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16. Abstract
This study updates Louisiana's Load Equivalency Factor (LEF) tables, which are used as an integral part of the State's highway design and rehabilitation effort. This study was required because the tables have not been updated in over 15 years and are, as such, overdue for revision. Attempts were also made to quantify Louisiana's traffic growth trends for similar reasons. The trend analysis ultimately proved to have inherent problems associated with the statistical significance of the representative data and, thus, had to be abandoned. In conjunction with this, a full statistical analysis of all representative LEF data was also carried out to quantify the significance of the derived LEF table figures.

Methods used to update the tables found in this report made use of the techniques and resources prescribed by the Highway Performance Monitoring System (HPMS), as developed by the Federal Highway Administration (FHWA), along with procedures developed by the American Association of State Highway and Transportation Officials (AASHTO). Sources of raw data needed to carry out investigations are drawn from the Louisiana Department of Transportation and Development's (LADOTD) Weigh-In-Motion (WIM) program and Louisiana's Traffic Volume Monitoring (TVM) program. Computer data processing is used to expedite the investigative process as much as possible. This effort uses the FHWA's Vehicle Travel Information System (VTRIS) software for primary calculations.

Results of this study include revised LEF tables and associated significance figures. Findings indicated that the 15-year-old tables do require revision, because the figures were, in some cases, significantly lower than the revision figures. Trend figures could not be accurately calculated due to a shortfall in relevant data.

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to be a comparatively limited database. Traffic monitoring, at present, is much better established and has produced raw data that is of greater volume and quality than was previously available. There are, though, still some inherent problems to traffic monitoring, to be discussed later, which continue to raise concerns over adequacy. All the same, tables derived from this newer data are considered a marked improvement over the old. It should also be noted that AASHTO has considered the possibility of abandoning the truck factor notion and substituting an approach that considers 18-kip Equivalent Single Axle Loads (ESALS) alone, which is independent of truck type. Until such time as an alternative approach might be proposed and implemented, the continued use of LEF tables are required. Also, in support of the tables, it has been suggested that the variations not accounted for in the LEF table design approach are kept at a minimum as long as the tables are kept current.

A parallel consideration of this research is the quantifying of traffic growth trends on Louisiana highways. This is required because highways are designed to carry future traffic, and the most viable way of predicting future traffic is through projecting current trends into the future. Once trends are established and highways are built, it then becomes possible to fine-tune projection models through comparison of projection to outcome. However, the first requirement, which is the goal of this research, is the establishment of the base trend figures upon which the projection models can be built.

OBJECTIVE

The primary objective of this research is to revise Louisiana's LEF tables and to quantify traffic growth trends as much as possible. A statistical analysis and summary of the table's supportive database is also an objective in order to provide a window into the relative precision and accuracy of each of the terms found in the revised tables.

SCOPE

The data necessary to develop the revised LEF tables and calculate growth was obtained from the Department's participation in the HPMS, which maintains inventory, condition, and operational data for the state's corridors. In conjunction with this, data from portable WIM sites, as collected by LADOTD's planning section, was used along with volume data collected under the Department's TVM program.

TMG as well as the HPMS Field Manual, both of which serve as guides to the State Highway Agencies in their efforts to collect, edit, assemble, and report the HPMS data to the FHWA.

The guides themselves provide direction for improved traffic counting, vehicle classification, and truck weighing. Beyond simply providing ideas for updating these activities, the guides outline statistical procedures aimed at allowing the manager to determine how much monitoring is needed to achieve a desired precision level. LADOTD's Traffic and Planning section implemented Louisiana's traffic monitoring program using these guidelines. But, clearly, usage of the data collected in this program must be supplemented by an understanding of the statistical procedures from which it is derived along with a knowledge of the precision levels that were required/achieved during collection. The TMG requires the establishment of a standard sample upon which models can be established. This sample is derived from a supportive database of statistically significant yet limited data. Any shortfalls or errors in this supportive data will reflect in the model as well. For this reason, it is imperative that the designer grasp more than just how to use the derived model. A clear understanding of the strengths and limitations of the standard sample as well as its supportive data must also be grasped if proper utilization of the derived model is to be possible.

<u>The HPMS Universe, HPMS Standard Sample, and Functional Classification System (FCS)</u>:

The Department uses a traffic monitoring strategy with procedures that emphasize statistical sampling tied to the HPMS Standard Sample that aims to minimize data collection and eliminate duplications. Each State has been compelled, by federal mandate, to establish its own HPMS Standard Sample by methods spelled out in the TMG and HPMS Field Manual. The establishment if the Standard Sample is mandatory, but the guidelines allow the State Agencies some latitude in their adherence to the spelled out methods. The HPMS Standard Sample creates a simple random sample consisting of 80 items whose size estimation process is tied to AADT. AADT was selected to achieve a desired level of precision during analysis, which requires that the size of the Standard Sample be governed by the constituent data having the highest variability (which would be AADT). The TMG also suggests a sampling program favoring the development of the samples in a sequential or top-down format. This implies that HPMS Volume Samples be taken from the HPMS Standard

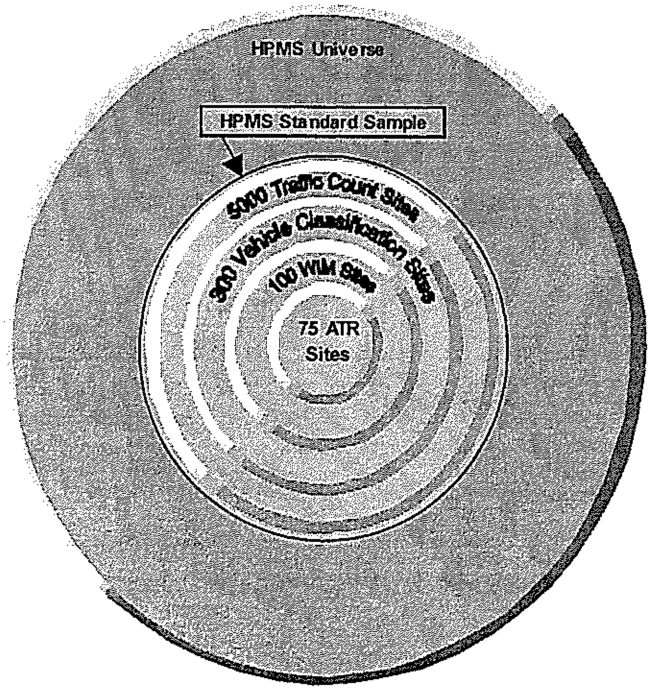
Sample, HPMS Vehicle Classification Samples be taken from the Volume Samples, and HPMS Truck Weight Samples be taken from the Vehicle Classification Samples.

All roads within a State except roads functionally classified as local are termed by the TMG as the HPMS Universe. The basic element by which roads are functionally expressed within this Universe is termed by the TMG as an HPMS Section. An HPMS section is comprised of a segment of road having constant or uniform traffic characteristics over its length. An HPMS Section includes both directions of travel as well as all associated lanes. Each HPMS Section is specified within the HPMS Universe according to its location (rural, small urban, and individual or collective urbanized areas) as well as its function (interstate, other principal arterial, minor arterial, major collector, and other freeways or expressways). This organizational system is termed by the TMG as the Functional Classification System (FCS), and it provides a convenient means by which the considerable volume of data contained in the HPMS can be categorized and managed. FCS designations are identified by location, function, and AADT.

The actual data collected into the HPMS Standard Sample, drawn from the HPMS Universe, primarily consists of AADT data collected at routine traffic count sites, vehicle classification and weight data collected at WIM sites, and continuously collected data obtained from Automatic Traffic Recorder (ATR) sites. All data is collected and organized within the FCS following a top-down or sequential sampling program. Logistics and cost constraints dictate that the routine traffic count data and WIM weight/classification data be collected as 48-hour short counts.

Using 3S2 vehicles as an example (the specifics would be different for other vehicle types), the TMG explains that there must be at least 300 short count sessions (vehicle classification sample) conducted over a 3-year cycle (100 sessions per year, proportionately distributed by functional class) to ensure that estimates of statewide percentages of 3S2 vehicles in the traffic stream be within ±10 percent of the theory with a confidence level of 95 percent. Similarly, at least 90 short count sessions (vehicle weight sample), also conducted over a 3-year cycle (30 sessions per year, proportionately distributed by functional class), are required to ensure that ESAL estimates of 3S2 trucks be within ±10 percent of the theory, also with a confidence level of 95 percent. As for the vehicle volume sample, if AADT constraints for the HPMS Standard Sample require that there to be a total of 6000 routine count sites to obtain proper precision, then the TMG suggests that the 6000 short count sessions (at minimum) be conducted over a 3-year cycle (2000 sessions per year, proportionately distributed by functional class) to ensure that estimates of total vehicle volumes in the traffic stream be within ±10 percent of the actual value with a confidence level of 95 percent.

The inclusion of ATR sessions, which collect data continuously year-round, are stipulated by the TMG as necessary, because continuous monitoring is required to determine the temporal and seasonal variations that are impossible for the 48-hour short count programs to detect. Figure 1 is provided to better illustrate the details expressed herein. An important detail must be noted at this point that relates to the development of revised LEF tables as required by this research. On the whole, 3S2 trucks carry the greatest proportion of weight on highways than any other vehicle type. The TMG, for this reason, has selected the 3S2 classification as the guiding element in the development of its sampling criteria that strives for ±10 percent accuracy to a confidence level of 95 percent. As such, this precision is only absolute for 3S2 vehicles. ESAL variability for 3S2's generally is less than for most other vehicle types. This means that to obtain the same precision for other vehicle types, it would be necessary to increase the sample sizes. In short, confidence estimates associated with LEF factors developed for vehicles with lower traffic counts than 3S2's will be less than 95 percent.



Data collection is carried out in 3-year cycles: logistics specify that, for this example, at least 1666 traffic count sites, 100 vehicle class sites, 33 WIM sites, and 25 ATR sites be surveyed each year. As such, the entire survey will be cycled through every 3 years.

Typical of how the data in the HPMS is organized, AADT figures may be found collected from 5000 routine vehicle count sites.

From these 5000 sites, a subset of 300 are used to collect vehicle classification data.

A further subset of 100 WIM sites are taken from the 300 vehicle classification sites to monitor vehicle weights.

In a similar manner, a subset of 75 continuous ATR sites are taken from the 100 WIM sites and used as the source of the most intense level of traffic monitoring.

Data is classified within the HPMS according to the highway classification from which it comes according to the table shown.

AREA TYPE	CODE	FHWA FUNCTIONAL SYSTEMS *FHWA ORDER M 5600.1B Chapter IV - November 6, 1996*
RURAL	1	PRINCIPAL ARTERIAL – INTERSTATE
	2	PRINCIPAL ARTERIAL – OTHER
	6	MINOR ARTERIAL
	7	MAJOR COLLECTOR
	8	MINOR COLLECTOR
URBAN	11	PRINCIPAL ARTERIAL – INTERSTATE
	12	PRINCIPAL ARTERIAL – OTHER FREEWAYS OR EXPRESSWAYS
	14	PRINCIPAL ARTERIAL – OTHER
	16	MINOR ARTERIAL
	17	COLLECTOR

Note that each Functional Class item isfurthur stratified into 13 separate volume ranges.

A Rural-Interstate-Group01, for example, has an AADT of from 0 to 9999

A Rural-Interstate-Group13, for example, has an AADT of from 135000

Figure 1

Traffic Monitoring Sample Structure of the HPMS and the HPMS Highway Classification reporting strata

Vehicle Classification Systems:
Most of the vehicles in a traffic stream can be defined as either a passenger car, bus, panel/pickup truck, or commercial carrier. Commercial carriers are sub-categorized according to the number of axles, tires, and trailers featured. Both the FHWA and the LADOTD classify vehicles according to the FHWA CLASS designations shown in Table 1. LADOTD has also made use of the additional designations listed under the LADOTD CLASS column of Table 1. Both conventions are provided for the sake of clarity.

Table 1
FHWA/LADOTD Vehicle Classification Systems*[5]*

VEHICLE DEFINITION		FHWA CLASS	LADOTD CLASS
Single Unit Vehicles	MOTORCYCLE	1	MOTORCYCLE
	CARS	2	CARS
	2 AXLE - 4 TIRE	3	2 AXLE - 4 TIRE
	BUSES	4	BUSES
	2 AXLE - 6 TIRE	5	2 AXLE - 6 TIRE
	3 AXLE	6	3 AXLE
	4 OR MORE AXLE	7	--- --- ---
Single Trailer Vehicles	4 OR LESS AXLE	8	2S1, 3S1, 2S2
	5 AXLE	9	3S2
	6 OR MORE AXLE	10	3S3
Multi-Trailer Vehicles	5 OR LESS AXLE	11	DBL 5
	6 AXLE	12	DBL 6
	7 OR MORE AXLE	13	--- --- ---

Data Collection and Validation:

The LADOTD has complied with the TMG's suggested approach to traffic monitoring with procedures emphasizing the use of statistical sampling tied to the HPMS Standard Sample and with the intention of minimizing data collection and eliminating duplications. Samples were developed in a sequential (top-down) format and were collected in the form of 48-hour short counts. This implies a minimalist, albeit, statistically significant approach to traffic monitoring. The statistical modeling theory maintains that every item collected as part of a statistical sample is recognized as a highly significant representative of a constituent part of the system it models. If the data collected is not a true representative of its constituent (be this due to equipment error, poor deployment of equipment, or unexpected conditions in the field) then the products of the model will be deficient. The highway engineer cannot always know if a model is adequate or if the data collected to enter into a model is a proper representative of its constituent. However, every effort should made to check those details that can be checked.

On one level, some problems can only be detected in the raw data before any processing is carried out that might obscure suspect data. Statistical procedures invariably resort to some form of averaging that can conceal an anomalous point amidst a conglomeration of normal data. Such singularities must be more than simply observed and discarded. They must be investigated and understood. If a WIM device records one axle in 10,000 as weighing more than 20 percent above expected standards, it should be investigated because it is considered proper engineering practice to do so. But moreover, the singularity should be investigated because it might represent some significant component of the reality being modeled. Investigating such singularities may be the only viable window into the quality of the model's data sources such as a problematic or mis-calibrated recording device. Singularities can also be used to expose the effects of data interdependence that can occur when samples are developed sequentially (top-down).

On another level, some problems can only be detected in post-processing. As previously noted, vehicle surveys are strategically conducted at various routine traffic count sites, classification sites, and WIM sites across the state to model Louisiana's highway system. In essence, all that is actually collected at the various test sites from the vehicles themselves is their total number (irrespective if vehicle class) along with a running record of axle properties (axle weights and distances between successive axles). Nowhere are vehicle classifications recorded directly. Classification is only addressed in post-processing. The raw data collected in the field is fed through a highly constrained filtering process that converts the stream of axle weights and spacings into an equivalent stream of vehicles that are defined according to rules and guidelines set down by the FHWA. To simplify this process by automation, the FHWA has developed the Vehicle Travel Information System (VTRIS)*[6]* computer program. The filtering process is not as straight-forward as it might appear and results may be subject to error. Undoubtedly, it was much easier for the programmers who developed recognition software to write algorithms capable of recognizing a car than it was to develop an algorithm capable of recognizing a class-13 multi-trailer. Therefore, the engineer must reconcile and deal with the singularities observed in much the same way as was required in pre-processing.

Further removed from the raw data are vehicle distribution figures, which can only be calculated once the raw axle data has been converted into vehicles. Upon examination of distributions, it becomes immediately clear that some vehicle types are better represented in the database than others. How might the engineer compare the properties calculated for one vehicle type with the same properties calculated for a different vehicle type? An automobile is very different from a class-7 truck, both in terms of its structure and in terms of the weight it carries. How is it possible to know that a derived property for one is any more or less reliable than the same property derived for the other? To address this, consider the following situation.

Suppose 22,000 passenger cars are sampled that, as a group, display a median front axle weight of 1.3 metric tons significant within a spread of 0.3 metric tons. In the same sample, only 50 class-7 vehicles are recorded that, as a group, display a median front axle weight of 4.6 metric tons significant within a spread of 3.0 metric tons. The higher spread of 3.0 metric tons may seem to suggest that front axle weights for class-7 vehicles exhibit a higher variability than do cars. This may not be the case, however, when one considers that the median weight for class-7 vehicles is twice that of cars. Spreads must be normalized. The way that this can be accomplished is by dividing the sample spread by the sample median weight. For the example cited, then, it would be found that the normalized spreads for the cars and class-7 vehicles, respectively, equal 0.23

and 0.65. Precision is then, indeed, shown to be higher for cars. However, analysis cannot stop here. It is also necessary to check for accuracy. Clearly, a median weight based on 22,000 tests should be more accurate than one based on 50 tests. Increasing sample populations usually improves accuracy, provided that data collection efforts recognize the possibility of biases leaking into to collection process. If these biases can be eliminated, then increasing the population size can only increase accuracy.

Population considerations can be used to develop a simple test for confidence that divides normalized spread by population. The resulting factor, as it approaches zero, would be indicative of increased accuracy and precision. In the example given above, the sample of cars would have a confidence factor value of $0.23 \div 22000 = 0.00001$. The class-7 vehicles would have a confidence factor value of $0.65 \div 50 = 0.013$. It can be concluded from this sample that the derived median weight for cars is, most likely, more reliable than that derived for class-7 vehicles.

VTRIS, WIM, and AASHTO:

VTRIS functions as a database management system for vehicle classification and truck weight data. It is based on the TMG and includes data conversion, validation, and summarization capabilities. It is also able to produce all standard TMG reports (W-1 through W-7 tables) with a great deal of flexibility in data organization and presentation. This report makes extensive use of the W-4 tables in developing ESAL figures. The TMG describes the W-4 tables as follows:

> *W-4 Table: Equivalency Factors:*
> *This table is most commonly used in pavement design since it contains information on truck axle loadings and their effect on flexible and rigid pavements based on equivalent single axle loads. It also provides the number of single, tandem, and tridem axles weighed that fall into particular weight ranges and gives the resulting equivalent single axle loads on the two types of pavement. All of the information is produced by truck types 3 through 13 and can be shown for each station location and/or functional classification of highway. The user defines the ranges of axle load to be used in the calculations. (Tandems and tridems are omitted from the example.)*

The bottom three rows on the first three pages of the table summarize vehicle information. The "Single Axles Weighed" row is the sum of the columns by vehicle type. The "Average Daily Count" row is the sum of vehicles counted according to their type, in this case types 3 through 13. These numbers match those indicated in the W-2 Table for those same vehicle types. The "Vehicles Weighed" row is the sum of vehicles weighed for that type, again in this case types 3 through 13. Likewise, these numbers should be the same as those indicated in the W-2 Table with the exception of types 3 and 4 which do not appear in the W-2 Table. Of the bottom three rows in the table, the last two will be identical for pages 1, 2, and 3 of the table and the first row will vary according to single, tandem, or tridem axles respectively.

The formula used in the calculation of the equivalent single axle loads is that developed by the American Association of State Highway and Transportation Officials. Three user-selected entry values are required:

1. *Serviceability index: "P" values range from 0.0 to 5.0 with 0.0 representing the worst possible pavement condition and 5.0 representing the best possible pavement condition.*

2. *Depth of rigid pavement: The thickness of the rigid pavement in inches.*

3. *Structural number of flexible pavement: The structural number is calculated from the depth and layer coefficient of the subbase, base, and surface courses. The fourth page of the W-4 Table summarizes the data from the three previous pages on single-axles, tandems, and tridems, developing ESAL value per vehicle and percent distribution by vehicle type for rigid and flexible pavements. In addition, the total number of vehicles counted and vehicles weighed is shown.*

Based upon the W-4 Table data, 20 YEAR ESAL ESTIMATES are shown, and depending upon the user's prediction of traffic growth and truck growth, a value can be developed for ESALs per 1000 vehicles of the average daily traffic (ADT). A compound growth factor is assumed for the ESAL's.

(FHWA-PL-95-031: Traffic Monitoring Guide [3rd Edition] - Sec. 5, Ch. 4,)

VTRIS follows procedures outlined in the AASHTO Guide For Design of Pavement Structures to derive Load Equivalency Table figures with steps that include making a detailed record of the axle loads and configurations observed in mixed traffic streams and converting the recorded data into ESALs. Weigh-in-motion databases, an integral part of the HPMS, are specified by AASHTO as an effective source of the traffic stream data to be used in ESAL calculations, because they are comprehensive in their representation of the traffic observed. The classification, weight, and volume of the various vehicles monitored, as well as the functional classification of the road segments themselves, are recorded in great detail under the WIM program. It this WIM data that is used by FHWA's VTRIS software in its calculations.

Trend Calculations and Vehicle Volume Growth Factors:
The standard practice used in highway design to account for future traffic, according to AASHTO, involves determining an annual growth-rate percentage for each vehicle type and then, effectively, applying these values to base-year traffic volumes so as to estimate future volumes. AASHTO recognizes that trends vary from one highway classification to the next. Therefore, guidelines have also been provided that expand procedures in such a way as to allow for the influences of highway classification. For example, AASHTO observes that highways classified as principal-arterial or interstate generally exhibit exponential growth. Traffic on some minor arterial or collector-type highways tend to increase along a straight line. These statements are given as generalities though, and the highway designer should understand that if trends observed in collected data do not conform to the trend guidelines, then the observed trends should take precedence.

Ideally, inventories from which observed trends can be derived should be comprehensive, housing the appropriate quantity of traffic volume and classification data to make reliable estimates possible. Since it is the long-term trends that are of primary interest, this data should be well represented in the time domain, having been collected over a considerable period (greater than 10 years). What is desired, but is generally not possible, is the drawing of this body of data from a single source. This is a critical point. Long-term and short-term trends as well as vehicle distribution patterns generally have a site-specific interdependence, which can only be discerned if data is collected in a coordinated manner from a particular study site over a considerable period. Anything short of this can cause gross misinterpretation of data during modeling.

Despite the need for such comprehensive inventories, the limitations of time, money, and manpower make the existence of the ideal source an impossibility. While aspects of the required coverage can be obtained, no one source is available that can provide the complete picture. For example, the TVM program collects data that adequately models the required long-term traffic trends in the time domain. However, TVM can only provide general AADT figures without recording vehicle distributions. On the other hand, WIM adequately samples the required vehicle distributions needed for model development. However, WIM data is collected in a cyclic/sporadic fashion that leaves inherent gaps in the data profile.

In theory, the gaps in data can be overcome by the synthetic merger of available sources into a usable whole. TVM could be used to develop the required long-term trend aspects of the model, while WIM could be used to develop the required distribution aspects. Investigations into this holistic approach to modeling showed that TVM sources combined with WIM sources could produce proper coverage. Model development was, therefore, approached in this manner and trend figures were produced accordingly.

The disadvantage remains, however, that obtaining coverage through the synthetic merging of data sources is, none the less, artificial. Any modeling derived in such a manner comes highly into question for the reasons cited earlier relating to site-specific data-interdependence. For this reason, the bulk of discussions and findings related to the development of trend figures are relegated to Appendix D. The details found therein should be looked upon as being of a separate and more suspect quality than the details found in the body this report. These findings are as precise and accurate as possible, but they are meant more as an elaboration on approach than as a foundation for policy.

DISCUSSION OF RESULTS

Data Collection, Validation, and Analysis

A survey and centralization of all available and relevant load measurements from LADOTD sources was carried out to archive raw data. Raw data was then validated to ensure it met basic requirements of accuracy. With a reliable database in place, the data was then arranged so as to be compatible with the methods available to perform an analysis. Finally, a statistical analysis of data organized in the previous steps followed so that revised LEF Table figures could be derived. Both off-the-shelf programs as well as governmentally-developed software packages were used. Underlying all method, though, was the AASHTO guidelines of obtaining traffic factors by converting the mixed traffic stream of different axle loads and configurations into a number of ESAL equivalents.

Specifics of Data Used in Determining Load Equivalency Factors (WIM):
Louisiana's WIM data was examined for the years 1994 thru 1999. Data from the years prior to 1994 did not adhere to the HPMS statistical requirements to be considered universally representative of Louisiana highways. Weight data collected during the years 1994, 1995, and 1996 proved to be suspect and were subsequently dismissed from further analysis. WIM station specifics for 1997 through 1999 are presented in Appendix A of this report. (A summary of the WIM testing schedule can be found at the end of Appendix A.) Figure 2 offers a perspective of this data geographically. Raw data is summarized in this report as the need arises.

Specifics of Data Used in Determining Growth Trend Factors:
Growth trends, as defined in this report, refer to changes in counts by vehicle classification over time that are observed in relation to functional systems. As previously discussed, the department does not maintain a universal database from which to calculate such growth figures directly. This fact made it necessary to develop a holistic approach that drew upon various data sources to obtain a solution. Traffic monitoring efforts provided a record of overall traffic volumes as well as a record of vehicle classification distributions using a functional system. By combining the vehicle distributions versus time with the AADT figures, it became possible to construct a synthesized profile of changing traffic flows. These were then used to develop growth factors.

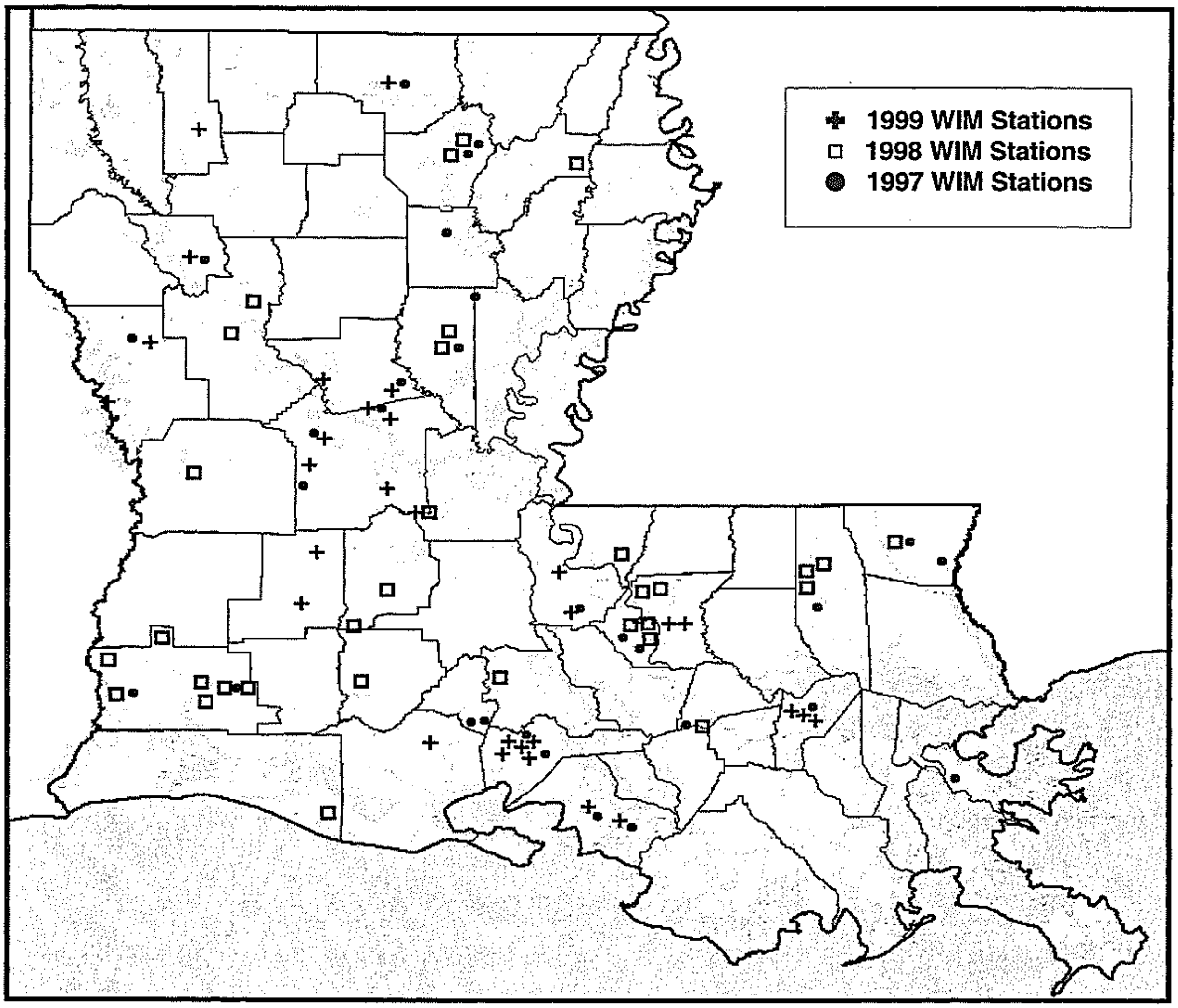


Figure 2
Weigh-In-Motion Station Distributions for Louisiana

Specifically, Weigh-In-Motion data was used to index vehicle distributions by classification. Shortfalls associated with WIM included the fact that WIM is developed in 3-year cycles on 48-hour short sessions, making it not comprehensive enough to base trend calculations on alone. Also, WIM data collected prior to 1994 and in 1996 had to be abandoned for not meeting HPMS requirements. Available TVM data, compiled by LADOTD's Planning Section since 1987, were found to be complete in the time domain. However, TVM data included only AADT figures without reference to vehicle distributions. At the time of the writing of this report, usable data represented AADT figures from 1987 to 1997 and WIM figures from 1994, 1995, and 1997. WIM data from 1994 and 1995, considered inadequate for weight calculations, were deemed suitable in terms of vehicle distributions.

Trend figures were calculated through synthetic integration of the two available databases: WIM provided distributions and TVM provided overall trends. Curve-fitting techniques were then used to bridge gaps in data. Since only three representatives of vehicle distributions were available (WIM data from 1994, 1995, and 1997), findings could not be considered reliable. As such, these findings were relegated to Appendix D along with the results of the curve-fitting analysis so as to separate them from the body of this report. During the course of this project, an additional two years worth of data became available (1998 and 1999). However, an examination of this additional data had suggested that it would not change findings or their relevance significantly. Thus, the records were not added to the database and trend figures were not recalculated.

In addition to the details found in Appendix D, raw data can be found in the appendices as well. Appendix B provides an ADT summary of data collected at WIM sites during the years 1994, 1995, and 1997. TVM sites were specifically selected so that they would geographically coincide as closely as possible with relevant WIM sites. Appendix C provides an AADT summary of data collected at the selected TVM sites from 1987 to 1998.

A final comment should be made relating to Appendix C. Inconsistencies between highway classifications as recorded by the WIM program and highway classifications as recorded by the TVM program are designated differently in some cases. It is possible that the segment was officially redesignated by the Department between tests, but, if not, there is cause for concern because there should be no difference between designations from one monitoring program to the next. As can be seen, the differences typically relate to a section's designation as being rural or urban, although other variations do exist. It is beyond the resources of this research to examine this matter more closely. However, the observation is considered significant enough to warrant mention.

Load Equivalency Factor Table Analysis:

State DOT's accumulate traffic information in the format of the FHWA W-4 truck weight tables, which are tabulations of the number of axles observed within a series of load groups with each load group covering a specific weight range. These distributions are given on an axle by axle basis for each vehicle classification in a given year. Louisiana's W-4 tables for the years 1997, 1998, and 1999 are provided in Appendix F and were used to define the typical weight of Louisiana vehicles, by class, for each of the years in question. For example, Appendix F records 21,846 class-2 vehicles monitored in 1997, where there were more axles, front and rear, recorded as weighing between 1.2 and 1.4 metric tons than in any other weight range. This W-4 table shows that a typical Louisiana automobile (class-2 vehicle) weighed approximately 2.6 metric tons in 1997 (1.3 metric tons on both the front and rear axles). LEF tables are developed from the W-4 tables and specify the structural number or rigid pavement thickness required to support these typical vehicles given a specific terminal serviceability.

Tables 2, 3, and 4 summarize the LEF factors themselves as derived from VTRIS for the years 1997, 1998, and 1999, respectively. Also, they serve as the revision of LEF figures stipulated as an objective of this research. LEF tables are based on the actual W-4 tables that are produced by FHWA's VTRIS program using WIM data. This was done in accordance with AASHTO procedures and in compliance with the TMG.

LEF Table Confidence Issues:

The LEF table design approach poses a twofold concern. First, it is an oversimplification to treat LEF factors as universal indicators; AASHTO stresses that the LEF figures represent only estimates when applied to highways other than those from which the supportive data were obtained. The only apparent solution to this would be to revise the current approach and to treat highways on a site by site basis. Since this is primarily an administrative issue, research must be content to accept the established approach until such time as the department sees fit to establish new techniques. The second concern relates to the fact that LEF factors are given with no reference to the nature of the distributions from which they were drawn. The highway engineer cannot know, at present, the quantity or quality of the data used to establish an LEF figure. In an attempt to begin bridging this shortfall, Appendix F records not only axle distributions but also each distribution's statistics (axle count, 25th percentile, median, 75th percentile, mean, and standard deviation).

Before proceeding to a more detailed discussion of the statistical analysis of the distributions presented in Appendix F, it should be pointed out that Appendix F is actually a variation on the standard W-4 tables produced by VTRIS. This was required because a more complete summary of the raw data was needed for the development of confidence figures than the standard W-4 tables, as produced by VTRIS, could provide. VTRIS is designed to clean up collected field data by filtering out readings that do not pass certain defined criteria. For example, if a WIM field recorder detects a 3-axle, class-2 vehicle then VTRIS will recognize the error and discard the data point from its summary calculations. When calculating confidence figures, however, these points should be incorporated because they comment on the quality of the data collection process. For this reason, Appendix F had been manually compiled so as to include all collected data points.

Confidence in an LEF table entry is dependant on the significance of the data defining it. This, specifically, refers to a sample population's size and range. Observing that the average weight of automobiles is 2.6 metric tons would have greater significance if it were known to be based on 10,000 observations as opposed to 100. Significance would also be improved if it were known that the observed weights on the 10,000 cars varied from one another by a range ±0.5 metric tons as opposed to ±5.5. This is not to suggest that the ±5.5 metric ton figure is necessarily in error. What it does indicate is that the representative 2.6 metric ton automobile would better model the ±0.5 metric ton data.

This reasoning was applied to the various axle weight distributions shown in Appendix F and contributed to the development of what will be referred to in this report as the *Variability Percentile on Each Axle* (VPEA). Subtracting the 25th percentile axle weight from the 75th percentile axle weight in each distribution

Table 2

Rigid Pavement Load Equivalency Tables by 1997 WIM data

FHWA Vehicle Classification	Terminal PSI = 2.0					
	Assumed Rigid Pavement Thickness					
	6	7	8	9	10	11
3	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017
4	4.6886	4.4479	4.3735	4.3756	4.4245	4.5045
5	1.1505	1.1018	1.0836	1.0851	1.0991	1.1213
6	2.9017	2.8133	2.7896	2.8077	2.8419	2.8810
7	8.0551	7.7425	7.7239	7.8499	8.0254	8.1916
8	4.7121	4.4943	4.4286	4.4406	4.4967	4.5793
9	3.7922	3.7370	3.7669	3.8283	3.8802	3.9145
10	5.1210	5.0292	5.0483	5.1255	5.2058	5.2692
11	4.6382	4.5566	4.5612	4.5964	4.6335	4.6675
12	2.4633	2.4285	2.4309	2.4417	2.4502	2.4550
13	8.2728	8.0312	8.0155	8.1161	8.2491	8.3765

FHWA Vehicle Classification	Terminal PSI = 2.5					
	Assumed Rigid Pavement Thickness					
	6	7	8	9	10	11
3	0.0019	0.0017	0.0016	0.0016	0.0016	0.0016
4	4.3121	3.9596	3.8173	3.8226	3.9166	4.0720
5	1.0606	0.9729	0.9381	0.9411	0.9675	1.0103
6	2.7062	2.5264	2.4821	2.5199	2.5887	2.6668
7	7.4170	6.9363	6.9034	7.1564	7.5118	7.8554
8	4.3387	3.9927	3.8670	3.8917	3.9999	4.1608
9	3.5952	3.4775	3.5388	3.6662	3.7757	3.8489
10	4.8240	4.6215	4.6624	4.8205	4.9863	5.1184
11	4.4681	4.3222	4.3324	4.4056	4.4817	4.5508
12	2.4572	2.4056	2.4084	2.4314	2.4501	2.4611
13	7.7037	7.2749	7.2511	7.4572	7.7276	7.9876

Flexible Pavement Load Equivalency Tables by 1997 WIM data

FHWA Vehicle Classification	Terminal PSI = 2.0					FHWA Vehicle Classification	Terminal PSI = 2.5				
	Assumed Flexible Pavement Structural Number						Assumed Flexible Pavement Structural Number				
	2	3	4	5	6		2	3	4	5	6
3	0.0019	0.0018	0.0017	0.0015	0.0014	3	0.0030	0.0025	0.0019	0.0014	0.0014
4	4.8370	4.3476	3.9300	3.7678	3.8320	4	4.6187	3.7946	3.0485	2.7824	2.8805
5	1.3580	1.2343	1.1147	1.0684	1.0861	5	1.3006	1.0665	0.8543	0.7793	0.8063
6	1.9915	1.8729	1.7526	1.7151	1.7435	6	1.9473	1.7248	1.5027	1.4359	1.4824
7	6.4599	5.9511	5.6016	5.5893	5.7817	7	6.2186	5.3484	4.6906	4.6728	5.0264
8	4.7985	4.3443	3.9452	3.8005	3.8722	8	4.5925	3.7940	3.0789	2.8418	2.9552
9	2.2945	2.2651	2.2240	2.2209	2.2383	9	2.3039	2.2486	2.1594	2.1453	2.1769
10	3.2801	3.1973	3.1026	3.0950	3.1387	10	3.2565	3.0791	2.8927	2.8719	2.9515
11	4.9011	4.6968	4.5184	4.4934	4.5611	11	4.8199	4.4433	4.1025	4.0570	4.1822
12	2.2058	2.1897	2.1488	2.1314	2.1361	12	2.2538	2.2652	2.1679	2.1168	2.1206
13	5.3730	5.0964	4.8697	4.8487	4.9603	13	5.2587	4.7655	4.3360	4.2927	4.4900

Table 3

Rigid Pavement Load Equivalency Tables by 1998 WIM data

FHWA Vehicle Classification	Terminal PSI = 2.0					
	Assumed Rigid Pavement Thickness					
	6	7	8	9	10	11
3	0.0018	0.0017	0.0017	0.0017	0.0017	0.0017
4	1.6991	1.6477	1.6277	1.6303	1.6459	1.6700
5	0.4031	0.3905	0.3858	0.3868	0.3908	0.3966
6	1.6420	1.6046	1.6024	1.6184	1.6377	1.6555
7	3.0119	2.9572	2.9720	3.0219	3.0712	3.1061
8	1.1334	1.1025	1.0922	1.0955	1.1048	1.1171
9	3.0275	2.9911	3.0171	3.0614	3.0958	1.1170
10	4.5633	4.4826	4.5029	4.5676	4.6300	4.6787
11	2.1007	2.0808	2.0764	2.0795	2.0827	2.0847
12	1.5530	1.5340	1.5232	1.5196	1.5183	1.5178
13	21.3264	20.6554	20.5571	20.8347	21.2516	21.6729

FHWA Vehicle Classification	Terminal PSI = 2.5					
	Assumed Rigid Pavement Thickness					
	6	7	8	9	10	11
3	0.0020	0.0018	0.0017	0.0017	0.0017	0.0017
4	1.6066	1.5036	1.4653	1.4706	1.5005	1.5470
5	0.3838	0.3581	0.3488	0.3507	0.3585	0.3697
6	1.5566	1.4803	1.4767	1.5099	1.5494	1.5857
7	2.8526	2.7410	2.7709	2.8722	2.9747	3.0489
8	1.0895	1.0261	1.0055	1.0122	1.0306	1.0547
9	2.8928	2.8164	2.8696	2.9622	3.0355	3.0810
10	4.3172	4.1531	4.1959	4.3294	4.4605	4.5611
11	2.1227	2.0763	2.0650	2.0706	2.0772	2.0817
12	1.6010	1.5557	1.5308	1.5222	1.5193	1.5182
13	19.5680	18.2429	18.0713	18.6310	19.4673	20.3204

Flexible Pavement Load Equivalency Tables by 1998 WIM data

FHWA Vehicle Classification	Terminal PSI = 2.0					FHWA Vehicle Classification	Terminal PSI = 2.5				
	Assumed Flexible Pavement Structural Number						Assumed Flexible Pavement Structural Number				
	2	3	4	5	6		2	3	4	5	6
3	0.0020	0.0018	0.0015	0.0015	0.0013	3	0.0000	0.0027	0.0020	0.0015	0.0015
4	1.7546	1.6403	1.5083	1.4509	1.4642	4	1.7000	1.4922	1.2551	1.1557	1.1720
5	1.4539	0.4256	0.3934	0.3808	0.3855	5	0.4000	0.3932	0.3335	0.3108	0.3174
6	1.1240	1.0850	1.0346	1.0167	1.0257	6	1.1000	1.0509	0.9532	0.9172	0.931
7	2.1371	2.0791	2.0277	2.0360	2.0713	7	2.1000	2.0073	1.9007	1.9099	1.9775
8	1.0258	0.9801	0.9195	0.8933	0.8994	8	1.0000	0.9406	0.8253	0.7750	0.7815
9	1.8213	1.1826	1.7857	1.7773	1.7824	9	1.8000	1.8379	1.7758	1.7507	1.7577
10	2.9649	2.8931	2.8142	2.8041	2.8363	10	2.9000	2.8186	2.6603	2.6341	2.6916
11	2.1077	2.1144	2.0842	2.0662	2.0650	11	2.1000	2.1854	2.1127	2.0629	2.0545
12	1.3130	1.3487	1.3242	1.2900	1.2742	12	1.3000	1.4889	1.4236	1.3407	1.2972
13	14.1140	13.2090	12.4680	12.4430	12.8510	13	13.5900	11.7576	10.3962	10.3754	11.1207

Table 4

Rigid Pavement Load Equivalency Tables by 1999 WIM data

FHWA Vehicle Classification	Terminal PSI = 2.0					
	Assumed Rigid Pavement Thickness					
	6	7	8	9	10	11
3	0.0012	0.0012	0.0012	0.0012	0.0021	0.0012
4	10.3777	9.9527	9.7839	9.8177	9.9799	10.2172
5	1.6332	1.5677	1.5415	1.5462	1.5706	1.6066
6	1.7465	1.6985	1.6896	1.7039	1.7259	1.7494
7	6.0956	5.8948	5.8384	5.8741	5.9517	6.0532
8	2.1943	2.1178	2.0906	2.0995	2.1284	2.1676
9	1.9997	1.9808	1.9951	2.0168	2.0328	2.0425
10	4.8913	4.7586	4.7366	4.7758	4.8328	4.8926
11	1.8126	1.7950	1.7872	1.7855	1.7852	1.7852
12	1.2532	1.2331	1.2189	1.2125	1.2097	1.2085
13	9.6068	9.3431	9.3440	9.5038	9.7050	9.8865

FHWA Vehicle Classification	Terminal PSI = 2.5					
	Assumed Rigid Pavement Thickness					
	6	7	8	9	10	11
3	0.0014	0.0013	0.0012	0.0012	0.0012	0.0012
4	9.4388	8.6052	8.2886	8.3561	8.6668	9.1280
5	1.4936	1.3647	1.3153	1.3247	1.3713	1.4412
6	1.6417	1.5450	1.5286	1.5581	1.6023	1.6494
7	5.6099	5.2141	5.1120	5.1875	5.3410	5.5394
8	2.0427	1.8902	1.8383	1.8562	1.9123	1.9891
9	1.9361	1.8952	1.9245	1.9704	2.0045	2.0253
10	4.5551	4.2913	4.2538	4.3364	4.4526	4.5728
11	1.8504	1.8087	1.7901	1.7858	1.7851	1.7851
12	1.3136	1.2659	1.2335	1.2188	1.2126	1.2099
13	8.8780	8.3525	8.3608	8.6831	9.0906	9.4638

Flexible Pavement Load Equivalency Tables by 1999 WIM data

FHWA Vehicle Classification	Terminal PSI = 2.0					FHWA Vehicle Classification	Terminal PSI = 2.5				
	Assumed Flexible Pavement Structural Number						Assumed Flexible Pavement Structural Number				
	2	3	4	5	6		2	3	4	5	6
3	0.0014	0.0013	0.0011	0.0010	0.0009	3	0.0023	0.0019	0.0014	0.0011	0.0010
4	11.7681	10.6493	9.5587	9.1773	9.3992	4	11.1430	8.9156	7.0132	6.4162	6.7725
5	1.9399	1.7614	1.5844	1.5201	1.5527	5	1.8460	1.4911	1.1810	1.0792	1.1307
6	1.2363	1.1765	1.1086	1.0867	1.1024	6	1.2223	1.1076	0.9795	0.9382	0.9627
7	4.3389	4.0322	3.7241	3.6186	3.6869	7	4.1793	3.5729	3.0291	2.8565	2.9641
8	2.2110	2.0445	1.8705	1.8080	1.8414	8	2.1392	1.8121	1.4999	1.3945	1.4461
9	1.1916	1.1997	1.1818	1.1674	1.1628	9	1.2289	1.2556	1.2115	1.1740	1.1607
10	3.0034	2.8509	2.6844	2.6283	2.6636	10	2.9478	2.6526	2.3472	2.2471	2.3028
11	1.8001	1.8214	1.7993	1.7769	1.7673	11	1.8580	1.9182	1.8612	1.8026	1.7772
12	1.0283	1.0707	1.0471	1.0111	0.9898	12	1.1162	1.2269	1.1626	1.0715	1.0198
13	5.3554	5.1123	4.9062	4.9155	5.0462	13	5.2411	4.7543	4.3581	4.3664	4.6062

produces a reasonable expression of the distribution weight range. Dividing this figure by the distribution's median weight serves to normalize the range. As explained in the methodology, normalization allows unrelated sample populations to be compared: a front axle to a back axle, for example, or a class-2 vehicle, axle to a class-9. Variability is at a minimum when the normalized weight range is zero. The significance of this increases as a sample's population size approaches infinity. VPEA, conceived to comment on minimum variability and maximum significance, can be expressed as follows:

$$\text{Variability Percentile on Each Axle (VPEA)} = \frac{(75^{th}\ \text{Percentile} - 25^{th}\ \text{Percentile}) * 100\%}{\text{Median Weight} * \text{Axle Count}}$$

VPEA figures are given in Appendix F for each distribution listed. They indicate, as they approach zero, that the calculated median weight of the axle distribution shown in the appendix is a significant and accurate model of the axle which it models. The lower the VPEA, the greater the significance and accuracy.

This reasoning must be expanded to comment on vehicles rather than just their constituent axle distributions. Taking the weighted average of the various VPEA figures associated with any particular vehicle classification in a particular year produces a figure that can be used as a confidence indicator on the LEF factor of that vehicle classification in that year. Termed the *Vehicle Average Variability Percentile* (VAVP), it is indicative of (as it approaches zero) larger sample populations and smaller variability in those populations.

$$\text{Vehicle Average Variability Percentile (VAVP)} = \frac{\sum(\text{Axle Counts} * \text{VPEA})}{\sum(\text{Axle Counts})} * 100\%$$

Qualitatively, confidence in an LEF factor increases as the associated VAVP factor decreases. Table 5 provides a summary of the VAVP figures associated with the various vehicle classes in each of the years studied. Figures in Table 5 are taken from the axle distributions shown in Appendix F.

Table 5 indicates that caution should be exercised in using LEF figures associated with class-4, class-7, class-12, and class-13 vehicles because VAVP percentages are excessive. LEF factors associated with excessively large VAVP percentages are characteristically supported by highly variable data or by databases with excessively small populations. Examination of Appendix F reflects this. Distributions associated with Class-4 vehicles in 1999 are highly variable. Class-13 vehicles, for all years examined, have markedly small populations. It is also worthy of note that the LEF factors for these vehicle

Table 5
Significance/Variability figures (VAVP)
associated with LEF Tables for 1997, 1998, and 1999

Vehicle Classification	Vehicle Average Variability (VAVP)		
	1997	**1998**	**1999**
2	0.20%	0.52%	0.52%
3	0.35%	0.98%	1.62%
4	***44.83%***	***19.79%***	***78.35%***
5	1.50%	---[1]	1.56%
6	4.33%	2.67%	3.92%
7	***178.00%***	---[1]	***302.78%***
8	12.00%	7.26%	13.18%
9	0.80%	0.30%	0.66%
10	10.83%	---[1]	14.72%
11	21.60%	8.98%	11.37%
12	***78.33%***	***18.58%***	***24.78%***
13	***620.21%***	***169.67%***	***436.52%***

[1] Indicates the presence of singularities in the WIM data that can only serve to lessen confidence in the associated LEF factor. (statistical calculations are not possible because too few vehicles exist in the distributions to allow it - See last page of Appendix F)

classifications as shown in tables 2, 3, and 4 are also discordant with the rest of the figures in the tables. The high VAVP indexes underlie that the probable cause is insufficient modeling. Decision making related to what is considered to be an acceptable VAVP figure is an administrative issue and is deferred to the Department.

Comparative Analysis and Effect on Pavement Design

Comparison of Load Equivalency Table factors arrived at through this research were compared to those currently in use. Values representing the percent difference between revised and established figures were calculated. In addition, an appraisal of the significance of the traffic growth rate figures was done. Lastly, suggestions for revision on all findings were indicated where relevant.

For purposes of comparison to the newly developed Load Equivalency Factors (found in Tables 2, 3, and 4), LADOTD's currently used Load Equivalency Factors are presented in Table 6. On the whole, the differences are considered pronounced, because the newer figures often proved many orders of magnitude greater than the old. This being the case, concerns arise relating to the effect these variations will have, and have had, on Louisiana's pavement design effort.

To address this, four 20-year design examples had been prepared (two flexible and two rigid). A set of typical daily traffic counts and growth figures were first assumed (details can be found in Appendix E). The counts were adjusted to account for the assumed traffic growth percentages according to the AASHTO Design Guide using the Traffic Growth Factors found in Table D.20 of the guide. The corrected counts were then converted into their ESAL equivalents using figures from the old and new tables (Flexible pavement: Pt=2.5", S=5; Rigid pavement: Pt=2.5, t=10").

ESAL figures for each case were summed and multiplied by 365 days per year and again by 20 years (the design life) to arrive at the number of cumulative ESALs that the prospective pavements would experience over their design lives. These cumulative ESAL figures were subsequently processed using AASHTO's DARWin 3.0 highway design computer program to arrive at a pavement design for each case that would be sufficient to support the expected loads. During the DARWin evaluations, all other factors that might have influenced design were held as constant. In this way, it was ensured that only ESAL variations could have contributed to the differences in design.

The more significant results of this analysis are summarized in the following chart.

Flexible Pavement (Pt=2.5, S=5)

LEF Table used	Projected Cumulative ESALs (20-year Design Life)	Design Structural Number	Asphalt Thickness
OLD	271474231	7.54 inches	26.67 inches
NEW	645473983	8.38 inches	28.58 inches

Rigid Pavement (Pt=2.5, t=10)

LEF Table used	Projected Cumulative ESALs (20-year Design Life)	Concrete Thickness
OLD	440216000	16.94 inches
NEW	1069757869	19.35 inches

This summary indicates that although the Projected Cumulative ESAL figures derived from the new and old LEF tables show considerable difference, the effect that these differences have on design thicknesses is minimal. For flexible pavement, an added 28.58 - 26.67 = 1.91 inches of asphalt would be required to compensate for the additional 645,473,983 - 271,474,231 = 373,999,752 ESALs that the new LEF tables predict. For rigid pavement, an added 19.35 - 16.94 = 2.41 inches of concrete would be required to compensate for the additional 1,069,757,869 - 440,216,000 = 629,541,869 ESALs that the new LEF tables predict.

To account and compensate for the cases of exponential growth typical of interstate and major arterial highways, directional and lane distribution factors for the examples were held at unity. It is difficult to quantify a global exponential growth pattern that can be considered typical. But, it is necessary to consider the effects that the increased traffic estimates associated with exponential growth will have on the disparity between designs arrived at using the old and new tables. Holding the directional and lane distribution factors of the examples at unity implies an assumption that all traffic is confined to a single lane. This is a false assumption producing a false design. But, the comparison analysis is intended to explore the disparity between designs, and not the absolute correctness of the individual designs themselves. Making the assumption compensates for those cases in which exponential growth occurs and it over designs in those cases where it doesn't. In either instance the disparity is shown to be minimal and it follows that the effects of table revision are shown to be minimal as well.

Table 6

LADOTD Rigid Pavement Load Equivalency Tables

LADOTD Vehicle Classification	Terminal PSI = 2.0					
	Assumed Rigid Pavement Thickness					
	6	7	8	9	10	11
cars	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004
pickups	0.0028	0.0027	0.0027	0.0029	0.0029	0.0026
2-Axle, 4-Tire	0.0149	0.0145	0.0143	0.0190	0.0189	0.0141
2-Axle, 6-Tire	0.1716	0.1687	0.1676	0.2018	0.2016	0.1678
3-Axle	0.5809	0.5746	0.5761	0.5956	0.5991	0.5856
2-S-1	0.5192	0.5099	0.5034	0.5549	0.5527	0.4989
2-S-2, 3-S-1	0.9954	0.9843	0.9851	1.0331	1.0368	0.9967
3-S-2	1.7000	1.7456	1.7376	1.7738	1.8046	1.7918
3-S-3	2.8730	2.8730	2.8730	2.8730	2.8730	2.8730
Double Trailer	1.8400	1.8400	1.8400	1.8400	1.8400	1.8400

LADOTD Vehicle Classification	Terminal PSI = 2.5					
	Assumed Rigid Pavement Thickness					
	6	7	8	9	10	11
cars	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004
pickups	0.0031	0.0028	0.0027	0.0027	0.0026	0.0026
2-Axle, 4-Tire	0.0162	0.0150	0.0144	0.0143	0.0142	0.0141
2-Axle, 6-Tire	0.1779	0.1700	0.1672	0.1673	0.1680	0.1677
3-Axle	0.5745	0.5600	0.5623	0.5706	0.5781	0.5658
2-S-1	0.5490	0.5251	0.5105	0.5044	0.5018	0.4998
2-S-2, 3-S-1	0.9945	0.9684	0.9687	0.9794	0.9891	0.9939
3-S-2	1.7102	1.6862	1.7099	1.7485	1.7719	1.7855
3-S-3	2.8730	2.8730	2.8730	2.8730	2.8730	2.8730
Double Trailer	1.8400	1.8400	1.8400	1.8400	1.8400	1.8400

LADOTD Flexible Pavement Load Equivalency Tables

LADOTD Vehicle Classification	Terminal PSI = 2.0				
	Assumed Flexible Pavement Structural Number				
	2	3	4	5	6
cars	0.0004	0.0004	0.0004	0.0004	0.0004
pickups	0.0030	0.0029	0.0026	0.0024	0.0023
2-Axle, 4-Tire	0.0154	0.0152	0.0143	0.0135	0.0132
2-Axle, 6-Tire	0.1733	0.1737	0.1690	0.1654	0.1644
3-Axle	0.3856	0.3907	0.3833	0.3768	0.3738
2-S-1	0.5036	0.5192	0.5086	0.4928	0.4843
2-S-2, 3-S-1	0.8744	0.8641	0.8506	0.8423	0.9127
3-S-2	1.0401	1.0580	1.0458	1.0313	1.0224
3-S-3	1.4500	1.4500	1.4500	1.4500	1.4500
Double Trailer	1.8400	1.8400	1.8400	1.8400	1.8400

LADOTD Vehicle Classification	Terminal PSI = 2.5				
	Assumed Flexible Pavement Structural Number				
	2	3	4	5	6
cars	0.0007	0.0006	0.0004	0.0004	0.0004
pickups	0.0045	0.0041	0.0036	0.0027	0.0024
2-Axle, 4-Tire	0.0198	0.0192	0.0227	0.0145	0.0137
2-Axle, 6-Tire	0.1853	0.1900	0.2216	0.1681	0.1648
3-Axle	0.4051	0.4215	0.4227	0.3842	0.3764
2-S-1	0.5469	0.5872	0.6274	0.5191	0.4969
2-S-2, 3-S-1	0.8999	0.9034	0.9101	0.8308	0.8315
3-S-2	1.0809	1.1271	1.1186	1.0543	1.0320
3-S-3	1.4500	1.4500	1.4500	1.4500	1.4500
Double Trailer	1.8400	1.8400	1.8400	1.8400	1.8400

Alternatives to the LEF Table Approach:

As previously indicated, the primary weakness associated with the LEF table approach to highway design is its practice of normalizing data and its tendency toward applying models globally. It may seem reasonable to suggest that a possible alternative approach would be to consider using a range of truck factor values (variable dependant upon highway classification, region, and vehicle classification). This implies a separate body of LEF tables be made for every highway classification on a region by region basis.

The problem with separate tables is that there is not enough raw data available to provide for adequate coverage. The total number of permutations that can be produced by combining the 13 vehicle classifications, 4 regional designations, and 14 highway classifications amounts to 13 x 4 x 14 = 728. To properly model the system, each of these permutations must be adequately represented. Current inventories are not extensive enough to satisfy need. Provided they were available, the figures would be representative of only the year in which the data was collected and would, therefore, eventually require recalculation.

The only way to accurately model a dynamic system is to constantly poll the system and apply the findings to the model parameters. There are, in effect, two ways to approach polling. One method, which was used to develop LADOTD's LEF tables, takes the global approach already described. This method accomplishes its end by, in effect, attempting to solve every design problem in advance by developing global indexes from a small but statistically significant database. The primary concern associated with this is that global solutions are not realistic and that data acquisition is too far removed from the design process. VAVP figures, as developed in this research, do confirm that model quality is lacking in some cases. However, these figures, at least, make it possible to explore the extent of the problem. They also serve to help bridge the gap between data acquisition and design by providing the designer with added insight into the quality and extent of the supportive database.

The second method to model a dynamic system entails solving problems as they arise. The site-by-site method would better model the specific locations being studied using data that is site specific, thereby facilitating a better marriage between design and regional circumstance. Modeling would be more accurate and precise. The primary difficulties relate to the need for a restructuring of the logistics associated with data collection and the fact that management of the process would be less centrally controlled and overseen than at present. Also, this method would require a more feverish pace in moving from planning through data collection to design (each design problem would require the development of its own unique set of truck factors). Special provisions would also need to be drawn up to map traffic growth patterns since historic archives would not be available.

It should be noted that both methods (global as well as site-by-site) comply with the TMG, HPMS field manual, and AASHTO procedures. These works serve as guides designed to ensure that findings (ESAL equivalents) are properly supported, statistically, by raw data. Organization, presentation, and implementation of findings are matters that the FHWA has left to the various state transportation agencies to decide. As described, Louisiana prepares LEF tables according to the global approach previously detailed. Research has contacted a number of other state transportation agencies (Mississippi, Georgia, Arkansas, and Alabama) to make comparisons of their methods to Louisiana's. The only significant difference is that three out of the four states consulted use an alternative to the VTRIS computer program (Alabama and Arkansas have both developed their own software whereas Georgia calculates factors by hand). This is more a matter of detail than true variation in that all methods conform to the same procedures and produce equivalent results. Also, as of this writing, all consulted agencies use the global approach.

CONCLUSIONS

The primary objective of this research have been met. Louisiana's LEF tables have been revised. Traffic growth trends have been tabulated to those lengths possible. And, the supportive data used to develop the LEF tables have been analyzed statistically. Conclusions resulting from this research are as follows:

- Load Equivalency Tables arising from procedures outlined herein have been established in the form of Tables 2, 3, and 4 of this report, which are derived from 1997, 1998, and 1999 WIM data. Figures found therein are considered reasonable when used in conjunction with the associated VAVP figures given in Table 5 in as much as a global approach to highway design allows.

- A comparison of Load Equivalency Table figures resulting from this research (summarized in Tables 2, 3, and 4) to those currently used by LADOTD (shown in Table 6) indicate that the current Load Equivalency Factors are under-specified. The evidence of this is that Table 6 figures are notably and consistently lower than revised figures.

- The effect of the changes in LEF tables have been shown to be minimal when applied to pavement thickness calculations. The design example, summarized in Appendix E, demonstrates that only 1.91 additional inches of asphalt would be required to compensate for the additional 373,999,752 ESALs that the new LEF tables would predict for a flexible pavement design over its 20-year life. Similarly, only 2.41 inches of additional concrete would be required to compensate for the additional 629,541,869 ESALs that the new LEF tables predict for a rigid pavement design over its 20-year life.

- The derived VAVP and VPEA figures found in Table 5 and in Appendix F indicate that axle and vehicle weights often vary considerably from their representative median weights. This fact calls into question the assumption associated with the LEF table approach to design, which asserts that median values can act as global representations of field conditions. These normalized figures are the LEF table figures themselves.

- Vehicle volume growth rate factors have been established in the form of Appendix D.3 of this report, which are derived from 1997, 1998, and 1999 WIM data as well as TVM data from the years 1987 through 1997. Figures found therein are not considered conclusive. The reason for this relates to the synthetic nature of the

the data coverage established to derive the figures as well as the limited and variable nature of the raw data that was used to obtain that coverage. Details are presented in appendixes B, C, and D. However, these are offered only as an elaboration of methods and for completeness and are not to be regarded as implementable.

RECOMMENDATIONS

The following recommendations can be made:

- LEF Table figures resulting from this research, as summarized in Tables 2, 3, and 4, are considered sufficient to carry on highway design according to the global approach, provided they take into consideration the insights provided by the VAVP figures given in Table 5. However, as a matter of practice, figures will need continual revision if they are to continue to be considered acceptable by LADOTD as policy.

- It is recommended that the procedures and software used during this research become integrated into future highway design procedures as a matter of convention. In particular, FHWA's VTRIS software and AASHTO's DARWin software are implied here.

- Inadequacies in Louisiana's current LEF tables must be addressed. Whether a mechanistic approach is taken (one which examines highways as well as the traffic they carry on a site by site basis and which solves design problems as need arises using site specific data) or a complete reworking of current LEF table methods is intended, it is recommended that an ongoing program be established that is dedicated to the continual verification and re-establishment of load equivalency figures. It is also recommended that these changes be made a part of highway design convention.

- In the event that a mechanistic approach is taken (one which examines highways as well as the traffic they carry on a site by site basis and which solves design problems as need arises using site specific data), it is recommended that a program of data collection be maintained that is not site specific but global. The purpose and extant of this is, at a minimum, is to provide the coverage necessary to calculate traffic growth figures in accordance with the sampling theory and requirements forwarded by the TMG and HPMS Field Manual. Coverage should consist of the standard 48-hour short-session counts carried out over the typical 3-year cycle as suggested by the TMG but only to the extent required to develop traffic growth trends (which is a vehicle count, not weight, issue).

- It is recommended that growth trend studies continue. As stated, results are, as of yet, inconclusive. It is recommended that at least ten years of verified WIM data be archived so as to be able to plot distributions more adequately than is presently possible. Preliminary investigations also appear to indicate that growth trend results may be divergent. If this is correct, then the divergence can be expected to complicate the issue further.

- It is recommended that in those cases where the naming convention of the LADOTD vehicle classification system varies from the FHWA convention that LADOTD change its naming convention to match that of FHWA.

LIST OF ACRONYMS/ABBREVIATIONS/SYMBOLS

AADT	Annual Average Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
ADT	Average Daily Traffic
ATR	Automatic Traffic Recorder
DARWin	Design, Analysis, and Rehabilitation for Windows
ESAL	Equivalent Single 18 kip Axle Load
FCS	Functional Classification System
FHWA	Federal Highway Administration
HPMS	Highway Performance Monitoring System
LADOTD	Louisiana Department of Transportation and Development
LEF	Load Equivalency Factor
PI	Principal Investigator
P_t	Terminal Serviceability
TMG	Traffic Monitoring Guide
TMS	Traffic Monitoring Sample
TMSS	Traffic Monitoring Sample Structure
TWS	Truck Weight Software
TVM	Traffic Volume Monitoring
VAV	Vehicle Average Variability
VPEA	Variability Percentile on Each Axle
VTRIS	Vehicle Travel Information System
WIM	Weigh In Motion

BIBLIOGRAPHY

1. "AASHTO Guide for Design of Pavement Structures," American Association of State Highway and Transportation Officials, 1986.

2. "Traffic Monitoring Guide, Third Edition," U.S. Department of Transportation, Federal Highway Administration, Office of Highway Information Management, February 1995, (FHWA-PL-95-031).

3. "HPMS Field Manual," U.S. Department of Transportation, Federal Highway Administration, Office of Highway Information Management, November 1996, (FHWA ORDER M 5600.1B).

4. "HPMS Field Manual," U.S. Department of Transportation, Federal Highway Administration, Office of Highway Information Management, November 1996, (FHWA ORDER M 5600.1B), *Chapter I - Scope of the HPMS.*

5. "HPMS Field Manual," U.S. Department of Transportation, Federal Highway Administration, Office of Highway Information Management, November 1996, (FHWA ORDER M 5600.1B). *Chapter III - Definitions And Codes.*

6. "Vehicle Travel Information System (VTRIS) User's Guide," U.S. Department of Transportation, Federal Highway Administration, Office of Highway Information Management.

LADOTD's 1999 Weigh-In-Motion Station Specifics

WIM Station #	Parish	Route	Location	Highway Class
7	Rapides	LA 463	0.5 mi S of LA 121, Hineston	Rural Major Collector
9	Allen	LA 26	1.0 Mile northwest of Oberlin	Rural Major Collector
10	Rapides	LA 28	0.5 mi E of LA 1205, Libuse	Rural Principle Arterial Other
18	E. Baton R	US 190	6.4 mi E of US 61, B. R.	Urban Principle Arterial Other
20	Rapides	I 49	at the Avoyelles-Rapides Line	Rural Principle Arterial Interstate
25	Sabine	LA 6	at the Texas State Line - Many -	Rural Principle Arterial Other
30	Rapides	US 71	1.2 mi N of LA 112, Lecompte	Rural Principle Arterial Other
31	Grant	LA 8	0.8 Mile west of US 165, Pollock	Rural Major Collector
35	Union	LA 2	1.2 miles West of LA 15, Farmerville	Rural Minor Arterial
52	Vermilion	LA 14	0.2 mi W of LA 14 Bus, Abbeville	Urban Principle Arterial Other
56	Allen	US 165	South City Limits of Oakdale	Rural Principle Arterial Other
57	Pointe	LA 1	1.0 mi S of LA 10, Morganza	Rural Major Collector
59	Red River	LA 155	0.9 mi ne of US 71, Coushatta	Rural Major Collector
61	Sabine	LA 175	0.6 mi S of LA 120, Belmont	Rural Major Collector
62	Rapides	LA 121	0.6 mi NE of Gardner	Rural Major Collector
64	E. Baton R	US 190	1.0 mi W of US 61, Baton Rouge	Urban Principle Arterial Other
77	Iberia	US 90	0.5 MILE SOUTH OF LA 83	Rural Principle Arterial Other
113	St. John	LA 3224	Bet. US 61 & LA 44, Laplace	Urban Collector
115	St. John	US 61	East of US 51, Laplace	Urban Principle Arterial Other
116	St. John	US 61	2.0 mi E of LA 54, Garyville	Rural Minor Arterial
121	Iberia	LA 182	North City Limits of New Iberia	Rural Major Collector
123	Iberia	US 90	7.0 mi. north of LA 14 at New Iberia	Rural Principle Arterial Other
131	St. Mary	LA 3211	0.2 mi. west of LA 182, N. of St. Mary	Rural Minor Collector
134	St. Mary	LA 182	North of Patterson City Limits	Rural Major Collector
135	Iberia	LA 182	South City Limits of New Iberia	Rural Major Collector
141	Pointe	LA 411	0.5 mi. south of US 190, Lavonia	Rural Minor Collector
143	Rapides	US 167	1.0 mi. n. of the Red River, Ph L	Urban Principle Arterial Other
144	Iberia	LA 674	1.5 mi. north of LA 14, New Iberia	Rural Major Collector
150	Webster	I 20	Between LA 7 and LA 531	Rural Principle Arterial Interstate
166	Grant	LA 8	0.5 mi. south of Main St., Colfax	Rural Major Collector

LADOTD's 1998 Weigh-In-Motion Station Specifics

WIM Station #	Parish	Route	Location	Highway Class
13	Calcasieu	I 10	3.8 mi W of LA 383, Chloe	Rural Principle Arterial
14	Calcasieu	US 90	1.5 Mile West of US 165 - Iowa	Rural Major Collector
16	W. Baton R	US 190	0.2 mi W of LA 415, Lobdell	Rural Principle Arterial Other
20	Rapides	I 49	at the Avoyelles-Rapides Line	Rural Principle Arterial
23	Vernon	US 171	0.1 mi S of LA 8, Leesville	Rural Principle Arterial Other
32	Lasalle	US 84	2.0 mi W of LA 8, Jena	Rural Principle Arterial Other
34	Richland	LA 17	4.1 miles North of US 80, Delhi	Rural Minor Arterial
39	W. Feliciana	US 61	1.7 mile South of La 10 St. Francisville	Rural Principle Arterial Other
42	Tangipahoa	US 51	0.3 mi S of LA 10, Fluker	Rural Minor Arterial
43	Washington	LA 16	0.1 mi West of LA 25, Franklinton	Rural Minor Arterial
55	Evangeline	US 190	0.1 mi E of LA 97, Basile	Rural Minor Arterial
60	Natchitoces	US 71	0.6 mi N of LA 6, Clarence	Rural Minor Arterial
70	Calcasieu	I 12	0.4 mi. Wesrt of LA 109, Starks	Rural Minor Arterial
72	Evangeline	LA 13	5.4 MILES SOUTH OF LA 104, MAMOU	Rural Minor Arterial
102	Lafayette	I 10	0.2 mi West of LA 328, Breaux Bridge	Rural Principle Arterial Interstate
106	Acadia	I 10	2.0 MI WEST OF LA 91, EGAN	Rural Principle Arterial Interstate
125	Ascension	LA 70	Ascension/Assumption Line	Rural Minor Arterial
127	Calcasieu	LA 12	3.7 mi. west of LA 389 at Dequincy	Rural Minor Arterial
130	LaSalle	US 84	0.3 mi. west of LA 772, at Trout	Rural Minor Arterial
133	Cameron	LA 27	0.1 mi. west of LA 1141	Rural Major Collector
136	Ouachita	LA 139	0.2 mi. S. of LA 134. SWARTZ	Rural Major Collector
139	Ouachita	US 165	0.2 mi. north of LA 840-6, Monroe	Urban Principle Arterial Other
142	Cameron	LA 82	7.5 Miles west of Vermilion Ph. L	Rural Major Collector
152	Calcasieu	I 10	1.0 mi. west of LA 109 at Toomey	Rural Principle Arterial Interstate
156	Natchitoces	I 49	7.5 mi. N. of LA 6 at Natchitoches	Rural Principle Arterial Interstate
159	Tangipahoa	LA 16	1.0 mi. East of US 51 at Amite	Rural Minor Arterial
160	Calcasieu	LA 385	0.2 mi. North of LA 3092	Rural Major Collector
161	Tanigipahoa	US 51	1.0 mi. S of LA 40 at Independence	Rural Major Collector
162	W. Baton R	I 10	1.0 mi. west of LA 415, near Port Allen	Rural Principle Arterial Interstate
163	W. Baton R	LA 1	0.8 mi. North of I-10, Port Allen	Urban Minor Arterial
171	Calcasieu	11383	Legion St. 0.1 mi. West of I-210	Urban Collector
998	E. Baton R	LA 3113	West of US 61 - Port Hudson	Rural Minor Collector
999	E. Baton R	LA 3113	West of US 61 - Port Hudson	Rural Minor Collector

LADOTD's 1997 Weigh-In-Motion Station Specifics

WIM Station #	Parish	Route	Location	Highway Class
7	Rapides	LA 463	0.5 mi. South of LA 121, Hinston	Rural Major Collector
13	Calcasieu	I 10	3.8 mi W of LA 383, Chloe	Rural Principle Arterial Interstate
22	Caldwell	US 165	Riverton	Rural Principle Arterial Other
27	St. John	US 61	St. John /St. Charles Parish Line,LaPlace	Urban Principle Arterial Other
31	Grant	LA 8	0.8 Mile west of US 165, Pollock	Rural Major Collector
32	Lasalle	US 84	2.0 mi W of LA 8, Jena	Rural Principle Arterial Other
35	Union	LA 2	1.2 miles West of LA 15, Farmerville	Rural Minor Arterial
43	Washington	LA 16	0.1 mi West of LA 25, Franklinton	Rural Minor Arterial
44	Washington	LA 21	1.6 miles North of LA 10, Bogalusa	Rural Minor Arterial
47	St.Bernard	LA 39	0.3 mi W of LA 46, Poydras	Urban Minor Arterial
51	Lafayette	US 90	10.0 Miles South of I-10, Broussard	Rural Principle Arterial Other
59	Red River	LA 155	0.9 mi ne of US 71, Coushatta	Rural Major Collector
61	Sabine	LA 175	0.6 mi S of LA 120, Belmont	Rural Major Collector
62	Rapides	LA 121	0.6 mi northeast of Gardner	Rural Major Collector
114	Catahoula	LA 124	LaSalle Parish Line	Rural Major Collector
121	Iberia	LA 182	North City Limits of New Iberia	Rural Major Collector
123	Iberia	US 90	7.0 mi. north of LA 14 at New Iberia	Rural Principle Arterial Other
125	Ascension	LA 70	Ascension/Assumption Line	Rural Minor Arterial
131	St. Mary	LA 3211	0.2 mi. west of LA 182	Rural Minor Collector
134	St. Mary	LA 182	North of Patterson City Limit	Rural Major Collector
136	Ouachita	LA 139	0.2 mi. S. of LA 134. Swartz	Rural Major Collector
139	Ouachita	US 165	0.2 mi. north of LA 840-6, Monroe	Urban Principle Arterial Other
141	Point Coupee	LA 411	0.5 mi south of US 190, Lavonia	Rural Minor Collector
143	Rapides	US 167	1.0 MI. North of the Red River Parish Line	Urban Principle Arterial Other
145	Lafayette	LA 89	0.5 mi. north of LA 92, Youngsville	Rural Major Collector
152	Calcasieu	I 10	1.0 mi. west of LA 109 at Toomey	Rural Principle Arterial Interstate
161	Tangipahoa	US 51	1.0 mi. S of LA 40 at Independence	Rural Major Collector
162	W B R	I 10	1.0 mi. west of LA 415, near Port Allen	Rural Principle Arterial Interstate
163	W B R	LA 1	0.8 mi. North of I-10, Port Allen	Urban Minor Arterial

LADOTD's Weigh-In-Motion Station Specifics:

(Vehicle Classification Temporal Distribution)

Functional System	Days of Week							Months											
	M	T	W	T	F	S	S	J	F	M	A	M	J	J	A	S	O	N	D
1997 Rural																			
Principle Arterial Interstate	x	x	x	x													x		x
Principle Arterial Other	x	x	x	x									x	x		x			
Minor Arterial	x	x	x	x	x										x				x
Major Collector	x	x	x	x								x	x	x	x	x	x		x
Minor Collector		x	x	x									x				x		
1997 Urban																			
Principle Arterial Interstate																			
Princ. Art. Other Freeway		x	x	x										x					
Principle Arterial Other		x	x	x											x	x			
Minor Arterial	x	x	x	x											x	x			
Collector																			
1998 Rural																			
Principle Arterial Interstate	x	x	x	x	x	x	x				x	x	x	x	x	x			
Principle Arterial Other		x	x	x								x		x		x			
Minor Arterial	x	x	x	x						x	x		x	x	x	x			
Major Collector	x	x	x	x						x	x				x	x	x		
Minor Collector	x	x													x				
1998 Urban																			
Principle Arterial Interstate																			
Princ. Art. Other Freeway																			
Principle Arterial Other	x	x	x												x	x			
Minor Arterial	x	x	x							x									
Minor Collector	x	x	x							x									
1999 Rural																			
Principle Arterial Interstate	x	x	x	x	x	x	x						x			x			
Principle Arterial Other	x	x	x	x					x	x	x		x						
Minor Arterial	x	x	x	x												x			
Major Collector	x	x	x	x					x	x	x		x		x				
Minor Collector	x	x	x								x					x			
1999 Urban																			
Principle Arterial Interstate																			
Princ. Art. Other Freeway		x	x	x										x					
Principle Arterial Other	x	x	x	x						x				x	x				
Minor Arterial																			
Minor Collector	x	x	x												x				

APPENDIX B

1994 AVERAGE DAILY COUNT SUMMARY

(PORTABLE WIM SITES)

STA. #	HIGHWAY CLASS	VEHICLE CLASS COUNTS 1	2	3	4	5	6	7	8	9	10	11	12	13	SUM
22	2	0	1889	493	3	46	26	0	22	249	3	9	0	0	2740
33	2	0	2085	241	0	64	14	0	15	156	3	0	0	0	2578
35	6	0	1046	246	1	30	24	0	7	132	1	0	0	0	1487
37	7	0	1158	147	1	35	14	1	5	39	0	0	0	0	1400
105	1	0	5209	445	30	159	58	1	93	1248	42	33	9	7	7334
114	7	0	97	17	0	5	2	0	1	0	0	0	0	0	122
122	16	0	5256	67	0	54	14	0	7	19	3	0	0	0	5420
123	2	0	5050	412	5	183	76	1	72	274	29	7	1	3	6113
124	16	0	878	185	0	13	1	0	1	1	0	0	0	0	1079
130	6	0	360	360	1	57	13	0	8	75	2	0	0	1	877
131	8	0	1723	177	1	39	6	0	6	36	9	0	0	0	1997
135	7	0	4163	448	2	74	13	0	10	17	1	0	0	0	4728
155	1	0	8311	1085	7	239	105	0	81	1514	24	33	6	1	11406
156	1	0	2360	259	6	88	18	0	45	577	12	41	11	1	3418
157	11	0	7347	762	8	228	110	3	77	1532	30	27	3	2	10129
160	7	0	2777	282	1	29	11	0	8	2	0	0	0	0	3110
172	16	0	3550	664	0	29	4	0	2	0	0	0	0	0	4249
SUM		0	53259	6290	66	1372	509	6	460	5871	159	150	30	15	68187
AVERAGE		0	3133	370	4	81	30	0	27	345	9	9	2	1	4011

1995 AVERAGE DAILY COUNT SUMMARY

(PORTABLE WIM SITES)

STA. #	HIGHWAY CLASS	VEHICLE CLASS COUNTS 1	2	3	4	5	6	7	8	9	10	11	12	13	SUM
10	2	0	3941	314	1	61	35	0	28	196	17	4	1	3	4601
14	7	0	1602	458	0	43	14	0	12	39	5	0	0	1	2174
16	2	0	3138	353	1	71	29	0	24	236	28	8	8	1	3897
23	2	0	2754	604	1	78	80	1	30	293	9	3	1	2	3856
52	14	0	3354	565	1	57	30	0	15	86	10	0	0	2	4120
55	6	0	1794	453	3	48	14	0	25	90	13	0	0	0	2440
56	2	0	2721	378	1	51	61	0	25	261	6	7	2	2	3515
57	7	4	2233	270	1	36	18	0	12	81	4	0	0	6	2665
58	6	0	615	69	1	12	17	0	5	22	13	0	0	0	754
64	14	0	3245	893	0	121	94	1	44	396	33	9	3	0	4839
103	1	0	4357	980	55	212	59	1	159	1785	48	58	10	5	7729
108	7	0	696	64	0	13	32	0	49	185	1	0	0	1	1041
109	1	0	2387	365	10	110	54	2	66	1194	15	71	12	1	4287
110	11	0	8445	471	12	151	67	2	90	1053	25	41	7	5	10369
111	1	0	4830	466	3	95	23	0	70	1723	8	110	28	1	7357
119	6	0	973	344	0	35	12	0	70	61	4	0	0	0	1499
127	6	0	923	222	3	22	74	1	6	162	8	1	0	1	1423
132	8	0	1739	301	1	41	3	0	2	55	5	0	0	2	2149
134	7	0	315	87	0	13	2	0	1	2	0	0	0	0	420
135	7	0	3988	553	2	65	11	0	11	29	1	0	0	1	4661
137	11	0	8262	1621	17	250	91	4	80	1483	16	93	19	3	11939
139	14	0	5826	395	6	84	80	3	40	365	7	7	1	3	6817
142	7	0	386	112	0	20	2	0	9	34	3	0	0	0	566
144	7	0	2582	413	4	45	10	1	22	27	2	0	0	1	3107
148	7	0	804	200	1	10	11	1	5	42	4	0	0	2	1080
153	7	0	415	78	1	13	1	0	3	4	1	0	0	0	516
164	14	0	3138	584	0	31	7	0	8	8	0	0	0	0	3776
165	16	0	871	154	0	28	70	1	7	98	0	0	0	1	1230
166	7	0	596	197	1	21	7	0	3	28	1	0	0	0	854
167	16	0	3263	384	5	25	5	0	11	26	2	0	0	0	3721
SUM		4	80193	12348	131	1862	1013	18	932	10064	289	412	92	44	107402
AVERAGE		0	2673	412	4	62	34	1	31	335	10	14	3	1	3580

1997 AVERAGE DAILY COUNT SUMMARY

(PORTABLE WIM SITES)

STA. #	HIGHWAY CLASS	VEHICLE CLASS COUNTS													SUM
		1	2	3	4	5	6	7	8	9	10	11	12	13	
13	1	0	6533	616	53	485	184	1	300	1698	88	61	18	10	10047
22	2	0	1901	325	5	164	20	1	45	109	4	6	1	7	2588
27	14	0	3462	910	6	265	83	7	41	162	12	0	0	2	4950
31	7	0	561	170	1	81	26	1	9	45	0	0	0	0	894
32	2	0	1202	222	0	59	11	1	14	51	8	0	0	0	1568
35	6	0	1225	215	0	80	13	0	9	111	2	0	0	0	1655
43	6	0	1065	240	0	84	20	0	10	93	4	0	0	0	1516
44	6	0	3004	582	3	119	35	0	24	337	18	0	0	1	4123
47	16	0	290	290	0	94	5	0	10	16	5	0	0	1	711
51	2	0	5958	568	12	438	106	5	113	232	16	5	0	6	7459
59	7	0	684	153	0	32	20	0	5	26	1	0	0	0	921
61	7	0	500	126	2	32	19	0	5	17	1	0	0	0	702
62	7	0	793	76	1	29	4	0	2	7	1	0	0	0	913
114	7	0	78	40	0	10	10	0	3	3	0	0	0	0	144
121	7	0	3793	865	3	132	29	1	21	24	2	0	0	0	4870
123	2	0	5218	904	10	558	94	2	137	404	30	8	3	8	7376
125	8	0	2503	471	3	147	24	1	21	138	23	1	1	1	3334
131	8	0	1780	323	1	139	18	0	11	122	3	1	0	0	2398
134	8	0	340	101	0	27	2	0	1	5	0	0	0	0	476
136	8	0	1543	324	1	59	22	1	11	57	8	1	0	0	2027
139	14	0	677	677	2	190	76	1	45	312	12	9	1	7	2009
141	8	0	366	35	0	11	5	0	1	10	0	0	0	19	447
143	14	0	2821	471	3	134	26	0	21	155	7	5	0	0	3643
145	7	0	2764	809	2	118	16	0	22	33	6	0	0	1	3771
152	1	0	3935	861	29	461	83	2	184	3217	54	87	26	5	8944
161	7	0	3208	578	3	140	6	1	9	6	1	0	0	1	3953
162	1	0	5503	685	57	525	144	6	250	2476	89	92	24	10	9861
163	16	0	2354	870	3	247	43	1	37	262	21	1	0	2	3841
SUM		0	64061	12507	200	4860	1144	32	1361	10128	416	277	74	81	95141
AVERAGE		0	2288	447	7	174	41	1	49	362	15	10	3	3	3398

APPENDIX C

Traffic Volume Monitoring (TVM) Summary

(Shaded cells indicate when and where WIM tests were conducted)

WIM Station	TVM Station	Hwy. Class (WIM/TVM)	AADT											
			1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
13	239640	1/11	33330	31010	28810	28860	29360	30360	35510	38720	42850	39670	**37937**	41488
103	237520	1	24880	24200	22830	21480	23430	25270	29700	30310	**29270**	27700	29808	
105	237480	1	23170	22690	26520	20380	20470	23840	27780	**29660**	29630	26970	29540	
109	122480	1	15260	16280	16630	14090	15620	15200	15470	21160	**29560**	17700	19832	
111	125200	1	23110	22270	23040	21300	18600	26480	26950	36870	**32560**	31310	32920	
152	240390	1	24600	30060	23630	20160	22880	24990	26420	28690	32540	26990	**28627**	37267
155	219250	1/11	28820	23830	24360	23160	26540	24480	33120	**33950**	32400	36610	40564	
156	111700	1	0	4960	3460	4820	5370	6860	8470	**8790**	10050	9670	8941	9658
162	203250	1	22900	24950	26970	28280	27120	31560	31870	36700	34900	35950	**33893**	36570
10	103570	2/14		8590			8980			8850			11560	
16	203080	2	10650			14590			14570			18630		18730
23	106451	2/14	14700			15000			16870			19570		21056
32	114340	2		4510			4000			4040			**3106**	6484
33	118231	2/14	11210			13200				**15550**		8690		
51	233030	2		22540			24200			34250				
56	242441	2/14	7560			7950			9870		**11640**		10388	
123	230480	2	14490			15720			23940			20560		
43	216601	6/7		4990			4730			7200			**5963**	7139
44	217381	6/14			8810			9260			9400			10055
55	243030	6	3870			4690			5810		**7970**			7804
119	237220	6		2220			2110			2620			3492	
127	240550	6			1520			1880			**2270**			3226
130	114330	6/2			2100			2780			2560			4707
14	238160	7	2710			3700			7420			4270		5602
31	114141	7			1660			1890			2260			
37	120190	7			1860			2350			2600			
57	201151	7/8			440			390			**450**			
59	109570	7			1070			1020			1340			
61	107330	7		970			1030			1650			**1585**	
108	122120	7		1930			2180			3230				
114	115110	7		210			180			**300**			**140**	325

Traffic Volume Monitoring (TVM) Summary

(Shaded cells indicate when and where WIM tests were conducted)

WIM Station	TVM Station	Hwy. Class (WIM/TVM)	AADT 1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
121	230431	7	5410			6890			9190			8490		
135	230121	7/7	11360			12300			13590			15980		
142	235030	7/14	1530			1830			1440			1670		
144	230520	7		7160			8060			8610			9481	
145	232470	7	4120			4330			5590			6690		
148	240170	7		3580			5380			6120			6224	5352
153	231310	7	3010			4290			4520			3970		4331
160	238530	7/14		6540			5990			**8540**			6519	8118
161	215400	7		4680			5500			6710			**6430**	6959
166	113451	7		2460			2280			3090			2594	
125	204630	8/6	4390			5160			7370			9730		6935
131	229670	8/16	4950			3410			4300			4960		
132	225690	8	760			3170			4100			3850		
134	229200	8/7	3120			3500			2620			3440		
136	135010	8	2790			2170			3360			3880		4429
141	202020	8	760			960			890			1990	**1614**	
110	128431	11	36680	30930	29080	27200	42110	22600	23120	32290	**38820**	32000	34345	32448
137	133211	11	45690	37760	45420	55820	44910	42540	46230	48490	**48780**	58390	44674	42780
157	219210	11	20830	23590	25910	27320	33080	28640	32850	**34380**	35550	33380	37568	
64	208341	14			46920			47670			**40140**			
139	134471	14			31270			31270			**32350**			36751
143	104411	14	29070			32730			38940			29650		
164	239341	14		14580			14810			17580			18047	16973
47	220470	16	5830			4250			4450			6960	**7170**	
122	228131	16/14	18020			24610			22260			23330	28201	
124	118251	16		7010			7510			**7530**			8060	
163	203241	16/14	13570			15800			21700			18610		19721
165	221601	16/17		3450			2720			3350		3530	3302	
167	110441	16		11070			9730			10100			11583	12214
172	238540	16/8			3510			3470			3570			6582

Growth Trend Analysis:

According to AASHTO, "highways classified as principal-arterial or interstate will have an exponential growth. Traffic on some minor-arterial or collector-type highways may increase along a straight line." AASHTO also suggests that "for major-arterial and interstate highways, the growth rate should be applied by truck class rather than to the total traffic."[8] Using the WIM and TVM data found in appendices B and C, as well as the AASHTO suggestions cited above, it is possible to quantify growth trends and historic vehicle distributions for traffic on the various highway classes.

Data from TVM sites designated as principal-arterial or interstate, drawn from Appendix C, have been regressed exponentially as AASHTO suggests. Similarly, data from minor-arterial and collector TVM sites, also drawn from Appendix C, have been regressed linearly. WIM data, drawn from Appendix B, was used to derive the required vehicle distributions. The results of the exponential and linear regressions as well as the calculated vehicle distribution percentages are summarized in Tables D.1 and D.2.

As an example of how these tables are to be interpreted, consider Station 156 (a principal-arterial interstate) as shown in Table D.1. The available TVM data, when regressed exponentially, will produce a curve that is defined by the equation:

$$Y=38875e^{(0.0975)x}$$

This equation suggests that in 1987 (when x=0) the regressed AADT (from the TVM data) equaled 38875 vehicles and in 1997 (when x=10) the regressed AADT was 103064 vehicles. The only available vehicle distribution data (taken from the WIM database) that exists for Station 156 is from 1994 (0.00% motorcycles, 69.00% cars, 7.58% pickup trucks, 0.18% busses, and so on). Table D.2 is designed to function in the same manner. AASHTO's non-requirement of vehicle distribution data for the projection studies, which concern the highway classes represented in Table D.2 , negate the need for their inclusion into Table D.2. Considering Station 31 (a major-collector), the available TVM data, when regressed linearly, will produce a curve that is defined by the equation:

$$Y = 1437 + (100)X$$

This equation suggests that in 1987 (when x=0) the regressed AADT (from the TVM data) equaled 1437 vehicles and in 1997 (when x=10) the regressed AADT would be 2437 vehicles.

It is possible to develop overall growth trend curves for the vehicle types in each highway class from Tables D.1 and D.2 by taking the weighted averages of the terms in the tables. For example, for the class-11 stations in Table D.1, the 'A' figures can be averaged (weighted by the R^2 factors) to produce an overall 'A' factor:

$$\frac{22974(0.85) + 23053(0.67) + 44577(0.05) + 30541(0.01) + 28759(0.64)}{0.85 + 0.67 + 0.05 + 0.01 + 0.64} = 25219$$

Extending this to the rest of the figures in Tables D.1 and D.2 yields Table D.3, which summarizes overall growth trends as can be determined from available WIM and TVM data sources. Table D.3 is interpreted in the same manner as Tables D.1 and D.2 with the exception that the curves are not station specific but are representative of overall growth trends to be found on all stations of a particular highway classification.

The details of Appendix C show that over ten years worth of TVM data was used to calculate trends. It also shows, however, that there are many gaps in the individual profiles that can serve to compromise the preciseness of those calculated trends. WIM data, shown in Appendix B, is even more limited, covering only the years 1994, 1995, and 1997, which further undermines the possible correctness of the derived trends. (There should be at least ten years of verified WIM data available to properly model vehicle distribution trends.) The R^2 error values listed are not indicative of these data gaps but are representative of the divergences found in the limited data that does exist. It is possible that as more data becomes available, these divergences may become more pronounced. If this turns out to be the case, then efforts to develop trend figures can be expected to be inconclusive. At such time as this becomes apparent, departmental discussion will be required.

Table D.1

Summary of TVM Exponential Regressions and WIM Vehicle Distributions for use in trend calculations

WIM Station	Hwy. Cla. WIM/TVM	$Y=(A)e^{(B)x}$ {11 years: 1987-1997}			Vehicle Classification Distribution Percents for year and station indicated {data only available for years: '94, '95, & '97}													
		(A)	(B)	R^2 error	Year	1	2	3	4	5	6	7	8	9	10	11	12	13
156	1	38875	0.0975	0.7963		0.00	69.00	7.58	0.18	2.57	0.53	0.00	1.32	16.80	0.35	1.20	0.32	0.03
155	1/11	23053	0.0479	0.6699	'94	0.00	72.80	9.51	0.06	2.10	0.92	0.00	0.71	13.20	0.21	0.29	0.05	0.01
105	1	21766	0.0299	0.4835		0.00	71.00	6.07	0.41	2.17	0.79	0.01	1.27	17.00	0.57	0.45	0.12	0.10
111	1	20348	0.0513	0.6180		0.00	65.60	6.33	0.04	1.29	0.31	0.00	0.95	23.40	0.11	1.50	0.38	0.01
103	1	22640	0.0283	0.5884	'95	0.00	56.30	12.60	0.71	2.74	0.76	0.01	2.06	23.00	0.62	0.75	0.13	0.06
109	1	14470	0.0379	0.3534		0.00	55.60	8.51	0.23	2.57	1.26	0.05	1.54	27.80	0.35	1.66	0.28	0.02
162	1	24360	0.0416	0.8712		0.00	55.80	6.95	0.58	5.32	1.46	0.06	2.54	25.10	0.90	0.93	0.24	0.10
13	1/11	28759	0.0330	0.6393	'97	0.00	65.00	6.13	0.53	4.83	1.83	0.01	2.99	16.90	0.88	0.61	0.18	0.10
152	1	22974	0.0286	0.3871		0.00	44.00	9.63	0.32	5.15	0.93	0.02	2.06	35.90	0.60	0.97	0.29	0.06
157	11	22974	0.0522	0.8554	'94	0.00	72.50	7.52	0.08	2.25	1.09	0.03	0.76	15.10	0.30	0.27	0.03	0.02
155	1/11	23053	0.0479	0.6699		0.00	72.80	9.51	0.06	2.10	0.92	0.00	0.71	13.20	0.21	0.29	0.05	0.01
137	11	44577	0.0076	0.0553	'95	0.00	69.20	13.50	0.14	2.09	0.76	0.03	0.67	12.40	0.13	0.78	0.16	0.03
110	11	30541	0.0044	0.0071		0.00	81.40	4.54	0.12	1.46	0.65	0.02	0.87	10.10	0.24	0.40	0.07	0.05
13	1/11	28759	0.0330	0.6393	'97	0.00	65.00	6.13	0.53	4.83	1.83	0.01	2.99	16.90	0.88	0.61	0.18	0.10
130	6/2	1745	0.0780	0.7681		0.00	41.05	41.05	0.11	6.50	1.48	0.00	0.91	8.55	0.23	0.00	0.00	0.11
123	2	14677	0.0490	0.6618	'94	0.00	82.60	6.74	0.08	2.99	1.24	0.02	1.18	4.48	0.47	0.11	0.02	0.05
33	2/14	12646	-0.0130	0.0443		0.00	80.80	9.35	0.00	2.48	0.54	0.00	0.58	6.05	0.12	0.00	0.00	0.00
23	2/14	14094	0.0350	0.9511		0.00	71.40	15.60	0.03	2.02	2.07	0.03	0.78	7.60	0.23	0.08	0.03	0.05
16	2	11341	0.0496	0.9012	'95	0.00	80.50	9.06	0.03	1.82	0.74	0.00	0.62	6.06	0.72	0.21	0.21	0.03
56	2/14	74783	0.0415	0.8157		0.00	77.40	10.70	0.03	1.45	1.74	0.00	0.71	7.43	0.17	0.20	0.06	0.06
10	2/14	80264	0.0292	0.6783		0.00	85.60	6.82	0.02	1.33	0.76	0.00	0.61	4.26	0.37	0.09	0.02	0.07
51	2	20076	0.0697	0.8731	'97	0.00	79.80	7.61	0.16	5.87	1.42	0.07	1.51	3.11	0.21	0.07	0.00	0.08
32	2	40606	0.0086	0.0180		0.00	76.60	14.10	0.00	3.76	0.70	0.06	0.89	3.25	0.51	0.00	0.00	0.00
122	16/14	19405	0.0307	0.6090		0.00	96.97	1.24	0.00	1.00	0.26	0.00	0.13	0.35	0.06	0.00	0.00	0.00
160	7/14	6263	0.0184	0.2476	'94	0.00	89.29	9.07	0.03	0.93	0.35	0.00	0.26	0.06	0.00	0.00	0.00	0.00
33	2/14	12646	-0.0130	0.0443		0.00	80.80	9.35	0.00	2.48	0.54	0.00	0.58	6.05	0.12	0.00	0.00	0.00
23	2/14	14094	0.0350	0.9511		0.00	71.40	15.60	0.03	2.02	2.07	0.03	0.78	7.60	0.23	0.08	0.03	0.05
56	2/14	74783	0.0415	0.8157		0.00	77.40	10.70	0.03	1.45	1.74	0.00	0.71	7.43	0.17	0.20	0.06	0.06
164	14	14254	0.0206	0.7496		0.00	83.10	15.40	0.00	0.82	0.19	0.00	0.21	0.21	0.00	0.00	0.00	0.00
139	14	29347	0.0173	0.7600	'95	0.00	85.40	5.79	0.09	1.23	1.17	0.04	0.59	5.35	0.10	0.10	0.01	0.04
10	2/14	80264	0.0292	0.6783		0.00	85.60	6.82	0.02	1.33	0.76	0.00	0.61	4.26	0.37	0.09	0.02	0.07
64	14	50997	-0.0260	0.6745		0.00	67.00	18.40	0.00	2.50	1.94	0.02	0.91	8.18	0.68	0.19	0.06	0.00
142	7/14	1605	0.0008	0.0008		0.00	68.20	19.79	0.00	3.53	0.35	0.00	1.59	6.01	0.53	0.00	0.00	0.00
44	6/14	8690	0.0137	0.9488		0.00	72.86	14.12	0.07	2.89	0.85	0.00	0.58	8.17	0.44	0.00	0.00	0.02
163	16/14	14543	0.0333	0.6272	'97	0.00	61.29	22.65	0.08	6.43	1.12	0.03	0.96	6.82	0.55	0.03	0.00	0.05
143	14	29070	0.0078	0.0507		0.00	77.40	12.90	0.08	3.68	0.71	0.00	0.58	4.25	0.19	0.14	0.00	0.00

The terms used in the exponential equation above are defined as follows: {y: AADT x: year factor (for 1987, x=0; for 1988, x=1) A, B: equation constants}

Table D.2

Summary of Linear Regressions of TVM data used in trend calculations

WIM Station	Highway Class WIM/TVM	Y= (A) + (B)X {11 years: 1987-1997}		
		(A)	(B)	R^2 error
31	7	1437	100.00	0.98
37	7	1653	123.33	0.97
135	7	11035	505.00	0.95
145	7	3837	299.00	0.94
108	7	1580	216.67	0.89
161	7	4658	211.82	0.87
61	7	857	82.17	0.79
121	7	5764	384.67	0.78
59	7	918	45.00	0.62
43	6/7	4638	206.99	0.55
148	7	4080	189.63	0.55
153	7	3534	84.51	0.39
14	7	3401	230.97	0.31
160	7/14	6273	131.53	0.24
166	7	2384	40.40	0.20
114	7	195	5.52	0.08
57	7/8	418	1.66	0.02
134	8/7	3158	2.67	0.00
142	7/14	1613	1.00	0.00

WIM Station	Highway Class WIM/TVM	Y= (A) + (B)X {11 years: 1987-1997}		
		(A)	(B)	R^2 error
136	8	2306	175.90	0.77
132	8	1440	340.00	0.75
141	8	638	107.97	0.71
172	16/8	2265	310.53	0.62
125	8/6	4600	365.00	0.60
131	8/16	4267	30.67	0.03
57	7/8	418	1.66	0.02
134	8/7	3158	2.67	0.00
124	16	6946	105.67	0.91
172	16/8	2265	310.53	0.62
122	16/14	19447	685.15	0.59
163	16/14	14679	551.97	0.58
47	16	4656	192.11	0.34
167	16	9998	142.68	0.33
165	16/17	3136	21.67	0.06
131	8/16	4267	30.67	0.03
44	6/14	8542	129.17	0.94
127	6	1031	183.60	0.94
55	6	3755	406.11	0.90
119	6	1817	144.20	0.79
130	6/2	1390	253.37	0.73
125	8/6	4600	365.00	0.60
43	6/7	4638	206.99	0.55

Where Y= (A) + (B)X is defined as follows:

Y: AADT

X: year factor (for 1987, x=0; for 1988, x=1, etc.)

A, B: equation constants

Table D.3

Summary of TVM Exponential/Linear Regressions and WIM Vehicle Distributions for use in trend calculations

(Major-Arterial and Interstate Highways)

Highway Classification	$Y = (A)e^{(B)x}$ {11 years: 1987-1997}			Vehicle Classification Distribution Percents based on years: '94, '95, & '97												
	(A)	(B)	R^2 error	1	2	3	4	5	6	7	8	9	10	11	12	13
1	25233	0.047	0.6449	0.00	62.61	8.02	0.35	3.24	0.98	0.02	1.74	21.24	0.52	0.91	0.22	0.06
11	25219	0.0441	0.7150	0.00	70.38	7.86	0.20	2.94	1.24	0.02	1.38	14.96	0.44	0.39	0.08	0.04
2	29579	0.0498	0.8115	0.00	73.97	13.95	0.06	3.14	1.37	0.02	0.90	5.99	0.34	0.11	0.05	0.06
14	31995	0.0216	0.7481	0.00	77.93	12.33	0.04	2.12	1.13	0.01	0.60	5.40	0.27	0.07	0.02	0.03

The terms used in the exponential equation above are defined as follows: [y: AADT; x: year factor (for 1987, x=0; for 1988, x=1); A, B: equation constants]

(Minor-Arterial or Collector-Type Highways)

Highway Classification	$Y = (A) + (B)X$ {11 years: 1987-1997}		
	(A)	(B)	R^2 error
7	3706	208.4	0.7711
8	2174	251.3	0.6872
16	9512	325.9	0.6145
6	3695	236.9	0.806

[Y: AADT; X: year factor (for 1987, x=0; for 1988, x=1, etc.); A, B: equation constants]

APPENDIX E

Comparative Pavement Design Summary

FHWA Types	(a)	(b)	(a)x(b)	Flexible Pavement (Pt=2.5, S=5)		Rigid Pavement (Pt=2.5, t=10")		Flexible Pavement (Pt=2.5, S=5)		Rigid Pavement (Pt=2.5, t=10")	
			(A)	(B)	(C)	(D)	(E)	(A)x(B)	(A)x(C)	(A)x(D)	(A)x(E)
	Veh. Count	Growth Factors	Adj. Veh. Count	18-kip Eq. Factor (old)	18-kip Eq. Factor (new)	18-kip Eq. Factor (old)	18-kip Eq. Factor (new)	Equiv. ESALs (old)	Equiv. ESALs (new)	Equiv. ESALs (old)	Equiv. ESALs (new)
2% Growth											
Cars	17925	24.3	435578	0.0004	0.0014	0.0004	0.0016	174	610	174	697
Pickup	4270	24.3	103761	0.0027	0.0014	0.0026	0.0016	280	145	270	166
2A-4T	52	24.3	1264	0.0145	0.0014	0.0142	0.0016	18	2	132	2
2A-6T	237	24.3	5759	0.1681	0.7793	0.1680	0.9675	968	4488	968	5572
3A	187	24.3	4544	0.3842	1.4359	0.5781	2.5887	1746	6525	2627	11763
4% Growth											
2S1	25	29.78	745	0.5191	2.8418	0.5018	3.9999	386	2116	374	2978
2S2	187	29.78	5569	0.8308	2.8418	0.9891	3.9999	4627	15826	5508	22275
3S1	0	29.78	0	0.8308	2.8418	0.9891	3.9999	0	0	0	0
3S2	761	29.78	22663	1.0543	2.1453	1.7719	3.7757	23893	48618	40156	85567
3S3	118	29.78	3514	1.4500	2.8719	2.8730	4.9863	5095	10092	10096	17522
5% Growth											
D. T.	0	33.06	0	1.8400	4.0570	1.8400	4.4817	0	0	0	0
				SUM				37188	88421	60304	146542
				18-kip ESALs over Performance Period (20 years) [Sum x 365 x 20]				271474231	645473983	440216000	1069757869
				Design Results, according to DARWin analysis, that will be required to support the 18-kip ESAL figures given, as applied over the 20-year life of project (all other factors are held constant)				Design SN: 7.54 inches Tot. Thickness: 26.67 in.	Design SN: 8.38 inches Tot. Thickness: 28.58 in.	16.94 in. of JPCP	19.35 in. of JPCP

Axle Weight Distribution (by Axle)
(Class 2 Vehicles, 1997)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	1st Axle Count	2nd Axle Count	3rd Axle Count	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count
0.0 - 0.2	0	0	0	0	0	0	0	0	0
0.2 - 0.4	0	0	0	0	0	0	0	0	0
0.4 - 0.6	0	0	0	0	1	0	0	0	0
0.6 - 0.8	0	1	0	0	4	0	0	1	1
0.8 - 1.0	0	199	0	0	17	0	0	4	4
1.0 - 1.2	1793	4162	1	8	20	0	2	4	4
1.2 - 1.4	13738	12890	32	25	23	4	0	3	2
1.4 - 1.6	4705	3533	41	27	10	6	5	0	1
1.6 - 1.8	1186	841	6	14	5	2	3	0	0
1.8 - 2.0	353	194	3	5	2	0	2	0	0
2.0 - 2.2	62	24	1	1	1	0	0	0	0
2.2 - 2.4	9	2	0	4	1	0	0	0	0
2.4 - 2.6	0	0	0	0	0	0	0	0	0
2.6 - 2.8	0	0	0	0	0	0	0	0	0
SUM	21846	21846	84	84	84	12	12	12	12
25th Percentile	1.2	1.2	1.3	1.2	0.9	1.3	0.1	0.9	0.9
Median	1.3	1.2	1.4	1.4	1.2	1.4	0.2	1.1	1.0
75th Percentile	1.4	1.3	1.5	1.6	1.3	1.5	0.2	1.1	1.1
Mean	1.3	1.3	1.4	1.4	1.2	1.4	0.2	1.0	1.0
Std. Dev.	0.15	0.15	0.17	0.28	0.31	0.15	0.24	0.18	0.21
VPEA	0.00	0.00	0.17	0.34	0.41	1.19	1.11	1.79	1.88

Axle Weight Distribution (by Axle)
(Class 3 Vehicles, 1997)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	1st Axle Count	2nd Axle Count	3rd Axle Count	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count
0.0 - 0.2	0	0	0	0	0	0	0	0	0
0.2 - 0.4	0	0	0	0	0	0	0	0	0
0.4 - 0.6	0	1	0	1	1	0	0	0	0
0.6 - 0.8	0	1	0	0	3	0	0	0	0
0.8 - 1.0	0	313	0	1	29	0	0	11	12
1.0 - 1.2	265	3644	5	20	75	2	4	14	9
1.2 - 1.4	4735	4452	71	53	80	16	10	9	12
1.4 - 1.6	4848	2680	75	55	40	12	10	1	2
1.6 - 1.8	2527	1396	61	44	13	4	7	0	0
1.8 - 2.0	729	566	21	27	5	1	3	0	0
2.0 - 2.2	108	148	11	29	0	0	1	0	0
2.2 - 2.4	2	15	2	11	1	0	0	0	0
2.4 - 2.6	1	0	0	2	0	0	0	0	0
2.6 - 2.8	1	0	0	3	0	0	0	0	0
2.8 - 3.0	0	0	0	1	0	0	0	0	0
3.0 - 3.2	0	0	0	0	0	0	0	0	0
SUM	13216	13216	247	247	247	35	35	35	35
25th Percentile	1.3	1.1	1.3	1.3	1.0	1.3	1.3	0.9	0.9
Median	1.4	1.3	1.5	1.5	1.2	1.3	1.4	1.0	1.1
75th Percentile	1.6	1.4	1.6	1.8	1.3	1.4	1.6	1.2	1.2
Mean	1.4	1.3	1.5	1.6	1.2	1.4	1.4	1.0	1.1
Std. Dev.	0.19	0.24	0.28	0.37	0.24	0.17	0.25	0.16	0.20
VPEA	0.00	0.00	0.08	0.13	0.10	0.22	0.61	0.86	0.78

Axle Weight Distribution (by Axle)
(Class 4 Vehicles, 1997)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	1st Axle Count	2nd Axle Count	3rd Axle Count
0.0 - 0.5	0	0	0	0	0
0.5 - 1.0	0	0	0	0	0
1.0 - 1.5	0	0	0	0	0
1.5 - 2.0	1	1	0	0	0
2.0 - 2.5	0	2	1	1	2
2.5 - 3.0	11	0	0	0	15
3.0 - 3.5	17	3	1	5	11
3.5 - 4.0	21	1	1	0	9
4.0 - 4.5	20	8	13	5	8
4.5 - 5.0	7	11	16	1	6
5.0 - 5.5	10	11	10	1	0
5.5 - 6.0	4	9	11	0	3
6.0 - 6.5	0	11	2	1	1
6.5 - 7.0	1	9	0	2	0
7.0 - 7.5	1	6	2	1	3
7.5 - 8.0	0	3	1	12	1
8.0 - 8.5	0	7	0	10	0
8.5 - 9.0	0	5	0	6	0
9.0 - 9.5	0	3	3	8	0
9.5 - 100	0	2	0	2	0
10.0 - 10.5	0	0	0	3	0
10.5 - 11.0	0	0	0	0	1
11.0 - 11.5	1	1	0	0	0
11.5 - 12.0	0	0	1	0	1
12.0 - 12.5	0	1	0	1	0
12.5 - 13.0	0	0	0	0	0
13.0 - 13.5	1	1	0	2	0
13.5 - 14.0	0	0	0	0	0
14.0 - 14.5	0	0	0	0	0
14.5 - 15.0	0	0	0	0	0
15.0 - 15.5	0	0	0	0	0
15.5 - 16.0	0	0	0	0	0
16.0 - 16.5	0	0	0	0	0

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	1st Axle Count	2nd Axle Count	3rd Axle Count
16.5 - 17.0	0	0	0	0	0
17.0 - 17.5	1	1	0	0	0
17.5 - 18.0	0	0	0	0	0
18.0 - 18.5	0	0	0	1	0
18.5 - 19.0	0	0	0	0	0
19.0 - 19.5	0	0	0	0	0
19.5 - 20.0	1	0	0	0	0
20.0 - 20.5	0	0	0	0	0
20.5 - 21.0	0	0	0	0	0
21.0 - 21.5	0	0	0	0	0
21.5 - 22.0	0	0	0	0	0
22.0 - 22.5	0	0	0	0	0
22.5 - 23.0	0	0	0	0	0
23.0 - 23.5	1	1	0	0	0
235 - 240	0	0	0	0	1
24.0 - 24.5	0	0	0	0	0
24.5 - 25.0	0	1	0	0	0
25.0 - 25.5	0	0	0	0	0
25.5 - 26.0	0	0	0	0	0
26.0 - 26.5	0	0	0	0	0
26.5 - 27.0	0	0	0	0	0
27.0 - 27.5	0	0	0	0	0
27.5 - 28.0	0	0	0	0	0
28.0 - 28.5	0	0	0	0	0
28.5 - 29.0	0	0	0	0	0
29.0 - 29.5	0	0	0	0	0
SUM	98	98	62	62	62
25th Percentile	3.4	4.8	4.4	7.0	2.8
Median	3.9	6.1	4.9	8.1	3.8
75th Percentile	4.7	7.7	5.6	9.0	4.6
Mean	4.6	6.7	5.3	7.8	4.4
Std. Dev.	3.16	3.38	1.50	2.71	3.10
VPEA	0.33	0.48	0.39	0.40	0.76

Axle Weight Distribution (by Axle)
(Class 5 Vehicles, 1997)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	Weight Range (metric tons)	1st Axle Count	2nd Axle Count
0.0 - 0.5	0	0	16.5 - 17.0	0	2
0.5 - 1.0	0	5	17.0 - 17.5	0	0
1.0 - 1.5	64	12	17.5 - 18.0	0	1
1.5 - 2.0	1674	576	18.0 - 18.5	1	1
2.0 - 2.5	1474	1240	18.5 - 19.0	0	0
2.5 - 3.0	384	711	19.0 - 19.5	1	0
3.0 - 3.5	351	421	19.5 - 20.0	0	0
3.5 - 4.0	320	295	20.0 - 20.5	0	1
4.0 - 4.5	253	277	20.5 - 21.0	0	0
4.5 - 5.0	152	242	21.0 - 21.5	1	1
5.0 - 5.5	100	215	21.5 - 22.0	1	1
5.5 - 6.0	41	188	22.0 - 22.5	1	2
6.0 - 6.5	24	136	22.5 - 23.0	2	4
6.5 - 7.0	11	121	23.0 - 23.5	3	4
7.0 - 7.5	6	91	235 - 240	5	8
7.5 - 8.0	7	69	24.0 - 24.5	2	1
8.0 - 8.5	1	71	24.5 - 25.0	0	1
8.5 - 9.0	2	61	25.0 - 25.5	1	3
9.0 - 9.5	1	41	25.5 - 26.0	0	3
9.5 - 100	1	18	26.0 - 26.5	3	8
10.0 - 10.5	3	19	26.5 - 27.0	1	1
10.5 - 11.0	1	11	27.0 - 27.5	2	3
11.0 - 11.5	6	11	27.5 - 28.0	0	0
11.5 - 12.0	1	8	28.0 - 28.5	0	0
12.0 - 12.5	0	1	28.5 - 29.0	0	0
12.5 - 13.0	0	3	29.0 - 29.5	0	0
13.0 - 13.5	1	6	**SUM**	4907	4907
13.5 - 14.0	3	3	**25th Percentile**	1.8	2.2
14.0 - 14.5	1	4	**Median**	2.1	2.9
14.5 - 15.0	0	2	**75th Percentile**	3.0	4.7
15.0 - 15.5	1	1	**Mean**	2.7	3.9
15.5 - 16.0	0	3	**Std. Dev.**	1.91	2.84
16.0 - 16.5	0	0	**VPEA**	0.01	0.02

Axle Weight Distribution (by Axle)
(Class 6 Vehicles, 1997)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count
0.0 - 0.5	0	0	0
0.5 - 1.0	0	0	1
1.0 - 1.5	1	2	4
1.5 - 2.0	3	6	18
2.0 - 2.5	15	11	40
2.5 - 3.0	19	34	51
3.0 - 3.5	46	83	114
3.5 - 4.0	131	118	102
4.0 - 4.5	235	103	131
4.5 - 5.0	263	121	120
5.0 - 5.5	175	126	75
5.5 - 6.0	93	86	84
6.0 - 6.5	68	67	55
6.5 - 7.0	34	67	55
7.0 - 7.5	31	55	60
7.5 - 8.0	23	39	43
8.0 - 8.5	12	50	47
8.5 - 9.0	9	38	45
9.0 - 9.5	3	45	37
9.5 - 10.0	6	38	24
10.0 - 10.5	3	21	20
10.5 - 11.0	2	12	11
11.0 - 11.5	0	12	11
11.5 - 12.0	1	13	8
12.0 - 12.5	0	7	2
12.5 - 13.0	1	4	3
13.0 - 13.5	0	2	2
13.5 - 14.0	0	2	0
14.0 - 14.5	0	5	1
14.5 - 15.0	0	1	0
15.0 - 15.5	0	2	0
15.5 - 16.0	2	2	0
16.0 - 16.5	0	2	1

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count
16.5 - 17.0	0	0	2
17.0 - 17.5	0	0	0
17.5 - 18.0	0	0	2
18.0 - 18.5	0	0	1
18.5 - 19.0	1	1	0
19.0 - 19.5	0	0	0
19.5 - 20.0	0	0	0
20.0 - 20.5	0	0	0
20.5 - 21.0	0	0	0
21.0 - 21.5	0	0	0
21.5 - 22.0	0	0	0
22.0 - 22.5	0	1	1
22.5 - 23.0	1	0	1
23.0 - 23.5	0	0	0
23.5 - 24.0	0	2	3
24.0 - 24.5	0	0	1
24.5 - 25.0	0	1	2
25.0 - 25.5	2	1	1
25.5 - 26.0	1	1	1
26.0 - 26.5	0	0	0
26.5 - 27.0	0	0	1
27.0 - 27.5	0	0	0
27.5 - 28.0	0	0	0
28.0 - 28.5	0	0	0
28.5 - 29.0	0	0	0
29.0 - 29.5	0	0	0
SUM	1181	1181	1181
25th Percentile	4.2	4.2	3.8
Median	4.7	5.4	5.0
75th Percentile	5.4	7.6	7.3
Mean	5.0	6.1	5.8
Std. Dev.	1.83	2.83	3.07
VPEA	0.02	0.05	0.06

Axle Weight Distribution (by Axle)
(Class 7 Vehicles, 1997)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count
0.0 - 0.5	0	0	0	0
0.5 - 1.0	0	0	0	7
1.0 - 1.5	0	0	0	1
1.5 - 2.0	0	0	0	2
2.0 - 2.5	2	0	2	4
2.5 - 3.0	0	1	0	4
3.0 - 3.5	1	1	2	0
3.5 - 4.0	6	3	4	1
4.0 - 4.5	9	2	1	3
4.5 - 5.0	8	6	6	3
5.0 - 5.5	3	5	2	4
5.5 - 6.0	0	1	1	2
6.0 - 6.5	3	5	3	1
6.5 - 7.0	1	1	1	0
7.0 - 7.5	2	1	5	0
7.5 - 8.0	2	2	1	3
8.0 - 8.5	0	1	1	1
8.5 - 9.0	1	2	4	1
9.0 - 9.5	1	1	4	1
9.5 - 10.0	0	1	1	3
10.0 - 10.5	1	5	1	0
10.5 - 11.0	2	3	2	0
11.0 - 11.5	2	3	2	1
11.5 - 12.0	1	1	0	0
12.0 - 12.5	0	0	1	0
12.5 - 13.0	1	0	0	1
13.0 - 13.5	0	0	1	0
13.5 - 14.0	0	0	0	0
14.0 - 14.5	0	0	0	1
14.5 - 15.0	0	1	0	0
15.0 - 15.5	0	0	0	1
15.5 - 16.0	0	0	0	0
16.0 - 16.5	0	0	0	0
165 - 170	0	0	0	0
170 - 175	0	0	0	0
175 - 180	0	0	0	0
180 - 185	0	0	1	1
185 - 190	0	0	0	0
SUM	46	46	46	46
25th Percentile	4.2	4.8	4.5	2.1
Median	4.6	6.4	7.1	4.8
75th Percentile	7.2	10.0	9.2	7.7
Mean	5.9	7.2	7.1	5.4
Std. Dev.	2.71	2.90	3.28	4.23
VPEA	1.42	1.76	1.42	2.52

Axle Weight Distribution (by Axle)
(Class 8 Vehicles, 1997)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count
0.0 - 0.5	0	0	0	0	0	0	0
0.5 - 1.0	0	0	9	0	1	5	64
1.0 - 1.5	3	0	78	4	1	17	33
1.5 - 2.0	52	5	34	63	8	59	64
2.0 - 2.5	47	14	20	82	21	63	71
2.5 - 3.0	28	28	12	25	52	49	65
3.0 - 3.5	58	27	14	53	53	59	72
3.5 - 4.0	62	20	21	93	39	82	64
4.0 - 4.5	47	21	33	160	46	78	63
4.5 - 5.0	26	29	43	157	62	66	60
5.0 - 5.5	11	33	21	74	69	55	46
5.5 - 6.0	2	34	19	27	66	38	19
6.0 - 6.5	2	43	8	9	49	25	15
6.5 - 7.0	0	28	2	7	51	15	12
7.0 - 7.5	0	20	6	0	43	23	22
7.5 - 8.0	2	10	3	3	44	23	13
8.0 - 8.5	0	6	2	1	28	19	16
8.5 - 9.0	0	4	2	0	27	15	9
9.0 - 9.5	0	5	1	0	21	11	9
9.5 - 10.0	0	2	0	0	22	13	4
10.0 - 10.5	0	4	1	0	12	11	1
10.5 - 11.0	0	0	0	0	10	10	1
11.0 - 11.5	0	2	1	0	10	9	4
11.5 - 12.0	0	0	0	0	8	4	3
12.0 - 12.5	0	0	0	0	2	1	2
12.5 - 13.0	0	1	2	1	3	1	3
13.0 - 13.5	0	1	0	0	4	1	3
13.5 - 14.0	0	0	0	0	1	0	0
14.0 - 14.5	0	0	1	0	0	1	1
14.5 - 15.0	0	1	1	0	1	2	0
15.0 - 15.5	0	0	0	0	1	1	2
15.5 - 16.0	0	0	0	0	1	1	1
16.0 - 16.5	0	0	0	0	1	0	0
16.5 - 17.0	0	0	0	0	0	0	1
17.0 - 17.5	0	0	1	0	1	0	0
17.5 - 18.0	0	1	0	0	0	0	1
18.0 - 18.5	0	0	0	0	0	0	0
18.5 - 19.0	0	0	0	0	0	0	0
19.0 - 19.5	0	0	0	0	0	0	0
19.5 - 20.0	0	0	0	0	0	0	0
20.0 - 20.5	0	0	0	0	0	0	0
20.5 - 21.0	0	0	0	0	0	1	1
21.0 - 21.5	0	0	0	0	0	0	0
21.5 - 22.0	0	0	0	0	0	0	0
22.0 - 22.5	0	0	0	0	0	0	1
22.5 - 23.0	0	0	0	0	2	0	2
23.0 - 23.5	0	0	1	0	0	1	0
23.5 - 24.0	0	1	2	0	1	1	2
24.0 - 24.5	1	0	1	0	0	0	2
24.5 - 25.0	0	0	0	0	0	0	0
25.0 - 25.5	0	1	0	0	0	0	0
25.5 - 26.0	0	0	2	0	0	0	2
26.0 - 26.5	0	0	0	2	0	1	4
26.5 - 27.0	0	1	0	0	0	0	3
27.0 - 27.5	1	0	1	0	0	0	0
27.5 - 28.0	0	0	0	0	0	0	0
28.0 - 28.5	0	0	0	0	0	0	0
28.5 - 29.0	0	0	0	0	0	0	0
29.0 - 29.5	0	0	0	0	0	0	0
SUM	342	342	342	761	761	761	761
25th Percentile	2.2	3.6	1.4	3.1	4.1	2.9	2.1
Median	3.3	5.4	3.7	4.2	5.6	4.2	3.5
75th Percentile	4.1	6.5	4.9	4.7	7.5	5.9	5.1
Mean	3.4	5.5	4.0	4.0	6.1	4.9	4.4
Std. Dev.	2.04	2.83	3.85	1.70	2.77	2.94	4.06
VPEA	0.17	0.16	0.28	0.05	0.08	0.09	0.11

Axle Weight Distribution (by Axle)
(Class 9 Vehicles, 1997)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count
0.0 - 0.5	0	0	0	0	0
0.5 - 1.0	0	0	0	5	4
1.0 - 1.5	5	1	2	14	24
1.5 - 2.0	9	5	9	51	91
2.0 - 2.5	17	19	35	174	175
2.5 - 3.0	29	45	66	455	465
3.0 - 3.5	67	145	200	738	744
3.5 - 4.0	443	377	548	700	722
4.0 - 4.5	1753	768	831	533	562
4.5 - 5.0	2383	684	666	426	457
5.0 - 5.5	1436	597	493	347	358
5.5 - 6.0	553	514	454	291	314
6.0 - 6.5	140	378	398	312	365
6.5 - 7.0	25	398	438	386	507
7.0 - 7.5	5	496	557	475	529
7.5 - 8.0	4	731	711	552	515
8.0 - 8.5	1	613	577	477	410
8.5 - 9.0	1	447	409	334	262
9.0 - 9.5	0	292	244	206	135
9.5 - 10.0	0	164	120	168	81
10.0 - 10.5	0	96	58	95	60
10.5 - 11.0	1	54	27	49	32
11.0 - 11.5	0	27	9	33	20
11.5 - 12.0	0	5	10	13	8
12.0 - 12.5	0	5	4	9	6
12.5 - 13.0	0	6	1	4	1
13.0 - 13.5	0	1	0	10	4
13.5 - 14.0	0	2	0	3	4
14.0 - 14.5	0	1	2	0	1
14.5 - 15.0	0	1	0	2	1
15.0 - 15.5	0	0	0	1	2
15.5 - 16.0	0	0	2	2	4
16.0 - 16.5	0	0	1	0	3
16.5 - 17.0	0	0	0	1	2
17.0 - 17.5	0	0	0	1	0
17.5 - 18.0	0	0	0	2	0
18.0 - 18.5	0	0	0	1	1
18.5 - 19.0	0	0	0	0	0
19.0 - 19.5	0	0	0	0	0
19.5 - 20.0	0	0	0	0	0
20.0 - 20.5	0	0	0	0	0
20.5 - 21.0	0	0	0	0	0
21.0 - 21.5	0	0	0	0	0
21.5 - 22.0	0	0	0	0	0
22.0 - 22.5	0	0	0	0	0
22.5 - 23.0	0	0	0	0	0
23.0 - 23.5	0	0	0	1	1
23.5 - 24.0	0	0	0	0	1
24.0 - 24.5	0	0	0	0	0
24.5 - 25.0	0	0	0	0	0
25.0 - 25.5	0	0	0	0	0
25.5 - 26.0	0	0	0	0	0
26.0 - 26.5	0	0	0	0	0
26.5 - 27.0	0	0	0	1	1
27.0 - 27.5	0	0	0	0	0
27.5 - 28.0	0	0	0	0	0
28.0 - 28.5	0	0	0	0	0
28.5 - 29.0	0	0	0	0	0
29.0 - 29.5	0	0	0	0	0
SUM	6872	6872	6872	6872	6872
25th Percentile	4.3	4.7	4.5	3.6	3.6
Median	4.7	6.3	6.1	5.4	5.2
75th Percentile	5.1	7.9	7.8	7.7	7.3
Mean	4.7	6.4	6.2	5.7	5.5
Std. Dev.	0.63	1.94	1.92	2.39	2.27
VPEA	0.00	0.01	0.01	0.01	0.01

Axle Weight Distribution (by Axle)
(Class 10 Vehicles, 1997)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count	6th Axle Count
0.0 - 0.5	0	0	0	0	0	0
0.5 - 1.0	0	0	0	1	0	1
1.0 - 1.5	0	0	1	7	2	4
1.5 - 2.0	0	1	0	6	6	6
2.0 - 2.5	2	2	2	26	11	9
2.5 - 3.0	3	2	2	48	16	20
3.0 - 3.5	6	8	10	58	18	21
3.5 - 4.0	30	9	13	47	15	13
4.0 - 4.5	104	9	14	37	8	18
4.5 - 5.0	115	11	12	24	19	18
5.0 - 5.5	68	17	19	15	17	23
5.5 - 6.0	29	20	13	16	21	27
6.0 - 6.5	8	15	22	21	25	21
6.5 - 7.0	1	28	34	15	28	48
7.0 - 7.5	1	40	43	18	31	33
7.5 - 8.0	0	53	51	11	38	28
8.0 - 8.5	0	57	60	6	37	33
8.5 - 9.0	1	43	41	3	27	26
9.0 - 9.5	0	29	16	1	23	11
9.5 - 10.0	0	11	6	2	14	6
10.0 - 10.5	0	7	3	0	8	0
10.5 - 11.0	1	4	1	0	2	2
11.0 - 11.5	0	0	3	4	0	0
11.5 - 12.0	0	1	1	1	0	0
12.0 - 12.5	0	0	0	0	0	0
12.5 - 13.0	0	1	0	0	1	0
13.0 - 13.5	0	0	1	0	0	0
13.5 - 14.0	0	0	0	0	0	0
14.0 - 14.5	0	0	0	0	1	0
14.5 - 15.0	0	0	0	1	0	0
15.0 - 15.5	0	0	0	0	0	0
15.5 - 16.0	0	0	0	0	0	0
16.0 - 16.5	0	0	0	0	0	0
16.5 - 17.0	0	0	0	0	0	0
17.0 - 17.5	0	1	0	0	0	0
17.5 - 18.0	0	0	0	0	0	0
18.0 - 18.5	0	0	0	0	0	0
18.5 - 19.0	0	0	0	0	0	0
19.0 - 19.5	0	0	0	0	0	0
19.5 - 20.0	0	0	0	0	0	0
20.0 - 20.5	0	0	0	0	1	0
20.5 - 21.0	0	0	0	0	0	0
21.0 - 21.5	0	0	0	0	0	0
21.5 - 22.0	0	0	0	0	0	0
22.0 - 22.5	0	0	1	1	0	1
22.5 - 23.0	0	0	0	0	0	0
23.0 - 23.5	0	0	0	0	0	0
SUM	369	369	369	369	369	369
25th Percentile	4.2	6.4	6.1	3.0	4.9	4.5
Median	4.6	7.7	7.4	3.9	6.9	6.5
75th Percentile	5.0	8.5	8.3	5.7	8.2	7.7
Mean	4.7	7.3	7.1	4.4	6.6	6.1
Std. Dev.	0.75	1.84	1.95	2.22	2.41	2.28
VPEA	0.05	0.07	0.08	0.19	0.13	0.13

Axle Weight Distribution (by Axle)
(Class 11 Vehicles, 1997)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count
0.0 - 0.5	0	0	0	0	0
0.5 - 1.0	0	0	0	0	0
1.0 - 1.5	0	0	0	0	0
1.5 - 2.0	0	0	0	0	0
2.0 - 2.5	0	0	0	0	2
2.5 - 3.0	1	0	3	1	5
3.0 - 3.5	3	0	2	2	9
3.5 - 4.0	15	0	4	10	13
4.0 - 4.5	41	0	7	15	15
4.5 - 5.0	43	4	13	17	13
5.0 - 5.5	22	5	7	15	16
5.5 - 6.0	10	5	14	16	13
6.0 - 6.5	2	6	13	18	19
6.5 - 7.0	0	10	16	15	11
7.0 - 7.5	0	20	16	13	11
7.5 - 8.0	0	27	11	4	5
8.0 - 8.5	0	22	10	3	1
8.5 - 9.0	0	12	4	5	1
9.0 - 9.5	0	9	9	2	2
9.5 - 10.0	0	5	4	0	0
10.0 - 10.5	0	5	2	0	0
10.5 - 11.0	0	2	0	0	0
11.0 - 11.5	0	2	1	0	0
11.5 - 12.0	0	1	0	0	0
12.0 - 12.5	0	1	0	0	0
12.5 - 13.0	0	1	0	0	0
13.0 - 13.5	0	0	0	0	0
13.5 - 14.0	0	0	0	0	0
14.0 - 14.5	0	0	0	0	0
14.5 - 15.0	0	0	0	0	0
15.0 - 15.5	0	0	0	0	0
15.5 - 16.0	0	0	0	0	0
16.0 - 16.5	0	0	0	0	0
16.5 - 17.0	0	0	0	0	0
17.0 - 17.5	0	0	0	0	0
17.5 - 18.0	0	0	0	0	0
18.0 - 18.5	0	0	0	0	0
18.5 - 19.0	0	0	0	0	0
19.0 - 19.5	0	0	0	0	0
19.5 - 20.0	0	0	0	0	0
20.0 - 20.5	0	0	0	0	0
20.5 - 21.0	0	0	0	0	0
21.0 - 21.5	0	0	0	0	0
21.5 - 22.0	0	0	0	0	0
22.0 - 22.5	0	0	0	0	0
22.5 - 23.0	0	0	0	0	0
23.0 - 23.5	0	0	0	0	0
23.5 - 24.0	0	0	0	0	0
24.0 - 24.5	0	0	0	0	0
24.5 - 25.0	0	0	1	1	1
25.0 - 25.5	0	0	0	0	0
SUM	137	137	137	137	137
25th Percentile	4.2	7.1	5.4	4.6	4.2
Median	4.5	7.8	6.6	5.6	5.3
75th Percentile	4.9	8.5	7.7	6.8	6.4
Mean	4.6	7.8	6.7	5.9	5.4
Std. Dev.	0.60	1.52	2.37	2.15	2.24
VPEA	0.11	0.13	0.25	0.29	0.30

Axle Weight Distribution (by Axle)
(Class 12 Vehicles, 1997)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count	6th Axle Count
0.0 - 0.5	0	0	0	0	0	0
0.5 - 1.0	0	0	0	0	0	0
1.0 - 1.5	0	0	0	0	0	0
1.5 - 2.0	1	0	0	0	0	0
2.0 - 2.5	0	0	0	0	0	0
2.5 - 3.0	0	1	1	0	0	1
3.0 - 3.5	0	0	1	1	1	2
3.5 - 4.0	6	0	0	0	3	1
4.0 - 4.5	7	2	5	3	4	5
4.5 - 5.0	11	11	7	3	4	8
5.0 - 5.5	4	5	7	5	7	4
5.5 - 6.0	0	5	5	4	2	4
6.0 - 6.5	0	3	3	7	4	1
6.5 - 7.0	0	2	0	2	2	3
7.0 - 7.5	0	0	0	4	0	0
7.5 - 8.0	0	0	0	0	0	0
8.0 - 8.5	0	0	0	0	2	0
8.5 - 9.0	0	0	0	0	0	0
SUM	29	29	29	29	29	29
25th Percentile	4.0	4.7	4.5	5.0	4.4	4.3
Median	4.5	5.0	5.0	5.8	5.2	4.7
75th Percentile	4.7	5.6	5.5	6.3	6.1	5.6
Mean	4.3	5.2	4.9	5.6	5.3	4.8
Std. Dev.	0.67	0.80	0.81	1.06	1.25	1.02
VPEA	0.54	0.62	0.69	0.77	1.13	0.95

Axle Weight Distribution (by Axle)
(Class 13 Vehicles, 1997)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count	6th Axle Count	7th Axle Count
0.0 - 0.5	0	0	0	0	0	0	0
0.5 - 1.0	0	0	0	1	1	2	3
1.0 - 1.5	0	0	0	0	0	0	0
1.5 - 2.0	0	0	0	0	0	0	0
2.0 - 2.5	0	0	0	1	0	0	1
2.5 - 3.0	0	0	0	0	0	0	0
3.0 - 3.5	0	0	0	1	2	0	3
3.5 - 4.0	3	0	0	1	1	2	3
4.0 - 4.5	2	1	0	3	3	2	2
4.5 - 5.0	4	2	1	1	0	1	0
5.0 - 5.5	3	0	1	2	3	3	3
5.5 - 6.0	4	0	0	0	0	3	1
6.0 - 6.5	4	0	3	3	2	1	2
6.5 - 7.0	2	3	3	1	3	2	3
7.0 - 7.5	0	3	4	0	2	2	0
7.5 - 8.0	0	4	2	3	3	3	1
8.0 - 8.5	0	3	3	1	0	1	0
8.5 - 9.0	0	2	1	2	0	0	0
9.0 - 9.5	0	2	0	1	2	0	0
9.5 - 10.0	0	1	2	1	0	0	0
10.0 - 10.5	0	0	2	0	0	0	0
10.5 - 11.0	0	1	0	0	0	0	0
11.0 - 11.5	0	0	0	0	0	0	0
SUM	22	22	22	22	22	22	22
25th Percentile	4.5	7.0	6.5	4.1	4.1	4.2	3.4
Median	5.2	7.6	7.3	6.2	6.1	5.7	4.1
75th Percentile	6.0	8.5	8.2	7.7	7.4	7.1	6.1
Mean	5.2	7.6	7.5	5.9	5.8	5.5	4.3
Std. Dev.	0.95	1.62	1.53	2.35	2.10	2.07	2.02
VPEA	1.30	0.91	1.07	2.61	2.42	2.31	3.02

Axle Weight Distribution (by Axle)
(Class 13 Vehicles, 1997)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count	6th Axle Count	7th Axle Count	8th Axle Count
0.0 - 0.5	0	0	0	0	0	0	0	0
0.5 - 1.0	0	0	0	0	0	0	1	1
1.0 - 1.5	0	0	0	0	0	0	0	0
1.5 - 2.0	0	0	0	0	0	0	0	0
2.0 - 2.5	0	0	0	0	0	0	0	0
2.5 - 3.0	0	0	0	0	0	0	0	1
3.0 - 3.5	0	0	0	0	1	0	1	0
3.5 - 4.0	0	0	0	0	0	0	0	0
4.0 - 4.5	1	0	0	1	0	0	0	0
4.5 - 5.0	0	0	0	0	0	1	0	0
5.0 - 5.5	1	1	1	1	0	0	0	0
5.5 - 6.0	0	0	1	0	0	0	0	0
6.0 - 6.5	0	0	0	0	0	0	1	0
6.5 - 7.0	1	0	0	0	1	1	0	1
7.0 - 7.5	0	1	0	0	0	1	0	0
7.5 - 8.0	0	0	0	0	0	0	0	0
8.0 - 8.5	0	1	0	0	1	0	0	0
8.5 - 9.0	0	0	0	0	0	0	0	0
9.0 - 9.5	0	0	1	1	0	0	0	0
9.5 - 10.0	0	0	0	0	0	0	0	0
SUM	3	3	3	3	3	3	3	3
25th Percentile	4.6	6.3	5.6	4.8	5.1	5.8	2.1	1.9
Median	5.0	7.3	5.9	5.3	6.9	6.8	3.4	2.9
75th Percentile	6.0	7.8	7.5	7.2	7.5	7.0	4.9	4.8
Mean	5.4	7.0	6.8	6.2	6.1	6.3	3.5	3.4
Std. Dev.	1.39	1.53	2.04	2.51	2.55	1.29	2.85	2.94
VPEA	9.00	6.85	10.73	15.09	11.84	5.88	27.94	33.33

Axle Weight Distribution (by Axle)
(Class 13 Vehicles, 1997)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count	6th Axle Count	7th Axle Count	8th Axle Count	9th Axle Count
0.0 - 0.5	0	0	0	0	0	0	0	0	0
0.5 - 1.0	0	0	0	0	0	0	0	0	1
1.0 - 1.5	0	0	1	0	0	0	0	0	0
1.5 - 2.0	1	0	0	0	0	0	0	0	0
2.0 - 2.5	0	1	0	1	0	0	0	0	1
2.5 - 3.0	0	0	0	0	1	1	1	1	0
3.0 - 3.5	0	0	0	0	0	0	0	0	0
3.5 - 4.0	0	0	0	0	0	0	0	0	0
4.0 - 4.5	0	0	0	0	0	0	0	0	0
4.5 - 5.0	1	0	0	0	0	0	0	1	0
5.0 - 5.5	0	0	0	0	0	0	0	0	0
5.5 - 6.0	1	0	1	0	0	0	1	0	0
6.0 - 6.5	0	1	0	1	1	1	0	0	0
6.5 - 7.0	0	0	0	0	0	0	0	0	0
7.0 - 7.5	0	0	0	0	0	0	1	0	1
7.5 - 8.0	0	0	0	1	1	0	0	1	0
8.0 - 8.5	0	0	0	0	0	1	0	0	0
8.5 - 9.0	0	1	1	0	0	0	0	0	0
9.0 - 9.5	0	0	0	0	0	0	0	0	0
9.5 - 10.0	0	0	0	0	0	0	0	0	0
10.0 - 10.5	0	0	0	0	0	0	0	0	0
SUM	3	3	3	3	3	3	3	3	3
25th Percentile	3.3	4.2	3.5	4.2	4.5	4.5	4.1	3.7	1.4
Median	4.7	6.3	5.7	6.3	6.4	6.3	5.6	4.6	2.3
75th Percentile	5.1	7.6	7.1	7.1	7.1	7.2	6.5	6.2	4.8
Mean	4.0	5.7	5.2	5.4	5.6	5.7	5.2	5.0	3.4
Std. Dev.	1.89	3.39	3.63	3.01	2.69	2.75	2.48	2.48	3.52
VPEA	12.77	17.72	21.05	15.34	13.54	14.29	14.58	17.75	49.28

Axle Weight Distribution (by Axle)
(Class 13 Vehicles, 1997)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count	6th Axle Count	7th Axle Count	8th Axle Count	9th Axle Count	10th Axle Count
0.0 - 0.5	0	0	0	0	0	0	0	0	0	0
0.5 - 1.0	0	0	0	0	1	2	1	2	1	1
1.0 - 1.5	0	0	2	2	3	1	2	1	2	3
1.5 - 2.0	2	1	0	1	0	1	1	1	1	0
2.0 - 2.5	0	1	1	0	0	0	0	0	0	0
2.5 - 3.0	0	0	0	0	0	0	0	0	0	0
3.0 - 3.5	0	0	0	0	0	0	0	0	0	0
3.5 - 4.0	0	0	0	0	0	0	0	0	1	1
4.0 - 4.5	1	1	1	1	1	1	1	1	0	0
4.5 - 5.0	0	0	0	0	0	0	0	0	0	0
5.0 - 5.5	0	0	0	0	0	0	0	0	0	0
5.5 - 6.0	1	0	0	0	0	0	0	0	0	0
6.0 - 6.5	0	0	0	0	0	0	0	0	0	0
6.5 - 7.0	0	0	0	0	0	0	0	0	0	0
7.0 - 7.5	0	0	0	0	0	0	0	0	0	0
7.5 - 8.0	0	0	0	0	0	0	0	0	0	0
8.0 - 8.5	0	0	0	0	0	0	0	0	0	0
8.5 - 9.0	0	1	1	0	0	0	0	0	0	0
9.0 - 9.5	0	1	0	1	0	0	0	0	0	0
9.5 - 10.0	1	0	0	0	0	0	0	0	0	0
10.0 - 10.5	0	0	0	0	0	0	0	0	0	0
10.5 - 11.0	0	0	0	0	0	0	0	0	0	0
SUM	5	5	5	5	5	5	5	5	5	5
25th Percentile	1.7	2.3	1.1	1.3	1.0	0.9	1.0	0.9	1.0	1.0
Median	4.2	4.2	2.0	1.7	1.3	1.0	1.0	1.0	1.0	1.1
75th Percentile	5.8	8.8	4.2	4.2	1.4	1.6	1.8	1.6	1.6	1.3
Mean	4.6	5.3	3.4	3.5	1.7	1.7	1.7	1.6	1.7	1.6
Std. Dev.	3.38	3.61	3.17	3.44	1.35	1.40	1.33	1.36	1.29	1.22
VPEA	19.52	30.95	31.00	34.12	6.15	14.00	16.00	14.00	12.00	5.45

Axle Weight Distribution (by Axle)
(Class 13 Vehicles, 1997)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count	6th Axle Count	7th Axle Count	8th Axle Count	9th Axle Count	10th Axle Count	11th Axle Count	12th Axle Count
0.0 - 0.5	0	0	0	0	0	0	0	0	0	0	0	0
0.5 - 1.0	0	0	0	1	0	0	0	0	0	0	0	0
1.0 - 1.5	0	0	0	0	0	0	1	1	1	1	1	3
1.5 - 2.0	0	0	0	0	0	0	0	1	1	1	1	0
2.0 - 2.5	0	1	1	0	1	0	0	0	0	0	0	0
2.5 - 3.0	1	0	0	1	0	0	1	1	1	1	1	1
3.0 - 3.5	0	0	0	1	0	0	0	0	0	0	0	0
3.5 - 4.0	0	0	0	0	0	0	0	0	0	0	0	0
4.0 - 4.5	0	0	0	0	0	0	1	0	0	0	0	0
4.5 - 5.0	0	0	0	0	1	0	0	0	0	0	0	0
5.0 - 5.5	1	0	0	0	0	0	0	0	0	0	0	0
5.5 - 6.0	1	2	2	1	1	2	1	1	1	1	1	0
6.0 - 6.5	1	0	0	0	0	0	0	0	0	0	0	0
6.5 - 7.0	0	0	0	0	0	0	0	0	0	0	0	0
7.0 - 7.5	0	0	0	0	1	1	0	0	0	0	0	0
7.5 - 8.0	0	0	0	0	0	0	0	0	0	0	0	0
8.0 - 8.5	0	1	0	0	0	0	0	0	0	0	0	0
8.5 - 9.0	0	0	1	0	0	0	0	0	0	0	0	0
9.0 - 9.5	0	0	0	0	0	0	0	0	0	0	0	0
9.5 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0
10.0 - 10.5	0	0	0	0	0	0	0	0	0	0	0	0
10.5 - 11.0	0	0	0	0	0	0	0	0	0	0	0	0
11.0 - 11.5	0	0	0	0	0	1	0	0	0	0	0	0
11.5 - 12.0	0	0	0	0	0	0	0	0	0	0	0	0
SUM	4	4	4	4	4	4	4	4	4	4	4	4
25th Percentile	4.6	4.7	4.8	2.2	4.1	5.8	2.4	1.7	1.5	1.4	1.5	1.1
Median	5.4	5.6	5.6	3.0	5.2	6.5	3.5	2.3	2.2	2.1	2.2	1.2
75th Percentile	5.7	6.3	6.4	3.9	6.2	8.2	4.6	3.4	3.4	3.4	3.4	1.6
Mean	4.9	5.4	5.5	3.1	5.0	7.5	3.4	2.8	2.7	2.7	2.7	1.5
Std. Dev.	1.60	2.50	2.62	2.10	2.03	2.55	1.97	1.94	1.98	2.01	1.99	0.74
VPEA	5.37	7.21	7.14	14.38	10.10	9.23	15.71	18.75	21.31	24.11	22.67	11.46

Axle Weight Distribution (by Axle)
(Class 13 Vehicles, 1997)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count	6th Axle Count	7th Axle Count	8th Axle Count	9th Axle Count	10th Axle Count	11th Axle Count	12th Axle Count	13th Axle Count
0.0 - 0.5	0	0	0	0	0	0	0	0	0	0	0	0	0
0.5 - 1.0	0	0	1	1	1	1	1	1	1	1	1	1	1
1.0 - 1.5	1	0	0	1	1	2	2	2	2	1	2	2	2
1.5 - 2.0	2	0	1	1	0	0	1	1	2	1	1	1	0
2.0 - 2.5	0	1	0	0	0	1	0	1	0	1	0	0	2
2.5 - 3.0	0	1	1	1	1	0	0	0	0	0	1	0	0
3.0 - 3.5	0	0	0	0	0	1	0	0	0	0	0	1	0
3.5 - 4.0	0	0	0	0	1	0	1	0	0	0	0	0	0
4.0 - 4.5	0	0	0	0	0	0	0	0	0	0	0	0	0
4.5 - 5.0	0	0	0	0	0	0	0	0	0	0	0	0	0
5.0 - 5.5	6	5	5	3	5	4	4	4	4	5	3	4	6
5.5 - 6.0	7	7	6	8	6	7	7	7	7	6	8	7	5
6.0 - 6.5	0	0	0	1	0	0	0	0	0	0	0	0	0
6.5 - 7.0	0	0	0	0	0	0	0	0	0	0	0	0	0
7.0 - 7.5	0	1	0	0	1	0	0	0	0	0	0	0	0
7.5 - 8.0	0	0	1	0	0	0	0	0	0	0	0	0	0
8.0 - 8.5	0	1	0	0	0	0	0	0	0	0	0	0	0
8.5 - 9.0	0	0	1	0	0	0	0	0	0	0	0	0	0
9.0 - 9.5	0	0	0	0	0	0	0	0	0	0	0	0	0
9.5 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0
10.0 - 10.5	0	0	0	0	0	0	0	0	0	1	0	0	0
10.5 - 11.0	0	0	0	0	0	0	0	0	0	0	0	0	0
11.0 - 11.5	0	0	0	0	0	0	0	0	0	0	0	0	0
SUM	16	16	16	16	16	16	16	16	16	16	16	16	16
25th Percentile	5.4	5.4	5.4	4.7	4.8	2.8	3.2	2.2	1.8	4.5	2.6	2.9	2.2
Median	5.4	5.5	5.5	5.5	5.4	5.4	5.4	5.4	5.4	5.4	5.5	5.4	5.4
75th Percentile	5.5	5.6	5.6	5.5	5.6	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Mean	4.7	5.4	5.1	4.6	4.7	4.3	4.3	4.2	4.2	4.8	4.2	4.3	4.2
Std. Dev.	1.61	1.42	1.96	1.79	1.71	1.91	1.90	1.97	1.99	2.29	1.91	1.88	1.92
VPEA	0.17	0.26	0.29	0.94	0.90	3.18	2.63	3.82	4.28	1.22	3.35	3.04	3.88

Gross Vehicle Weight Distribution
(Class 2 Vehicles, 1998)

Weight Range (metric tons)	Vehicles w/ 2 Axles 1st Axle Count	2nd Axle Count	Vehicles w/ 3 Axles 1st Axle Count	2nd Axle Count	3rd Axle Count	Vehicles w/ 4 Axles 1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count
0.0 - 0.2	0	0	0	0	0	0	0	0	0
0.2 - 0.4	0	0	0	0	0	0	0	0	0
0.4 - 0.6	0	1	0	0	0	0	0	0	0
0.6 - 0.8	0	2	0	0	4	0	0	1	1
0.8 - 1.0	0	178	0	1	3	0	0	0	0
1.0 - 1.2	952	2508	2	7	14	0	1	0	2
1.2 - 1.4	8172	7532	19	13	8	2	1	2	0
1.4 - 1.6	4547	3988	7	6	3	1	1	0	0
1.6 - 1.8	1854	1618	4	4	2	0	0	0	0
1.8 - 2.0	557	343	2	3	1	0	0	0	0
2.0 - 2.2	93	10	0	1	0	0	0	0	0
2.2 - 2.4	4	0	1	0	0	0	0	0	0
2.4 - 2.6	1	0	0	0	0	0	0	0	0
2.6 - 2.8	0	0	0	0	0	0	0	0	0
2.8 - 3.0	0	0	0	0	0	0	0	0	0
3.0 - 3.2	0	0	0	0	0	0	0	0	0
SUM	16180	16180	35	35	35	3	3	3	3
25th Percentile	1.2	1.2	1.2	1.2	1.0	1.3	1.2	1.0	0.9
Median	1.3	1.3	1.3	1.3	1.1	1.3	1.2	1.2	1.0
75th Percentile	1.5	1.4	1.4	1.5	1.3	1.4	1.4	1.2	1.1
Mean	1.4	1.3	1.4	1.4	1.1	1.3	1.3	1.0	0.9
Std. Dev.	0.18	0.19	0.25	0.27	0.26	0.10	0.21	0.29	0.21
VPEA	0.00	0.00	0.44	0.66	0.78	2.56	5.56	6.94	6.67

Gross Vehicle Weight Distribution
(Class 3 Vehicles, 1998)

Weight Range (metric tons)	Vehicles w/ 2 Axles 1st Axle Count	2nd Axle Count	Vehicles w/ 3 Axles 1st Axle Count	2nd Axle Count	3rd Axle Count	Vehicles w/ 4 Axles 1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count
0.0 - 0.2	0	0	0	0	0	0	0	0	0
0.2 - 0.4	0	0	0	0	0	0	0	0	0
0.4 - 0.6	0	3	0	0	3	0	0	0	0
0.6 - 0.8	0	3	0	0	3	0	0	1	2
0.8 - 1.0	0	248	0	2	14	0	0	2	2
1.0 - 1.2	147	2346	1	10	52	0	2	10	8
1.2 - 1.4	3092	2738	53	40	63	13	5	5	5
1.4 - 1.6	3886	2433	65	39	44	6	4	1	0
1.6 - 1.8	2267	1638	51	37	22	0	7	0	2
1.8 - 2.0	865	758	22	24	6	0	1	0	0
2.0 - 2.2	113	189	11	29	0	0	0	0	0
2.2 - 2.4	13	23	3	16	0	0	0	0	0
2.4 - 2.6	0	4	1	8	0	0	0	0	0
2.6 - 2.8	0	0	0	2	0	0	0	0	0
2.8 - 3.0	0	0	0	0	0	0	0	0	0
3.0 - 3.2	0	0	0	0	0	0	0	0	0
SUM	10383	10383	207	207	207	19	19	19	19
25th Percentile	1.3	1.1	1.3	1.4	1.1	1.2	1.3	1.1	1.1
Median	1.4	1.3	1.5	1.6	1.2	1.3	1.5	1.1	1.1
75th Percentile	1.6	1.6	1.7	2.0	1.4	1.4	1.7	1.2	1.2
Mean	1.5	1.4	1.5	1.7	1.3	1.3	1.5	1.1	1.1
Std. Dev.	0.20	0.27	0.25	0.39	0.26	0.09	0.24	0.17	0.23
VPEA	0.00	0.00	0.13	0.18	0.12	0.81	1.40	0.48	0.48

Gross Vehicle Weight Distribution
(Class 4 Vehicles, 1998)

Weight Range (metric tons)	Vehicles w/ 2 Axles 1st Axle Count	Vehicles w/ 2 Axles 2nd Axle Count	Vehicles w/ 3 Axles 1st Axle Count	Vehicles w/ 3 Axles 2nd Axle Count	Vehicles w/ 3 Axles 3rd Axle Count
0.0 - 0.5	0	0	0	0	0
0.5 - 1.0	0	0	0	1	0
1.0 - 1.5	0	0	0	0	1
1.5 - 2.0	1	2	0	1	1
2.0 - 2.5	7	3	3	2	17
2.5 - 3.0	17	12	9	0	28
3.0 - 3.5	28	14	14	5	26
3.5 - 4.0	39	21	14	8	24
4.0 - 4.5	47	26	29	6	19
4.5 - 5.0	40	23	42	7	21
5.0 - 5.5	17	18	36	13	19
5.5 - 6.0	3	13	25	9	11
6.0 - 6.5	7	23	11	9	8
6.5 - 7.0	5	15	10	12	5
7.0 - 7.5	4	11	1	22	8
7.5 - 8.0	2	13	2	21	4
8.0 - 8.5	1	11	1	30	3
8.5 - 9.0	1	7	0	22	1
9.0 - 9.5	3	3	1	12	1
9.5 - 10.0	1	3	0	8	0
10.0 - 10.5	0	2	0	6	0
10.5 - 11.0	0	0	0	2	1
11.0 - 11.5	1	0	0	1	0
11.5 - 12.0	1	2	0	0	0
12.0 - 12.5	0	1	0	1	0
12.5 - 13.0	0	0	0	0	0
13.0 - 13.5	0	1	0	0	0
13.5 - 14.0	0	0	0	0	0
14.0 - 14.5	0	0	0	0	0
14.5 - 15.0	0	0	0	0	0
15.0 - 15.5	0	0	0	0	0

Weight Range (metric tons)	Vehicles w/ 2 Axles 1st Axle Count	Vehicles w/ 2 Axles 2nd Axle Count	Vehicles w/ 3 Axles 1st Axle Count	Vehicles w/ 3 Axles 2nd Axle Count	Vehicles w/ 3 Axles 3rd Axle Count
15.5 - 16.0	0	0	0	0	0
16.0 - 16.5	0	0	0	0	0
16.5 - 17.0	0	0	0	0	0
17.0 - 17.5	0	0	0	0	0
17.5 - 18.0	0	0	0	0	0
18.0 - 18.5	0	0	0	0	0
18.5 - 19.0	0	1	0	0	0
19.0 - 19.5	0	0	0	0	0
19.5 - 20.0	0	0	0	0	0
20.0 - 20.5	0	0	0	0	0
20.5 - 21.0	0	0	0	0	0
21.0 - 21.5	0	0	0	0	0
21.5 - 22.0	0	0	0	0	0
22.0 - 22.5	0	0	0	0	0
22.5 - 23.0	0	0	0	0	0
23.0 - 23.5	1	1	0	0	0
23.5 - 24.0	1	0	0	0	0
24.0 - 24.5	0	0	0	0	0
24.5 - 25.0	0	0	0	0	0
25.0 - 2.55	0	0	0	0	0
25.5 - 26.0	0	0	0	0	0
26.0 - 26.5	0	1	0	0	0
26.5 - 27.0	1	1	0	0	0
27.0 - 27.5	1	1	0	0	0
SUM	23	229	198	198	198
25th Percentile	3.5	4.0	4.1	5.8	3.0
Median	4.1	5.4	4.9	7.5	4.0
75th Percentile	4.8	7.1	5.5	8.5	5.2
Mean	4.7	6.0	4.8	7.2	4.3
Std. Dev.	3.11	3.46	1.18	2.00	1.66
VPEA	1.38	0.25	0.14	0.18	0.28

Axle Weight Distribution (by Axle)
(Class 5 Vehicles, 1998)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count
0.0 - 0.5	0	0
0.5 - 1.0	0	7
1.0 - 1.5	134	20
1.5 - 2.0	2287	868
2.0 - 2.5	2149	1737
2.5 - 3.0	684	911
3.0 - 3.5	507	609
3.5 - 4.0	459	506
4.0 - 4.5	314	424
4.5 - 5.0	185	369
5.0 - 5.5	77	318
5.5 - 6.0	36	234
6.0 - 6.5	22	210
6.5 - 7.0	12	185
7.0 - 7.5	13	126
7.5 - 8.0	8	99
8.0 - 8.5	5	72
8.5 - 9.0	1	53
9.0 - 9.5	2	48
9.5 - 10.0	2	29
10.0 - 10.5	1	24
10.5 - 11.0	1	12
11.0 - 11.5	1	11
11.5 - 12.0	0	3
12.0 - 12.5	0	11
12.5 - 13.0	0	3
13.0 - 13.5	0	3
13.5 - 14.0	1	2
14.0 - 14.5	0	2
14.5 - 15.0	0	1
15.0 - 15.5	0	0
15.5 - 16.0	0	1
16.0 - 16.5	0	1
16.5 - 17.0	1	1
17.0 - 17.5	1	0
17.5 - 18.0	0	0
18.0 - 18.5	0	0
18.5 - 19.0	0	0
19.0 - 19.5	0	0
19.5 - 20.0	1	0
20.0 - 20.5	0	0
20.5 - 21.0	0	0
21.0 - 21.5	0	0
21.5 - 22.0	1	1
22.0 - 22.5	0	0
22.5 - 23.0	1	1
23.0 - 23.5	0	0
23.5 - 24.0	3	2
24.0 - 24.5	3	5
24.5 - 25.0	0	1
25.0 - 2.55	0	0
25.5 - 26.0	3	3
26.0 - 26.5	2	2
26.5 - 27.0	1	3
SUM	6918	6918
25th Percentile	1.8	2.2
Median	2.1	2.9
75th Percentile	2.9	4.6
Mean	2.6	3.7
Std. Dev.	1.46	2.24
VPEA	0.01	0.01

Axle Weight Distribution (by Axle)
(Class 6 Vehicles, 1998)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count
0.0 - 0.5	0	0	0
0.5 - 1.0	0	1	0
1.0 - 1.5	6	3	5
1.5 - 2.0	24	36	72
2.0 - 2.5	72	83	128
2.5 - 3.0	127	109	173
3.0 - 3.5	151	227	222
3.5 - 4.0	287	203	185
4.0 - 4.5	420	187	176
4.5 - 5.0	361	176	146
5.0 - 5.5	241	141	173
5.5 - 6.0	143	146	122
6.0 - 6.5	62	128	123
6.5 - 7.0	45	107	90
7.0 - 7.5	26	83	85
7.5 - 8.0	11	87	82
8.0 - 8.5	15	78	64
8.5 - 9.0	8	50	62
9.0 - 9.5	10	51	44
9.5 - 10.0	4	44	28
10.0 - 10.5	3	36	16
10.5 - 11.0	1	22	12
11.0 - 11.5	1	11	6
11.5 - 12.0	0	7	3
12.0 - 12.5	2	2	0
12.5 - 13.0	0	2	0
13.0 - 13.5	0	1	1
13.5 - 14.0	1	1	1
14.0 - 14.5	0	0	1
14.5 - 15.0	0	0	0

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count
15.0 - 15.5	0	0	1
15.5 - 16.0	0	1	0
16.0 - 16.5	0	0	0
16.5 - 17.0	0	0	0
17.0 - 17.5	0	0	0
17.5 - 18.0	0	0	0
18.0 - 18.5	0	0	0
18.5 - 19.0	1	0	1
19.0 - 19.5	0	0	0
19.5 - 20.0	0	0	0
20.0 - 20.5	0	0	0
20.5 - 21.0	0	0	0
21.0 - 21.5	0	0	0
21.5 - 22.0	0	0	0
22.0 - 22.5	0	0	0
22.5 - 23.0	0	0	0
23.0 - 23.5	0	0	0
23.5 - 24.0	0	0	0
24.0 - 24.5	2	2	2
24.5 - 25.0	0	0	0
25.0 - 2.55	0	0	0
25.5 - 26.0	0	0	0
26.0 - 26.5	0	0	0
26.5 - 27.0	1	0	0
SUM	2025	2025	2025
25th Percentile	3.7	3.6	3.3
Median	4.4	4.9	4.6
75th Percentile	5.1	6.8	6.4
Mean	4.5	5.4	5.0
Std. Dev.	15.83	2.35	2.36
VPEA	0.02	0.03	0.03

Axle Weight Distribution (by Axle)
(Class 7 Vehicles, 1998)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count
0.0 - 0.5	0	0	0	0
0.5 - 1.0	0	0	0	6
1.0 - 1.5	1	0	0	3
1.5 - 2.0	2	1	1	4
2.0 - 2.5	0	3	1	14
2.5 - 3.0	8	4	7	9
3.0 - 3.5	10	13	7	4
3.5 - 4.0	11	10	12	6
4.0 - 4.5	13	8	7	3
4.5 - 5.0	13	10	6	4
5.0 - 5.5	15	7	4	3
5.5 - 6.0	5	5	3	5
6.0 - 6.5	4	5	12	5
6.5 - 7.0	0	6	9	1
7.0 - 7.5	0	7	7	5
7.5 - 8.0	3	5	2	5
8.0 - 8.5	0	2	4	2
8.5 - 9.0	1	1	2	1
9.0 - 9.5	0	0	1	4
9.5 - 10.0	0	0	1	3
10.0 - 10.5	0	0	1	0
10.5 - 11.0	0	0	0	0
11.0 - 11.5	1	0	0	0
11.5 - 12.0	0	0	0	0
SUM	87	87	87	87
25th Percentile	3.5	3.5	3.6	3.6
Median	4.3	4.7	5.3	5.3
75th Percentile	5.2	6.4	6.7	6.7
Mean	4.5	4.9	5.4	5.4
Std. Dev.	1.52	1.71	1.94	1.94
VPEA	0.45	0.71	0.68	0.68

Axle Weight Distribution (by Axle)
(Class 9 Vehicles, 1998)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count
0 - 5	0	0	0	0	0
5 - 10	0	0	1	10	6
10 - 15	15	6	13	69	69
15 - 20	69	52	82	262	321
20 - 25	356	222	239	497	501
25 - 30	594	274	365	830	883
30 - 35	625	483	667	1417	1365
35 - 40	1402	988	1262	1431	1520
40 - 45	3693	1623	1725	1227	1260
45 - 50	5211	1526	1364	977	1103
50 - 55	3166	1137	1095	984	986
55 - 60	1093	1099	1116	968	1023
60 - 65	299	1087	1131	1031	1125
65 - 70	64	1245	1343	1173	1292
70 - 75	12	1436	1514	1245	1369
75 - 80	7	1760	1590	1360	1188
80 - 85	4	1453	1257	1110	965
85 - 90	0	958	804	812	639
90 - 95	1	568	451	489	406
95 - 100	0	285	296	283	246
100 - 105	0	188	137	174	144
105 - 110	0	113	84	114	83
110 - 115	0	46	35	60	53
115 - 120	0	26	17	34	28
120 - 125	0	16	11	21	21
125 - 130	0	11	3	10	9
130 - 135	1	4	5	10	4
135 - 140	0	4	4	4	1
140 - 145	0	1	0	4	1
145 - 150	0	1	0	2	0
150 - 155	0	0	0	2	0
155 - 160	0	0	0	1	0
160 - 165	0	0	0	0	0
165 - 170	0	0	0	0	0
170 - 175	0	0	0	0	0
175 - 180	0	0	0	0	0
180 - 185	0	0	0	0	0
185 - 190	0	0	0	0	0
190 - 195	0	0	0	0	0
195 - 200	0	0	0	0	0
200 - 205	0	0	0	0	0
205 - 210	0	0	0	0	0
210 - 215	0	0	0	0	1
215 - 220	0	1	1	1	0
220 - 225	0	0	0	0	0
225 - 230	0	0	0	0	0
230 - 235	0	0	0	0	0
235 - 240	0	0	0	0	0
240 - 245	0	0	0	0	0
245 - 250	0	0	0	0	0
250 - 255	0	0	0	0	0
255 - 260	0	0	0	0	0
260 - 265	1	0	1	1	1
265 - 270	0	0	0	0	0
270 - 275	0	0	0	0	0
275 - 280	0	0	0	0	0
SUM	16613	16613	16613	16613	16613
25th Percentile	4.1	4.6	4.4	3.8	3.8
Median	4.6	6.4	6.1	5.8	5.6
75th Percentile	5.0	7.8	7.6	7.6	7.3
Mean	4.5	6.3	6.1	5.8	5.6
Std. Dev.	0.84	1.97	1.98	2.26	2.18
VPEA	0.00	0.00	0.00	0.00	0.00

Axle Weight Distribution (by Axle)
(Class 8 Vehicles, 1998)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count
0.0 - 0.5	0	0	0	0	0	0	0
0.5 - 1.0	0	0	5	0	1	5	84
1.0 - 1.5	12	2	89	26	6	27	47
1.5 - 2.0	97	9	109	124	26	103	119
2.0 - 2.5	94	55	53	153	68	116	166
2.5 - 3.0	57	69	35	110	109	157	163
3.0 - 3.5	59	53	33	144	165	165	135
3.5 - 4.0	84	34	22	204	137	180	145
4.0 - 4.5	70	33	35	279	141	128	138
4.5 - 5.0	34	38	33	170	103	126	83
5.0 - 5.5	11	38	24	86	117	84	78
5.5 - 6.0	5	37	28	19	85	58	49
6.0 - 6.5	5	28	16	12	77	48	40
6.5 - 7.0	2	32	9	5	77	35	23
7.0 - 7.5	0	26	10	0	65	25	16
7.5 - 8.0	2	23	13	1	38	29	15
8.0 - 8.5	0	19	9	0	28	14	9
8.5 - 9.0	0	11	0	0	30	3	10
9.0 - 9.5	0	10	3	0	22	14	3
9.5 - 10.0	0	7	1	0	15	5	3
10.0 - 10.5	1	2	1	1	9	4	4
10.5 - 11.0	1	1	2	1	9	6	2
11.0 - 11.5	0	4	3	0	1	2	1
11.5 - 12.0	1	4	1	0	1	0	0
12.0 - 12.5	0	0	0	1	1	0	1
12.5 - 13.0	0	0	0	0	2	0	0
13.0 - 13.5	0	0	0	0	0	0	0
13.5 - 14.0	0	0	0	0	1	0	0
14.0 - 14.5	1	0	0	0	1	0	0
14.5 - 15.0	0	0	0	0	0	0	0
15.0 - 15.5	0	0	0	0	0	0	1
15.5 - 16.0	0	1	0	0	0	0	0
16.0 - 16.5	0	0	0	0	0	0	0
16.5 - 17.0	0	0	0	0	0	1	0
17.0 - 17.5	0	0	0	0	0	0	0
17.5 - 18.0	0	0	0	0	0	0	0
18.0 - 18.5	0	0	0	0	0	0	0
18.5 - 19.0	0	0	0	0	1	0	0
19.0 - 19.5	0	0	0	0	0	0	0
19.5 - 20.0	0	0	0	0	0	0	0
20.0 - 20.5	0	0	0	0	0	0	0
20.5 - 21.0	0	0	0	0	0	0	0
21.0 - 21.5	0	0	0	0	0	0	0
21.5 - 22.0	0	0	0	0	0	0	0
22.0 - 22.5	0	0	0	0	0	0	0
22.5 - 23.0	0	0	0	0	0	0	1
23.0 - 23.5	0	0	0	0	0	0	0
23.5 - 24.0	0	0	0	0	0	1	0
24.0 - 24.5	0	1	0	1	0	0	0
24.5 - 25.0	0	0	1	0	0	0	0
25.0 - 2.55	1	1	1	1	2	2	1
25.5 - 26.0	0	0	0	0	0	0	0
26.0 - 26.5	0	0	0	0	0	0	1
26.5 - 27.0	1	0	2	0	0	0	0
27.0 - 27.5	0	0	0	0	0	0	0
27.5 - 28.0	0	0	0	0	0	0	0
28.0 - 28.5	0	0	0	0	0	0	0
28.5 - 29.0	0	0	0	0	0	0	0
29.0 - 29.5	0	0	0	0	0	0	0
SUM	538	538	538	1338	1338	1338	1338
25th Percentile	2.0	2.9	1.6	2.6	3.3	2.7	2.2
Median	3.0	4.7	2.6	3.7	4.5	3.7	3.3
75th Percentile	4.0	6.6	4.7	4.4	6.2	4.9	4.5
Mean	3.2	5.0	3.5	3.6	5.0	4.1	3.6
Std. Dev.	1.96	2.59	2.90	1.44	2.24	2.09	2.12
VPEA	0.12	0.15	0.22	0.04	0.05	0.04	0.05

Axle Weight Distribution (by Axle)
(Class 10 Vehicles, 1998)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count	6th Axle Count
0.0 - 0.5	0	0	0	0	0	0
0.5 - 1.0	0	0	0	10	5	6
1.0 - 1.5	1	0	0	12	8	4
1.5 - 2.0	1	0	2	19	9	13
2.0 - 2.5	16	5	6	45	19	20
2.5 - 3.0	28	8	12	59	32	29
3.0 - 3.5	19	20	18	73	52	39
3.5 - 4.0	62	24	30	64	33	43
4.0 - 4.5	109	28	30	67	28	38
4.5 - 5.0	181	27	32	46	24	47
5.0 - 5.5	113	36	36	40	44	38
5.5 - 6.0	43	27	33	30	35	27
6.0 - 6.5	7	39	38	23	31	36
6.5 - 7.0	6	51	46	28	35	26
7.0 - 7.5	3	49	64	14	27	35
7.5 - 8.0	2	54	55	22	29	38
8.0 - 8.5	0	52	60	13	34	33
8.5 - 9.0	0	65	47	8	36	46
9.0 - 9.5	0	52	48	3	31	23
9.5 - 10.0	0	33	20	3	28	23
10.0 - 10.5	0	11	9	2	25	12
10.5 - 11.0	0	4	3	2	11	6
11.0 - 11.5	0	4	2	4	8	3
11.5 - 12.0	0	2	1	0	3	3
12.0 - 12.5	0	0	0	2	1	1
12.5 - 13.0	0	0	0	1	0	0
13.0 - 13.5	0	0	0	1	2	1
13.5 - 14.0	0	0	0	0	0	0
14.0 - 14.5	0	0	0	1	2	0
14.5 - 15.0	0	0	0	0	0	0
15.0 - 15.5	0	0	0	0	0	1
15.5 - 16.0	0	0	0	0	0	0
16.0 - 16.5	0	0	0	0	0	1
16.5 - 17.0	0	0	0	0	0	0
17.0 - 17.5	0	0	0	0	0	0
17.5 - 18.0	0	0	0	0	0	0
18.0 - 18.5	0	0	0	0	0	0
18.5 - 19.0	0	0	0	0	0	0
19.0 - 19.5	0	0	0	0	0	0
19.5 - 20.0	0	0	0	0	0	0
20.0 - 20.5	0	0	0	0	0	0
20.5 - 21.0	0	0	0	0	0	0
21.0 - 21.5	0	0	0	0	0	0
21.5 - 22.0	0	0	0	0	0	0
22.0 - 22.5	0	0	0	0	0	0
22.5 - 23.0	0	0	0	0	0	0
23.0 - 23.5	1	1	0	0	0	0
SUM	592	592	592	592	592	592
25th Percentile	4.1	5.5	5.1	3.0	3.7	3.8
Median	4.6	7.3	7.1	4.1	6.1	5.8
75th Percentile	5.0	8.6	8.2	5.6	8.4	8.0
Mean	4.5	7.0	6.7	4.5	6.2	6.0
Std. Dev.	1.19	2.13	2.00	2.15	2.72	2.56
VPEA	0.03	0.07	0.07	0.11	0.13	0.12

Axle Weight Distribution (by Axle)
(Class 11 Vehicles, 1998)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count
0.0 - 0.5	0	0	0	0	0
0.5 - 1.0	0	0	0	0	0
1.0 - 1.5	0	0	0	0	0
1.5 - 2.0	0	0	0	1	3
2.0 - 2.5	14	1	6	9	10
2.5 - 3.0	17	3	5	18	11
3.0 - 3.5	18	5	15	24	30
3.5 - 4.0	63	12	29	60	47
4.0 - 4.5	144	8	42	61	76
4.5 - 5.0	131	20	40	44	44
5.0 - 5.5	57	38	53	49	49
5.5 - 6.0	13	43	24	45	42
6.0 - 6.5	1	37	50	43	50
6.5 - 7.0	1	63	41	32	26
7.0 - 7.5	1	49	45	33	30
7.5 - 8.0	0	55	39	23	18
8.0 - 8.5	0	47	27	11	9
8.5 - 9.0	0	26	22	2	7
9.0 - 9.5	0	21	8	2	2
9.5 - 10.0	0	16	9	2	2
10.0 - 10.5	0	8	1	0	3
10.5 - 11.0	0	5	1	0	0
11.0 - 11.5	0	3	0	1	0
11.5 - 12.0	0	0	1	0	0
12.0 - 12.5	0	0	0	0	1
12.5 - 13.0	0	0	0	0	0
13.0 - 13.5	0	0	0	0	0
13.5 - 14.0	0	0	0	0	0
14.0 - 14.5	0	0	1	0	0
14.5 - 15.0	0	0	1	0	0
15.0 - 15.5	0	0	0	0	0
SUM	460	460	460	460	460
25th Percentile	4.0	5.8	4.7	4.0	4.1
Median	4.4	7.0	6.1	5.0	5.0
75th Percentile	4.8	8.1	7.4	6.3	6.2
Mean	4.3	6.9	6.1	5.2	5.2
Std. Dev.	0.74	1.66	1.85	1.57	1.62
VPEA	0.04	0.07	0.07	0.11	0.13

Axle Weight Distribution (by Axle)
(Class 12 Vehicles, 1998)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count	6th Axle Count
0.0 - 0.5	0	0	0	0	0	0
0.5 - 1.0	0	0	0	0	0	0
1.0 - 1.5	0	0	0	0	0	0
1.5 - 2.0	0	0	1	0	0	2
2.0 - 2.5	2	2	0	3	3	0
2.5 - 3.0	3	1	2	1	4	4
3.0 - 3.5	8	3	9	4	8	11
3.5 - 4.0	29	23	17	11	19	20
4.0 - 4.5	55	25	29	13	27	17
4.5 - 5.0	52	35	34	15	14	23
5.0 - 5.5	14	32	26	19	26	24
5.5 - 6.0	2	16	24	24	19	23
6.0 - 6.5	0	14	14	22	13	21
6.5 - 7.0	0	8	4	17	12	7
7.0 - 7.5	0	4	2	13	12	7
7.5 - 8.0	0	2	2	9	2	3
8.0 - 8.5	0	0	1	4	4	2
8.5 - 9.0	0	0	0	2	0	0
9.0 - 9.5	0	0	0	4	2	0
9.5 - 10.0	0	0	0	2	0	0
10.0 - 10.5	0	0	0	0	0	1
10.5 - 11.0	0	0	0	1	0	0
11.0 - 11.5	0	0	0	1	0	0
11.5 - 12.0	0	0	0	0	0	0
SUM	165	165	165	165	165	165
25th Percentile	3.9	4.2	4.2	4.8	4.1	4.1
Median	4.3	4.8	4.8	5.8	5.1	5.0
75th Percentile	4.6	5.5	5.6	6.9	6.1	5.9
Mean	4.3	4.9	4.9	5.8	5.1	5.1
Std. Dev.	0.61	0.99	1.00	1.61	1.40	1.32
VPEA	0.10	0.16	0.18	0.22	0.24	0.22

Axle Weight Distribution (by Axle)
(Class 13 Vehicles, 1998)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count	6th Axle Count	7th Axle Count
0.0 - 0.5	0	0	0	0	0	0	0
0.5 - 1.0	0	0	0	5	4	6	8
1.0 - 1.5	1	0	0	3	1	0	2
1.5 - 2.0	1	2	0	1	0	2	1
2.0 - 2.5	1	0	0	3	2	0	0
2.5 - 3.0	2	0	0	0	2	3	1
3.0 - 3.5	6	4	2	3	2	1	2
3.5 - 4.0	1	3	0	1	2	1	4
4.0 - 4.5	7	1	2	2	4	5	4
4.5 - 5.0	10	2	3	3	3	3	1
5.0 - 5.5	7	5	3	3	1	1	5
5.5 - 6.0	4	4	5	1	0	2	1
6.0 - 6.5	0	2	1	3	2	4	2
6.5 - 7.0	1	2	2	2	5	3	2
7.0 - 7.5	1	3	3	2	0	3	0
7.5 - 8.0	0	3	8	1	4	2	2
8.0 - 8.5	1	5	3	2	1	2	3
8.5 - 9.0	0	1	2	2	5	1	2
9.0 - 9.5	0	2	0	2	1	1	0
9.5 - 10.0	0	1	2	2	1	0	2
10.0 - 10.5	0	1	3	1	1	1	0
10.5 - 11.0	0	0	1	0	1	1	0
11.0 - 11.5	0	1	1	0	0	0	0
11.5 - 12.0	0	0	1	1	0	0	0
12.0 - 12.5	0	0	1	0	0	0	0
12.5 - 13.0	0	1	0	0	1	0	0
13.0 - 13.5	0	0	0	0	0	0	0
13.5 - 14.0	0	0	0	0	0	1	1
14.0 - 14.5	0	0	0	0	0	0	0
14.5 - 15.0	0	0	0	0	0	0	0
15.0 - 15.5	0	0	0	0	0	0	0
15.5 - 16.0	0	0	0	0	0	0	0
16.0 - 16.5	0	0	0	0	0	0	0
16.5 - 17.0	0	0	0	0	0	0	0
SUM	43	43	43	43	43	43	43
25th Percentile	3.7	4.6	5.6	2.4	3.6	3.2	2.4
Median	4.6	6.0	7.5	5.0	6.3	5.1	4.3
75th Percentile	5.3	8.3	8.6	7.6	8.0	7.0	6.8
Mean	4.5	6.3	7.3	5.1	5.7	5.2	4.7
Std. Dev.	1.35	2.51	2.26	3.16	2.99	3.00	3.08
VPEA	0.81	1.41	0.93	2.44	1.64	1.76	2.41

Axle Weight Distribution (by Axle)
(Class 13 Vehicles, 1998)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count	6th Axle Count	7th Axle Count	8th Axle Count
0.0 - 0.5	0	0	0	0	0	0	0	0
0.5 - 1.0	0	0	0	0	0	2	3	4
1.0 - 1.5	0	0	0	1	1	2	1	1
1.5 - 2.0	0	0	0	0	1	0	0	0
2.0 - 2.5	0	1	1	1	0	0	0	0
2.5 - 3.0	1	1	1	1	0	0	0	0
3.0 - 3.5	0	0	1	0	1	0	0	0
3.5 - 4.0	2	1	0	1	0	1	1	0
4.0 - 4.5	0	0	0	2	2	0	1	1
4.5 - 5.0	4	1	0	0	0	0	0	1
5.0 - 5.5	1	0	0	0	0	0	1	0
5.5 - 6.0	1	1	0	0	0	1	0	0
6.0 - 6.5	0	1	0	0	1	0	0	0
6.5 - 7.0	0	1	1	0	0	0	0	1
7.0 - 7.5	0	1	0	0	1	0	1	1
7.5 - 8.0	1	2	1	0	1	1	1	0
8.0 - 8.5	0	0	1	2	1	0	0	0
8.5 - 9.0	0	0	0	0	0	1	0	0
9.0 - 9.5	0	0	2	0	1	0	1	0
9.5 - 10.0	0	0	0	0	0	2	0	0
10.0 - 10.5	0	0	1	1	0	0	0	1
10.5 - 11.0	0	0	0	1	0	0	0	0
11.0 - 11.5	0	0	1	0	0	0	0	0
11.5 - 12.0	0	0	0	0	0	0	0	0
SUM	10	10	10	10	10	10	10	10
25th Percentile	4.0	3.9	4.3	3.0	3.4	1.2	1.0	0.8
Median	4.7	6.0	8.0	4.3	5.2	4.8	4.0	2.9
75th Percentile	5.3	7.1	9.2	8.3	7.7	8.4	6.6	6.1
Mean	4.8	5.5	7.1	5.6	5.3	4.9	4.1	3.7
Std. Dev.	1.36	2.09	3.16	3.46	2.82	3.80	3.17	3.37
VPEA	2.71	5.33	6.22	12.53	8.30	15.26	14.00	18.42

Axle Weight Distribution (by Axle)
(Class 13 Vehicles, 1998)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count	6th Axle Count	7th Axle Count	8th Axle Count	9th Axle Count
0.0 - 0.5	0	0	0	0	0	0	0	0	0
0.5 - 1.0	0	0	0	0	0	1	1	1	1
1.0 - 1.5	0	0	0	0	0	0	0	0	0
1.5 - 2.0	0	0	0	0	0	0	0	0	0
2.0 - 2.5	0	0	0	0	0	0	0	0	0
2.5 - 3.0	0	0	0	0	0	0	0	0	0
3.0 - 3.5	0	0	0	0	0	0	0	0	0
3.5 - 4.0	0	0	0	0	0	0	0	0	0
4.0 - 4.5	0	1	0	0	0	0	0	0	0
4.5 - 5.0	1	0	0	0	0	0	0	0	0
5.0 - 5.5	0	1	0	0	0	0	0	0	0
5.5 - 6.0	1	0	0	1	0	0	0	0	0
6.0 - 6.5	0	0	1	0	0	1	0	1	1
6.5 - 7.0	0	0	0	0	2	0	1	0	0
7.0 - 7.5	0	0	0	0	1	1	0	0	0
7.5 - 8.0	0	0	1	0	0	0	0	1	1
8.0 - 8.5	1	1	0	1	0	0	0	0	0
8.5 - 9.0	0	0	0	0	0	0	1	0	0
9.0 - 9.5	0	0	0	0	0	0	0	0	0
9.5 - 10.0	0	0	0	0	0	0	0	0	0
10.0 - 10.5	0	0	0	0	0	0	0	0	0
10.5 - 11.0	0	0	0	0	0	0	0	0	0
11.0 - 11.5	0	0	0	0	0	0	0	0	0
11.5 - 12.0	0	0	0	1	0	0	0	0	0
12.0 - 12.5	0	0	1	0	0	0	0	0	0
12.5 - 13.0	0	0	0	0	0	0	0	0	0
13.0 - 13.5	0	0	0	0	0	0	0	0	0
SUM	3	3	3	3	3	3	3	3	3
25th Percentile	5.2	4.6	6.8	7.0	6.7	3.5	3.7	3.5	3.4
Median	5.7	5.0	7.5	8.0	6.7	6.2	6.6	6.2	6.1
75th Percentile	6.9	6.7	9.9	9.8	7.1	6.6	7.7	7.1	7.0
Mean	6.1	5.8	8.6	8.5	6.9	4.6	5.4	4.9	4.9
Std. Dev.	1.69	2.17	3.29	2.83	0.40	3.43	4.19	3.76	3.75
VPEA	9.65	13.67	14.00	11.67	1.74	16.94	20.45	19.35	19.67

Axle Weight Distribution (by Axle)
(Class 13 Vehicles, 1998)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count	6th Axle Count	7th Axle Count	8th Axle Count	9th Axle Count	10th Axle Count
0.0 - 0.5	0	0	0	0	0	0	0	0	0	0
0.5 - 1.0	0	0	0	1	1	2	1	1	1	2
1.0 - 1.5	0	1	0	0	0	0	0	0	0	0
1.5 - 2.0	0	0	0	0	0	0	0	0	0	0
2.0 - 2.5	0	0	0	0	0	0	0	0	0	0
2.5 - 3.0	0	0	0	0	0	1	0	0	0	0
3.0 - 3.5	1	0	0	1	1	0	0	0	0	1
3.5 - 4.0	1	1	2	1	0	3	3	1	1	2
4.0 - 4.5	3	0	1	1	1	3	0	2	2	3
4.5 - 5.0	7	6	4	7	5	3	3	5	7	5
5.0 - 5.5	5	7	5	4	4	7	4	7	4	6
5.5 - 6.0	3	1	5	5	2	3	6	4	5	3
6.0 - 6.5	6	5	4	2	2	1	4	4	3	4
6.5 - 7.0	1	1	0	1	5	3	4	1	4	1
7.0 - 7.5	1	2	2	2	1	2	0	1	0	0
7.5 - 8.0	1	1	1	1	4	1	3	2	1	1
8.0 - 8.5	0	2	3	2	2	0	1	1	1	1
8.5 - 9.0	0	1	0	1	1	0	0	0	0	0
9.0 - 9.5	0	1	2	0	0	0	0	0	0	0
9.5 - 10.0	0	0	0	0	0	0	0	0	0	0
10.0 - 10.5	0	0	0	0	0	0	0	0	0	0
SUM	29	29	29	29	29	29	29	29	29	29
25th Percentile	4.8	4.8	5.0	4.8	4.8	4.3	5.0	4.8	4.7	4.3
Median	5.2	5.4	5.6	5.4	6.0	5.0	5.8	5.4	5.2	5.1
75th Percentile	6.0	6.7	7.1	6.4	7.3	5.6	6.5	6.2	6.2	5.8
Mean	5.4	5.8	6.0	5.6	6.0	4.9	5.6	5.4	5.4	5.0
Std. Dev.	0.99	1.59	1.51	1.63	1.75	1.63	1.51	1.41	1.40	1.61
VPEA	0.80	1.21	1.29	1.02	1.44	0.90	0.89	0.89	0.99	1.01

Axle Weight Distribution (by Axle)
(Class 13 Vehicles, 1998)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count	6th Axle Count	7th Axle Count	8th Axle Count	9th Axle Count	10th Axle Count	11th Axle Count
0.0 - 0.5	0	0	0	0	0	0	0	0	0	0	0
0.5 - 1.0	0	0	0	0	0	0	0	0	0	0	0
1.0 - 1.5	0	0	0	0	0	0	0	0	0	0	0
1.5 - 2.0	0	0	0	0	0	0	0	0	0	0	0
2.0 - 2.5	0	0	0	0	0	0	0	0	0	0	0
2.5 - 3.0	0	0	0	0	0	0	0	0	0	0	0
3.0 - 3.5	0	1	0	0	0	0	1	0	0	3	0
3.5 - 4.0	2	0	0	0	0	0	0	0	0	0	0
4.0 - 4.5	2	3	0	1	0	2	1	2	1	1	1
4.5 - 5.0	2	4	2	3	2	1	1	1	3	3	0
5.0 - 5.5	2	0	1	4	3	2	4	2	1	2	2
5.5 - 6.0	2	0	4	2	1	1	0	5	5	1	3
6.0 - 6.5	2	4	2	1	3	4	1	1	3	4	7
6.5 - 7.0	1	1	3	0	3	0	1	2	1	2	0
7.0 - 7.5	1	1	3	2	1	3	6	0	0	0	1
7.5 - 8.0	2	1	0	1	2	1	0	1	1	0	1
8.0 - 8.5	0	1	0	0	1	0	0	0	1	0	0
8.5 - 9.0	0	0	0	2	0	1	0	1	0	0	1
9.0 - 9.5	0	0	0	0	0	0	0	0	0	0	0
9.5 - 10.0	0	0	0	0	0	0	0	0	0	0	0
10.0 - 10.5	0	0	0	0	0	0	0	1	0	0	0
10.5 - 11.0	0	0	0	0	0	0	0	0	0	0	0
11.0 - 11.5	0	0	0	0	0	0	0	0	0	0	0
11.5 - 12.0	0	0	0	0	0	0	0	0	0	0	0
12.0 - 12.5	0	0	0	0	0	0	0	0	0	0	0
12.5 - 13.0	0	0	0	0	0	0	0	0	0	0	0
13.0 - 13.5	0	0	0	0	0	1	0	0	0	0	0
13.5 - 14.0	0	0	0	0	0	0	0	0	0	0	0
14.0 - 14.5	0	0	0	0	0	0	0	0	0	0	0
14.5 - 15.0	0	0	1	0	0	0	0	0	0	0	0
15.0 - 15.5	0	0	0	0	0	0	0	0	0	0	0
15.5 - 16.0	0	0	0	0	0	0	0	0	0	0	0
16.0 - 16.5	0	0	0	0	0	0	1	0	0	0	0
16.5 - 17.0	0	0	0	0	0	0	0	0	0	0	0
SUM	16	16	16	16	16	16	16	16	16	16	16
25th Percentile	4.6	4.6	5.7	5.1	5.1	5.4	5.1	5.3	5.2	4.6	5.5
Median	5.6	5.5	6.0	5.5	6.3	6.2	6.5	5.7	5.7	5.1	6.1
75th Percentile	6.4	6.4	6.7	7.1	6.7	7.1	7.1	6.7	6.4	6.2	6.3
Mean	5.5	5.6	6.6	6.1	6.2	6.6	6.6	6.1	5.8	5.2	6.1
Std. Dev.	1.37	1.40	2.27	1.44	1.07	2.16	2.83	1.57	1.07	1.20	1.07
VPEA	2.06	2.09	1.04	2.29	1.60	1.70	1.95	1.48	1.36	1.96	0.85

Axle Weight Distribution (by Axle)
(Class 13 Vehicles, 1998)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count	6th Axle Count	7th Axle Count	8th Axle Count	9th Axle Count	10th Axle Count	11th Axle Count	12th Axle Count
0.0 - 0.5	0	0	0	0	0	0	0	0	0	0	0	0
0.5 - 1.0	0	0	0	0	0	0	0	0	0	0	0	2
1.0 - 1.5	0	0	0	0	0	0	0	0	0	0	0	0
1.5 - 2.0	0	0	0	0	0	0	0	0	0	0	0	0
2.0 - 2.5	0	0	0	0	0	0	0	0	0	0	0	0
2.5 - 3.0	0	0	0	0	0	0	0	2	0	0	0	0
3.0 - 3.5	0	0	0	1	0	0	0	1	0	1	0	0
3.5 - 4.0	0	0	0	0	0	1	0	0	1	0	0	0
4.0 - 4.5	1	2	0	3	1	2	1	1	1	0	2	0
4.5 - 5.0	5	1	1	2	3	2	1	1	0	2	2	2
5.0 - 5.5	4	2	2	2	6	1	2	1	5	6	3	3
5.5 - 6.0	1	1	3	2	2	2	4	2	3	1	4	4
6.0 - 6.5	0	2	1	0	0	3	2	3	0	1	1	1
6.5 - 7.0	1	2	4	0	0	1	0	0	2	1	0	0
7.0 - 7.5	1	2	2	1	1	1	1	0	0	2	1	1
7.5 - 8.0	1	1	1	1	1	0	1	1	0	0	0	1
8.0 - 8.5	0	0	0	0	0	1	0	1	2	0	1	0
8.5 - 9.0	0	0	0	0	0	0	1	0	0	0	0	0
9.0 - 9.5	0	1	0	1	0	0	0	0	0	0	0	0
9.5 - 10.0	0	0	0	1	0	0	0	0	0	0	0	0
10.0 - 10.5	0	0	0	0	0	0	0	0	0	0	0	0
10.5 - 11.0	0	0	0	0	0	0	0	0	0	0	0	0
11.0 - 11.5	0	0	0	0	0	0	0	0	0	0	0	0
11.5 - 12.0	0	0	0	0	0	0	0	0	0	0	0	0
12.0 - 12.5	0	0	0	0	0	0	0	0	0	0	0	0
12.5 - 13.0	0	0	0	0	0	0	0	0	0	0	0	0
13.0 - 13.5	0	0	0	0	0	0	1	0	0	0	0	0
13.5 - 14.0	0	0	0	0	0	0	0	1	0	0	0	0
14.0 - 14.5	0	0	0	0	0	0	0	0	0	0	0	0
SUM	14	14	14	14	14	14	14	14	14	14	14	14
25th Percentile	4.7	5.2	5.7	4.4	4.9	4.7	5.4	4.4	5.5	5.0	4.9	4.9
Median	5.1	6.0	6.3	5.2	5.3	5.9	5.8	5.7	5.5	5.3	5.5	5.4
75th Percentile	5.5	7.3	6.8	6.8	5.5	6.4	7.0	6.3	6.5	6.1	5.9	5.8
Mean	5.9	6.2	6.2	5.8	5.4	5.7	6.5	5.9	5.8	5.5	5.6	5.0
Std. Dev.	1.05	1.48	0.87	1.94	0.94	1.31	2.34	2.81	1.32	1.07	1.05	2.08
VPEA	1.05	2.53	1.31	3.36	0.82	1.98	2.00	2.32	1.30	1.38	1.25	1.29

Axle Weight Distribution (by Axle)
(Class 13 Vehicles, 1998)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count	6th Axle Count	7th Axle Count	8th Axle Count	9th Axle Count	10th Axle Count	11th Axle Count	12th Axle Count	13th Axle Count
0.0 - 0.5	0	0	0	0	0	0	0	0	0	0	0	0	0
0.5 - 1.0	0	0	0	1	0	0	0	0	0	0	0	2	2
1.0 - 1.5	0	0	0	0	1	1	1	1	1	1	2	0	0
1.5 - 2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.0 - 2.5	0	0	0	0	0	0	0	0	0	0	0	0	0
2.5 - 3.0	0	0	0	0	0	0	0	0	0	0	0	1	1
3.0 - 3.5	0	0	0	0	0	0	0	0	0	0	0	1	0
3.5 - 4.0	2	1	1	1	1	0	0	1	0	0	0	2	1
4.0 - 4.5	7	5	3	1	2	0	2	0	2	3	5	2	4
4.5 - 5.0	7	12	3	4	4	10	10	9	7	6	8	11	7
5.0 - 5.5	12	8	9	8	14	15	9	5	11	3	11	9	19
5.5 - 6.0	9	14	8	13	8	8	11	14	8	11	8	14	7
6.0 - 6.5	11	8	16	9	10	17	11	14	16	15	10	6	10
6.5 - 7.0	15	9	11	8	13	7	11	6	11	7	8	9	10
7.0 - 7.5	4	4	5	5	11	9	7	6	3	8	5	7	4
7.5 - 8.0	2	4	2	9	2	0	0	5	2	3	5	3	4
8.0 - 8.5	1	3	4	2	1	0	2	2	4	3	0	3	1
8.5 - 9.0	0	1	2	3	0	2	1	0	2	2	2	0	0
9.0 - 9.5	1	0	4	2	0	0	0	2	0	3	4	1	0
9.5 - 10.0	0	1	2	1	1	0	0	0	0	0	0	0	0
10.0 - 10.5	0	0	0	2	0	0	1	1	0	1	0	0	0
10.5 - 11.0	0	0	0	0	0	0	0	0	1	2	0	0	0
11.0 - 11.5	0	1	0	0	0	0	0	0	0	1	1	0	0
11.5 - 12.0	0	0	1	1	0	0	1	1	0	0	0	0	0
12.0 - 12.5	0	0	0	0	1	0	0	0	0	0	0	0	0
12.5 - 13.0	0	0	0	1	1	0	0	0	0	0	0	0	0
13.0 - 13.5	0	0	0	0	1	0	1	0	0	1	0	0	0
13.5 - 14.0	0	0	0	0	0	1	0	1	2	0	1	0	0
14.0 - 14.5	0	0	0	0	0	0	1	0	0	0	1	0	0
14.5 - 15.0	0	0	0	0	0	0	0	2	0	0	0	0	1
15.0 - 15.5	0	0	0	0	0	0	1	0	0	1	0	0	0
15.5 - 16.0	0	0	0	0	0	0	0	0	0	0	0	0	0
16.0 - 16.5	0	0	0	0	0	1	1	0	0	0	0	0	0
16.5 - 17.0	0	0	0	0	0	0	0	0	1	0	0	0	0
17.0 - 17.5	0	0	0	0	0	0	0	0	0	0	0	0	0
SUM	71	71	71	71	71	71	71	71	71	71	71	71	71
25th Percentile	5.0	5.0	5.5	5.7	5.4	5.2	5.2	5.5	5.3	5.6	5.2	4.9	5.0
Median	5.7	5.7	6.2	6.4	6.4	6.0	6.1	6.1	6.1	6.3	6.1	5.7	5.5
75th Percentile	6.6	6.7	7.1	7.5	7.0	6.8	6.8	7.3	6.8	7.4	7.2	6.8	6.6
Mean	5.8	6.0	6.5	6.7	6.3	6.2	6.5	6.8	6.5	6.8	6.3	5.7	5.7
Std. Dev.	1.12	1.38	1.53	1.81	1.79	1.84	2.47	2.56	2.20	2.08	2.06	1.53	1.75
VPEA	0.40	0.43	0.35	0.40	0.34	0.36	0.38	0.40	0.33	0.39	0.45	0.47	0.41

Gross Vehicle Weight Distribution
(Class 3 Vehicles, 1999)

Weight Range (metric tons)	Vehicles w/ 2 Axles		Vehicles w/ 3 Axles			Vehicles w/ 4 Axles			
	1st Axle Count	2nd Axle Count	1st Axle Count	2nd Axle Count	3rd Axle Count	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count
0.0 - 0.2	0	0	0	0	0	0	0	0	0
0.2 - 0.4	0	0	0	0	0	0	0	0	0
0.4 - 0.6	0	2	0	0	2	0	0	0	0
0.6 - 0.8	0	1	0	0	0	0	0	0	0
0.8 - 1.0	0	129	0	2	5	0	0	2	2
1.0 - 1.2	89	1275	1	7	21	1	0	5	4
1.2 - 1.4	2060	1635	20	14	32	8	4	2	4
1.4 - 1.6	2196	1380	37	14	19	1	0	2	1
1.6 - 1.8	1331	1063	19	20	4	1	6	0	0
1.8 - 2.0	406	506	10	18	6	0	1	0	0
2.0 - 2.2	94	155	1	8	1	0	0	0	0
2.2 - 2.4	6	36	2	3	0	0	0	0	0
2.4 - 2.6	2	2	0	2	0	0	0	0	0
2.6 - 2.8	0	0	0	2	0	0	0	0	0
2.8 - 3.0	0	0	0	0	0	0	0	0	0
SUM	6184	6184	90	90	90	11	11	11	11
25th Percentile	1.3	1.2	1.4	1.3	1.1	1.2	1.3	1.0	1.0
Median	1.4	1.4	1.5	1.6	1.3	1.2	1.6	1.0	1.1
75th Percentile	1.6	1.6	1.7	1.9	1.4	1.3	1.6	1.3	1.3
Mean	1.5	1.4	1.5	1.6	1.3	1.3	1.5	1.1	1.1
Std. Dev.	0.20	0.28	0.23	0.37	0.28	0.13	0.22	0.22	0.18
VPEA	0.00	0.00	0.21	0.40	0.26	0.76	1.99	2.27	2.07

Gross Vehicle Weight Distribution
(Class 2 Vehicles, 1999)

Weight Range (metric tons)	Vehicles w/ 2 Axles		Vehicles w/ 3 Axles		
	1st Axle Count	2nd Axle Count	1st Axle Count	2nd Axle Count	3rd Axle Count
0.0 - 0.2	0	0	0	0	0
0.2 - 0.4	0	0	0	0	0
0.4 - 0.6	0	1	0	0	0
0.6 - 0.8	0	2	0	0	0
0.8 - 1.0	0	71	0	1	1
1.0 - 1.2	618	1280	0	2	2
1.2 - 1.4	5554	5248	5	1	5
1.4 - 1.6	3261	3005	3	3	2
1.6 - 1.8	1599	1510	2	1	1
1.8 - 2.0	405	340	0	3	0
2.0 - 2.2	27	11	0	0	0
2.2 - 2.4	4	0	0	0	0
2.4 - 2.6	0	0	0	0	0
2.6 - 2.8	0	0	1	0	0
2.8 - 3.0	0	0	0	0	0
3.0 - 3.2	0	0	0	0	0
SUM	11468	11468	11	11	11
25th Percentile	1.2	1.2	1.3	1.2	1.2
Median	1.3	1.3	1.4	1.4	1.3
75th Percentile	1.5	1.5	1.5	1.8	1.4
Mean	1.4	1.3	1.5	1.4	1.2
Std. Dev.	0.18	0.19	0.43	0.38	0.20
VPEA	0.00	0.00	1.30	3.90	1.40

Gross Vehicle Weight Distribution
(Class 4 Vehicles, 1999)

Weight Range (metric tons)	Vehicles w/ 2 Axles 1st Axle Count	Vehicles w/ 2 Axles 2nd Axle Count	Vehicles w/ 3 Axles 1st Axle Count	Vehicles w/ 3 Axles 2nd Axle Count	Vehicles w/ 3 Axles 3rd Axle Count
0.0 - 0.5	0	0	0	0	0
0.5 - 1.0	0	2	0	0	0
1.0 - 1.5	1	1	0	0	0
1.5 - 2.0	6	3	1	1	2
2.0 - 2.5	7	5	1	0	8
2.5 - 3.0	17	8	3	2	15
3.0 - 3.5	11	7	7	0	5
3.5 - 4.0	15	5	7	5	9
4.0 - 4.5	17	13	9	5	6
4.5 - 5.0	7	17	12	8	5
5.0 - 5.5	12	13	7	5	7
5.5 - 6.0	10	10	4	3	1
6.0 - 6.5	6	5	3	1	2
6.5 - 7.0	4	6	5	3	2
7.0 - 7.5	4	6	1	6	0
7.5 - 8.0	3	3	2	5	0
8.0 - 8.5	4	5	0	8	0
8.5 - 9.0	3	6	0	2	0
9.0 - 9.5	1	3	0	2	0
9.5 - 10.0	2	5	2	2	1
10.0 - 10.5	4	3	0	1	0
10.5 - 11.0	2	2	0	0	1
11.0 - 11.5	3	3	1	1	0
11.5 - 12.0	1	2	0	0	0
12.0 - 12.5	3	1	1	2	1
12.5 - 13.0	6	3	0	2	0
13.0 - 13.5	4	2	2	0	0
13.5 - 14.0	4	2	0	0	1
14.0 - 14.5	3	4	0	1	1
14.5 - 15.0	3	5	0	0	1

Weight Range (metric tons)	Vehicles w/ 2 Axles 1st Axle Count	Vehicles w/ 2 Axles 2nd Axle Count	Vehicles w/ 3 Axles 1st Axle Count	Vehicles w/ 3 Axles 2nd Axle Count	Vehicles w/ 3 Axles 3rd Axle Count
15.0 - 15.5	3	2	0	1	0
15.5 - 16.0	1	1	0	1	0
16.0 - 16.5	2	2	0	0	0
16.5 - 17.0	1	1	0	0	1
17.0 - 17.5	2	3	0	0	0
17.5 - 18.0	5	2	0	1	0
18.0 - 18.5	1	1	0	0	1
18.5 - 19.0	0	0	1	1	0
19.0 - 19.5	3	2	0	0	0
19.5 - 20.0	0	4	0	0	0
20.0 - 20.5	0	2	0	0	0
20.5 - 21.0	1	5	0	0	0
21.0 - 21.5	0	2	0	1	0
21.5 - 22.0	1	0	0	0	0
22.0 - 22.5	2	3	0	0	0
22.5 - 23.0	2	4	0	0	0
23.0 - 23.5	0	0	0	0	0
23.5 - 24.0	1	1	0	0	0
24.0 - 24.5	0	3	0	0	0
24.5 - 25.0	2	1	0	0	0
25.0 - 25.5	1	0	1	0	0
25.5 - 26.0	0	2	0	0	0
26.0 - 26.5	2	2	0	0	0
26.5 - 27.0	0	0	0	0	0
SUM	193	193	70	70	70
25th Percentile	3.6	4.6	3.7	4.7	2.7
Median	5.5	7.1	4.8	7.2	3.7
75th Percentile	12.6	14.4	6.1	8.6	5.0
Mean	8.3	9.7	5.7	7.6	4.8
Std. Dev.	6.15	6.78	3.68	3.86	3.54
VPEA	0.85	0.72	0.70	0.77	0.89

Axle Weight Distribution (by Axle)
(Class 5 Vehicles, 1999)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count
0.0 - 0.5	0	0
0.5 - 1.0	0	3
1.0 - 1.5	176	21
1.5 - 2.0	1543	557
2.0 - 2.5	1396	1034
2.5 - 3.0	451	699
3.0 - 3.5	381	516
3.5 - 4.0	331	342
4.0 - 4.5	227	287
4.5 - 5.0	142	235
5.0 - 5.5	81	249
5.5 - 6.0	37	183
6.0 - 6.5	28	143
6.5 - 7.0	24	118
7.0 - 7.5	16	95
7.5 - 8.0	24	75
8.0 - 8.5	20	63
8.5 - 9.0	14	52
9.0 - 9.5	26	57
9.5 - 10.0	19	32
10.0 - 10.5	19	31
10.5 - 11.0	15	24
11.0 - 11.5	8	22
11.5 - 12.0	10	23
12.0 - 12.5	3	16
12.5 - 13.0	14	20
13.0 - 13.5	8	12
13.5 - 14.0	10	7
14.0 - 14.5	6	20
14.5 - 15.0	4	18
15.0 - 15.5	13	11

Weight Range (metric tons)	1st Axle Count	2nd Axle Count
15.5 - 16.0	9	17
16.0 - 16.5	9	12
16.5 - 17.0	6	11
17.0 - 17.5	6	8
17.5 - 18.0	10	6
18.0 - 18.5	8	9
18.5 - 19.0	4	9
19.0 - 19.5	3	7
19.5 - 20.0	5	5
20.0 - 20.5	3	9
20.5 - 21.0	10	16
21.0 - 21.5	11	14
21.5 - 22.0	7	17
22.0 - 22.5	3	14
22.5 - 23.0	23	20
23.0 - 23.5	0	0
23.5 - 24.0	4	8
24.0 - 24.5	6	5
24.5 - 25.0	5	12
25.0 - 25.5	4	8
25.5 - 26.0	3	5
26.0 - 26.5	3	8
26.5 - 27.0	8	6
27.0 - 27.5	0	5
27.5 - 28.0	0	0
SUM	5196	5196
25th Percentile	1.9	2.3
Median	2.2	3.2
75th Percentile	3.4	5.3
Mean	3.4	4.8
Std. Dev.	3.62	4.34
VPEA	0.01	0.02

Axle Weight Distribution (by Axle)
(Class 6 Vehicles, 1999)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count
0.0 - 0.5	0	0	0
0.5 - 1.0	0	0	1
1.0 - 1.5	7	4	14
1.5 - 2.0	52	41	51
2.0 - 2.5	144	101	119
2.5 - 3.0	156	172	206
3.0 - 3.5	127	212	184
3.5 - 4.0	219	152	141
4.0 - 4.5	249	146	119
4.5 - 5.0	217	130	161
5.0 - 5.5	130	112	108
5.5 - 6.0	86	75	70
6.0 - 6.5	43	67	60
6.5 - 7.0	21	41	45
7.0 - 7.5	23	27	33
7.5 - 8.0	7	29	22
8.0 - 8.5	4	32	38
8.5 - 9.0	6	38	48
9.0 - 9.5	2	32	30
9.5 - 10.0	4	28	18
10.0 - 10.5	5	24	10
10.5 - 11.0	0	14	10
11.0 - 11.5	1	4	5
11.5 - 12.0	1	4	3
12.0 - 12.5	1	3	6
12.5 - 13.0	0	6	3
13.0 - 13.5	0	2	1
13.5 - 14.0	0	3	0
14.0 - 14.5	1	2	0

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count
14.5 - 15.0	0	2	0
15.0 - 15.5	1	1	1
15.5 - 16.0	0	0	0
16.0 - 16.5	2	2	3
16.5 - 17.0	1	1	1
17.0 - 17.5	0	0	1
17.5 - 18.0	2	2	2
18.0 - 18.5	0	0	0
18.5 - 19.0	0	0	0
19.0 - 19.5	1	2	0
19.5 - 20.0	1	2	0
20.0 - 20.5	0	1	0
20.5 - 21.0	0	0	1
21.0 - 21.5	2	1	3
21.5 - 22.0	0	1	1
22.0 - 22.5	1	0	1
22.5 - 23.0	1	0	0
23.0 - 23.5	0	0	0
23.5 - 24.0	0	0	0
24.0 - 24.5	1	2	0
24.5 - 25.0	1	2	0
25.0 - 25.5	0	0	0
SUM	1520	1520	1520
25th Percentile	3.0	3.1	2.9
Median	4.1	4.2	4.1
75th Percentile	4.9	5.9	5.6
Mean	4.2	5.0	4.7
Std. Dev.	2.10	2.86	2.61
VPEA	0.03	0.04	0.04

Axle Weight Distribution (by Axle)
(Class 7 Vehicles, 1999)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count
0.0 - 0.5	0	0	0	0
0.5 - 1.0	0	0	0	1
1.0 - 1.5	1	0	2	5
1.5 - 2.0	4	5	4	1
2.0 - 2.5	3	3	1	2
2.5 - 3.0	2	2	1	0
3.0 - 3.5	1	2	0	1
3.5 - 4.0	0	2	1	1
4.0 - 4.5	7	0	0	3
4.5 - 5.0	5	1	2	0
5.0 - 5.5	0	1	1	3
5.5 - 6.0	1	0	1	3
6.0 - 6.5	0	0	0	0
6.5 - 7.0	2	1	3	2
7.0 - 7.5	0	1	2	1
7.5 - 8.0	0	1	2	1
8.0 - 8.5	2	2	1	0
8.5 - 9.0	0	1	0	1
9.0 - 9.5	1	2	3	1
9.5 - 10.0	1	0	1	2
10.0 - 10.5	0	0	1	0
10.5 - 11.0	0	4	3	0
11.0 - 11.5	0	2	1	0
11.5 - 12.0	1	0	1	1
12.0 - 12.5	0	1	0	0
12.5 - 13.0	0	0	0	1
13.0 - 13.5	0	0	0	0
13.5 - 14.0	0	0	0	0
14.0 - 14.5	0	0	1	0
14.5 - 15.0	0	0	0	0
15.0 - 15.5	0	0	0	0

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count
15.5 - 16.0	0	0	0	1
16.0 - 16.5	0	0	0	0
16.5 - 17.0	0	1	0	0
17.0 - 17.5	0	0	0	0
17.5 - 18.0	0	0	0	0
18.0 - 18.5	0	0	0	0
18.5 - 19.0	0	0	0	0
19.0 - 19.5	0	0	0	0
19.5 - 20.0	0	0	0	0
20.0 - 20.5	0	0	0	0
20.5 - 21.0	0	0	0	0
21.0 - 21.5	0	0	0	0
21.5 - 22.0	0	0	0	0
22.0 - 22.5	0	0	0	0
22.5 - 23.0	0	0	0	0
23.0 - 23.5	0	0	0	0
23.5 - 24.0	0	0	0	0
24.0 - 24.5	0	0	0	0
24.5 - 25.0	0	0	0	0
25.0 - 25.5	0	0	0	0
25.5 - 26.0	0	0	0	0
26.0 - 26.5	0	0	0	1
26.5 - 27.0	1	0	0	0
27.0 - 27.5	0	0	0	0
SUM	32	32	32	32
25th Percentile	2.8	2.5	3.3	2.4
Median	4.3	6.0	7.0	5.2
75th Percentile	6.0	9.5	9.5	7.9
Mean	5.3	6.4	6.6	6.2
Std. Dev.	4.70	4.05	3.63	5.24
VPEA	2.33	3.65	2.76	3.38

Gross Vehicle Weight Distribution
(Class 8 Vehicles, 1999)

Weight Range (metric tons)	Vehicles w/ 3 Axles			Vehicles w/ 4 Axles			
	1st Axle Count	2nd Axle Count	3rd Axle Count	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count
0.0 - 0.5	0	0	0	0	0	0	0
0.5 - 1.0	0	0	4	0	0	3	73
1.0 - 1.5	5	4	29	27	6	30	36
1.5 - 2.0	70	13	61	65	33	61	72
2.0 - 2.5	71	29	47	79	47	65	73
2.5 - 3.0	35	37	31	73	52	54	66
3.0 - 3.5	38	43	13	56	45	78	61
3.5 - 4.0	36	25	38	95	62	80	73
4.0 - 4.5	55	38	28	126	56	74	71
4.5 - 5.0	17	19	24	94	53	46	41
5.0 - 5.5	12	35	16	33	59	37	23
5.5 - 6.0	2	21	10	8	45	25	16
6.0 - 6.5	2	10	17	3	44	22	16
6.5 - 7.0	5	19	6	2	37	16	9
7.0 - 7.5	2	22	3	2	26	8	10
7.5 - 8.0	4	11	6	1	24	11	10
8.0 - 8.5	5	8	3	2	17	14	2
8.5 - 9.0	2	4	2	2	20	9	5
9.0 - 9.5	2	4	2	0	20	17	1
9.5 - 10.0	1	6	2	1	7	10	2
10.0 - 10.5	1	5	0	0	6	3	2
10.5 - 11.0	0	0	2	0	2	1	2
11.0 - 11.5	1	3	0	0	2	1	1
11.5 - 12.0	0	2	1	2	1	2	1
12.0 - 12.5	1	2	3	0	1	0	1
12.5 - 13.0	1	1	2	1	1	1	0
13.0 - 13.5	2	0	2	0	1	0	0
13.5 - 14.0	0	1	1	0	1	0	0
14.0 - 14.5	3	3	0	0	1	1	1
14.5 - 15.0	0	2	7	0	1	1	0
15.0 - 15.5	0	1	1	0	0	0	0
15.5 - 16.0	0	1	0	0	0	0	0
16.0 - 16.5	1	0	1	0	0	0	0
16.5 - 17.0	0	0	1	0	0	0	0
17.0 - 17.5	0	0	1	0	0	0	0
17.5 - 18.0	0	1	0	0	0	0	0
18.0 - 18.5	1	1	2	0	1	0	1
18.5 - 19.0	0	1	0	0	0	0	1
19.0 - 19.5	1	1	2	0	0	0	0
19.5 - 20.0	0	2	3	0	0	0	0
20.0 - 20.5	0	0	1	0	0	0	0
20.5 - 21.0	0	0	0	0	0	0	0
21.0 - 21.5	0	0	1	0	0	0	0
21.5 - 22.0	1	1	0	0	0	0	0
22.0 - 22.5	0	1	0	1	1	1	2
22.5 - 23.0	0	0	1	0	0	0	0
23.0 - 23.5	0	0	1	1	1	1	1
23.5 - 24.0	1	0	1	0	1	1	0
24.0 - 24.5	0	0	1	0	0	0	0
24.5 - 25.0	1	1	0	0	0	1	1
25.0 - 25.5	1	1	1	0	0	0	0
25.5 - 26.0	0	1	0	0	0	0	0
26.0 - 26.5	0	1	3	0	0	0	0
26.5 - 27.0	0	0	0	0	0	0	0
27.0 -27.5	1	0	0	0	0	0	0
SUM	381	381	381	674	674	674	674
25th Percentile	2.1	3.1	2.0	2.4	3.3	2.5	1.9
Median	3.1	4.5	3.5	3.7	4.8	3.8	3.1
75th Percentile	4.2	6.7	5.3	4.3	6.5	5.1	4.3
Mean	3.9	5.6	4.8	3.6	5.2	4.3	3.5
Std. Dev.	3.44	3.96	4.81	1.72	2.65	2.68	2.66
VPEA	0.18	0.21	0.25	0.08	0.10	0.10	0.11

Axle Weight Distribution (by Axle)
(Class 9 Vehicles, 1999)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count
0.0 - 0.5	0	0	0	0	0
0.5 - 1.0	0	1	2	9	11
1.0 - 1.5	20	17	22	98	101
1.5 - 2.0	101	85	130	413	379
2.0 - 2.5	415	311	322	478	491
2.5 - 3.0	642	306	319	591	647
3.0 - 3.5	478	373	494	900	964
3.5 - 4.0	673	767	957	805	832
4.0 - 4.5	1930	1134	1012	630	711
4.5 - 5.0	2975	767	753	520	523
5.0 - 5.5	1515	655	609	502	505
5.5 - 6.0	319	541	546	435	452
6.0 - 6.5	43	506	513	444	466
6.5 - 7.0	10	592	610	495	573
7.0 - 7.5	2	700	781	648	689
7.5 - 8.0	2	866	863	729	720
8.0 - 8.5	0	715	636	638	517
8.5 - 9.0	1	466	301	411	297
9.0 - 9.5	0	179	150	197	135
9.5 - 10.0	0	63	58	83	53
10.0 - 10.5	0	52	30	37	24
10.5 - 11.0	0	13	4	21	6
11.0 - 11.5	0	6	2	11	9
11.5 - 12.0	0	5	3	11	7
12.0 - 12.5	0	1	4	6	4
12.5 - 13.0	0	0	2	6	4
13.0 - 13.5	0	2	1	2	2
13.5 - 14.0	0	2	0	0	1
14.0 - 14.5	0	1	0	0	0
14.5 - 15.0	0	0	1	1	0
15.0 - 15.5	0	0	0	0	1
15.5 - 16.0	0	0	0	0	1
16.0 - 16.5	0	0	1	1	0
16.5 - 17.0	0	0	0	1	1
17.0 - 17.5	0	0	1	0	0
17.5 - 18.0	0	0	0	1	1
18.0 - 18.5	0	0	0	0	0
18.5 - 19.0	0	0	0	0	0
19.0 - 19.5	0	0	0	0	0
19.5 - 20.0	0	0	0	0	0
20.0 - 20.5	1	0	0	1	0
20.5 - 21.0	0	0	0	0	0
21.0 - 21.5	0	0	0	0	0
21.5 - 22.0	0	0	0	1	0
22.0 - 22.5	0	0	0	0	0
22.5 - 23.0	0	0	0	0	0
23.0 - 23.5	0	0	0	0	0
23.5 - 24.0	0	0	0	0	0
24.0 - 24.5	0	0	0	0	0
24.5 - 25.0	0	1	0	1	0
25.0 - 25.5	0	0	0	0	0
SUM	9127	9127	9127	9127	9127
25th Percentile	3.9	4.1	4.0	3.4	3.3
Median	4.5	5.6	5.4	5.1	4.9
75th Percentile	4.9	7.5	7.3	7.4	7.1
Mean	4.3	5.7	5.6	5.3	5.1
Std. Dev.	0.90	2.00	2.00	2.30	2.20
VPEA	0.00	0.01	0.01	0.01	0.01

Axle Weight Distribution (by Axle)
(Class 10 Vehicles, 1999)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count	6th Axle Count
0.0 - 0.5	0	0	0	0	0	0
0.5 - 1.0	0	0	0	3	1	1
1.0 - 1.5	2	0	0	13	6	4
1.5 - 2.0	13	6	7	34	12	17
2.0 - 2.5	28	9	10	44	28	16
2.5 - 3.0	37	10	19	56	36	38
3.0 - 3.5	27	20	35	55	40	49
3.5 - 4.0	52	41	34	43	31	36
4.0 - 4.5	92	41	27	41	23	30
4.5 - 5.0	84	28	35	26	32	35
5.0 - 5.5	58	33	28	16	29	30
5.5 - 6.0	20	23	36	23	28	21
6.0 - 6.5	9	35	26	19	29	22
6.5 - 7.0	6	22	33	17	18	26
7.0 - 7.5	2	34	26	7	18	21
7.5 - 8.0	1	32	36	5	19	21
8.0 - 8.5	0	32	27	4	17	22
8.5 - 9.0	0	23	23	5	19	12
9.0 - 9.5	0	19	16	5	16	14
9.5 - 10.0	0	11	4	4	11	8
10.0 - 10.5	0	7	7	3	10	6
10.5 - 11.0	0	3	0	2	5	2
11.0 - 11.5	0	2	1	4	2	0
11.5 - 12.0	0	0	0	2	2	1
12.0 - 12.5	0	1	1	0	0	0
12.5 - 13.0	0	0	0	0	0	0
13.0 - 13.5	0	0	0	1	0	0
13.5 - 14.0	0	0	0	0	0	0
14.0 - 14.5	0	0	0	1	0	0

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count	6th Axle Count
14.5 - 15.0	0	0	0	0	0	0
15.0 - 15.5	0	0	0	0	0	0
15.5 - 16.0	0	0	0	0	0	0
16.0 - 16.5	0	0	0	0	0	0
16.5 - 17.0	0	0	0	0	0	0
17.0 - 17.5	0	0	0	0	0	0
17.5 - 18.0	0	0	0	0	0	0
18.0 - 18.5	0	0	0	0	0	0
18.5 - 19.0	0	1	0	0	0	0
19.0 - 19.5	0	0	0	0	0	0
19.5 - 20.0	0	0	0	0	0	0
20.0 - 20.5	0	0	0	0	0	0
20.5 - 21.0	0	0	0	0	0	0
21.0 - 21.5	0	0	1	0	1	0
21.5 - 22.0	1	0	0	1	0	1
22.0 - 22.5	0	0	0	0	0	0
22.5 - 23.0	0	0	0	0	0	0
23.0 - 23.5	0	0	0	0	0	0
23.5 - 24.0	0	0	0	0	1	0
24.0 - 24.5	1	0	1	0	0	1
24.5 - 25.0	1	1	1	0	0	0
25.0 - 25.5	0	0	0	0	0	0
SUM	434	434	434	434	434	434
25th Percentile	3.5	4.2	4.0	2.6	3.3	3.3
Median	4.3	6.0	5.7	3.5	5.1	4.8
75th Percentile	4.9	7.8	7.5	5.2	7.3	7.0
Mean	4.3	6.1	5.9	4.2	5.5	5.3
Std. Dev.	1.96	2.42	2.56	2.40	2.74	2.53
VPEA	0.08	0.14	0.14	0.17	0.18	0.13

Axle Weight Distribution (by Axle)
(Class 11 Vehicles, 1999)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count
0.0 - 0.5	0	0	0	0	0
0.5 - 1.0	0	0	0	0	0
1.0 - 1.5	0	0	2	1	1
1.5 - 2.0	4	1	1	4	6
2.0 - 2.5	10	1	8	8	10
2.5 - 3.0	15	5	6	5	16
3.0 - 3.5	16	1	8	20	20
3.5 - 4.0	18	3	20	22	34
4.0 - 4.5	86	15	18	28	30
4.5 - 5.0	87	14	22	20	23
5.0 - 5.5	77	16	28	38	33
5.5 - 6.0	10	9	33	37	38
6.0 - 6.5	0	30	40	35	33
6.5 - 7.0	0	27	25	49	30
7.0 - 7.5	0	40	25	28	22
7.5 - 8.0	0	42	31	12	11
8.0 - 8.5	0	32	17	10	11
8.5 - 9.0	0	30	23	4	4
9.0 - 9.5	0	30	10	2	1
9.5 - 10.0	0	17	3	0	0
10.0 - 10.5	0	8	3	0	0
10.5 - 11.0	0	2	0	0	0
11.0 - 11.5	0	0	0	0	0
SUM	323	323	323	323	323
25th Percentile	4.2	6.3	4.8	4.2	3.9
Median	4.5	7.4	6.2	5.7	5.3
75th Percentile	5.0	8.5	7.6	6.7	6.4
Mean	4.4	7.2	6.1	5.5	5.2
Std. Dev.	0.80	1.70	1.80	1.60	1.70
VPEA	0.06	0.09	0.14	0.14	0.15

Axle Weight Distribution (by Axle)
(Class 12 Vehicles, 1999)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count	6th Axle Count
0.0 - 0.5	0	0	0	0	0	0
0.5 - 1.0	0	0	0	0	0	0
1.0 - 1.5	0	0	0	0	0	0
1.5 - 2.0	0	0	0	0	0	0
2.0 - 2.5	0	0	2	2	2	5
2.5 - 3.0	2	3	3	2	5	3
3.0 - 3.5	0	3	3	2	5	5
3.5 - 4.0	8	2	3	6	7	12
4.0 - 4.5	48	6	12	7	9	10
4.5 - 5.0	33	19	20	8	11	13
5.0 - 5.5	13	26	29	6	13	13
5.5 - 6.0	1	31	20	13	12	14
6.0 - 6.5	0	6	7	19	15	15
6.5 - 7.0	0	6	4	15	18	8
7.0 - 7.5	0	3	2	13	3	5
7.5 - 8.0	0	0	0	7	4	2
8.0 - 8.5	0	0	0	0	1	0
8.5 - 9.0	0	0	0	2	0	0
9.0 - 9.5	0	0	0	1	0	0
9.5 - 10.0	0	0	0	2	0	0
10.0 - 10.5	0	0	0	0	0	0
SUM	105	105	105	105	105	105
25th Percentile	4.1	4.9	4.6	4.8	4.4	4.1
Median	4.4	5.4	5.1	6.1	5.5	5.1
75th Percentile	4.7	5.7	5.5	6.9	6.4	6.1
Mean	4.4	5.2	5.0	5.9	5.3	5.0
Std. Dev.	0.50	0.90	1.00	1.50	1.40	1.30
VPEA	0.13	0.14	0.17	0.33	0.35	0.37

Axle Weight Distribution (by Axle)
(Class 13 Vehicles, 1999)

Weight Range (metric tons)	1st Axle Count	2nd Axle Count	3rd Axle Count	4th Axle Count	5th Axle Count	6th Axle Count	7th Axle Count
0.0 - 0.5	0	0	0	0	0	0	0
0.5 - 1.0	0	0	0	0	0	0	0
1.0 - 1.5	0	0	0	0	0	0	0
1.5 - 2.0	1	0	0	0	0	0	0
2.0 - 2.5	1	0	0	0	0	0	1
2.5 - 3.0	2	0	0	2	1	1	0
3.0 - 3.5	0	1	0	0	0	0	0
3.5 - 4.0	0	0	0	0	1	1	2
4.0 - 4.5	0	1	0	0	0	0	0
4.5 - 5.0	3	0	0	0	1	0	1
5.0 - 5.5	3	1	1	1	0	1	1
5.5 - 6.0	0	0	1	1	0	2	0
6.0 - 6.5	0	1	2	1	0	0	0
6.5 - 7.0	0	1	0	1	3	0	0
7.0 - 7.5	0	1	1	0	0	1	1
7.5 - 8.0	0	2	1	1	1	1	2
8.0 - 8.5	0	0	1	1	0	1	0
8.5 - 9.0	0	0	0	0	1	0	0
9.0 - 9.5	0	0	1	0	0	1	0
9.5 - 10.0	0	1	0	2	0	1	0
10.0 - 10.5	0	0	2	0	1	0	1
10.5 - 11.0	0	0	0	0	1	0	1
11.0 - 11.5	0	1	0	0	0	0	0
11.5 - 12.0	0	0	0	0	0	0	0
SUM	10	10	10	10	10	10	10
25th Percentile	2.7	5.6	6.2	5.3	5.2	5.5	4.0
Median	4.8	7.0	7.4	6.7	6.8	6.3	6.3
75th Percentile	5.0	7.6	8.8	8.0	8.4	8.3	7.9
Mean	4.0	6.9	7.6	6.5	6.8	6.5	6.3
Std. Dev.	1.40	2.40	1.80	2.50	2.60	2.30	2.90
VPEA	4.79	2.86	3.51	4.03	4.71	4.44	6.19

Vehicle Singularities

Year	Vehicle Class	Axle Weight (metric tons)												
		Axle 1	Axle 2	Axle 3	Axle 4	Axle 5	Axle 6	Axle 7	Axle 8	Axle 9	Axle 10	Axle 11	Axle 12	Axle 13
1998	5	25	43	5										
	5	45	43	5										
	7	15	10	10	10	5								
	10	43	69	61	17	58	59	5						
1999	13	41	73	74	31	27	30	35	36	36				
	13	50	87	89	83	83	94	87	61	98	103			
	13	52	45	97	97	100	97	76	71	45	71	71		
	13	42	42	109	108	72	65	56	70	87	82	98	91	
	13	17	44	52	24	37	86	51	39	86	42	46	45	102

The 9 vehicles listed above were recorded in the WIM raw data. These vehicles represent singularities for which statistical calculations are either not possible or would be considered meaningless. They are included for completeness sake and to provide a clearer image of the raw data.

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