%
Detroit, MI District	481, 482	92,359,000	2,717	46,482	0.050%
Greensboro, NC District	270-279, 286	7,654,000	2,019	48,114	0.629%
Houston, TX District	770-778	91,883,000	4,169	78,575	0.086%
Orlando (Mid FL) District	327-329, 334, 347, 349	32,288,000	3,308	64,802	0.201%
Portland, OR District	970-979, 986	31,534,000	2,416	38,799	0.123%

Source: United States Postal Service for postal vehicles and the Highway Pavement Management System for total vehicle miles traveled.

School Bus Fleet Surveys

It has been estimated that school enrollment in the United States will increase 33 percent between 1990 and 2030.[9] This means an additional four million children by 2005 and 15 million by 2030. The school transport industry provides 10 billion student rides annually – this is the largest form of public transportation in the United States. There are over 400,000 school buses operating each school day in the United States and school bus drivers log over four billion miles each school year. There are 50 million children in public and private schools, and yellow school buses transport half of this number every day.

Schoolbusfleet.com[10] is an information service of the magazine *School Bus Fleet*, a trade publication serving school transportation professionals in the United States

[9] http://transportation.sandi.net/stats.html.

[10] http://www.schoolbusfleet.com.

and Canada. *School Bus Fleet* provides information on the management and maintenance of school bus fleets operated by school districts, private schools, Head Start agencies and childcare centers.

In addition to management and maintenance articles, statistics on the largest 100 school district fleets also are published every year. Several districts' statistics are shown in Table 3.27. It should be noted that the school districts shown in the table do not, in general, represent all of the school districts located in the urban areas shown. The daily school bus VMT and the percentages of total VMT should therefore not be assumed to include all school bus VMT in the urban areas. The entire table of the largest fleets for the year 2000 is shown in Appendix B.

Table 3.27 School District Statistics

Size Rank	School District	Location	State	Buses in Operation	Students Transported (Daily)	Annual Route Mileage	Daily School Bus VMT	Total VMT – All Vehicles (HPMS)	Percentage of Total VMT
2	Los Angeles Unified School District	Los Angeles	CA	3,299	75,600	21,500,000	119,444	280,791,781	0.043%
41	San Diego Unified School District	San Diego	CA	477	22,000	N/A		62,808,219	
57	Denver Public Schools	Denver	CO	660	45,739	5,000,000	27,778	43,999,000	0.063%
30	Fulton County Schools	Fairburn	GA	554	53,600	5,053,140	28,073	100,693,000	0.028%
20	Cobb County Public Schools	Marietta, GA	GA	834	70,865	10,779,438	59,886	100,693,000	0.059%
18	Gwinnett County Public Schools	Lawrenceville, GA	GA	928	77,000	13,970,000	77,611	100,693,000	0.077%
21	Detroit Public Schools	Detroit	MI	777	20,800	N/A		92,359,000	
25	Guilford County Schools	Greensboro	NC	598	38,223	7,555,130	41,973	7,654,000	0.548%
67	Winston-Salem/Forsyth County Schools	Winston-Salem	NC	345	24,108	4,955,328	27,530	7,397,260	0.372%
86	Portland Public Schools	Portland	OR	257	12,000	3,047,139	16,929	31,534,000	0.054%
89	Spring Branch Independent School District	Houston	TX	244	12,000	1,700,000	9,444	91,883,000	0.010%
80	Katy Independent School District	Houston	TX	290	17,500	2,461,460	13,675	91,883,000	0.015%
50	Cypress-Fairbanks Independent School District	Houston	TX	418	46,000	3,684,987	20,472	91,883,000	0.022%

Source: School Bus Fleet magazine in year 2000.

Taxi Fact Book

The National Association of Taxicab Operators was established in 1917 in Washington, D.C. In 1991 the Taxicab, Limousine & Paratransit Association (TLPA) was established with five membership divisions, including the Taxicab Division. TLPA publishes the magazine *Transportation Leader* quarterly and the *Taxicab Division Fact Book* annually. Table 3.28 presents taxi statistics by fleet size from the *Taxicab Division Fact Book*.

Table 3.28 Taxi Statistics

Items	Fleet Size			
	1-24	25-99	100-Up	Average
Average Annual Total Miles per Taxi	51,314	53,276	54,579	54,214
Average Distance per Paid Taxi Trip (miles)	5.38	5.82	6.57	5.80
Average Annual Paid Trips per Taxi	7,362	6,228	5,919	6,040
Average Annual Passengers per Taxi	10,048	8,229	7,703	7,913
Average Passengers per Paid Trip	1.36	1.33	1.3	1.31

Source: Taxicab Division Fact Book, 2002.

The complete *Fact Book* data are shown in Appendix C. However, the taxi statistics for selected 13 cities are presented in Table 3.29.

Table 3.29 Taxi Data by City

City	State	Population (000s)	Number of Licenses	Annual Taxicab VMT	Daily Taxicab VMT	Adjusted Daily Total All Vehicle VMTs (000s)	VMT Percent
Los Angeles	California	4,000	1,931	105,392,049	288,745	90,695	0.32
Sacramento	California	1,000	250	13,644,750	37,383	21,323	0.18
San Diego	California	1,200	910	49,666,890	136,074	28,410	0.48
San Francisco	California	775	1,381	75,373,599	206,503	17,395	1.19
Denver	Colorado	2,600	842	45,955,518	125,906	57,396	0.22
Orlando	Florida	1,200	1,000	54,579,000	149,532	33,401	0.45
Atlanta	Georgia	4,125	1,600	87,326,400	239,250	139,523	0.17
Detroit	Michigan	850	1,310	71,498,490	195,886	20,465	0.96
High Point	North Carolina	70	41	2,184,316	5,984	2,564	0.23
Winston-Salem	North Carolina	170	60	3,196,560	8,758	5,396	0.16
Portland	Oregon	1,500	400	21,831,600	59,813	38,872	0.15
Houston	Texas	1,800	2,245	122,529,855	335,698	66,502	0.50

Source: Taxicab Division Fact Book, 2002.

Airport Ground Access Planning Guide

The *Airport Ground Access Planning Guide* presents the results of the first phase of a project jointly sponsored by the Federal Highway Administration and the Federal Aviation Administration.[11] It outlines the process for planning ground access to airports within the context of current laws, regulations, and procedures. This report identifies the key components of an airport access work program, discusses performance measures, and provides extensive information on alternative strategies for improving airport access conditions. The relevant portions of this report are described below.

The *Airport Ground Access Planning Guide* reports mode split, trip length, and trip cost data for trips to airports in 27 cities in the United States. Mode splits are presented in Table 3.30, summarized by urban area size. Data on each urban area is presented in Appendix D. Mode split and average trip length for other on-demand services, scheduled bus/van services and courtesy van services were combined to represent the fixed shuttle service commercial vehicle category for this study. These results show that as city size increases, the percent of travel using shuttle services also increases, from 11 percent in cities with less than 2,500,000 people, to 15 percent in cities with 2,500,000 to 5,000,000 people, to 21 percent in cities with more than 5,000,000 people.

Table 3.30 Summary of the Airport Access Mode Split

	Mode Split (Percent)						
	Private Vehicle	Rental Car	Taxicab	Other On-Demand	Scheduled Bus/Van	Courtesy Vans	Other
Summary Statistics							
Minimum	21.0	2.0	2.6	0	0	0	0
Average	51.9	20.7	10.2	8.0	4.0	3.2	2.0
Maximum	78.8	46.2	36.0	24.0	12.4	8.0	7.0
Averages by City Size							
<500k	49.4	29.2	7.1	7.2	1.6	2.0	3.5
5-2.5mil	58.4	22.1	6.3	3.7	4.3	3.2	2.0
2.5-5mil	53.5	17.8	12.5	7.7	3.6	3.6	1.3
>5mil	47.5	18.4	10.9	11.6	6.0	3.5	1.8

Source: Derived from the Airport Ground Access Planning Guide for 27 cities provided in Tables 6.4-8, 10, 12, and 14.

[11] *Airport Ground Access Planning Guide* First Phase, Federal Highway Administration Intermodal Division, Washington, D.C. 20590. http://ntl.bts.gov/DOCS/AGAPP.html.

Table 3.31 presents summary data on average trip length, fleet sizes, and vehicle miles traveled for shuttle services in the 27 cities in the *Airport Access Planning Guide*. The *Guide* presents average trip lengths for the taxi and bus modes only; the shuttle service average trip length was assumed to be five minutes or 2.5 miles longer than the average taxi trip length to account for pickup and drop-off travel time and distance. Airport shuttle services serve different kinds of trips than taxis, with some trips much shorter (for shuttles that serve airport hotels) and other trips much longer (for shuttles that serve other cities), so the average trip length for taxis is assumed to be in the range of the average for shuttle services. Average trip lengths reported as ranges were converted to the midpoints of the ranges for this analysis. Shuttle fleet sizes were estimated from the available data in the guide using the following assumptions:

- Average daily person trips by mode were estimated by applying the mode split percentages to the annual originations, factored by 365 to represent average daily originations. This factor of 365 days per year is based on the fact that most shuttle services operate seven days per week.
- Vehicle trips by mode were estimated by applying average vehicle occupancy factors to the person trips, estimated from data presented for Logan International Airport in Boston.[12] These factors are three persons per vehicle for other on-demand shuttles and courtesy vans and 10 persons per vehicle for scheduled bus/van shuttle services.
- VMT was estimated as the product of the average fleet size (in vehicles) and the average trip length per vehicle per day.

The total VMT for shuttle services is presented in Table 3.31 for comparison across different urban areas. These data were derived from the HPMS, presented in Section 3.3. The percentage of total VMT attributed to shuttle services increases from close to zero in cities under 500,000 in population to 0.03 percent in cities with over five million people. The airport with the largest fleet size is San Francisco (2,660 vehicles), the highest VMT is Los Angeles (51.240 miles), and the highest percentage of total VMT is New Orleans (0.09 percent). The airport with the longest average trip length is Ontario (31.3 miles), within the Los Angeles metropolitan area.

[12] Federal Highway Administration, *Airport Ground Access Planning Guide*, Intermodal Division, HEP-50, page 110.

Table 3.31 Summary of Shuttle Service Airport Access Vehicle Trips and Miles Traveled

	Average Trip Length			Vehicle Miles Traveled		
	Minutes	Miles	Vehicle Trips	Shuttle Service Vehicles	All Vehicles	Percent of Total
Summary Statistics						
Minimum	10.0	5.0	2	41	3,045,000	0.00%
Average	30.3	15.2	648	11,518	49,149,760	0.02%
Maximum	62.5	31.3	2,660	51,240	280,792,000	0.09%
Averages by City Size						
<500k	25.0	12.5	20	184	4,047,500	0.00%
5-2.5mil	19.4	9.7	95	951	9,736,500	0.01%
2.5-5mil	34.0	17.0	508	9,200	47,731,600	0.02%
>5mil	34.6	17.3	1,632	29,294	99,470,286	0.03%

Source: Derived from the Airport Ground Access Planning Guide from 27 cities provide in Tables 6.4-8, 10, 12, and 14.

The *Airport Ground Access Planning Guide* also presents data on taxis and rental cars. These data were analyzed and are presented for information only, since there are other data sources that provide a more comprehensive picture of taxis and rental cars. Tables 3.32 and 3.33 present, respectively, summary data on the taxis and rental cars servicing airport trips. There are similar trends in shuttle services with respect to the percent of total VMT increasing with city size. New York's LaGuardia Airport has the largest number of vehicle trips and highest VMT for taxis, and New Orleans has the highest taxi percentage of VMT. Orlando has the largest number of vehicle trips and highest rental car percentage of VMT, and Los Angeles has the highest VMT for rental cars. Full data on taxis and rental cars for the 27 cities are presented in Appendix D.

Table 3.32 Summary of Taxi Airport Access Vehicle Trips and Miles Traveled

	Average Trip Length			Vehicle Miles Traveled		
	Minutes	Miles	Vehicle Trips	Taxis	All Vehicles	Percent of Total
Summary Statistics						
Minimum	5.0	2.5	20	133	3,045,000	0.00%
Average	25.3	12.7	1,415	20,850	49,149,760	0.04%
Maximum	57.5	28.8	9,480	142,200	280,792,000	0.27%
Averages by City Size						
<500k	20.0	10.0	53	706	4,047,500	0.02%
5-2.5mil	14.4	7.2	235	1,499	9,736,500	0.02%
2.5-5mil	29.0	14.5	1,484	22,538	47,731,600	0.05%
>5mil	29.6	14.8	2,954	43,644	99,470,286	0.04%

Source: Derived from the Airport Ground Access Planning Guide for 27 cities provided in Tables 6.4-8, 10, 12 and 14.

Table 3.33 Summary of Rental Car Airport Access Vehicle Trips and Miles Traveled

	Average Trip Length			Vehicle Miles Traveled		
	Minutes	Miles	Vehicle Trips	Rental Cars	All Vehicles	Percent of Total
Summary Statistics						
Minimum	5.0	2.5	4	32	3,045,000	0.00%
Average	25.3	12.7	1,478	20,060	49,149,760	0.05%
Maximum	57.5	28.8	6,308	106,624	280,792,000	0.24%
Averages by City Size						
<500k	20.0	10.0	168	1,470	4,047,500	0.04%
5-2.5mil	14.4	7.2	552	3,479	9,736,500	0.04%
2.5-5mil	29.0	14.5	1,329	18,151	47,731,600	0.04%
>5mil	29.6	14.8	3,178	45,815	99,470,286	0.05%

Source: Derived from the Airport Ground Access Planning Guide for 27 cities provided in Tables 6.4-8, 10, 12, and 14.

3.5 INDIVIDUAL CONTACTS

In addition to all of the data sources discussed, individual firms and agencies in both the public and private sectors and in all 12 urban areas were contacted. It was not expected to receive totals for all commercial vehicles operated by the firms contacted and commercial vehicle mileages in each city, but it was desired to capture a snapshot of the typical mileages that are driven by commercial vehicles of different industries in support of the other data sources. Although we contacted all 12 cities in some cases, only a few cities responded to our request for information. In cases where we needed to contact multiple firms in one category, we focused on collecting data in a single city. The following is a list of the individual contacts that were made:

- School departments (five cities);
- Public works departments (four cities);
- Police departments (two cities);
- Rental car companies (six companies, one city);
- Towing companies (three companies, one city); and
- United States Postal Service (one city).

Two pieces of information were asked for from each contact: the number of vehicles operated and the annual mileage that the vehicles accrued. The responses were received in many forms (e.g., average miles per vehicle for the fleet, total fleet mileage per year, mileages for the previous fiscal year) owing to the wide variety of sources contacted. Commercial vehicles were defined for the respondents as "any non-personal vehicle."

Issues

Some issues encountered during these contacts are worth briefly mentioning:

- An individual contact could result in either double-counting or under-representing the number of vehicles. Double-counting could occur, for example, in instances where the Public Works Department services part of the police department fleet and the police department also has its own vehicle fleet management. This could result in potentially double-counting some of the police vehicles. Under-representation could occur due to the lack of comprehensive inventories.
- Many agencies operate regionally (e.g., inner city plus suburbs) or are responsible for multiple cities; therefore it was difficult for them to estimate the number of miles which were traveled in each city. For example, school bus mileages were available for Winston-Salem/Forsyth County Schools combined, but not for just the Winston-Salem urban area. Therefore the mileage for the Winston-Salem urban area was simply estimated as a fraction of the mileage that the entire Winston-Salem/Forsyth County School buses operate as a total.
- Detailed data about the fleets was difficult to obtain; consistency among the data sources was therefore difficult to achieve. Very few agencies have a handy inventory of all vehicles they operate. Most agencies contacted knew the number of vehicles they owned, but mileage was more difficult to estimate, and mileage by vehicle type was even more difficult. Some agencies did not include heavier vehicles in their estimates.
- Data quality was highly variable. Some agencies could report mileage down to the 10th of a mile; other agencies could offer only an estimate of the number of vehicles in their fleet.

Results of Individual Contacts

School Departments

A total of 12 cities were contacted, but responses were received only from Detroit, Atlanta, Winston-Salem, Greensboro, and High Point. These are cities rather than the full urban area, based on the school districts, so the information is directly compared to urban area information. Information provided included the numbers of buses, food service vehicles, activity vehicles, maintenance/support vehicles, and special education buses. The information obtained is summarized in Table 3.34. School buses accrue most of their mileage during the school year.

Table 3.34 School Bus Statistics from Individual Contacts

City	Vehicles	Annual VMT/Vehicle	Source
Detroit	Buses = 430	15,000 Miles/Bus	Detroit Public Schools Garage
	Food Services = 60	13,000 Miles/Vehicle	
Atlanta	Buses = 388	12,630 Miles/Bus	Atlanta Public Schools Transportation
Winston-Salem	Buses = 123	14,090 Miles/Year	Winston-Salem/Forsyth County Schools Transportation
	Maintenance and Support Vehicles = 32	8,000 Miles/Year	
Greensboro	Buses = 203	11,516 Miles/Year	Guilford County Public Schools Department of Transportation
	Countywide Activity Vehicles = 74	5,730 Miles/Year	
	Special ed Buses Countywide = 87	8,550 Miles/Year	
High Point	Buses = 112	9,200 Miles/Year	Guildford County Public Schools Department of Transportation
	Countywide Activity Vehicles = 74	5,730 Miles/Year	
	Special Ed Buses Countywide = 87	8,550 Miles/Year	

Departments of Public Works

The Department of Public Works in each city is usually responsible for the fleets of city government vehicles. These vehicles perform functions such as solid waste collection and disposal, parks and recreation maintenance, public library support, street maintenance, traffic and parking enforcement, inspections, health department functions, and utility work. The mix of functions differs among the cities who responded to the contacts. For example, in some cities, the public works departments are responsible for maintaining the police department fleet while in other cities, the police departments maintain their own garages and fleets. Data were received from Detroit, Denver, Winston-Salem, and Greensboro and are summarized in Table 3.35. Again, these data represent cities rather than entire urban areas and are not directly comparable to data from urban areas.

Table 3.35 Public Works Department Statistics from Individual Contacts

City	Vehicles	Annual VMT/ Vehicle	Source
Detroit	3,500 – 4,500, Not Including Water and DOT	N/A	Detroit Department of Public Works Fleet Management
Denver	3,354 Includes Police Vehicles	15,300 Miles	Denver Public Works Fleet Maintenance Division
Winston-Salem	1,100	8,200 Miles	City of Winston-Salem Fleet Services
Greensboro	1,500	N/A	Greensboro DOT Equipment Services

Police Departments

Most of the cities contacted did not want to share data because of security issues. Data were obtained only from Denver and Winston-Salem and represent cities rather than urban areas. The Denver Police Department maintains a total of 942 police vehicles, and the average VMT per vehicle per year is 11,300 miles. The Winston-Salem Police Transportation Department maintains 556 vehicles, and the average VMT per vehicle per year is 8,100 miles.

Rental Car Companies

Individual branches were contacted for several of the larger rental car companies. It is difficult to estimate the share of the market in each city represented by these rental car companies. The data on their fleets were available either at the main office of each city or from corporate headquarters. One company pointed out that vehicle rentals for the first part of the week can be almost double the number of vehicle rentals on the weekends.

The rental car companies have requested that their data not be released individually; therefore the information listed below represents the aggregated responses from multiple rental car companies. We were able to obtain rental car data only from a single rental car company with one of the largest fleets in Atlanta. This company has a total of 5,400 vehicles and averages 80 miles per day per customer and about 6,810 customers per week. This suggests that the average total daily VMT for rental cars in Atlanta is about 80 x 6,810/7 ~ 78,000 miles per day.

Towing Services

Towing companies are abundant in cities, but the number of vehicles owned by each company is low. Three towing companies in Denver were contacted to obtain fleet size information and the average VMT per vehicle. This information is summarized in Table 3.36. In order to expand these data to represent the entire urban area, all towing companies would need to be contacted.

Table 3.36 Sample Towing Truck Statistics from Individual Contacts

Company Name	Number of Trucks	Average VMT/Day
APT Service Inc.	20 trucks	75-100 miles/day Five days in a week
Burning Desire to Tow	Two weekday One weekend	150 miles/day/truck Less mileage on weekends
Midnight Express	One local truck Two long-distance trucks One repo truck	150 miles/day, Five days in a week

United States Postal Services

The United States Postal Service has Vehicle Maintenance Facilities (VMF) in each large city. The VMFs have the information on the number of vehicles in each city and the VMT that they travel. The Postal Service operations in all 12 urban areas were contacted, but data were received only from Houston. In Houston the USPS maintains:

- 40 tractors/trailers (intracity transportation);
- 35 cargo vans (intracity transportation);
- 2,280 light and medium vehicles (residential delivery); and
- 139 service and administrative vehicles.

The average annual mileage per vehicle is 7,160.

Comparison of Data from Individual Contacts with Those from Other Sources

In general, the data obtained from individual contacts numbers show lower total numbers of vehicles and VMT than the data from other (generally national) sources. In the case of school buses, as shown in Table 3.37, the total numbers of school buses and VMT from the individual contacts are substantially lower than the data from the *School Bus Fleet* survey and these represent the same geographic area (school districts). Similarly, the information on USPS vehicles and VMT obtained from the contact in Houston differs significantly from the data obtained from the national USPS source. Further evaluation of these data may indicate that the geographic coverage of these datasets are not the same, even though it is reported for the same area or it may indicate that the individual contacts are not capturing all vehicles where the national sources are better at capturing all vehicles. We were unable to determine the cause of the differences from the data available from these sources.

Table 3.37 Comparison with Other Data Sources

	Fleet Size			
	School Bus		USPS	
Cities	Individual Contact	School Bus Fleet Data	Individual Contact	National USPS Contact
Atlanta	388	2,885		
Winston-Salem	156	345		
Greensboro	364	598		
Detroit	490	777		
Houston			2,494	4,169
TOTAL	**1,671**	**4,605**	**2,494**	**4,169**

Table 3.37 Comparison with Other Data Sources (continued)

Fleet Size	School Bus		USPS	
Cities	**Individual Contact**	**School Bus Fleet Data**	**Individual Contact**	**National USPS Contact**
VMT				
Atlanta	27,225	97,475		
Winston-Salem	11,050	27,530		
Greensboro	19,476	41,973		
Detroit	40,167	28,132		
Houston			58,356	78,575
TOTAL	**110,130**	**195,110**	**58,356**	**78,575**

4.0 Magnitude and Distribution

In this section, the data from all of the sources discussed in the previous section are combined to provide a picture of the total magnitude and distribution of commercial vehicle travel in the 13 selected urban areas. The results have been developed for each of the 12 commercial vehicle categories defined in Section 2.0. The following measures of commercial vehicle travel have been developed:

- Total fleet size;
- Per capita fleet size;
- Vehicle miles traveled (VMT);
- Percentage of total vehicle miles traveled; and
- Average VMT per day.

Data also were obtained to review the magnitude and distribution of commercial vehicles by time periods and facility types, but these data were not sufficient to stratify the data by urban area or commercial vehicle category. Summary data are presented in the following sections.

After combining all of the various data sources, there were still data gaps for many urban areas. Data were obtained for all commercial vehicle categories for only two urban areas. The remaining 11 urban areas do not have data for all 12 categories. There are at least four urban areas for each individual commercial vehicle category, which provides a basis for evaluating trends across different types of cities.

4.1 Analysis by Commercial Vehicle Category and Urban Area

Tables 4.1 through 4.5 present the summary statistics for total fleet size, per capita fleet size, average VMT per vehicle per day, average total VMT, and percentage of total VMT for the commercial vehicle category, respectively. These data are derived from a variety of data sources, as noted by the color-coding in the tables. While we are comparing these data across categories and across cities, it is important to recognize that the data sources may not be fully compatible, although we tried to achieve compatibility wherever possible. Although we had data from some of the individual contacts that were made, these data were not included in the summary tables because they were not comprehensive and not comparable to the other sources of data we compiled. These tables also present the minimum, maximum, and average across all urban areas for each commercial vehicle category. Finally, summaries are provided at the ends of each table on totals for the following three general categories of commercial vehicle trips: goods, people, and services. These summary statistics are described for each commercial vehicle category in the following sections.

Table 4.1 Fleet Sizes

		Los Angeles	San Francisco	Detroit	Atlanta	San Diego	Houston	Denver	Portland	Sacramento	Orlando	Winston-Salem	Greensboro	High Point	All Data Minimum	All Data Maximum	All Data Average
Vehicle Type																	
1	School Bus	3,299	1,510	777	2,316	477	534	660	257	1,011		345	598		257	3,299	1,071
2	Fixed Shuttle Services	2,665	2,660				204		291		377				204	2,665	1,239
3	Private Transportation	1,931	1,381	1,310	1,600	910	2,245	842	400	250	1,000	60		41	41	2,245	998
4	Paratransit	769	163	164	60	167	448	111	132	80	120	19	19	6	6	769	174
5	Rental Cars	88,217	89,805			12,107				9,913					9,913	89,805	50,011
6	Package, Product and Mail Delivery	449	470	7,620	7,409	41	4,169	9,328	2,416	42	3,308	2,939			41	9,328	3,472
7	Urban Freight Distribution, Warehouse Deliveries	69,617	22,484	41,338	66,239	8,510		29,614		10,651		7,836			7,836	69,617	32,036
8	Construction Transport	36,318	22,561	5,501	8,267	6,939		8,411		8,798		839			839	36,318	12,204
9	Safety Vehicles	11,149	5,090	3,492		3,364				7,090					3,364	11,149	6,037
10	Utility Vehicles	19,488	7,552	1,380	1,420	2,729		4,935		5,108		220			220	19,488	5,354
11	Public Service Vehicles	83,219	38,094			13,111				36,710					13,111	83,219	42,784
12	Business and Personal Services	321,445	152,263	15,740	24,463	50,488		12,485		43,984					12,485	321,445	88,695
	Movement of People (Cat. 1-5)	96,881	95,519	2,251	3,976	13,661	3,431	1,613	1,080	11,254	1,497	424	617		424	96,881	53,492
	Movement of Goods (Cat. 6-8)	106,384	45,515	54,459	81,915	15,490	4,169	47,353	2,416	19,491	3,308	3,871	3,776	3,776	2,416	106,384	47,712
	Services (Cat. 9-12)	435,301	202,999	20,612	25,883	69,692		17,420		92,892					17,420	435,301	142,870
	TOTAL	**638,567**	**344,033**	**77,322**	**111,774**	**98,843**	**7,600**	**66,386**	**3,496**	**123,637**	**4,805**	**4,295**	**4,393**	**3,776**	**20,260**	**638,567**	**244,074**

California DMV | Taxicab Fact Book | FTA Section 15 | Commercial Vehicle Surveys

USPS Data | CV Survey and USPS | School Bus Fleet | Airport Access Planning Guide (Vehicle trips)

Table 4.2 Average Trip Length in Miles

		Los Angeles	San Francisco	Detroit	Atlanta	San Diego	Houston	Denver	Portland	Sacramento	Orlando	Winston-Salem	Greensboro	High Point	All Data		
															Minimum	Maximum	Average
Vehicle Type																	
1	School Bus	36.2	36.2	36.2	42.1	42.1		42.1	65.9	65.9		79.8	70.2		36.2	79.8	51.7
2	Fixed Shuttle Services	22.2	15.0				20.0	21.7	12.5		15.0				12.5	22.2	17.7
3	Private Transportation	149.5	149.5	149.5	149.5	149.5	149.5	149.5	149.5	149.5	149.5	146.0		146.0	146.0	149.5	148.9
4	Paratransit	20.3	15.7	22.6	30.2	19.9	21.0	24.5	26.1	32.0	34.5	21.3	17.9	22.3	15.7	34.5	23.7
5	Rental Cars	43.1	43.1			43.1				43.1					43.1	43.1	43.1
6	Package, Product and Mail Delivery	76.1	76.1	85.8	33.2	76.1	19.2	9.7	16.4	76.1	20.0	27.4	27.4	27.4	9.7	85.8	43.9
7	Urban Freight Distribution, Warehouse Deliveries	74.5	74.5	50.2	74.0	74.5		64.7		74.5		56.0	56.0	56.0	50.2	74.5	65.5
8	Construction Transport	45.7	45.7	50.8	58.3	45.7		30.6		45.7		37.3	37.3	37.3	30.6	58.3	43.4
9	Safety Vehicles	52.6	52.6	36.4		52.6				52.6					36.4	52.6	49.4
10	Utility Vehicles	60.0	60.0	23.3	40.9	60.0		10.7		60.0		14.5	14.5	14.5	10.7	50.0	35.8
11	Public Service Vehicles	29.3	30.9			27.5				28.2					27.5	30.9	29.0
12	Business and Personal Services	41.3	41.3	50.2	27.0	41.3		77.6		41.3					27.0	77.6	45.7
	Movement of People (Cat. 1-5)	44.2	43.7			49.9				47.4	106.4	86.5	79.9		43.7	106.4	65.5
	Movement of Goods (Cat. 6-8)	64.7	60.2	55.2	68.7	61.6	19.2	47.8	16.4	61.5	20.0	57.4	58.8	58.8	16.4	68.7	50.0
	Services (Cat. 9-12)	40.1	40.3	46.1	27.8	40.0		55.6		38.0		39.0			27.8	55.6	41.1
	Average Trip Length All Vehicles	**44.8**	**43.9**	**54.1**	**49.8**	**44.7**	**56.5**	**51.0**	**35.3**	**42.6**	**46.9**				**35.3**	**59.8**	**48.0**

CV Survey VIUS

Table 4.3 Vehicle Miles Traveled (VMT)

		Los Angeles	San Francisco	Detroit	Atlanta	San Diego	Houston	Denver	Portland	Sacramento	Orlando	Winston-Salem	Greensboro	High Point	All Data Minimum	All Data Maximum	All Data Average
Vehicle Type																	
1	School Bus	119,444	54,671	28,132	97,475	20,076		27,778	16,929	66,594		27,530	41,973		16,929	119,444	50,060
2	Fixed Shuttle Services	59,171	39,897				4,073		3,638		5,654				3,638	59,171	22,487
3	Private Transportation	288,745	206,503	195,886	239,250	136,074	335,698	125,906	59,813	37,383	149,532	8,758	7,005	5,984	5,984	335,698	138,195
4	Paratransit	15,579	2,557	3,702	1,811	3,327	9,404	2,719	3,443	2,563	4,136	404	340	134	134	15,579	3,855
5	Rental Cars	3,803,035	3,871,494			521,933				427,349					427,349	3,871,494	2,155,953
6	Package, Product and Mail Delivery	34,164	35,762	653,567	245,682	3,120	80,116	90,015	39,560	3,196	66,073	74,402			3,120	653,567	120,514
7	Urban Freight Dist, Warehouse Deliveries	5,186,467	1,675,058	2,074,754	4,901,560	633,995		1,915,730		793,500		588,817			588,817	5,186,467	2,221,235
8	Construction Transport	1,659,733	1,031,038	279,341	481,804	317,112		257,208		402,069		3,181			3,181	1,659,733	533,936
9	Safety vehicles	586,437	267,734	127,248		176,946				372,934					127,248	586,437	306,260
10	Utility Vehicles	1,168,306	452,742	32,099	58,043	163,604				306,225		8,574			8,574	1,168,306	312,799
11	Public Service Vehicles	2,441,880	1,178,520			360,930				1,033,650					360,930	2,441,880	1,253,745
12	Business and Personal Services	13,275,697	6,288,450	790,305	660,730	2,085,158		969,086		1,816,533					660,730	13,275,697	3,697,994
	Movement of People (Cat. 1-5)	4,285,975	4,175,122	227,721	338,536	681,409	349,175	156,403	83,822	533,890	159,322	36,691	49,318	6,118	6,118	4,285,975	4,639,752
	Movement of Goods (Cat. 6-8)	6,880,364	2,741,858	3,007,662	5,629,046	954,227	80,116	2,262,953	39,560	1,198,764	66,073	222,133	222,133	222,133	39,560	6,880,364	1,172,995
	Services (Cat. 9-12)	17,472,320	8,187,447	949,653	718,773	2,786,638		969,086		3,529,341		2,858	2,858	2,858	2,858	17,472,320	3,394,230
	TOTAL	**28,638,658**	**15,104,427**	**4,185,036**	**6,686,355**	**4,422,274**	**429,291**	**3,388,442**	**123,381**	**5,261,395**	**225,395**	**261,682**	**274,309**	**231,109**	**48,536**	**28,638,658**	**9,206,977**
	Per Capita VMT	**2.3**	**3.8**	**1.1**	**2.2**	**1.7**		**1.7**		**3.8**					**1.1**	**3.8**	**2.4**

Taxicab Fact Book0 FTA Section 15 School Bus Fleet USPS Data

Table 4.4 Percent of Total VMT

		Los Angeles	San Francisco	Detroit	Atlanta	San Diego	Houston	Denver	Portland	Sacramento	Orlando	Winston-Salem	Greensboro	High Point	All Data		
															Minimum	Maximum	Average
Vehicle Type																	
1	School Bus	0.04%	0.06%	0.03%	0.10%	0.03%		0.06%	0.05%	0.22%		0.37%	0.55%		0.03%	0.55%	0.15%
2	Fixed Shuttle Services	0.02%	0.04%				0.00%		0.01%		0.02%				0.00%	0.04%	0.02%
3	Private Transportation	0.10%	0.23%	0.21%	0.24%	0.22%	0.37%	0.29%	0.19%	0.13%	0.46%	0.12%		0.13%	0.09%	0.46%	0.21%
4	Paratransit	0.01%	0.00%	0.00%	0.00%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.01%	0.01%
5	Rental Cars	1.35%	4.29%			0.83%				1.44%					0.83%	4.29%	1.98%
6	Package, Product and Mail Delivery	0.01%	0.04%	0.71%	0.24%	0.00%	0.09%	0.20%	0.13%	0.01%	0.20%	0.38%			0.00%	0.71%	0.18%
7	Urban Freight Distribution, Warehouse Deliveries	1.85%	1.86%	2.25%	4.87%	1.01%		4.35%		2.67%		3.00%			1.01%	4.87%	2.73%
8	Construction Transport	0.59%	1.14%	0.30%	0.48%	0.50%		0.58%		1.35%		0.02%			0.02%	1.35%	0.62%
9	Safety Vehicles	0.21%	0.30%	0.14%		0.28%				1.25%					0.14%	1.25%	0.44%
10	Utility Vehicles	0.42%	0.50%	0.03%	0.06%	0.26%				1.03%		0.12%			0.03%	1.03%	0.35%
11	Public Service Vehicles	0.87%	1.31%			0.57%				3.48%					0.57%	3.48%	1.56%
12	Business and Personal Services	4.73%	6.97%	0.86%	0.66%	3.32%		2.20%		6.11%					0.66%	6.97%	3.55%
	Movement of People (Cat. 1-5)	1.53%	4.63%	0.25%	0.34%	1.08%	0.38%	0.36%	0.27%	1.80%	0.49%	0.50%	0.64%		1.0%	5.4%	2.4%
	Movement of Goods (Cat. 6-8)	2.45%	3.04%	3.26%	5.59%	1.52%		5.14%		4.03%		3.00%	2.90%	4.85%	1.0%	6.9%	3.5%
	Services (Cat. 9-12)	6.22%	9.07%	1.03%	0.71%	4.44%				11.87%					1.4%	12.7%	5.9%
	TOTAL	**10.20%**	**16.73%**	**4.53%**	**6.64%**	**7.04%**		**7.70%**		**17.70%**		**9.62%**	**0.64%**	**0.13%**	**3.39%**	**25.01%**	**11.79%**

Table 4.5 Fleet Size per 1,000 Population

		Los Angeles	San Francisco	Detroit	Atlanta	San Diego	Houston	Denver	Portland	Sacramento	Orlando	Winston-Salem	Greensboro	High Point	All Data		
															Minimum	Maximum	Average
Vehicle Type																	
1	School Bus	0.3	0.4	0.2	0.8	0.2	0.2	0.3	0.2	0.7		1.5	2.7		0.2	2.7	0.7
2	Fixed Shuttle Services	0.2	0.7				0.1		0.2		0.3				0.1	0.7	0.3
3	Private Transportation	0.2	0.3	0.3	0.5	0.3	0.9	0.4	0.3	0.2	0.9	0.3		0.3	0.2	0.9	0.4
4	Paratransit	0.1	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.2	0.1
5	Rental Cars	7.1	22.3			4.6				7.1					4.6	22.3	10.3
6	Package, Product and Mail Delivery	0.0	0.1	2.0	2.5	0.0	1.7	4.7	1.6	0.0	2.9	12.6			0.0	12.6	2.6
7	Urban Freight Distribution, Warehouse Deliveries	5.6	5.6	10.8	22.3	3.2		14.9		7.6		33.6			3.2	33.6	12.9
8	Construction Transport	2.9	5.6	1.4	2.8	2.6		4.2		6.3		3.6			1.4	6.3	3.7
9	Safety Vehicles	0.9	1.3	0.9		1.3				5.1					0.9	5.1	1.9
10	Utility Vehicles	1.6	1.9	0.4	0.5	1.0		2.5		3.7		0.9			0.4	3.7	1.6
11	Public Service Vehicles	6.7	9.5			4.9				26.3					4.9	26.3	11.9
12	Business and Personal Services	26.0	37.9	4.1	8.2	19.0		6.3		31.6					4.1	37.9	19.0
	Movement of People (Cat. 1-5)	7.8	23.7	0.6	1.3	5.1		0.8		8.1		1.8	2.8	0.4	5.0	26.8	11.7
	Movement of Goods (Cat. 6-8)	8.6	11.3	14.2	27.5	5.8		23.8		14.0		16.6	16.6	16.6	4.7	52.6	19.2
	Services (Cat. 9-12)	35.2	50.5	5.4	8.7	26.3		8.7		66.6		0.9	0.9	0.9	10.3	72.9	34.3
	TOTAL	**51.6**	**85.5**	**20.2**	**37.5**	**37.3**		**33.3**		**88.7**		**19.4**	**19.4**	**17.0**	**19.9**	**152.3**	**65.2**

Category 1 – School Buses

School bus data are derived from two sources: school bus fleet data and California Department of Motor Vehicles (DMV) data. There are nine urban areas with school bus fleet data and two urban areas with data from the California DMV. As expected, the fleet sizes are generally larger for larger cities, except Atlanta, which has a much larger fleet than San Francisco and Detroit. Atlanta also has the highest VMT of all cities reviewed. The highest per capita fleet sizes occur in the smallest cities, indicating some efficiency for larger cities. There are a wide range of average daily miles per vehicle, with higher averages for smaller cities and lower averages for larger cities. For example, in Los Angeles the average VMT per vehicle is 52 miles whereas in Winston-Salem the average is 79.8 miles. Overall, the contribution to total VMT is very small (0.1 percent), but the data are not difficult to obtain or use.

Category 2 – Fixed Shuttle Service Vehicles

There are data from five urban areas for shuttle services, derived primarily from the *Airport Ground Access Planning Guide*. In addition, data on shuttle services were available from the commercial vehicle survey in Denver. This category was originally intended to encompass shuttle services to a variety of destinations (airports, rail stations, bus stations, etc.) but data on non-airport sources were not readily available for evaluation. In addition, it was felt that the shuttle services to airports constituted the majority of this fleet for most cities. The statistics for per capita fleet size, percentage of total VMT, and average miles per day are very stable across urban areas. San Francisco and Orlando have the highest per capita fleet sizes, probably because of the high influence of tourism in these cities. Overall, shuttle services contribute a very small amount (0.02 percent) to the overall VMT in any urban area. In addition, the data used to characterize these services are not based on an ongoing data source and may not provide appropriate data for use over time.

Category 3 – Private Transportation Vehicles

All but one of the 12 urban areas (Greensboro) has data on private transportation from one data source – the Taxicab Fact Book. The per capita fleet size rates are fairly stable across urban areas, except for Houston and Orlando, which have rates that are more than double the average rate. This is again likely due to the influence of tourism in cities with a reliance on highway modes of transportation. The average miles per day are almost the same across all urban areas. Again, the overall impact on VMT is small (0.2 percent), but the data are readily available and easy to use.

Category 4 – Paratransit Vehicles

All 13 urban areas have data on paratransit services, derived from the Federal Transit Administration's (FTA) Section 15 data. Los Angeles has a much higher total fleet size than any other urban area in our sample, but this is proportional to

its population, and the per capita fleet size rates are similar for all urban areas. The overall impact on percent of VMT is very small (less than 0.01 percent).

Category 5 – Rental Cars

The only comprehensive source of data for rental cars was the DMV data in California, where we have data for four urban areas. The California Energy Commission identified the rental cars from the master list of rental companies. These data indicate high numbers of vehicles compared to all other commercial vehicles carrying passengers. The average miles per day statistic falls between that for other passenger commercial vehicles, with shuttle service and paratransit vehicles much lower and school buses and taxis much higher. These results make intuitive sense. The per capita fleet size and percentage of total VMT is three times higher in San Francisco than any other urban area; presumably this is due to the high rate of tourism in San Francisco.

Category 6 – Package, Product and Mail Delivery Trucks

Data for package, product, and mail delivery trucks are estimated from three different sources, representing data for all 13 urban areas:

1. The California DMV provides data on parcel delivery trucks for Los Angeles, San Francisco, San Diego, and Sacramento.
2. The United States Postal Service (USPS) provides data on package and mail delivery for seven urban areas (Atlanta, Denver, Detroit, Greensboro, Houston, Orlando, and Portland).
3. The commercial vehicle surveys included package and product delivery trucks for six urban areas (Atlanta, Denver, Detroit, Greensboro, Winston-Salem, and High Point).

The fleet sizes for the California cities were only 10 percent of the average for this category, indicating that a majority of these vehicles were either not included in the data source or classified under another category. In the analysis of the commercial vehicle survey data, these vehicles were identified based on cargo carried and whether the purpose was for pickup or delivery, but the DMV database only captured vehicles that were identified with a body type of parcel delivery trucks. Excluding the California DMV data, the remaining urban areas have similar fleet sizes per capita, except in the Piedmont Triad cities, where the rates are very high. There is a similar trend with the percent of total VMT statistics. The average miles per day are high for all California cities, based on VIUS data, and Detroit has a similar statistic, but all other urban areas have average miles per day of less than half this value. This is assumed to be a byproduct of different definitions of vehicles in this category, as evidenced by the differing fleet sizes. For example, longer mileage per day may indicate an emphasis on product delivery where shorter mileage per day would indicate an emphasis on mail and package delivery.

Category 7 – Urban Freight Distribution Vehicles

There are two primary sources of data for urban freight distribution and warehouse delivery trucks: California DMV data and commercial vehicle survey data. The commercial vehicle survey data are consistently higher for per capita fleet size ratios and percent of total VMT statistics than the California DMV data. It is hypothesized that this is because we are unable to separate all business service trucks from the urban freight category in the commercial vehicle surveys, thus overestimating urban freight trucks. The combination of the urban freight truck VMT with the business service truck VMT is more consistent between the two data sources than the individual categories, supporting this theory. The average miles traveled per day is very consistent across all urban areas, with the California cities slightly higher than other cities. Overall, the California DMV data results in the shares of total VMT in the one to three percent range and the commercial vehicle survey data results in the shares of total VMT in the two to four percent range.

Category 8 – Construction Transport

Again, there are two primary sources of data for construction transport: the California DMV data and commercial vehicle survey data. In this case, though, there is less variability across the urban areas with different data sources because the definition of vehicles in this category is more straightforward. The Piedmont Triad area has significantly lower fleet size and VMT than other urban areas, indicating that there may be less construction activity in this urban area (and possibly in other smaller urban areas). The average miles per day are reasonably consistent across urban areas, ranging from 31 miles per day in Denver to 58 miles per day in Atlanta. The overall share of total VMT is in the one to two percent range for all urban areas except Piedmont-Triad.

Category 9 – Safety Vehicles

There is only one data source that provides data on safety vehicles: the California DMV data. The Detroit commercial vehicle survey data did include tow trucks, and so this data set yields data for a portion of the potential vehicles in this category, but is not comprehensive since it excludes other public safety vehicles such as police and fire trucks. The average miles per day also are lower in the Detroit data, again resulting from the different definition of vehicles in this category. The average miles per day for California urban areas in this table is based on data from the VIUS, which also only includes tow trucks. The estimate of average miles per day of police cars, derived from the individual contacts, yields a lower average of between 22 and 31 miles per day (assuming that police cars operate 365 days per year). These data are not reported in the table, because the information are estimates and not based on collected data sources.

The range of percent VMT is between 0.2 and 1.2 percent of the total VMT and the range of per capita fleet size is one to five per thousand population. Sacramento has the highest statistics in both cases, possibly because some fleets

associated with the State of California may have vehicles that operate elsewhere registered in the capital City of Sacramento, similar to major companies registering fleets at the headquarters location rather than the operating location.

Category 10 – Utility Vehicles

The California DMV data and two of the three commercial vehicle surveys contain data on utility vehicles. The commercial vehicle surveys underestimate fleet size since they include only private utility vehicles, such as trucks for plumbers and electricians, whereas the California DMV data also includes public utility vehicles, such as trash collection and meter reader vehicles. The range for the percentage of total VMT is between 0.03 and one percent, with the per capita fleet size ranging from one to four per thousand population in California cities. Again, Sacramento is quite a bit higher than the other California cities, possibly for the same reason that some public utilities vehicles may be registered in the capital city rather than in the operating city. The VIUS data for utility vehicles provides a very similar estimate for average miles per day compared to Detroit, whereas the Atlanta estimate for average miles per day is quite a bit lower. This may be a result of the different definitions in the different surveys (Atlanta defines the purpose as maintenance; Detroit has a more general utilities industry category).

Category 11 – Public Service Vehicles

The only source with information on public service vehicles is the California DMV data, which has many categories of public service vehicles at the Federal, state, city, and local government levels. In the California DMV database, government vehicles are identified strictly by type-license codes assigned by DMV on all fee-exempt records at time of registration. Per capita fleet size ranges from five to 25 per thousand population, with the highest ratio in Sacramento. The percentage of total VMT ranges from 0.6 to 3.5, also with Sacramento having the highest percentage.

Category 12 – Business and Personal Service Vehicles

The California DMV data has a large category of "other commercial" light duty vehicles that have been allocated to this business and personal services category for our purposes. The California DMV employed the same approach used by R.L. Polk. They split and employ all key words from the 120-character owner field of each record in the database that reveal any potential business use information. Since not all of the "other commercial" vehicles are being used for commercial purposes, this category has been factored to exclude the business and personal service vehicles being used for personal activities, based on the VIUS estimates of the use of these vehicles. In this case, personal service includes door-to-door sales and realtors and is included where personal activities are not included.

The Denver, Detroit, and Atlanta commercial vehicle surveys also include vehicles in this category, but these surveys do not include light duty vehicles, and so the estimates of fleet size are only a fraction of the actual total fleet sizes reflected in the California DMV data. This is the largest category of all commercial vehicles, ranging from three to seven percent of the total VMT for California cities. The per capita fleet size ranges from 19 to 38 per thousand population. The average miles per day are very consistent across urban areas from all sources, except in Atlanta, where it is quite a bit lower. This is likely due to the inclusion of personal activities, which are expected to be shorter duration than business and personal services.

4.2 AGGREGATED CATEGORIES

In our original analysis, the commercial vehicle categories were aggregated into three types of vehicles, based on trip purpose. These three types were moving people, moving goods, or providing services. Table 4.6 presents a summary of fleet sizes per 1,000 population for selected urban areas by these aggregated categories. This table includes only urban areas with either a commercial vehicle survey or DMV data. At this aggregated level, the following conclusions can be drawn:

- The inclusion of rental cars in the DMV data and not in the commercial vehicle survey data has a significant impact on the percent of vehicles moving people, with a difference of 14 percent between these two sources.
- The specific definitions of the Business and Personal services and Urban Freight Distribution categories (12 and 7, respectively) for the two data sources have a significant impact on the summary totals for vehicles moving goods and providing services. In the case of the DMV data, Business and Personal Services is the dominant category, and in the case of the commercial vehicle surveys, Urban Freight Distribution is the dominant category. In both cases, the vehicles in these categories were not easily separated to create consistency in the definitions.
- The Package, Product, and Mail Delivery category (#6) is dominated by fleets in the U.S. Postal Service, but these data are not clearly identified in the DMV data. From the results, it appears that U.S. Postal Service vehicles are not included in the DMV data regarding parcel delivery, but are included in the public service vehicle category. In the commercial vehicle surveys, U.S. Postal Service vehicles were excluded, and the U.S. Postal Service separately provided the necessary data for addition to the commercial vehicle survey data.
- The DMV data yields 73 percent higher average per capita fleet sizes than the commercial vehicle survey because of the more comprehensive nature of these data.

- From a data analysis perspective, it may be useful to combine certain categories that were unable to be stratified. This will be considered during the next task to identify methods for evaluation.

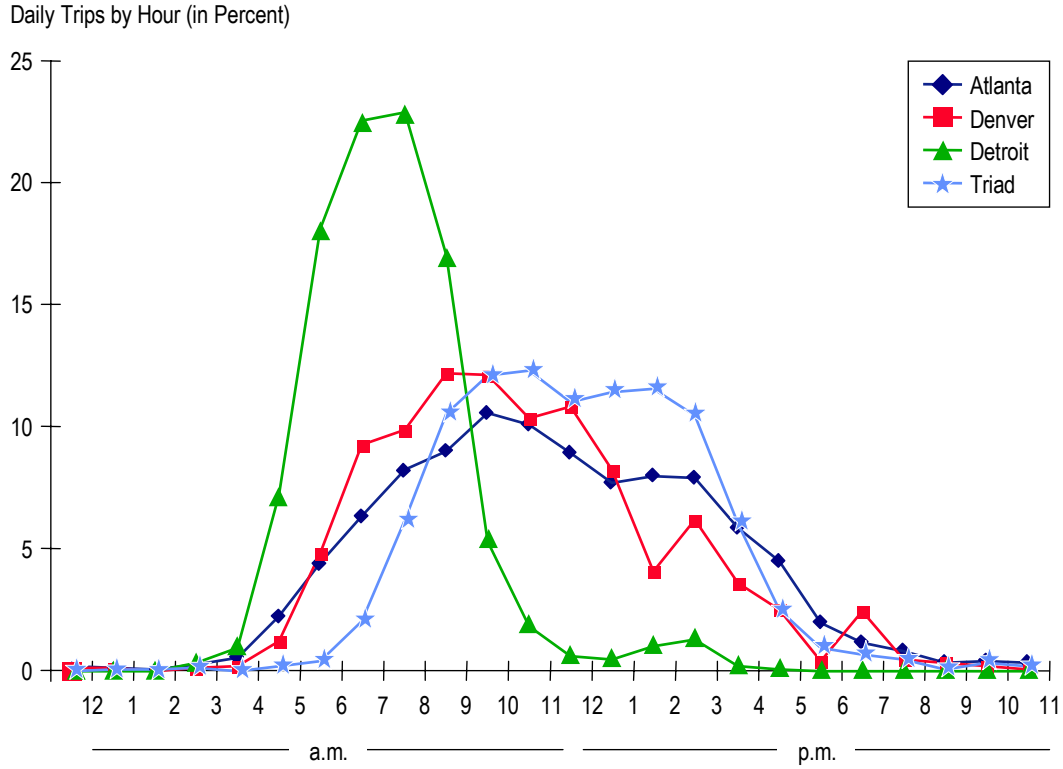
Table 4.6 Summary of Fleet Size per 1,000 Population by Aggregated Category and Data Source for Selected Urban Areas

					Percent		
	Moving People	Moving Goods	Providing Services	Total	Moving People	Moving Goods	Providing Services
Los Angeles	7.8	8.6	35.2	51.6	15%	17%	68%
San Francisco	23.7	11.32	50.5	85.5	27%	13%	60%
Detroit	0.6	14.2	5.4	20.2	2%	81%	18%
Atlanta	1.3	27.5	8.7	37.5	4%	73%	23%
San Diego	5.1	5.8	26.3	37.3	14%	16%	70%
Denver	0.8	23.8	8.7	33.3	2%	69%	29%
Sacramento	8.1	14.0	66.6	88.7	9%	16%	75%
Winston-Salem	1.8	16.6	0.9	19.4	3%	93%	4%
Greensboro	2.8	16.6	0.9	20.3	5%	91%	4%
High Point	0.4	16.6	0.9	17.9	1%	95%	4%
DMV Cities	11.2	9.9	44.6	65.8	17%	15%	68%
CV Survey Cities	1.1	20.5	5.9	27.6	4%	74%	22%

4.3 ANALYSIS BY TIME PERIOD

The four commercial vehicle surveys (Atlanta, Denver, Detroit, and Piedmont Triad) provide the ability to review the behavior of commercial vehicle travel by time of day. A summary of these data from the four surveys is presented in Figure 4.1. Three of the surveys show the expected distribution of trips during daylight hours, without the typical peaking that is apparent in passenger travel. The Detroit survey has a strong peak in the a.m. peak hour and relatively small numbers of trips at other times of day. This was most likely a result of the method of data collection rather than a true representation of the temporal distribution of commercial vehicle trips.

Figure 4.1 Percent of Daily Commercial Vehicle Trips by Hour



Since one of the objectives of understanding commercial vehicles is to identify the impact on peak periods, we have reviewed these data in typical a.m. and p.m. peak periods. These data are presented in Table 4.7. The a.m. peak period is 6:00 a.m. to 9:00 a.m. and the p.m. peak period is 3:00 p.m. to 6:00 p.m. The off-peak time period includes all remaining hours. The Atlanta, Denver, and Triad surveys show a consistent pattern where from 65 to 71 percent of commercial vehicle traffic occurs in the off-peak period, with 29 to 35 percent occurring in the peak period. The Atlanta and Denver surveys, representing larger urban areas, have 13 to 22 percent of traffic in individual peak periods, where the Triad survey has a wider range of commercial vehicles in the individual peak periods. This may be an anomaly of the Triad survey or may be indicative of patterns of commercial travel in smaller urban areas.

Table 4.7 Percent of Total Daily Commercial Vehicle Trips by Time Period and Urban Area

Time Period	Atlanta	Denver	Detroit	Triad	Total
A.M. Peak	13%	15%	48%	3%	31%
Off-peak	65%	71%	50%	69%	58%
P.M. Peak	22%	14%	3%	28%	11%

4.4 ANALYSIS BY FACILITY TYPE

The Freight Analysis Framework (FAF) data allow us to review intercity freight and non-freight (urban commercial) trucks by urban area. These data are presented in Table 4.8 as the sum of all urban areas as it is felt that the data are more robust in total than they would be for individual urban areas. These data show that freight trucks have a much higher percentage of VMT on freeways and lower percentage of total VMT on other facilities. Non-freight trucks have a similar percentage of VMT across all facility types, as expected, since these include more trips made to serve businesses and residences on local and arterial streets.

Table 4.8 Vehicle Miles Traveled by Vehicle Type and Facility Type

	Vehicle Miles Traveled			
	Auto	**Freight Truck**	**Non-Freight Truck**	**Total**
Interstate	213,326,538	5,085,094	12,024,381	230,436,013
Expressway	91,586,794	1,227,175	4,906,545	97,720,514
Principal Arterial	48,422,950	656,831	2,419,347	51,499,128
Minor Arterial	428,272	8,221	33,938	470,432
Minor Collector	57,575	204	4,354	62,132
TOTAL	**353,822,128**	**6,977,526**	**19,388,565**	**380,188,219**
	Percentage of Total VMT			
Interstate	60.3%	72.9%	62.0%	60.6%
Expressway	25.9%	17.6%	25.3%	25.7%
Principal Arterial	13.7%	9.4%	12.5%	13.5%
Minor Arterial	0.1%	0.1%	0.2%	0.1%
Minor Collector	0.0%	0.0%	0.0%	0.0%
TOTAL	**100.0%**	**100.0%**	**100.0%**	**100.0%**

5.0 Next Steps

The results of the available data on the magnitude and distribution of commercial vehicle trips are presented in this report. There are quite a few data sources available to use to quantify these data and quite a few data gaps in trying to identify a comprehensive assessment of commercial vehicles in an urban area. These data gaps are discussed in Section 5.1. Some of the differences we identified potentially have to do with the definitions of categories rather than real differences in the amount of commercial vehicle travel. This problem could be alleviated, albeit not completely, by aggregating categories for analysis, as described in Section 4.2. Section 5.2 describes the results of an evaluation related to upcoming priorities for modeling in the next task in the project.

5.1 DATA GAPS

There are three categories of commercial vehicles where data could be obtained from only one source and for only a limited number of urban areas: Fixed Shuttle Service vehicles (category 2), Rental Cars (category 5), and Public Service vehicles (category 11). We had data on fixed shuttle service vehicles in 27 urban areas in the United States, but these included only included five of the cities we reviewed. The data were based on the *Airport Ground Access Planning Guide*, which is not an ongoing data collection effort but a one-time report designed to improve planning for airport ground access travel. Information on Rental Cars and Public Service vehicles were available only in the California Energy Commission database, which is DMV database that has been specially processed for use in California. The Polk data, a private sector source of DMV data, can be purchased to fill this data gap.

The urban areas with either DMV data or commercial vehicle survey data provide the most comprehensive evaluation of commercial vehicles in an urban area. In the commercial vehicle surveys, though, many trips made by what are defined for this project as commercial vehicles are excluded. This is apparent in the total percentage of vehicle miles traveled (VMT) and per capita fleet size statistics for an urban area because the areas for which the VMT are based on DMV data are quite a bit higher in total VMT than the cities for which the VMT are based on commercial vehicle survey data. These differences are readily apparent in categories where vehicles have been excluded, such as business and personal services, public service vehicles, public utility vehicles, public safety vehicles, and public mail delivery (U.S. Postal Service).

There also are gaps in the DMV databases because they include data only on fleet size, and the VIUS was used to estimate average miles per day for these data (since VMT data were not available in the DMV databases). The VIUS data can be used to estimate average miles per day for all urban areas in a state but not for individual urban areas because the sample sizes for individual areas are too small.

5.2 PRIORITIES FOR MODELING

Table 5.1 presents the range of the percentage of VMT in the 11 urban areas in our evaluation (Houston and Orlando were not included as they did not have either registration or survey data sources). These 11 urban areas (presented in Table 4.6) were selected because the data were more comprehensive to support statistical evaluation. This table demonstrates that many of the commercial vehicle categories defined for this project have a negligible impact on VMT (school buses, fixed shuttle services, private transportation, and paratransit vehicles all comprise less than one percent of VMT). At a small-area level, however, the percentages may be significantly higher; for example, shuttle services may contribute a very high percentage of overall VMT near the airport, and taxis may contribute a very high percentage of overall VMT in downtown areas.

The commercial vehicles with the largest impact on vehicle miles traveled are Business and Personal Services (maximum 7.0 percent), Urban Freight Distribution (maximum 4.9 percent), Rental Cars (maximum 4.3 percent), and Public Service Vehicles (maximum 3.5 percent). The maximum values are used for this evaluation because the average across cities is affected by the exclusion of some vehicles in certain categories, making this statistic less useful for our purposes.

The overall impact of commercial vehicles ranges from 3.4 to 25.0 percent for the urban areas in our evaluation. This is reasonable compared to ballpark estimates of commercial vehicle travel in urban areas.

Table 5.1 Range of Percent Vehicle Miles Traveled Across Select Urban Areas

Vehicle Type	Minimum	Maximum	Average
School Bus	0.0%	0.5%	0.1%
Shuttle Service at Airports, Stations, etc.	0.0%	0.0%	0.0%
Private Transportation: Taxi, Limos, Shuttles	0.1%	0.5%	0.2%
Paratransit: Social Services, Church Buses	0.0%	0.0%	0.0%
Rental Cars	0.8%	4.3%	2.0%
Package, Product and Mail Delivery: USPS, UPS, FedEx, etc.	0.0%	0.7%	0.2%
Urban Freight Distribution, Warehouse Deliveries	1.0%	4.9%	2.7%
Construction Transport	0.0%	1.4%	0.6%
Safety Vehicles: Police, Fire, Building Inspections, Tow Trucks	0.1%	1.3%	0.4%
Utilities Vehicles: Trash, Meter Readers, Maintenance, Plumbers, Electricians, etc.	0.0%	1.0%	0.3%
Public Service (Federal, State, City, Local Government)	0.6%	3.5%	1.6%
Business and Personal Services (Personal Transportation, Realtors, Door-to-Door Sales, Public Relations)	0.7%	7.0%	3.5%
TOTAL	**3.4%**	**25.0%**	**11.8%**

Appendix A

Paratransit Trips

Table A.1 Paratransit Trips

Transit Operating Statistics: Service Supplied and Consumed: Details by Transit Agency
Directly Operated and Purchased Transportation Service

State	Transit Agency Name	ID/Org.	Mode[1]	1995 Annual Data in Thousands			1990 Population	2000 Population	1990 Population Over 65	1990 Per Capita Income	Annual VMT (All Vehicles) in Millions (HPMS)	Percentage Paratransit VMT
				VMT	Unlinked Passenger Trips	Passenger Miles						
AL	Birmingham-Max	4042-A	DR	516	77	834	651,525	663,615	91,748	13,277	8,462	0.006%
AL	Huntsville	4071-B	DR	498	280	1,332	238,912	213,253	21,437	15,443	2,110	0.024%
AL	Mobile-MTA	4043-B	DRp	116	22	147	378,643	317,605	44,460	11,158	3,192	0.004%
AL	Montgomery-Autauga	4099-A	DR	666	140	633	209,085	196,892	24,299	12,806	2,052	0.032%
AL	Tuscaloosa-CP&TA	4045-A	DR	133	24	195	150,522	116,888	17,101	11,406	1,180	0.011%
AK	Municipality of Anchorage	12-B	DRp	410	64	378	226,338	225,744	8,114	19,620	1,622	0.025%
AZ	Peoria Transit	9140-A	DR	135	37	128	2,122,101	247,172	264,650	14,970	1,937	0.007%
AZ	Phoenix PTD	9032-B	DRp	2,745	361	2,446	2,122,101	2,907,049	264,650	14,970	21,408	0.013%
AZ	Phoenix-Glendale	9034-A	DR	3,036	562	2,951	2,122,101	2,907,049	264,650	14,970	21,408	0.014%
AZ	Tucson-Sun Tran	9033-A	DR	2,185	269	2,233	666,880	720,425	91,257	13,177	4,951	0.044%
AR	Fayetteville-CRG	6072-F	DR	860	367	4,099	113,409	276,368	12,772	11,625	2,468	0.035%
AR	Little Rock-CAT	6033-B	DR	280	79	161	349,660	360,331	40,093	13,760	3,368	0.008%
CA	Bakersfield-GET	9004-B	DRp	288	45	368	543,477	396,125	52,642	12,154	2,653	0.011%
CA	City of Los Angeles	9147-B	DRp	4,027	1,208	4,622	8,863,164	11,789,487	855,666	16,149	102,489	0.004%
CA	Fairfield	9092-B	DRp	74	20	32	340,421	112,446	27,879	14,833	1,177	0.006%
CA	Fresno-FAX	9027-B	DRp	679	89	667	667,490	554,923	68,311	11,824	4,233	0.016%
CA	LA-Access	9157-F	DRp	10,907	2,581	13,944	8,863,164	11,789,487			102,489	0.011%
CA	Lancaster-AV Transit	9121-B	DRp	645	78	761	8,863,164	11,789,487	855,666	16,149	1,601	0.040%
CA	Modesto-MAX	9007-B	DRp	519	109	707	370,522	310,945	40,253	12,731	1,787	0.029%
CA	Oakland-AC Transit	9014-B	MB	133	20	91	1,279,182	3,228,605	135,285	17,547	32,951	0.000%
CA	Oxnard-SCAT	9035-A	DRp	108	9	64	669,016	337,591	62,469	17,861	4,583	0.002%

State	Transit Agency Name	ID/Org.	Mode[1]	1995 Annual Data in Thousands			1990 Population	2000 Population	1990 Population Over 65	1990 Per Capita Income	Annual VMT (All Vehicles) in Millions (HPMS)	Percentage Paratransit VMT
				VMT	Unlinked Passenger Trips	Passenger Miles						
CA	Palm Springs-SunBus	9079-B	DRp	541	64	923	1,170,413	1,340,000	153,890	14,510	1,140	0.047%
CA	Redding-RABA	9093-B	DRp	574	70	328	147,036	103,000	20,765	12,381	407	0.141%
CA	Riverside Special Trans.	9086-A	DR	526	138	489	1,170,413	1,506,819	153,890	14,510	12,000	0.004%
CA	Riverside-Corona	9052-B	DRp	1,064	281	1,454	1,170,413	1,506,816	153,890	14,510	12,000	0.009%
CA	SF-CalTrain	9134-B	CRp	1,632	187	1,311	723,959	3,228,605	105,263	19,695	32,951	0.005%
CA	Sacramento-RT	9019-B	DRp	2,563	318	2,755	1,041,219	1,393,498	109,674	15,265	10,849	0.024%
CA	Salinas-Monterey	9055-B	DRp	596	74	602	355,660	179,173	34,514	14,578	496	0.120%
CA	San Bernardino-OMNITRANS	9029-B	DRp	2,613	575	2,905	1,418,380	1,506,816	123,838	13,358	12,000	0.022%
CA	San Diego Transit	9026-B	DRp	779	269	781	2,498,016	2,674,436	272,348	16,220	22,925	0.003%
CA	San Diego- The Trolley	9054-F	LR	2,548	453	2,860	2,498,016	2,674,436	272,348	16,220	22,925	0.011%
CA	San Francisco-BART	9003-B	HR	793	410	2,610	723,959	3,228,605	105,263	19,695	32,951	0.002%
CA	San Jose-SCCTD	9013-B	DRp	1,511	324	1,795	1,497,577	1,538,312	128,846	20,423	13,995	0.011%
CA	Santa Cruz-METRO	9006-B	DRp	190	29	233	229,734	157,348	26,090	17,347	7,315	0.003%
CA	Santa Maria Area Transit	9087-B	DRp	162	28	184	369,608	107,000	45,093	17,155	572	0.028%
CA	Santa Rosa-City Bus	9017-B	DRp	202	26	102	388,222	285,408	52,348	17,239	1,632	0.012%
CA	Visalia City Coach	9091-B	DRp	142	34	163	311,921	101,000	33,337	10,302	654	0.022%
CA	Yuba-Sutter	9061-B	DRp	289	11	88	64,415	90,000	7,705	12,763	581	0.050%
CO	Colorado Springs Transit	8005-B	DRp	1,435	364	1,408	397,014	466,122	31,674	13,664	3,094	0.046%
CO	Denver-RTD	8006-B	DR	2,719	313	3,737	467,610	1,984,889	64,152	15,590	16,059	0.017%
CO	Fort Collins-Transfort	8011-B	DRp	709	66	749	186,136	206,757	17,939	13,968	937	0.076%
CO	Grand Junction-MesABILITY	8016-B	DRp	334	118	654	93,145	92,362	13,408	11,850	573	0.058%
CO	Greeley-The Bus	8010-A	DR	109	24	76	131,821	93,879	13,285	11,350	512	0.021%
CO	Pueblo-CityBus	8007-B	DRp	155	27	135	123,051	123,351	18,568	10,347	731	0.021%
CT	Bridgeport-VTD	1042-B	DR	376	119	629	827,645	888,890	109,907	26,160	3,144	0.012%
CT	Danbury-HART	1051-B	DR	437	75	478	827,645	154,455	109,907	26,160	1,501	0.029%

State	Transit Agency Name	ID/Org.	Mode[1]	1995 Annual Data in Thousands			1990 Population	2000 Population	1990 Population Over 65	1990 Per Capita Income	Annual VMT (All Vehicles) in Millions (HPMS)	Percentage Paratransit VMT
				VMT	Unlinked Passenger Trips	Passenger Miles						
CT	Greater Bridgeport TD	1050-B	DRp	966	139	742	827,645	888,890			3,144	0.031%
CT	Hartford-Conn DOT	1102-C	CRp	1,550	435	2,489	851,783	851,535	119,641	18,983	5,909	0.026%
CT	Middletown-MAT	1063-B	DRp	187	48	285	143,196	50,071	18,791	19,660	1,036	0.018%
CT	New Haven-CT Transit	1055-F	MB	842	144	881	804,219	531,314	117,863	17,666	3,807	0.022%
CT	Norwalk-Wheels	1057-B	DR	176	25	119	827,645	115,000	109,907	26,160	1,213	0.015%
DC	Washington-WMATA	3030-B	DRp	672	42	534	606,900	3,933,920	77,672	18,881	30,280	0.002%
DE	Delaware-DAST	3032-C	DR	2,804	266	5,296		579,000			5,157	0.054%
FL	Daytona Beach-STS	4050-A	MB	1,838	214	2,156	370,712	255,353	84,378	13,288	2,254	0.082%
FL	Ft. Pierce-St. Lucie COA	4097-F	DR	347	77	400	150,171	270,774	31,862	13,387	1,314	0.026%
FL	Gainesville-RTS	4030-A	DR	409	98	945	181,596	159,508	16,765	12,252	927	0.044%
FL	Jacksonville-JTA	4040-B	AG	1,563	128	1,520	672,971	882,295	71,942	13,857	8,962	0.017%
FL	Lakeland-Citrus Connect	4031-A	DR	368	88	805	405,382	199,487	75,235	12,392	1,205	0.031%
FL	Miami-COMSIS	4106-F	DRp	10,088	866	9,205	1,937,094	4,919,036	270,863	13,686	15,906	0.063%
FL	Orlando-LYNX	4035-B	DRp	4,136	484	5,111	677,491	1,157,431	71,862	14,570	11,785	0.035%
FL	Panama City-Bay Council	4085-A	DR	747	161	1,773	126,994	132,419	15,258	12,225	860	0.087%
FL	Pensacola-ECTS	4038-B	DRp	222	30	221	262,798	323,783	31,498	12,161	3,008	0.007%
FL	Sarasota-SCTA	4046-B	DRp	271	48	439	277,776	559,229	89,484	18,441	3,601	0.008%
FL	St. Petersburg-PSTA	4027-B	DR	1,266	170	1,462	851,659	2,062,339	221,564	15,712	16,233	0.008%
FL	Tallahassee-TALTRAN	4036-B	DR	435	61	406	192,493	204,260	15,716	14,088	754	0.058%
FL	Tampa-Hartline	4041-B	AGp	6,286	570	4,885	834,054	2,062,339	101,886	14,203	16,233	0.039%
FL	Vero Beach-Indian River	4104-F	DR	268	90	246	90,208	120,962	24,591	17,825	403	0.066%
FL	West Palm-CoTran	4037-B	DRp	786	68	979	863,518	393,289	210,389	19,937	9,226	0.009%
GA	Albany-ATS	4021-A	DR	125	28	125	96,311	95,450	9,872	10,888	602	0.021%
GA	Athens-ATS	4047-A	DR	103	16	96	87,594	106,482	7,490	11,604	551	0.019%
GA	Atlanta-CCT	4078-B	DRp	1,811	87	959	1,194,788	3,499,840	111,048	17,841	36,753	0.005%

State	Transit Agency Name	ID/Org.	Mode[1]	1995 Annual Data in Thousands			1990 Population	2000 Population	1990 Population Over 65	1990 Per Capita Income	Annual VMT (All Vehicles) in Millions (HPMS)	Percentage Paratransit VMT
				VMT	Unlinked Passenger Trips	Passenger Miles						
GA	Augusta-APT	4023-A	DR	74	11	53	189,719	335,630	18,929	11,799	2,868	0.003%
GA	Columbus-METRA	4024-A	DR	177	42	46	179,278	242,324	19,323	11,949	1,996	0.009%
GA	Rome-Transit Department	4058-A	DR	36	6	36	81,251	58,287	11,871	12,121	506	0.007%
GA	Savannah-CAT	4025-B	DRp	351	48	342	216,935	208,886	27,632	12,983	2,096	0.017%
HI	Honolulu-DTS	9002-B	MB	4,147	666	8,133	836,231	718,182	91,485	16,256	4,173	0.099%
ID	Boise Urban Stages	11-A	DR	123	20	115	205,775	272,625	21,419	14,268	2,060	0.006%
ID	Idaho Falls-C.A.R.T	38-A	DR	380	165	380	72,207	66,973	6,459	12,123	399	0.095%
ID	Pocatello Urban Transit	22-A	DR	57	19	63	66,026	62,498	6,698	10,976	401	0.014%
IL	Bloomington-Normal	5047-A	DR	74	26	125	129,180	92,456	13,474	14,138	482	0.015%
IL	Chicago-CTA/Cook Dupage	5134-D	DR	15,251	2,789	18,981	5,886,733	8,307,904	699,460	16,422	57,758	0.026%
IL	Decatur-DPTS	5061-B	DRp	154	40	165	117,206	52,315	17,009	13,762	937	0.016%
IL	Peoria-GP Transit	5056-B	DRp	238	67	537	182,827	247,172	25,922	13,924	1,937	0.012%
IL	Rockford-RMTD	5058-B	DRp	378	97	576	252,913	270,414	32,081	14,516	1,807	0.021%
IL	Springfield-SMTD	5059-A	DR	324	53	307	178,386	153,516	24,443	14,947	1,111	0.029%
IL	St. Louis-MCT	5146-B	DRp	1,326	128	1,149	588,995	-	78,576	12,509	21,448	0.006%
IN	Bloomington-BPT	5110-B	DRp	93	18	52	108,978	92,456	9,165	12,017	482	0.019%
IN	Elkhart-Goshen	5149-B	DRp	350	181	432	156,198	131,226	17,482	13,825	1,092	0.032%
IN	Evansville-METS	5043-A	DR	282	67	200	165,058	211,989	25,904	13,434	1,752	0.016%
IN	Fort Wayne-PTC	5044-A	DR	150	20	126	300,836	287,759	34,260	14,631	2,142	0.007%
IN	Indianapolis-Metro	5050-B	DRp	1,546	95	992	797,159	1,218,919	92,807	14,614	10,730	0.014%
IN	Lafayette-GLPTC	5051-A	DR	135	23	123	130,669	125,738	18,301	12,811	1,372	0.010%
IN	Muncie-MITS	5054-A	DR	214	49	165	119,659	90,673	15,114	12,168	626	0.034%
IN	NW IN-East Chicago	5042-A	MB	1,903	582	3,285	5,886,683	8,307,904			57,758	0.003%
IN	South Bend-Transpo	5052-B	DR	162	24	137	247,052	276,498	34,866	13,277	1,945	0.008%
IN	Terre Haute-TU	5053-B	DRp	10	2	26	106,107	79,376	15,988	11,973	941	0.001%

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IA	Des Moines-Metro	7010-B	DR	741	212	725	327,140	370,505	37,539	15,365	2,951	0.025%
IA	Dubuque, IA-KeyLine	7011-B	DRp	49	20	48	64,000	65,251			391	0.013%
IA	Iowa City Transit	7018-B	DRp	237	62	241	96,119	85,247	7,163	14,113	438	0.054%
IA	Iowa City-CAMBUS	7019-A	DR	57	12	25	96,119	85,247	7,163	14,113	438	0.013%
IA	Sioux City-STC	7012-B	DRp	65	16	63	98,276	106,119	14,476	12,218	607	0.011%
IA	Waterloo-MET	7013-B	DRp	303	110	627	123,798	108,298	16,889	12,321	792	0.038%
KS	Topeka-TMTA	7014-B	DR	195	35	354	160,976	142,411	21,068	14,091	1,117	0.017%
KS	Wichita-MTA	7015-B	DR	427	110	486	403,662	422,301	46,097	14,555	2,896	0.015%
KY	Cincinnati-TANK	4019-A	DR	347	35	319	316,652	1,503,262	35,812	12,944	11,901	0.003%
KY	Lexington-Fayette-LexTran	4017-B	DRp	501	95	676	225,366	250,994	22,303	14,962	2,667	0.019%
KY	Louisville-TARC	4018-B	DR	3,632	299	3,379	664,937	863,582	89,367	14,067	8,321	0.044%
LA	Alexandria-ATRANS	6025-A	DR	52	8	55	131,556	78,504	15,770	10,014	660	0.008%
LA	Baton Rouge-CTC	6022-B	DRp	146	13	128	380,105	479,019	34,792	13,126	3,042	0.005%
LA	Lafayette-COLT	6038-B	DRp	139	-	78	164,762	125,738	13,639	11,983	1,372	0.010%
LA	Monroe-MTS	6026-A	DR	11	2	6	142,191	113,818	16,068	10,593	873	0.001%
LA	New Orleans-Crescent City	6020-C	FB	1,520	218	1,520	496,938	1,009,283	64,587	11,372	5,626	0.027%
LA	Shreveport-SparTran	6024-B	DRp	379	36	257	334,341	275,213	40,818	11,530	2,408	0.016%
ME	Lewiston-Hudson Bus	1101-D	MB	366	90	830	105,259	50,317	14,121	12,397	513	0.071%
ME	Portland-CBL	1088-A	FB	408	111	903	243,135	188,080	31,738	15,816	1,220	0.033%
MD	Annapolis Public Transit	3040-A	DR	140	83	397	427,239	77,000	37,507	18,509	740	0.019%
MD	Baltimore-ColumBus	3043-F	MB	2,664	327	1,935	1,428,148	2,076,354	197,438	15,224	16,433	0.016%
MD	City of Frederick	3072-A	DR	388	50	-	150,208	119,144	14,180	16,571	637	0.061%
MD	Maryland-Ride-On	3051-B	DR	977	167	1,046	(999)	2,689,647	(999)	(999)	28,861	0.003%
MA	Boston-CATA	1053-B	DRp	8,903	847	5,591	663,906	4,032,484	80,633	15,414	21,666	0.041%
MA	Brockton-BAT	1004-B	DRp	735	199	788	435,276	188,000	50,278	16,523	1,473	0.050%

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MA	Fitchburg-MART	1061-B	DRp	777	221	881	709,705	-	97,287	15,500	550	0.141%
MA	Hyannis-Cape Cod-CCRTA	1105-B	DRp	1,911	307	1,703	186,605	-	41,322	16,402	1,531	0.125%
MA	Lawrence-MVRTA	1013-B	DRp	491	106	310	670,080	79,647	94,436	17,586	444	0.111%
MA	Lowell-LRTA	1005-B	DRp	395	90	343	1,398,468	105,167	175,234	20,343	2,117	0.019%
MA	Providence-GATRA	1064-B	DRp	965	204	1,403	506,325	1,174,548	73,367	13,853	7,463	0.013%
MA	Springfield-PVTA	1008-B	DRp	1,456	291	1,275	456,310	153,516	67,483	14,029	1,111	0.131%
MA	Worcester-WRTA	1014-B	DR	1,718	327	1,555	709,705	429,882	97,287	15,500	3,426	0.050%
MI	Ann Arbor-AATA	5040-B	DR	1,949	329	926	282,937	283,904	21,266	17,115	2,603	0.075%
MI	Battle Creek-BCT	5030-A	DR	171	30	261	135,982	79,135	18,129	12,729	760	0.022%
MI	Bay City-Metro Transit	5029-A	DR	423	62	629	111,723	74,048	14,927	12,597	578	0.073%
MI	Benton Harbor-Twin Cities	5132-A	DR	287	120	383	161,378	61,745	22,187	12,636	691	0.042%
MI	Detroit-Blue Water	5148-A	DR	3,702	964	7,204	2,111,687	3,903,377	263,997	13,016	33,711	0.011%
MI	Flint-MTA	5032-B	DR	1,221	252	1,078	430,459	365,096	43,583	13,583	3,540	0.034%
MI	Grand Rapids-GRATA	5033-B	DRp	1,188	187	1,283	500,631	539,080	53,857	14,378	4,435	0.027%
MI	Holland-Dial-A-Ride	5147-B	DRp	350	156	350	278,277	91,921	28,759	13,746	591	0.059%
MI	Jackson-JTA	5034-A	DR	618	95	729	149,756	88,050	18,505	12,556	804	0.077%
MI	Kalamazoo-Metro	5035-B	DRp	72	6	32	223,411	187,961	23,665	14,548	1,692	0.004%
MI	Lansing-CATA	5036-B	DR	1,675	280	2,675	374,791	300,032	33,590	14,026	2,328	0.072%
MI	Muskegon Area Transit	5037-B	DRp	80	9	47	158,983	154,729	20,761	11,345	860	0.009%
MN	Duluth-DTA	5025-B	DRp	179	30	178	198,213	118,265	33,496	11,833	987	0.018%
MN	Rochester	5092-B	DRp	131	41	282	106,470	91,271	10,625	16,214	588	0.022%
MN	St. Cloud-Metro Bus	5028-B	DR	193	79	392	190,921	91,305	19,114	11,860	556	0.035%
MS	Jackson-Jatran	4015-A	DR	274	37	440	341,602	88,050	36,673	12,356	804	0.034%
MO	Columbia-CATS	7016-A	DR	86	17	113	112,379	98,779	9,392	12,707	767	0.011%
MO	Kansas City-KCATA	7005-B	DR	2,681	253	1,333	844,510	1,361,744	103,314	14,220	15,033	0.018%

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MO	Springfield-CU	7003-A	DR	116	17	92	207,949	153,516	27,829	12,468	1,111	0.010%
MO	St. Joseph Express	7032-B	DRp	64	6	35	83,083	77,231	13,609	11,193	580	0.011%
MO	St. Louis-Bi-State	7006-A	DR	2,819	284	2,226	993,529	77,231	129,906	18,625	21,448	0.013%
MT	Billings-MET	8004-B	DRp	281	12	33	113,419	100,317	13,999	12,416	587	0.048%
MT	Great Falls-GFT	8012-B	DRp	18	6	18	77,691	64,387	9,849	12,011	334	0.005%
MT	Missoula-Mountain Line	8009-A	DR	74	15	72	78,687	69,491	8,098	11,944	393	0.019%
NE	Lincoln- StarTRAN	7001-B	DR	328	71	329	213,641	226,582	23,332	13,803	1,427	0.023%
NE	Omaha-TA	7002-B	DR	463	60	311	416,444	626,623	47,295	14,644	4,451	0.010%
NV	Reno-Citifare	9001-B	DRp	1,194	198	1,137	254,667	303,689	25,924	16,365	1,936	0.062%
NH	Manchester-MTA	1002-A	DR	40	9	30	336,073	143,549	34,382	17,404	1,151	0.004%
NH	Nashua-City Bus	1087-B	DRp	286	57	495	336,073	197,155	34,382	17,404	811	0.035%
NJ	New Jersey Transit	2080-B	CR	1,580	75	654		706,903			6,993	0.023%
NM	Albuquerque-Sun Tran	6019-A	DR	1,292	117	851	480,577	598,191	50,379	13,594	4,433	0.029%
NM	Las Cruces-RoadRUNNER	6049-A	DR	78	18	56	135,510	104,186	12,024	9,374	898	0.009%
NM	Santa Fe Trails	6077-B	DRp	1,168	93	-		80,337			693	0.168%
NM	Santa Fe-Sr. Citizens	6045-A	DR	155	25	151	98,928	80,337	10,005	15,327	693	0.022%
NY	Buffalo-NFTA	2004-A	DR	92	8	76	968,532	976,703	147,430	13,560	7,829	0.001%
NY	Elmira-Chemung County	2005-B	DRp	379	97	936	95,195	67,159	14,309	12,069	549	0.069%
NY	Glens Falls-GGFT	2120-B	DR	21	3	10	59,209	57,627	8,551	14,378	612	0.003%
NY	Ithaca-TOMTRAN	2145-B	DRp	176	36	128	94,097	53,528	8,417	13,171	272	0.065%
NY	Poughkeepsie-LOOP	2010-A	DR	381	74	700		351,982			1,566	0.024%
NY	Rochester-RTS	2113-A	DR	868	132	1,121	713,968	91,271	88,603	16,162	588	0.148%
NY	Syracuse-RTA-Cayuga	2116-A	MB	382	84	514	468,973	402,267	60,479	14,703	3,441	0.011%
NY	Utica-UTA	2021-A	DR	153	27	143	250,836	113,409	38,729	12,227	1,679	0.009%
NC	Asheville-City Coach	4005-B	DRp	119	22	119	174,821	221,570	28,329	13,211	2,182	0.005%

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NC	Charlotte-CTS	4008-B	DR	1,001	118	1,012	511,433	758,927	47,584	16,910	6,970	0.014%
NC	Durham-Chapel Hill	4051-A	DR	641	117	584	275,686	287,796	27,526	15,284	2,935	0.022%
NC	Greensboro-GTA	4093-B	DRp	340	66	575	347,420	267,884	41,321	15,373	2,794	0.012%
NC	High Point-Hitran	4011-B	DR	134	50	150	580,643	132,844	69,330	14,167	1,671	0.008%
NC	Raleigh-CAT	4007-B	DRp	403	223	227	423,380	541,527	32,951	17,195	5,350	0.008%
NC	Wilmington-WTA	4006-A	DR	32	6	17	120,284	161,149	15,066	13,863	4,616	0.001%
NC	Winston-Salem-WSTA	4012-A	DR	404	164	999	265,878	299,920	32,399	16,151	2,700	0.015%
ND	Bis-Man Transit	8019-B	DRp	571	174	571	60,131	-	6,413	13,018	413	0.138%
ND	Fargo-MAT	8003-B	DRp	149	39	171	102,874	142,477	10,121	13,240	796	0.019%
ND	Grand Forks-City Bus	8008-B	DRp	149	37	114	70,683	56,573	6,189	11,414	273	0.055%
OH	Akron-Kent State	5097-A	MB	1,497	401	1,639	514,990	570,215	71,133	14,409	4,754	0.031%
OH	Canton-RTA Proline	5011-A	DR	146	20	138	367,585	266,595	53,216	39,151	1,845	0.008%
OH	Cincinnati-SORTA	5012-B	DRp	1,918	216	2,530	316,652	1,503,262	35,812	12,944	11,901	0.016%
OH	Cleveland-Brunswick	5143-B	MBp	3,432	590	4,447	1,412,140	1,786,647	220,659	14,912	13,797	0.025%
OH	Columbus-COTA	5016-B	DRp	1,224	101	885	1,064,898	242,324	104,131	14,781	1,996	0.061%
OH	Dayton-RTA	5017-B	DR	1,348	119	955	573,809	703,444	72,040	14,495	5,943	0.023%
OH	Lorain-LCT	5095-B	DRp	278	46	229	271,126	193,586	31,267	12,733	1,930	0.014%
OH	Mansfield-RCT	5090-B	DRp	66	25	80	126,137	79,698	16,377	12,514	460	0.014%
OH	Newark	5138-B	DRp	933	234	839	128,300	70,001	15,227	12,864	326	0.286%
OH	Springfield-SCAT	5020-D	DR	50	13	45	147,548	153,516	20,386	12,348	1,111	0.004%
OH	Toledo-TARTA	5022-B	DRp	408	42	329	462,361	503,008	59,901	13,778	4,318	0.009%
OH	Youngstown-WRTA	5024-A	DR	121	30	106	492,619	417,437	77,943	12,237	2,653	0.005%
OK	Oklahoma City-COTPA	6017-B	DR	1,231	171	985	958,839	747,003	105,174	13,269	9,483	0.013%
OK	Tulsa-MTA	6018-B	DRp	1,407	243	2,405	544,986	558,329	63,833	14,465	6,572	0.021%
OR	Eugene-LTD	7-B	DRp	450	94	518	282,912	224,049	37,090	12,570	1,507	0.030%

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OR	Medford-RVTD	34-B	DRp	97	32	76	146,389	128,780	23,700	12,492	533	0.018%
OR	Portland-Tri-Met	8-B	DR	3,443	541	4,681	1,277,399	188,080	156,031	15,213	1,220	0.282%
PA	Allentown-Lanta	3010-B	DRp	1,732	325	2,084	291,130	82,520	44,878	15,458	3,446	0.050%
PA	Altoona-AMTRAN	3011-B	DRp	49	10	40	130,542	82,520	22,179	11,233	496	0.010%
PA	Erie-EMTA	3013-B	DR	836	169	1,150	275,572	194,804	38,017	12,317	988	0.085%
PA	Harrisburg-Cat	3014-B	DRp	41	6	46	237,813	362,782	33,983	14,890	3,555	0.001%
PA	Lancaster-RRTA	3018-B	DRp	1,339	271	2,675	422,822	323,554	55,517	14,235	1,601	0.084%
PA	Philadelphia-Penn DOT	3057-C	CRp	9,591	1,424	9,097	1,585,577	5,149,079	241,206	12,091	28,107	0.034%
PA	Pittsburgh-GG&C Bus	3050-D	DR	13,067	2,127	11,829	1,336,449	1,753,136	232,505	15,115	13,006	0.100%
PA	Reading-BARTA	3024-B	DR	665	198	1,337	336,523	240,264	52,658	14,604	1,332	0.050%
PA	Scranton-Colts	3025-B	DRp	248	16	108	219,039	385,237	43,193	12,358	2,570	0.010%
PA	State College-Centre Line	3054-B	DRp	136	24	86	123,786	71,301	11,114	11,854	403	0.034%
PA	Williamsport-City Bus	3026-B	DRp	5	2	5	118,710	58,693	17,963	11,714	507	0.001%
PR	San Juan-MBA	4086-C	DR	291	37	210		2,216,616	(999)	(999)	6,357	0.005%
RI	Providence-RIPTA	1001-B	DRp	167	15	171	596,270	1,174,548	94,252	13,871	7,463	0.002%
SC	Columbia-SCE&G	4069-F	DRp	583	69	664	285,720	98,779	26,646	13,243	767	0.076%
SC	Florence-PDRTA	4056-A	DR	2,765	406	7,052	114,344	71,299	12,719	11,007	803	0.344%
SC	Greenville-GTA	4053-A	DR	441	256	1,780	320,167	84,059	37,942	13,918	519	0.085%
SC	Myrtle Beach-CRPTA	4102-A	DR	542	33	919	144,053	122,984	18,262	12,385	919	0.059%
SC	Spartanburg-County	4088-B	DRp	609	90	1,066	226,800	145,058	28,688	12,218	1,035	0.059%
SC	Sumter-Santee Wateree	4100-A	DR	1,855	310	4,080	102,637	64,320	9,591	9,997	411	0.451%
SD	Rapid City Transit System	8014-A	DR	152	56	156	81,343	66,780	8,174	12,031	458	0.033%
SD	Sioux Falls-The Bus	8002-B	DR	478	119	431	139,236	124,269	16,599	13,223	790	0.060%
TN	Clarksville-CTS	4092-A	DR	102	10	69	100,498	121,775	7,934	11,056	1,035	0.010%
TN	Jackson Transit Authority	4057-A	DR	64	13	115	77,982	88,050	10,734	11,655	804	0.008%

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TN	Johnson City-JCT	4054-A	DR	120	23	91	143,820	102,456	20,720	11,183	1,014	0.012%
TN	Kingsport	4080-B	DR	400	71	150	188,161	95,766	26,368	12,164	1,049	0.038%
TN	Knoxville-K-Trans	4002-A	DR	238	33	195	335,749	419,830	42,672	14,007	4,225	0.006%
TN	Memphis-MATA	4003-A	DR	801	133	1,499	826,330	972,091	86,153	13,330	8,294	0.010%
TN	Nashville-MTA	4004-A	DR	1,054	112	633	510,784	749,935	59,235	15,195	8,304	0.013%
TX	Abilene-CityLink	6040-A	DR	206	24	141	136,145	107,041	17,392	11,563	1,049	0.020%
TX	Amarillo-ACT	6001-A	DR	144	20	144	187,547	179,312	21,711	12,687	1,730	0.008%
TX	Austin-Capital Metro	6048-B	DR	3,788	443	3,548	715,958	901,920	52,047	14,805	7,282	0.052%
TX	Beaumont-BMT	6016-A	DR	123	17	93	239,397	139,304	33,446	12,348	1,557	0.008%
TX	Brownsville-BUS	6014-B	DR	173	39	189	260,120	165,776	27,331	7,125	691	0.025%
TX	City of Denton	6076-B	DRp	163	29	178	273,525	299,823	13,694	16,105	865	0.019%
TX	Corpus Christi-The B	6051-B	DRp	1,447	197	2,213	349,894	293,925	35,076	11,065	2,724	0.053%
TX	Dallas - Handitran	6041-B	DR	476	78	556	1,852,810	4,145,659	151,510	16,243	42,540	0.001%
TX	Dallas-DART	6056-B	DRp	11,466	840	11,339	1,852,810	4,145,659	151,510	16,243	42,540	0.027%
TX	El Paso-Sun Metro	6006-B	DR	1,859	246	2,248	591,610	674,801	48,033	9,150	4,398	0.042%
TX	Fort Worth-The T	6007-B	DR	2,931	269	2,708	1,170,103	4,145,659	97,139	15,178	42,540	0.007%
TX	Galveston-Island Transit	6015-B	DR	83	148	227	217,399	54,770	22,716	13,993	504	0.016%
TX	Houston-Metro	6008-B	DRp	9,404	888	9,155	3,322,025	3,822,509	233,818	15,073	33,537	0.028%
TX	Laredo-El Metro	6009-A	DR	254	39	148	133,239	175,586	10,310	6,771	959	0.027%
TX	Lubbock-Citibus	6010-A	DR	322	47	307	222,636	202,225	21,616	12,008	1,828	0.018%
TX	Port Arthur-PAT	6013-A	DR	88	22	115	239,397	114,656	33,446	12,348	795	0.011%
TX	San Angelo-Antran	6037-A	DR	169	43	169	98,458	87,969	12,508	11,482	594	0.028%
TX	San Antonio-VIA	6011-B	DR	13,233	1,110	12,858		1,327,554			12,207	0.108%
TX	Waco Transit System	6012-A	DR	81	18	81	189,123	153,198	25,386	11,185	1,730	0.005%
UT	Logan Transit District	8021-B	DRp	24	5	19	70,183	76,187	5,704	9,544	477	0.005%

State	Transit Agency Name	ID/Org.	Mode[1]	1995 Annual Data in Thousands			1990 Population	2000 Population	1990 Population Over 65	1990 Per Capita Income	Annual VMT (All Vehicles) in Millions (HPMS)	Percentage Paratransit VMT
				VMT	Unlinked Passenger Trips	Passenger Miles						
UT	Salt Lake City-UTA	8001-B	DR	2,614	316	2,210	725,956	887,650	61,079	12,222	7,445	0.035%
VT	Burlington-CT	1066-B	DRp	94	15	98	131,761	94,248	10,634	16,096	1,286	0.007%
VA	Charlottesville Transit	3036-B	DRp	7	4	4	40,341	81,449	4,912	12,928	508	0.001%
VA	Charlottesville-Jaunt	3045-A	DR	1,579	204	1,300	40,341	81,449	4,912	12,928	508	0.311%
VA	Danville-DTS	3069-A	DR	43	10	28	53,056	53,223	9,874	11,344	466	0.009%
VA	Lynchburg-GLTC	3008-A	DR	66	11	63	66,049	98,714	10,895	12,657	985	0.007%
VA	Petersburg Area Transit	3009-B	DRp	36	11	36	38,386	123,000	5,739	10,547	2,556	0.001%
VA	Richmond-GRTC	3006-B	DRp	916	94	930	203,056	818,836	31,059	13,993	6,161	0.015%
VA	Roanoke-Valley Metro	3007-B	DRp	234	28	234	96,397	197,442	16,471	12,513	1,755	0.013%
WA	Bellingham-WTA	21-B	DR	642	138	651	127,780	84,324	16,225	13,753	562	0.114%
WA	Bremerton-Kitsap Transit	20-B	DR	1,197	242	2,249	189,731	178,369	20,284	14,311	1,069	0.112%
WA	Olympia-IT	19-A	DR	849	160	640	161,238	143,826	18,799	13,901	1,212	0.070%
WA	Seattle-Everett	5-A	DR	5,027	800	7,053	1,507,319	2,712,205	167,328	18,587	18,772	0.027%
WA	Spokane-STA	2-B	DR	2,531	442	3,462	361,364	334,858	47,877	12,804	2,440	0.104%
WA	Tacoma-Pierce Ferry	28-B	FBp	4,763	530	4,707	586,203	606,000	61,247	13,439	4,986	0.096%
WA	Yakima Transit	6-B	DRp	424	100	399	188,823	112,816	24,471	10,735	689	0.062%
WV	Charleston-KRT	3001-A	DR	328	28	310	207,619	182,991	32,496	12,887	3,220	0.010%
WV	Huntington-TTA	3002-B	DRp	114	11	62	138,463	177,550	21,605	11,275	1,440	0.008%
WI	Appleton-Valley Transit	5001-B	DRp	636	116	417	315,121	187,683	37,455	13,698	1,429	0.044%
WI	Beloit-City of Beloit	5109-B	DRp	11	2	8	139,510	56,462	17,620	13,428	462	0.002%
WI	Eau Claire-Chippewa Falls	5133-B	DRp	342	100	300	137,543	91,393	18,071	11,561	780	0.044%
WI	Green Bay-GBT	5002-B	DRp	338	28	149	194,594	187,316	21,080	13,906	1,646	0.021%
WI	Janesville-JTS	5108-B	DRp	11	4	10	139,510	66,034	17,620	13,428	439	0.003%
WI	Madison-MMT	5005-B	DR	1,532	193	1,135	367,085	329,533	33,767	15,542	2,201	0.070%
WI	Milwaukee-County	5008-A	MB	7,263	889	4,655	1,054,603	1,308,913	140,444	13,505	11,639	0.062%

State	Transit Agency Name	ID/Org.	Mode[1]	1995 Annual Data in Thousands			1990 Population	2000 Population	1990 Population Over 65	1990 Per Capita Income	Annual VMT (All Vehicles) in Millions (HPMS)	Percentage Paratransit VMT
				VMT	Unlinked Passenger Trips	Passenger Miles						
WI	Oshkosh-OTS	5009-B	DRp	441	122	413	140,320	71,070	17,999	13,696	419	0.105%
WI	Racine-Belle Urban System	5006-B	DRp	473	41	468	175,034	129,545	21,002	14,023	643	0.074%
WI	Sheboygan-ST	5088-B	DRp	183	14	91	103,877	68,600	15,134	13,425	367	0.050%
WI	Wausau-WATS	5091-B	DRp	55	16	60	115,400	68,221	14,596	12,718	552	0.010%
WY	Cheyenne Transit	8020-A	DR	583	147	538	73,142	68,202	7,439	12,932	568	0.103%
WY	City of Casper	8013-B	DRp	264	83	247	61,226	57,719	6,393	12,992	459	0.058%
	TOTAL			**317,322**	**49,333**	**351,778**	**155,985,470**	**210,012,251**	**16,552,795**	**3,734,226**	**1,650,016**	**0.019%**

[1] DR = Demand Responsive
DRp = Demand Responsive – Purchased
LR = Light Rail; MB = Motor Bus
MBp = Motor Bus Purchased
HR = Heavy Rail
AG = Automated Guideway
FB = Ferry Boat
FBp = Ferry Boat – Purchased

Source: http://www.people.virginia.edu/~sns5r/sect15stf/disab/t1995.prn.

Appendix B

Largest 100 School District Bus Fleets in 2000

Table B.1 Largest 100 School District Bus Fleets in 2000

Rank	School District	Location	Buses Operated	Students Transported (Daily)	Annual Route Mileage	Daily School Bus VMT	Total Population (000s)	Buses per Population	Daily All Vehicle VMT (000s) (HPMS)	School Bus VMTs as Percent of Total VMT
87	Anchorage School District	Anchorage, Alaska	254	20,000	3,000,000	16,667	248	0.102%	4,443	0.375%
51	Jefferson County Public Schools	Birmingham, Alaska	406	22,064	2,800,000	15,556	667	0.061%	23,184	0.067%
78	Little Rock School District	Little Rock, Arkansas	296	18,000	5,000,000	27,778	325	0.091%	9,227	0.301%
82	Tucson Unified School District	Tucson, Arizona	287	16,000	4,380,000	24,333	619	0.046%	13,564	0.179%
2	Los Angeles Unified School District	Los Angeles, California	3,299	75,600	21,500,000	119,444	12,384	0.027%	280,792	0.043%
41	San Diego Unified School District	San Diego, California	477	22,000	n/a		2,653	0.018%	62,809	0.000%
57	Denver Public Schools	Denver, Colorado	660	45,739	5,000,000	27,778	1,993	0.033%	43,996	0.063%
27	Lee District School Board	Fort Myers, Florida	571	32,386	12,114,437	67,302	290	0.197%	6,758	0.996%
10	Broward County Schools	Oakland Park, Florida	1,079	67,000	37,230,000	206,833	1,601	0.067%	37,335	0.554%
11	School District of Hillsborough & Pinnellus	Thonotosassa, Florida	1,598	131,006	33,793,232	187,740	1,953	0.082%	44,474	0.422%
17	Duval County Public Schools	Jacksonville, Florida	938	55,078	17,853,777	99,188	869	0.108%	24,553	0.404%
28	School District of Palm Beach County	West Palm Beach, Florida	564	61,925	17,000,000	94,444	1,041	0.054%	25,277	0.374%
5	Miami-Dade County Public Schools	Miami, Florida	1,448	70,738	23,739,639	131,887	2,227	0.065%	43,577	0.303%
100	Cherokee County Schools	Canton, Georgia	219	19,000	5,200,000	28,889		–		–
30	Fulton County Schools	Fairburn, Georgia	554	53,600	5,053,140	28,073		–		–
20	Cobb County Public Schools	Marietta, Georgia	834	70,865	10,779,438	59,886		–		–
18	Gwinnett County Public Schools	Lawrenceville, Georgia	928	77,000	13,970,000	77,611		–		–
66	Savannah-Chatham County Public Schools	Savannah, Georgia	350	23,588	4,129,740	22,943	233	0.150%	5,743	0.399%
63	Rockford Board of Education	Rockford, Illinois	356	21,300	4,218,000	23,433	208	0.171%	4,950	0.473%
3	Chicago Public Schools	Chicago, Illinois	2,050	39,796	27,000,000	150,000	7,702	0.027%	158,241	0.095%
47	Wichita Public Schools	Wichita, Kansas	436	20,966	8,750,000	48,611	377	0.116%	7,935	0.613%
98	Fayette County Public Schools	Lexington, Kentucky	220	15,000	3,000,000	16,667	245	0.090%	7,307	0.228%
84	Calcasieu Parish School Board	Lake Charles, Louisiana	274	15,500	1,078,000	5,989	122	0.225%	2,826	0.212%

Rank	School District	Location	Buses Operated	Students Transported (Daily)	Annual Route Mileage	Daily School Bus VMT	Total Population (000s)	Buses per Population	Daily All Vehicle VMT (000s) (HPMS)	School Bus VMTs as Percent of Total VMT
33	Boston Public Schools	Boston, Massachusetts	535	37,000	9,465,380	52,585	2,917	0.018%	59,360	0.089%
37	Anne Arundel County Public Schools	Annapolis, Maryland	498	52,000	9,575,000	53,194	77	0.647%	2,027	2.624%
93	Grand Rapids Public Schools	Grand Rapids, Michigan	240	15,000	3,000,000	16,667	530	0.045%	12,150	0.137%
21	Detroit Public Schools**	Detroit, Michigan	777	20,800	n/a		3,836	0.020%	92,359	0.000%
26	Minneapolis Public Schools	Minneapolis, Minnesota	592	53,000	14,250,000	79,167	2,475	0.024%	60,719	0.130%
68	St. Paul Public Schools	St. Paul, Minnesota	341	43,400	5,100,000	28,333	2,475	0.014%	60,719	0.047%
39	Kansas City School District	Kansas City, Missouri	480	20,800	7,085,745	39,365	1,422	0.034%	41,187	0.096%
36	St. Louis Public Schools	St. Louis, Missouri	505	25,000	6,366,204	35,368	2,044	0.025%	58,761	0.060%
25	Guilford County Schools	Greensboro, North Carolina	598	38,223	7,555,130	41,973	223	0.268%	7,654	0.548%
16	Charlotte-Mecklenburg Schools	Charlotte, North Carolina	997	63,500	17,235,000	95,750	646	0.154%	19,097	0.501%
23	Wake County Public Schools	Raleigh, North Carolina	713	52,000	13,000,000	72,222	477	0.149%	14,658	0.493%
67	Winston-Salem/Forsyth County Schools	Winston-Salem, North Carolina	345	24,108	4,955,328	27,530	233	0.148%	7,396	0.372%
81	Buncombe County Public Schools	Asheville, North Carolina	288	15,900	2,853,360	15,852	126	0.229%	5,977	0.265%
12	Clark County School District	Las Vegas, Nevada	1,012	98,605	16,465,668	91,476	1,256	0.081%	24,127	0.379%
52	Albuquerque Public Schools	Albuquerque, New Mexico	399	28,287	5,545,749	30,810	427	0.093%	12,144	0.254%
43	Buffalo City School District	Buffalo, New York	454	37,811	3,797,280	21,096	1,112	0.041%	21,448	0.098%
96	Greece Central Schools	Rochester, New York	223	14,655	2,454,278	13,635	652	0.034%	15,303	0.089%
24	Rochester City School District	Rochester, New York	611	24,500	n/a		652	0.094%	15,303	0.000%
1	New York City Public Schools*	New York, New York	5,066	170,000	n/a		17,089	0.030%	263,904	0.000%
38	Columbus City Schools	Columbus, Ohio	482	27,362	8,066,160	44,812	940	0.051%	24,732	0.181%
32	Cleveland Municipal School District	Cleveland, Ohio	544	24,665	5,393,882	29,966	1,783	0.031%	37,799	0.079%
79	Tulsa Public Schools	Tulsa, Oklahoma	292	20,000	5,800,000	32,222	803	0.036%	18,006	0.179%
86	Portland Public Schools	Portland, Oregon	257	12,000	3,047,139	16,929	1,552	0.017%	31,534	0.054%
13	Philadelphia School District	Philadelphia, Pennsylvania	1,012	31,670	7,525,800	41,810	4,278	0.024%	77,006	0.054%
88	Clarksville-Montgomery County Schools	Clarksville, Tennessee	253	18,000	2,864,780	15,915	147	0.172%	2,836	0.561%
64	Knox County Schools	Knoxville, Tennessee	353	42,019	3,082,500	17,125	325	0.109%	11,574	0.148%

Rank	School District	Location	Buses Operated	Students Transported (Daily)	Annual Route Mileage	Daily School Bus VMT	Total Population (000s)	Buses per Population	Daily All Vehicle VMT (000s) (HPMS)	School Bus VMTs as Percent of Total VMT
35	Metro Nashville Public Schools	Nashville, Tennessee	508	41,689	3,931,920	21,844	605	0.084%	22,752	0.096%
45	Memphis City Schools	Memphis, Tennessee	451	19,607	3,721,840	20,677	919	0.049%	22,724	0.091%
89	Spring Branch Independent School District	Houston, Texas	244	12,000	1,700,000	9,444		–		–
80	Katy Independent School District	Houston, Texas	290	17,500	2,461,460	13,675		–		–
8	Dallas County Schools	Dallas, Texas	1,100	50,000	13,000,000	72,222	3,746	0.029%	116,549	0.062%
70	North East Independent School District	San Antonio, Texas	336	20,000	3,715,000	20,639	1,143	0.029%	33,444	0.062%
50	Cypress-Fairbanks Indpt. School District	Houston, Texas	418	46,000	3,684,987	20,472	2,487	0.017%	91,883	0.022%
60	Fort Worth Independent School District	Fort Worth, Texas	366	12,385	2,440,620	13,559	3,746	0.010%	116,549	0.012%
46	Northside Independent School District	San Antonio, Texas	450	34,400	n/a		1,143	0.039%	33,444	0.000%
6	Houston Independent School District*	Houston, Texas	1,300	47,000	n/a		2,487	0.052%	91,883	0.000%
58	Loudoun County Schools	Leesburg, Virginia	368	23,682	4,500,000	25,000	106	0.347%	2,698	0.927%
53	Henrico County Public Schools	Richmond, Virginia	396	37,000	3,937,000	21,872	694	0.057%	16,879	0.130%
48	Seattle School District	Seattle, Washington	435	28,130	5,640,000	31,333	2,013	0.022%	51,430	0.061%
4	Milwaukee Public Schools	Milwaukee, Wisconsin	1,650	51,100	n/a		1,341	0.123%	31,888	0.000%

Source: http://www.schoolbusfleet.com/stats/pdf/top 100_2002.pdf.

Table B.2 School Bus Transportation Data by State
1999-2000 School Year

State	Public School Pupils Transported	Private School Pupils Transported	Total Buses	Total Route Mileage
Alabama	395,401	0	8,035	62,769,466
Alaska	43,933	300	858	10,661,561
Arizona	25,219	0	6,796	60,258,729
Arkansas	314,852	n/a	6,266	43,680,600
California	986,817	n/a	25,317	367,893,624
Colorado	278,789	n/a	5,900	48,774,798
Connecticut	3,692,051	249,151	6,136	n/a
Delaware	97,327	0	1,560	20,480,844
Florida	969,213	0	20,292	267,956,013
Georgia	1,082,713	0	15,434	146,539,980
Hawaii	32,500	n/a	795	6,048,000
Idaho	110,762	0	2,609	24,021,336
Illinois	1,368,740	35,918	18,000	208,147,114
Indiana	718,622	11,688	11,988	77,753,813
Iowa	248,215	14,326	7,109	n/a
Kansas	208,546	1,502	5,819	80,759,503
Kentucky	433,725	n/a	9,469	101,246,438
Louisiana	478,906	22,493	8,198	35,191,260
Maine	179,102	n/a	2,668	32,417,593
Maryland[1]	598,262	2,771	6,394	113,156,876
Massachusetts[1]	631,779	133,572	8,200	75,600,000
Michigan[1]	n/a	n/a	15,785	183,885,757
Minnesota	768,461	74,622	10,608	136,996,818
Mississippi	407,726	n/a	5,646	53,077,377
Missouri	577,100	0	11,190	104,662,401
Montana	66,507	218	2,168	19,328,220
Nebraska	73,481	3,660	2,462	27,737,077
Nevada	128,512	n/a	1,830	n/a
New Hampshire	124,070	14,120	2,306	n/a
New Jersey	655,695	92,191	19,000	n/a

State	Public School Pupils Transported	Private School Pupils Transported	Total Buses	Total Route Mileage
New Mexico[1]	167,192	0	3,000	31,702,465
New York[1]	1,733,005	295,204	45,497	204,829,897
North Carolina	696,802	0	13,104	148,315,938
North Dakota	46,114	n/a	1,469	23,349,766
Ohio	1,120,279	104,042	17,373	181,384,200
Oklahoma	333,538	0	7,552	53,780,139
Oregon	256,065	0	6,123	38,767,019
Pennsylvania	1,513,603	n/a	26,175	346,477,854
Rhode Island	156,454	n/a	1,691	n/a
South Carolina	282,928	0	5,042	67,800,000
South Dakota	44,595	n/a	1,651	13,935,887
Tennessee	456,436	n/a	7,859	51,192,720
Texas	1,367,706	n/a	33,376	307,527,644
Utah	159,465	550	2,048	21,933,000
Vermont	60,000	n/a	1,175	12,629,027
Virginia	887,497	n/a	11,809	165,467,666
Washington	482,986	0	8,801	85,000,000
West Virginia	221,506	n/a	3,691	42,667,945
Wisconsin	550,000	50,000	10,200	n/a
Wyoming	33,059	n/a	1,755	12,731,922
Totals	22,961,410	797,087	**458,229**	**4,118,538,287**

[1] 1998-99 school year.

Appendix C

Taxi Data from Fact Book 2002 *(Taxicab Division)*

Table C.1 Taxicab Statistics 2002
From Fact Book 2002

City	State	Population (000s)	Number of Taxicab Licenses	Annual Taxicab VMT	Daily Taxicab VMT	Adjusted Daily Total All Vehicle VMTs (000s)	Taxicab VMT as a Percent of Total
Birmingham	Alabama	900	140	7,641,060	20,934	31,283	0.07
Mobile	Alabama	400	40	2,131,040	5,838	10,537	0.06
Anchorage	Alaska	225	168	9,169,272	25,121	4,031	0.62
Little Rock	Arkansas	350	280	15,282,120	41,869	9,937	0.42
Los Angeles	California	4,000	1,931	105,392,049	288,745	90,695	0.32
Palm Springs	California	150	90	4,794,840	13,137	2,533	0.52
Sacramento	California	1,000	250	13,644,750	37,383	21,323	0.18
San Diego	California	1,200	910	49,666,890	136,074	28,410	0.48
San Francisco	California	775	1,381	75,373,599	206,503	17,395	1.19
San Jose	California	1,700	600	32,747,400	89,719	40,088	0.22
Santa Barbara	California	200	65	3,462,940	9,488	4,497	0.21
Simi Valley	California	175	6	307,884	844	3,336	0.03
Colorado Springs	Colorado	300	90	4,794,840	13,137	5,470	0.24
Denver	Colorado	2,600	842	45,955,518	125,906	57,396	0.22
Grand Junction	Colorado	52	11	564,454	1,546	809	0.19
Stamford	Connecticut	105	75	3,995,700	10,947	2,389	0.46
Washington	D.C.	573	6,200	338,389,800	927,095	13,142	7.05
Wilmington	Delaware	491	80	4,262,080	11,677	12,345	0.09
Jacksonville	Florida	1,000	300	16,373,700	44,859	28,254	0.16

City	State	Population (000s)	Number of Taxicab Licenses	Annual Taxicab VMT	Daily Taxicab VMT	Adjusted Daily Total All Vehicle VMTs (000s)	Taxicab VMT as a Percent of Total
Orlando	Florida	1,200	1,000	54,579,000	149,532	33,401	0.45
Pensacola	Florida	249	308	16,810,332	46,056	7,003	0.66
Atlanta	Georgia	4,125	1,600	87,326,400	239,250	139,523	0.17
Honolulu	Hawaii	850	1,900	103,700,100	284,110	14,004	2.03
Peoria	Illinois	150	60	3,196,560	8,758	3,263	0.27
Springfield	Illinois	130	90	4,794,840	13,137	3,167	0.41
Bloomington	Indiana	80	24	1,231,536	3,374	1,487	0.23
Evansville	Indiana	125	25	1,331,900	3,649	3,243	0.11
Fort Wayne	Indiana	255	45	2,397,420	6,568	6,035	0.11
Indianapolis	Indiana	780	430	23,468,970	64,299	25,061	0.26
Cedar Rapids	Iowa	125	40	2,131,040	5,838	2,446	0.24
Des Moines	Iowa	400	80	4,262,080	11,677	9,240	0.13
Iowa City	Iowa	100	21	1,077,594	2,952	1,537	0.19
Topeka	Kansas	125	38	2,024,488	5,547	2,693	0.21
Wichita	Kansas	400	150	8,186,850	22,430	8,419	0.27
Louisville	Kentucky	1,200	300	16,373,700	44,859	33,238	0.13
Newport	Kentucky	105	36	1,917,936	5,255	1,548	0.34
Alexandria	Louisiana	65	40	2,131,040	5,838	1,336	0.44
Baton Rouge	Louisiana	475	63	3,356,388	9,196	10,556	0.09
Lafayette	Louisiana	105	30	1,598,280	4,379	2,968	0.15
New Orleans	Louisiana	557	1,608	87,763,032	240,447	8,062	2.98
Bangor	Maine	52	60	3,196,560	8,758	1,268	0.69

City	State	Population (000s)	Number of Taxicab Licenses	Annual Taxicab VMT	Daily Taxicab VMT	Adjusted Daily Total All Vehicle VMTs (000s)	Taxicab VMT as a Percent of Total
Portland	Maine	95	91	4,848,116	13,283	2,462	0.54
Baltimore	Maryland	650	1,157	63,147,903	173,008	13,889	1.25
Boston	Massachusetts	975	1,825	99,606,675	272,895	19,841	1.38
Hyannis	Massachusetts	45	50	2,663,800	7,298	1,642	0.44
New Bedford	Massachusetts	105	65	3,462,940	9,488	1,761	0.54
Pittsfield	Massachusetts	95	20	1,026,280	2,812	1,719	0.16
Springfield	Massachusetts	190	94	5,007,944	13,720	4,628	0.30
Worcester	Massachusetts	175	108	5,894,532	16,149	4,589	0.35
Ann Arbor	Michigan	120	85	4,528,460	12,407	3,089	0.40
Battle Creek	Michigan	55	16	821,024	2,249	1,413	0.16
Detroit	Michigan	850	1,310	71,498,490	195,886	20,465	0.96
Port Huron	Michigan	35	11	564,454	1,546	821	0.19
Saginaw	Michigan	150	55	2,930,180	8,028	3,459	0.23
Rochester	Minnesota	100	34	1,811,384	4,963	1,895	0.26
St. Cloud	Minnesota	150	35	1,864,660	5,109	2,624	0.19
Kansas City	Missouri	950	600	32,747,400	89,719	27,516	0.33
Springfield	Missouri	165	90	4,794,840	13,137	4,019	0.33
St. Joseph	Missouri	78	10	513,140	1,406	1,588	0.09
St. Louis	Missouri	1,500	1,200	65,494,800	179,438	43,122	0.42
Billings	Montana	45	25	1,331,900	3,649	731	0.50
Great Falls	Montana	70	12	615,768	1,687	942	0.18
Lincoln	Nebraska	280	32	1,704,832	4,671	4,844	0.10

City	State	Population (000s)	Number of Taxicab Licenses	Annual Taxicab VMT	Daily Taxicab VMT	Adjusted Daily Total All Vehicle VMTs (000s)	Taxicab VMT as a Percent of Total
Omaha	Nebraska	700	165	9,005,535	24,673	13,173	0.19
Las Vegas	Nevada	1,200	1,400	76,410,600	209,344	23,051	0.91
Reno	Nevada	280	250	13,644,750	37,383	4,821	0.78
Manchester	New Hampshire	75	20	1,026,280	2,812	1,862	0.15
Atlantic City	New Jersey	65	250	13,644,750	37,383	1,471	2.54
Albuquerque	New Mexico	900	170	9,278,430	25,420	25,596	0.10
Las Cruces	New Mexico	100	14	718,396	1,968	3,842	0.05
Santa Fe	New Mexico	113	27	1,438,452	3,941	3,832	0.10
Ithaca	New York	100	12	615,768	1,687	1,431	0.12
Rochester	New York	298	260	14,190,540	38,878	5,648	0.69
Charlotte	North Carolina	500	700	38,205,300	104,672	14,781	0.71
Durham	North Carolina	200	180	9,824,220	26,916	6,282	0.43
High Point	North Carolina	70	41	2,184,316	5,984	2,564	0.23
Raleigh	North Carolina	350	221	12,061,959	33,046	10,755	0.31
Wilmington	North Carolina	200	130	7,095,270	19,439	5,029	0.39
Winston-Salem	North Carolina	170	60	3,196,560	8,758	5,396	0.16
Akron	Ohio	222	120	6,549,480	17,944	5,315	0.34
Canton	Ohio	90	13	667,082	1,828	1,834	0.10
Cincinnati	Ohio	460	600	32,747,400	89,719	12,754	0.70
Cleveland	Ohio	2,000	420	22,923,180	62,803	42,399	0.15
Columbus	Ohio	562	375	20,467,125	56,074	13,021	0.43
Dayton	Ohio	1,065	90	4,794,840	13,137	29,048	0.05

City	State	Population (000s)	Number of Taxicab Licenses	Annual Taxicab VMT	Daily Taxicab VMT	Adjusted Daily Total All Vehicle VMTs (000s)	Taxicab VMT as a Percent of Total
Toledo	Ohio	385	150	8,186,850	22,430	9,109	0.25
Lawton	Oklahoma	85	100	5,457,900	14,953	1,458	1.03
Florence	Oregon	14	5	256,570	703	400	0.18
Medford	Oregon	65	24	1,231,536	3,374	1,032	0.33
Newport	Oregon	10	4	205,256	562	147	0.38
Portland	Oregon	1,500	400	21,831,600	59,813	38,872	0.15
Salem	Oregon	150	24	1,231,536	3,374	2,413	0.14
Philadelphia	Pennsylvania	1,500	1,441	78,648,339	215,475	27,001	0.80
Pittsburgh	Pennsylvania	1,250	600	32,747,400	89,719	28,388	0.32
Reading	Pennsylvania	240	50	2,663,800	7,298	4,707	0.16
Washington	Pennsylvania	20	12	615,768	1,687	459	0.37
Williamsport	Pennsylvania	35	10	513,140	1,406	748	0.19
Columbia	South Carolina	450	105	5,730,795	15,701	10,166	0.15
Myrtle Beach	South Carolina	45	35	1,864,660	5,109	1,666	0.31
Spartanburg	South Carolina	250	40	2,131,040	5,838	5,908	0.10
Sioux Falls	South Dakota	130	30	1,598,280	4,379	2,288	0.19
Memphis	Tennessee	900	230	12,553,170	34,392	22,254	0.15
Nashville	Tennessee	440	407	22,213,653	60,859	16,547	0.37
Abilene	Texas	110	50	2,663,800	7,298	2,874	0.25
Austin	Texas	925	533	29,090,607	79,700	28,789	0.28
Harlingen	Texas	50	18	923,652	2,531	1,065	0.24
Houston	Texas	1,800	2,245	122,529,855	335,698	66,502	0.50

City	State	Population (000s)	Number of Taxicab Licenses	Annual Taxicab VMT	Daily Taxicab VMT	Adjusted Daily Total All Vehicle VMTs (000s)	Taxicab VMT as a Percent of Total
Lubbock	Texas	200	25	1,331,900	3,649	5,272	0.07
Midland	Texas	110	32	1,704,832	4,671	2,418	0.19
San Angelo	Texas	101	25	1,331,900	3,649	1,869	0.20
San Antonio	Texas	1,100	725	39,569,775	108,410	32,186	0.34
Victoria	Texas	60	6	307,884	844	1,167	0.07
Salt Lake City	Utah	1,000	278	15,172,962	41,570	24,575	0.17
Alexandria	Virginia	120	598	32,638,242	89,420	2,467	3.62
Charlottesville	Virginia	50	80	4,262,080	11,677	838	1.39
Roanoke	Virginia	150	55	2,930,180	8,028	3,718	0.22
Bellingham	Washington	66	20	1,026,280	2,812	1,320	0.21
Seattle	Washington	1,000	850	46,392,150	127,102	25,549	0.50
Spokane	Washington	350	65	3,462,940	9,488	7,243	0.13
Charleston	West Virginia	200	32	1,704,832	4,671	3,895	0.12
Green Bay	Wisconsin	115	30	1,598,280	4,379	2,930	0.15
La Crosse	Wisconsin	63	16	821,024	2,249	1,390	0.16
Madison	Wisconsin	220	140	7,641,060	20,934	4,949	0.42
Milwaukee	Wisconsin	1,500	321	17,519,859	48,000	35,669	0.13
Oshkosh	Wisconsin	65	12	615,768	1,687	1,167	0.14
Casper	Wyoming	65	11	564,454	1,546	1,573	0.10
Cheyenne	Wyoming	60	8	410,512	1,125	1,393	0.08

Source: *Fact Book 2002*, Taxicab Division. Taxicab, Limousine & Paratransit Association. http://www.trpa.org.

Appendix D

Airport Surveys

Table D.1 Travel Time, Travel Cost, and Mode Split Data

				Mode Split (Percent)							Travel Time to Airport (minutes)		Travel Cost to Airport		
	Airport Code	Originations – Annual	Year Survey Conducted	Private Vehicle	Rental Car	Taxicab	Other On-Demand	Scheduled Bus/Van	Courtesy Vans	Other	Via Taxicab	Via Bus	Via Taxicab	Via Bus	Bus Headways (Minutes)
Palm Springs	(PSP)	200,000	1990	43.0	38.0	8.0	--	--	8.0	3.0	5	15	$5.00	$0.50	30
Springfield	(SPI)	200,000	1993	38.0	46.0	3.0	4.0	-	2.0	7.0	15	--	$8.00	--	--
Long Beach	(LGB)	300,000	1991	70.8	16.6	10.3	-	1.5	--	0.8	20-70	45-60	$15-35	$0.75-2.70	30
Savannah	(SAV)	400,000	1989	37.1	43.5	4.2	8.0	2.3	--	4.9	15	15	$15.00	$12.00	10
Atlantic City	(ACY)	100,000	1995	58.0	2.0	10.0	24.0	4.0	--	2.0	15	--	$27.00	--	--
Wichita	(ICT)	500,000	1989	76.5	14.5	3.9	3.2	--	--	1.9	10-15	--	$7.60	--	--
Albany	(ALB)	800,000	1993	58.0	15.0	9.0	5.0	4.0	6.0	3.0	20	20-30	$13.00	$0.75	30-60
Tucson	(TUS)	1,100,000	1991	50.8	31.1	4.4	4.9	0.6	6.8	1.4	15-20	25	$15-17	$0.75	60
Reno	(RNO)	1,800,000	1989	48.3	27.8	7.9	1.8	12.4	-	1.8	5-10	20	$8.00	$1.00	25
Chicago Midway	(MDW)	2,600,000	1990	48.3	10.6	26.8	9.7	0.6	1.5	2.5	20-30	20-50	$17-20	$1.80	12-14
San Jose	(SJC)	2,800,000	1990	66.1	24.7	3.4	2.1	1.2	2.2	0.3	10-45	15-20	$16-35	$1.00	30-60
Ontario	(ONT)	3,000,000	1987	59.0	22.2	6.3	3.2	3.6	3.4	2.3	25-90	30-120	$25-90	$0.75-3.85	60
New Orleans	(MSY)	3,000,000	1994	21.0	18.0	33.0	24.0	1.0	3.0	--	20-30	50	$21.00	$1.10	10-20
Portland	(PDX)	3,000,000	1990	64.0	18.0	5.0	--	6.0	7.0	--	20	25	$22.00	$1.00	15-30
Fort Lauderdale	(FLL)	3,400,000	1990	46.0	27.5	10.0	5.7	8.5	2.0	0.3	5-7	5-7	$8.00	$8-10	20
Tampa	(TPA)	4,000,000	1990	48.6	32.4	2.8	11.0	0.6	3.7	0.9	20-40	30	$13-15	$0.85	60
Houston	(IAH)	4,100,000	1986	67.0	15.0	7.0	--	5.0	3.0	3.0	30-40	60	$30-40	$1.20	20-25
St Louis	(STL)	4,400,000	1990	63.4	12.5	12.0	1.0	1.7	6.1	3.3	15-30	10	$13-18	$1.35	7-15
New York - JFK	(JFK)	4,800,000	1993	38.0	3.0	24.0	21.0	10.0	3.0	2.0	35-60	20-75	$30-35	$1.25	30
Minn-St Paul	(MSP)	4,900,000	1985	67.4	12.2	7.3	6.9	1.9	4.3	-	15-30	42	$20.00	$0.90	20-40
Seattle	(SEA)	6,000,000	1988	78.8	5.2	2.6	--	8.0	3.7	1.7	20-45	40	$12-48	$1.60	30
Miami	(MIA)	6,100,000	1991	44.5	25.5	12.2	12.9	1.2	3.7	--	20	35-40	$16.50	$1.00	60
Orlando	(MCO)	6,400,000	1990	33.2	46.2	5.4	1.0	8.1	1.9	4.2	25	40	$24.00	$0.75	60
New York - LGA	(LGA)	7,900,000	1993	30.0	4.0	36.0	21.3	5.0	1.0	1.0	20-40	20-75	$15-25	$1.25	10-20
Newark	(EWR)	8,400,000	1993	52.0	10.0	7.0	20.8	5.9	3.0	1.0	30-45	30-45	$30-35	$7.00	15-30
San Francisco	(SFO)	9,900,000	1993	43.0	18.0	8.0	16.0	8.0	6.0	1.0	25	30-50	$29.00	$1.75	30
Los Angeles	(LAX)	13,600,000	1993	50.9	19.6	5.4	9.4	6.0	4.9	3.8	30-45	45-50	$27-30	$1.10	30

Source: Airport Ground Access Planning Guide, FHWA, Washington, D.C. 20590.

Table D.2 Daily Person Trip and Trip Length Data

			Daily Person Trips by Mode					Average Daily Trip Length					
	Airport Code	Private Vehicle	Rental Car	Taxicab	Other On-Demand	Scheduled Bus/Van	Courtesy Vans	Minutes	Miles	Fleet Size (Vehicles)	VMT	Total VMT	Percent of Total
Palm Springs	(PSP)	287	253	53	–	–	53	10.0	5.0	18	88	3,124,000	0.00%
Springfield	(SPI)	253	307	20	27	–	13	20.0	10.0	13	132	3,045,000	0.00%
Long Beach	(LGB)	708	166	103	–	15	–	55.0	27.5	2	41		
Savannah	(SAV)	495	580	56	107	31	–	20.0	10.0	38	383	5,743,000	0.01%
Atlantic City	(ACY)	193	7	33	80	13	–	20.0	10.0	28	277	4,278,000	0.01%
Wichita	(ICT)	1,275	242	65	53	–	–	17.5	8.8	18	154	7,935,000	0.00%
Albany	(ALB)	1,547	400	240	133	107	160	25.0	12.5	107	1,343	12,144,000	0.01%
Tucson	(TUS)	1,863	1,140	161	180	22	249	22.5	11.3	144	1,617	13,564,000	0.01%
Reno	(RNO)	2,898	1,668	474	108	744	–	12.5	6.3	110	688	5,303,000	0.01%
Chicago Midway	(MDW)	4,186	919	2,323	841	52	130	30.0	15.0	326	4,883		
San Jose	(SJC)	6,169	2,305	317	196	112	205	32.5	16.3	144	2,334	38,343,000	0.01%
Ontario	(ONT)	5,900	2,220	630	320	360	340	62.5	31.3	254	7,931	32,877,000	0.02%
New Orleans	(MSY)	2,100	1,800	3,300	2,400	100	300	30.0	15.0	901	13,515	15,414,000	0.09%
Portland	(PDX)	6,400	1,800	500	–	600	700	25.0	12.5	291	3,638	31,534,000	0.01%
Fort Lauderdale	(FLL)	5,213	3,117	1,133	646	963	227	11.0	5.5	384	2,114	37,335,000	0.01%
Tampa	(TPA)	6,480	4,320	373	1,467	80	493	35.0	17.5	655	11,459	44,474,000	0.03%
Houston	(IAH)	9,157	2,050	957	–	683	410	40.0	20.0	204	4,073	91,883,000	0.00%
St Louis	(STL)	9,299	1,833	1,760	147	249	895	27.5	13.8	369	5,068	58,761,000	0.01%
New York - JFK	(JFK)	6,080	480	3,840	3,360	1,600	480	52.5	26.3	1,427	37,464	65,976,000	0.06%
Minn-St Paul	(MSP)	11,009	1,993	1,192	1,127	310	702	27.5	13.8	635	8,727	60,719,000	0.01%
Seattle	(SEA)	15,760	1,040	520	–	1,600	740	37.5	18.8	404	7,579	51,430,000	0.01%
Miami	(MIA)	9,048	5,185	2,481	2,623	244	752	25.0	12.5	1,138	14,228	43,577,000	0.03%
Orlando	(MCO)	7,083	9,856	1,152	213	1,728	405	30.0	15.0	377	5,654	32,288,000	0.02%
New York - LGA	(LGA)	7,900	1,053	9,480	5,609	1,317	263	35.0	17.5	2,070	36,217	131,952,000	0.03%
Newark	(EWR)	14,560	2,800	1,960	5,824	1,652	840	42.5	21.3	2,364	50,242	65,976,000	0.08%
San Francisco	(SFO)	14,190	5,940	2,640	5,280	2,640	1,980	30.0	15.0	2,660	39,897	90,277,000	0.04%
Los Angeles	(LAX)	23,075	8,885	2,448	4,261	2,720	2,221	42.5	21.3	2,411	51,240	280,792,000	0.02%

Table D.3 Taxi and Rental Car Data

		Taxi						Rental Car					
		Average Daily Trip Length						Average Daily Trip Length					
	Airport Code	Minutes	Miles	Fleet Size (Vehicles)	VMT	Total VMT	Percent of Total	Minutes	Miles	Fleet Size (Vehicles)	VMT	Total VMT	Percent of Total
Palm Springs	(PSP)	5.0	2.5	53	133	3,124,000	0.00%	5.0	2.5	162	405	3,124,000	0.01%
Springfield	(SPI)	15.0	7.5	20	150	3,045,000	0.00%	15.0	7.5	196	1,472	3,045,000	0.05%
Long Beach	(LGB)	50.0	25.0	103	2,575			50.0	25.0	106	2,656		
Savannah	(SAV)	15.0	7.5	56	420	5,743,000	0.01%	15.0	7.5	371	2,784	5,743,000	0.05%
Atlantic City	(ACY)	15.0	7.5	33	250	4,278,000	0.01%	15.0	7.5	4	32	4,278,000	0.00%
Wichita	(ICT)	12.5	6.3	65	406	7,935,000	0.01%	12.5	6.3	155	967	7,935,000	0.01%
Albany	(ALB)	20.0	10.0	240	2,400	12,144,000	0.02%	20.0	10.0	256	2,560	12,144,000	0.02%
Tucson	(TUS)	17.5	8.8	161	1,412	13,564,000	0.01%	17.5	8.8	730	6,386	13,564,000	0.05%
Reno	(RNO)	7.5	3.8	474	1,778	5,303,000	0.03%	7.5	3.8	1,068	4,003	5,303,000	0.08%
Chicago Midway	(MDW)	25.0	12.5	2,323	29,033			25.0	12.5	588	7,349		
San Jose	(SJC)	27.5	13.8	317	4,363	38,343,000	0.01%	27.5	13.8	1,475	20,287	38,343,000	0.05%
Ontario	(ONT)	57.5	28.8	630	18,113	32,877,000	0.06%	57.5	28.8	1,421	40,848	32,877,000	0.12%
New Orleans	(MSY)	25.0	12.5	3,300	41,250	15,414,000	0.27%	25.0	12.5	1,152	14,400	15,414,000	0.09%
Portland	(PDX)	20.0	10.0	500	5,000	31,534,000	0.02%	20.0	10.0	1,152	11,520	31,534,000	0.04%
Fort Lauderdale	(FLL)	6.0	3.0	1,133	3,400	37,335,000	0.01%	6.0	3.0	1,995	5,984	37,335,000	0.02%
Tampa	(TPA)	30.0	15.0	373	5,600	44,474,000	0.01%	30.0	15.0	2,765	41,472	44,474,000	0.09%
Houston	(IAH)	35.0	17.5	957	16,742	91,883,000	0.02%	35.0	17.5	1,312	22,960	91,883,000	0.02%
St Louis	(STL)	22.5	11.3	1,760	19,800	58,761,000	0.03%	22.5	11.3	1,173	13,200	58,761,000	0.02%
New York - JFK	(JFK)	47.5	23.8	3,840	91,200	65,976,000	0.14%	47.5	23.8	307	7,296	65,976,000	0.01%
Minn-St Paul	(MSP)	22.5	11.3	1,192	13,414	60,719,000	0.02%	22.5	11.3	1,275	14,347	60,719,000	0.02%
Seattle	(SEA)	32.5	16.3	520	8,450	51,430,000	0.02%	32.5	16.3	666	10,816	51,430,000	0.02%
Miami	(MIA)	20.0	10.0	2,481	24,807	43,577,000	0.06%	20.0	10.0	3,318	33,184	43,577,000	0.08%
Orlando	(MCO)	25.0	12.5	1,152	14,400	32,288,000	0.04%	25.0	12.5	6,308	78,848	32,288,000	0.24%
New York - LGA	(LGA)	30.0	15.0	9,480	142,200	131,952,000	0.11%	30.0	15.0	674	10,112	131,952,000	0.01%
Newark	(EWR)	37.5	18.8	1,960	36,750	65,976,000	0.06%	37.5	18.8	1,792	33,600	65,976,000	0.05%
San Francisco	(SFO)	25.0	12.5	2,640	33,000	90,277,000	0.04%	25.0	12.5	3,802	47,520	90,277,000	0.05%
Los Angeles	(LAX)	37.5	18.8	2,448	45,900	280,792,000	0.02%	37.5	18.8	5,687	106,624	280,792,000	0.04%

Appendix E

FHWA Vehicle Classes

Table E.1 FHWA Vehicle Classes

Number	Heading	Description
1, 2	PC-C	Passenger cars and motorcycles
3	2a4t	Pickup truck/sports utility, four-tire vehicles
4	Bus	Full size school and transit buses
5	2a6t	Two-axle six tire, delivery type van or heavy duty pickup
6	3aSU	Three-axle single unit, short-haul delivery truck, dump truck
7	4aSU	Four-axle single unit, short-haul delivery truck, concrete truck
8	4aST	Less than five-axle tractor/single trailer, medium-haul delivery
9	5aST	Five-axle tractor/single trailer, ‘‘18 Wheeler’’
10	6aST	More than five-axle tractor/single trailer, tanker truck, logging truck
11	5aMT	Less than six-axle multi trailer truck
12	6aMT	Six-axle multi trailer truck
13	7aMT	More than six-axle multi trailer truck

Note: Light Duty Vehicles: Passenger vehicle (FHWA Vehicle Class 1-3).
Medium Duty Vehicles: Single unit truck (FHWA Vehicle Class 4-7).
Heavy Duty Vehicles: Tractor-trailer truck (FHWA Vehicle Class 8-13).