NEW JERSEY TRUCK RESEARCH STUDY



PREPARED FOR: New Jersey Department of Transportation By: Delaware Valley Regional Planning Commission JUNE 1995

NEW JERSEY TRUCK RESEARCH STUDY

DELAWARE VALLEY REGIONAL PLANNING COMMISSION The Bourse Building 111 S. Independence Mall East Philadelphia, PA 19106-2515

June 1995

This report, prepared by the Transportation Planning Division of the Delaware Valley Regional Planning Commission, was financed in part by the Federal Highway Administration, and the New Jersey Department of Transportation. The authors, however, are solely responsible for its finding and conclusions, which may not represent the official views or policies of the funding agencies.

Created in 1965, the Delaware Valley Regional Planning Commission (DVRPC) is an interstate, intercounty and intercity agency which provides continuing, comprehensive and coordinated planning for the orderly growth and development of the Delaware Valley region. The region includes Bucks, Chester, Delaware, and Montgomery counties, as well as the City of Philadelphia, in Pennsylvania; and Burlington, Camden, Gloucester, and Mercer counties in New Jersey. The Commission is an advisory agency which divides its planning and service functions among the Office of the Executive Director, the Office of Public Affairs, and four line Divisions: Transportation Planning, Regional Planning, Regional Information Services Center, and Finance and Administration. DVRPC's mission for the 1990s is to emphasize technical assistance and services, and to conduct high priority studies for member state and local governments, while determining and meeting the needs of the private sector.



The DVRPC logo is adapted from the official seal of the Commission and is designed as a stylized image of the Delaware Valley. The outer ring symbolizes the region as a whole while the diagonal bar signifies the Delaware River flowing through it. The two adjoining crescents represent the Commonwealth of Pennsylvania and the State of New Jersey. The logo combines these elements to depict the areas served by DVRPC.

This report is printed on recycled paper.

DELAWARE VALLEY REGIONAL PLANNING COMMISSION

Publication Abstract

TITLE	Date Published:	June 1995
New Jersey Truck Research Study		
	Publication No.	95012

Geographic Area Covered:

Burlington, Camden, and Gloucester Counties, New Jersey

Key Words:

Traffic Count, Classification Count, Average Daily Traffic (ADT), Truck Travel, Traffic Counter, Statistics, Ranking.

ABSTRACT

This report presents the results of a truck classification counting effort to test the validity of using short-term counts to estimate 24 hour truck percentages and related characteristics. An evaluation of the degree of performance of four automatic counters, marketed by different manufacturers, is also included. The sampling, statistical methodology, analysis and conclusions of the study are documented in this report.

For More Information Contact:

 Delaware Valley Regional Planning Commission The Bourse Building
 111 South Independence Mall East Philadelphia, PA 19106 (215) 592-1800

New Jersey Truck Research Study

TABLE OF CONTENTS

	Page
EXECUTIVE SUMMARY	. 1
I. INTRODUCTION	. 3
II. SAMPLE DESIGN	. 5
 Sample Size Estimation	.5 .5 .9
III. DATA COLLECTION TECHNIQUES 1. Manual Traffic Counting 2. Automatic Traffic Counting	11 11 11
IV. RECORDING EQUIPMENT 1. Manual Classifier 2. Automatic Classifier 3. Equipment Rotation Schedule	13 13 15 25
V. INITIAL PROCESSING, VERIFICATION, AND RETAKES	29
VI. SCREENING OF CLASSIFICATION COUNTS	35
 VII. ANALYSIS AND EVALUATION OF FIELD COUNTS 1. Analysis of Time Period 2. Analysis of Automatic Counters A. Analysis by individual location B. Analysis by functional classification 3. Ranking of Automatic Counters 	37 37 37 38 39 39
VIII. CONCLUSIONS	4 3

APPENDIX

1	٦.		~	•
.1		1	2	e

Sample Size Estimation Formula A	- 1
Count Locations by County A	-3
Retake Locations	-7
Analysis Summary Tables A	-9

LIST OF MAPS

Map No.						P	age
1. Counting Locations	 	••	 ••	•••	•••		7

LIST OF TABLES

Т	able No.	Page
1.	Vehicle Classification Description (NJDOT 16 Class Format)	. 9
2.	Equipment Rotation Schedule and Usage	25
3.	List of Machine Counts Used in Processing Data	36
4.	Comparison of 8 Hour and Daily Percent of Trucks for All Locations	37
5.	Comparison of 8 Hour and Daily Percent of Trucks for All Locations	38
6.	Ranking of the Four Automatic Classifiers	41

LIST OF FIGURES

Figure No. Pa	age
1. TDC-8	13
2. Golden River Archer 6400 Series	15
3. Peek TrafiCOMP III, Model 241	17
4. Timemark Delta I	19
5. GK 5000	21
6. Four Tasks of the Data Collection Phase	23
7. Automatic Vehicle Classification Recording in Progress	27
 Percent of Truck Counts by Automatic Recorder	31
9. Machine Setup for Roads with Two Lanes by Direction	33
10. Graphical Representation of Counter Rankings	41

.

EXECUTIVE SUMMARY

Some projects, such as the Highway Performance Monitoring System (HPMS), Vehicle Miles of Travel Estimation, and noise and pollution studies, require reliable truck traffic statistics. To meet these requirements, the New Jersey Department of Transportation (NJDOT) uses a short-term manual classification count (8 hours). This count is then expanded to a 24-hour period in order to estimate truck percentages and other related characteristics. The Federal Highway Administration (FHWA) questioned NJDOT as to whether the short-term counts (10 am - 6 pm) are really representative of the 24-hour truck travel.

In response to this inquiry, NJDOT asked the Delaware Valley Regional Planning Commission (DVRPC) to undertake a truck research study to test the validity of the short-term counts versus those derived from a longer manual survey. At the same time, the study called for an evaluation of the automatic recorders used by DVRPC and NJDOT. The evaluation enabled DVRPC to compare the manual data with the automatic counts for accuracy and performance. This report describes the tests performed by DVRPC, and documents methodology, analysis, results, and general conclusions of the study.

To make the test statistically valid, a total of 60 directional counts, at 30 locations, were taken. The 30 locations were selected throughout Burlington, Camden, and Gloucester counties in a manner which insured that all functional classes of roads and highways, with the exception of local roads, would be properly represented. The final selections were coordinated with NJDOT, and took both urban and rural area types into consideration.

A side-by-side (manual and recorder) operation was conducted under normal traffic conditions. The manual classifications followed the NJDOT expanded version of the 13 column FHWA Scheme F format to 16 columns. The recorder classifications were performed using the FHWA's 13 class pattern. Nevertheless, for a fair comparison, the two count formats were imported to common files of 13 classes. All automatic devices were installed in such a way that each recorder was counting directionally one traffic lane at a time.

Although four manufacturer products were tested in this study, because of manpower and fiscal constraints, three different types of machines were used for comparison purposes at the same location. A rotation schedule was implemented in order to have each manufacturer represented with a minimum of 20 counts to statistically validate the study. Manual counts were taken on the second day of the three day machine count to ensure a fair comparison of the manual records with the automatic counts of the same day.

The manual counts provided the basis for the evaluation of the performance of each counting device. In summary, the statistical analysis of the field data provided the following conclusions:

- A longer (24 hours) classification count when compared to a shorter survey (8 hours) showed a slightly lower percentage of trucks. This difference ranged between 0.4% and 1.2% of the total number of trucks counted during the shorter period. With respect to the overall average, the eight hour count resulted in an overestimation of daily trucks by less than one percentage point, which is well within the validity range for vehicle classification counts. The analysis therefore confirmed the validity of the 10 am - 6 pm classification count in determining the 24-hour truck percentage.
- All four types of automatic recorders, disguised with an alphabetical letter to protect the manufacturers' identity, were found to perform adequately, when the resulting percentages of each device were compared to the other recorders. All classifiers worked within the average to good performance range, and no counting device demonstrated a superior performance over the others.
- No automatic counter provided reasonable results when installed across two lanes of heavy traffic flowing in the same direction. The percentage of total trucks was determined to be acceptable only when using one recorder to count each lane of directional traffic.
- All classifiers showed difficulty in differentiating between passenger cars and other 2-Axle/4-Tire vehicles. Sometimes, other classes were also misrepresented.
- The automatic classifiers, once installed properly, worked without major problems. Speed, vehicle density, traffic volume, and vehicle mix in the flow of traffic are some of the variables that can cause problems. These problems are difficult to deal with for all automatic devices, due to the wide range of traffic conditions present throughout a 24-hour period.

Truck traffic constitutes a very important component of total travel demand. To evaluate the condition of the highway system, to design adequate enhancements, and to prepare a Transportation Improvement Program (TIP), reliable truck statistics must be obtained through a survey of vehicle types and an analysis of the counts derived from this effort.

The New Jersey Department of Transportation (NJDOT) has the responsibility for meeting the requirements of federally mandated programs, such as pollutant emissions, noise studies, and Vehicle Miles of Travel (VMT) estimation. Additionally, it is responsible for determining truck characteristics needed for the Highway Performance Monitoring System (HPMS). To meet these requirements, NJDOT employs short-term (8-hour) manual traffic classification counts. These counts are then used to determine 24-hour total truck classification percentages and other truck related factors.

The Federal Highway Administration (FHWA) questioned NJDOT as to whether the shortterm (10 am - 6 pm) count is representative of the total truck percentage estimated for a 24-hour period. As a result of this request by FHWA, NJDOT asked the Delaware Valley Regional Planning Commission (DVRPC) to prepare a proposal to conduct a study of truck traffic. The study was to have two objectives: test the validity of the 8-hour manual count versus a longer manual count, and to compare the results of manual and automatic classification counts taken at the same time, for the purpose of evaluating the performance of each device used in the study.

In 1993, NJDOT approved the scope of work prepared by DVRPC and granted authorization to proceed with a Truck Research Study. This report has been compiled in response to the NJDOT request to document the work and results of the study. It contains a complete description of the study, including the sample design; equipment used; the data file processing, verification, analysis, and evaluation procedures; and a section on the conclusions derived from the study. An appendix defining the sampling formula, counting locations, and other details is also included.

II. SAMPLE DESIGN

1. Sample Size Estimation

The size of the sample used for this research study was determined by the statistical equation shown in the Appendix. The sample was designed to yield a precision rate of 10 percent with a 95 percent confidence level. The precision rate is the degree of confidence that the sampling error of a produced estimate will fall within a desired range $(\pm 10 \%)$. The confidence level represents the probability that the count will fall within that range. For the equation, the percentage of trucks was assumed to be 20 percent of the sample. As a result, the sample size, the number of manual or machine counts, was estimated to be 60 counts. This translated into 30 locations to be counted by direction.

2. Selection of Locations

After designing the sample size, DVRPC, in cooperation with NJDOT, selected the individual sample locations to be counted in each county. The samples were divided by the highway functional classification system as follows:

- Interstate, Freeway, and Expressway 6 locations
- Principal Arterial 9 locations
- Minor Arterial 8 locations
- Collector 7 locations

The locations selected for the study were chosen to give a representative sample of all types of facilities with various levels of total traffic and truck traffic. All functional classes of facilities were represented except local roads, and locations were selected from Burlington, Camden, and Gloucester counties to provide both urban and rural area type characteristics. These locations are shown on Map 1 on page 7.

A prime consideration in the determination of count locations was the physical characteristics of the sites. The selected locations provided a place to set the counting equipment and a safe and accessible location for the manual count. Whenever possible, Interstate, Freeway, and Expressway sample locations were selected where a median existed to permit traffic counters to be attached and secured. Also, the sample sites were selected with the practical consideration of attempting to provide a range of typical installations where classification counts would be desirable for HPMS purposes.



Page 7



3. Vehicle Class Types

Vehicles were classified into 16 categories defined by the New Jersey Department of Transportation. These categories represent the expanded manual count version of FHWA's 13 category Classification Scheme F. Vehicles were grouped into different classes according to their standard axle pattern. The following table lists the 16 categories that were used in this study and includes a brief description for each one. It is important to note that passenger vehicles were comprised of Class 1 (passenger cars) and Class 15 (motorcycles). All other vehicles were used in the calculation of truck traffic.

Column Title	Classification
Class 1 - Cars Class 2 - 2Axle4Tire Class 3 - 2A6T	Passenger cars, including those towing trailers Four tire vehicles, other than passenger cars Single frame vehicles having two axles and dual rear tires
Class 4 - 3AxleSingleUnit Class 5 - 4ASU * Class 6 - 3AxleTractorTrailer * Class 7 - 4ATT Class 8 - 5ATT Class 9 - 6ATT Class 10 - 5AxleMulti-Trailer Class 11 - 6AMT Class 12 - 7AMT + Class 13 - School Bus + Class 14 - Comm Bus Class 15 - Cycle	Single frame vehicles having three axles Single frame vehicles with four axles Three axle tractor trailer Four axle tractor trailer Five axle tractor trailer Six axle tractor trailer Five axle tractor multi-trailer Six axle tractor multi-trailer Seven axle tractor multi-trailer School buses Commercial passenger carrying buses Two- or three wheeled motorized vehicles
× Class 16 - Else	Other vehicles

Table 1. Vehicle Classification Description (NJDOT 16 Class Format)

NOTE : Class 1 (passenger cars) and Class 15 (motorcycles) are combined to calculate the amount of passenger vehicles. Truck traffic was comprised of all other classes (2-14).

* Class 6 and Class 7 are combined on the FHWA vehicle classification Scheme F (• 4ATT).
 + Class 13 and Class 14 are combined on the FHWA vehicle classification Scheme F (Buses).
 × Class 16 does not exist on the FHWA vehicle classification Scheme F.

III. DATA COLLECTION TECHNIQUES

This section describes the counting techniques used by DVRPC in the data collection and processing steps used to derive daily traffic volumes and truck percentages. The two counting techniques that DVRPC utilized for this study are the manual count and automatic classification recorder count.

1. Manual Traffic Counting

The manual classification is generally considered to be more reliable and accurate than the electronic recorder classification. As a result, manual classification counts were used as the base when the data in this study was analyzed. In its simplest form, the manual count is performed by field personnel using a counting tabulator, a sheet of paper, and a pencil. However, most of the manual counts performed by DVRPC involve the use of hand-held electronic counters.

The battery-powered electronic counter is a state of the art device that allows the user to count vehicles continuously, without having to take one's eyes off the road. The device tallies the vehicles counted at predetermined intervals, so that the field personnel need not do so themselves. After the count is completed, the machine is downloaded onto a personal computer (PC) where the data is placed into a spreadsheet program for easy handling and processing.

The manual counts were performed by two teams of two people at each location. The manual classification counts were taken by direction and vehicles were classified into 16 categories as defined by NJDOT according to the standard axle-pattern. The counting periods were from 6:00 am - 2:00 pm and 2:00 pm - 9:00 pm.

Safety of field personnel was a prime consideration in this type of count. Therefore, field conditions at each particular location, such as darkness or inclement weather, dictated the actual count hours. Count hours ranged from 14 to 15 hours. The counts were taken in June, July, and August in order to maximize visibility during daylight hours.

2. Automatic Traffic Counting

Automatic traffic counters are used to determine the number and type of vehicles passing a particular location. The counters are anchored to a fixed object, such as a utility pole, and use sensors (rubber hoses) that stretch across the width of the road. A diaphragm switch, actuated by the tires of a vehicle passing over the hose, sends an air pulse to the recorder, which in turn activates the electronic memory. A clock mechanism set by the field operator determines the time for tallying the number of vehicles counted. At the end of a counting interval, usually a 60 minute period, the data is electronically stored in the counter memory. Power for the counters is supplied by long lasting, rechargeable batteries.

Page 12

By using two road tubes spaced at a known distance, the electronic counters can classify vehicles according to their standard axle-pattern and group them into 13 categories as defined by the FHWA. If a machine had bi-directional classification capability, it was set accordingly. The counters were set for approximately 48 hours over a three day period. The second day of the count was the full 24-hour analysis period, and was scheduled to coincide with the day of the manual count. At the end of a counting period, a field technician picked up the recorded counts from the locations and returned to the office to download and print the data. Software in the Travel Monitoring Unit of DVRPC allowed the data to be transferred directly from the electronic counters to the PC using the serial computer input port and cable.

Finally, each Friday, field personnel made sure that all of the counting devices were synchronized to a common time basis, checked battery voltage, and verified the performance conditions of each recorder in order to minimize errors or biased counts.

IV. RECORDING EQUIPMENT

To record the classification counts at each site, an electronic device was used for the manual effort while four electronic classifiers represented the automated means of gathering truck counts.

The following were used in the study:

	Manufacturer	Product	Counter Type
•	Jamar Technologies, Inc.	TDC-8	Manual Classifier
•	Golden River Limited	Archer 6400	Automatic Classifier
•	Peek Traffic	TrafiCOMPIII, Model 241	Automatic Classifier
•	Timemark, Inc.	Delta I	Automatic Classifier
•	GK Instruments, Inc.	GK 5000 Series	Automatic Classifier

The following is a brief description of each recorder's specifications and operating characteristics:

1. Manual Classifier

TDC-8. This device, used in manual counting, is a tool that helps in performing the most common traffic data collection studies, including total volumes, turning movements, classification counts, and travel time studies. The TDC-8, shown in Figure 1 stores the type of study, the date and

time, interval used, a site code, and Figure 1. TDC-8 the data for each study. At any convenient time, one can transfer the data to a personal computer through a serial port and process it. A software program is available to read, edit, and print a variety of reports.

A full range of built-in diagnostic tests assures that the TDC-8 is working satisfactorily. Four disposable AA batteries provides the power necessary to perform the studies. The counter stores all data in its internal



memory. The manufacturer provides four templates that show how the keys are used when performing a study. Template #1 is used for classification counts. One side of this template shows the FHWA Scheme F. The other side allows one to define a customized format of up to 16 classes (NJDOT format).

2. Automatic Classifiers

Golden River Archer 6400. The Archer 6400 is an automatic two-tube vehicle classifier. The machine has a four-key keyboard and LCD display which allow the user to set the parameters for a count. The power supply on the Archer is variable. The machine can hold up to six "D" size

batteries, but will operate with as few as three. Like other automatic traffic counters, the Archer comes with two air switches used to detect axles. However, the Archer only supports road tubes as sensors, while the other counters also have the ability to support loops. The Archer also has an internal 128 kilobyte memory and a serial port.

The Archer 6400 allows the most flexibility in configuration for a count. Parameters that may be configured by field personnel, include tube separation, minimum and maximum wheelbase, minimum and maximum speed, and maximum speed variation. In addition to this, many of the standard parameters such as site number and interval length, are entered by the field personnel. Finally, the user has the ability to set the counter to start and end at specific dates and times, or to run until the memory is full.

Once a count is completed, the data may be downloaded via the serial port to a personal computer, lap-top computer, or printer. The latter is possible because the Archer classifies vehicles as it counts, rather

Figure 2. Golden River Archer 6400 Series



than relying on software to do it. The Archer uses the FHWA Type F vehicle classification scheme in combination with the user configured parameters to classify vehicles. The Archer 6400 is shown in Figure 2.

New Jersey Truck Research Study

Peek TrafiCOMP III, Model 241. This is a computerized traffic counter used to perform volume and classification studies. The machine comes standard with an internal computer with 64 kilobytes of memory, a keyboard interface with a digital display, two air switches, one serial port, and a 10 ampere-hour battery. This combination yields a simple, easily contained method to gather, store, and process traffic count data.

Figure 3. Peek TrafiCOMP III, Model 241

At a traffic count location, the machine is configured to perform the appropriate type of study. The user must provide a station identification number, count interval, and count type to the machine. Additionally, for a classification count, the spacing between the two road tubes is entered. To this information, the counter automatically adds the date and time of the count. The counter is then armed and ready to begin the count. Figure 3, on the right shows a picture of the TrafiCOMP III, model 241.

For a classification study, the TrafiCOMP III uses the FHWA Type F vehicle classification scheme. The machine records air pulses from rubber tubes stretched across the traffic lanes. This information, combined with the tube spacing, is then translated into the appropriate vehicle class and stored in the internal memory. These counts may then be downloaded to a printer or a computer via the serial port on the traffic counter.



New Jersey Truck Research Study

Timemark Delta I. The Delta I is an automatic traffic recorder that comes with a graphic user interface. On the control panel of the counter, eight different sensor configurations are presented, including two that are user defined. This allows the user to quickly and easily choose the correct layout for both the machine and the road tubes. The Delta I also comes standard with two air switches, 32 kilobytes of internal memory, a slot for a 1 megabyte memory card, and a 6 Volt 10 Amp-hour lead gel cell battery.

Engaging a Delta I for a traffic count is different from most other counters. At the count location, the user must simply select the proper sensor configuration from the control panel. The counter does not require a station identification number or any other data from the user. It keeps the

date and time internally, and uses this information and the sensor configuration to store the data. When the count is complete, the machine is downloaded to a personal computer for processing and analysis.

The Delta I requires no information to perform the count, the count identification (location, direction, etc.) must be provided after downloading a count. For a classification count, the road tube spacing, count interval, and count location are input into the computer. The software then uses this information to produce the desired count, using the FHWA Classification Scheme F.

Figure 4. Timemark Delta I



The Delta I is the only counter used in this study that does not process the count in real time. All processing is done by the software after the count. This allows for flexibility in what information is derived from the count. A picture of this unit is provided in Figure 4.

GK 5000. The GK 5000 model series recorder is a standard two road-tube counter/classifier. The unit contains a Liquid Crystal Display (LCD) on its front panel which displays the various parameters and functions associated with the counter. Power is supplied to the GK 5000 by a rechargeable sealed 6 Volt 10 Amphour lead gel battery. In the event of the battery becoming disconnected, the recorder will remember all configured parameters, including any count data. These parameters are stored in a non-volatile memory powered by a miniature battery contained on the recorder's Central Processing Unit (CPU) board, while a real time clock circuit maintains the correct time and date. To ensure reliable operation, a built in battery voltage monitor is provided suggesting that batteries should be replaced when the indicated voltage is 5.5 volts or less.

The GK 5000 can be set to perform a classification count at a particular site using two road tubes. With the proper site configuration programmed for a classification count, and the recommended spacing of 16 feet between the two road tubes, the GK 5000 is capable of classifying traffic into the 13 vehicle FHWA

Figure 5. GK 5000



classification scheme. Internal algorithms convert the impulses into the various vehicle classes within the traffic recorder. The GK 5000 is shown in Figure 5.

Once the data is collected at a given location, a data module is inserted into the GK 5000, and the count is extracted from the recorder. The data module is then removed and linked to a personal computer using the serial cable and port. The personal computer contains software that allows the data to be read and printed.

As the machine descriptions indicate, there are a variety of tasks common to the collection of data. Figure 6, on page 23, shows examples of the four most common tasks of data collection using these machines.



2. Install and check an automatic classifier.



Figure 6. Data Collection Tasks

1. Take a manual classification count.





4. Program sensor layout and other required parameters. 3. Inspect for adherence to manufacturers' requirements.



3. Equipment Rotation Schedule

There were a total of four automatic counters used in this study. Throughout this study, each automatic recorder was randomly assigned an alphabetical letter (A through D) to protect the manufacturer's identity and to avoid disclosure of performance rating toward any particular equipment brand. Because of fiscal constraints, manpower considerations, and equipment shortages, three counters were used at each location. Each recorder type was rotated according to the schedule shown below.

Interstate,		Principal	Minor			U	sage	•
]	Freeway	Arterial	Arterial	Collectors	A	B	<u>C</u>	D
	ABC	ABC	ABC	ABC	4	4	4	
	ABD	ABD	ABD	ABD	4	4		4
	ACD	ACD	ACD	ACD	4		4	4
	BCD	BCD	BCD	BCD		4	4	4
	ABC	ABC	ABC	ABC	4	4	4	
	BCD	ABD	ABD	ABD	3	4	1	4
		ACD	ACD	ACD	3		3	3
		BCD	BCD			2	2	2
		ABC			1	1	1	
Totals	6	9	8	7	23	23	23	21

Table 2. Equipment Rotation Schedule and Usage

In total, 90 automatic classifiers were used in the collection of data at the 30 locations. Classifiers A, B, and C were used 23 times while equipment D was used 21 times.

To statistically validate the test, each manufacturer's device was represented with a minimum of 20 counts.

Figure 7, on page, 27 shows an on-going classification count taken by an automatic recorder.


Figure 7. Automatic Vehicle Classification Recording in Progress

. 1

V. INITIAL PROCESSING, VERIFICATION, AND RETAKES

At the end of each scheduled week of machine classification counts, the counters were downloaded onto a computer and processed. A printout was then obtained and checked out against each field sheet to see if any abnormalities in the field conditions were observed and reported by the unit installers.

Similarly, the manual classification counts recorded on TDC-8 counters were downloaded and processed with TDC-8's own software. Again, the manual counts were checked with the field sheet to identify any unusual circumstances observed during the course of the count. This was done to identify anything that would influence the count, such as an unusual traffic backup, an accident, a temporary closure of a lane, etc.

The design of the study permitted direct comparison between the manual and machine classification counts since they were taken at the same location on the same day. This eliminated the need to apply any seasonal factors to the machine counts and greatly facilitated the comparison of machine and manual counts.

The field counts were imported into Lotus spreadsheet files. One spreadsheet file consisted of a manual count and three or four machine counts (Machines A, B, C, D) for a single location in one direction - northbound/eastbound (NB/EB) or southbound/westbound (SB/WB). Each location had two corresponding spreadsheet files. One file recorded the traffic volumes in a northbound or eastbound direction, and the second file recorded the traffic volumes in a southbound or westbound direction. All traffic volumes were recorded on an hourly basis.

The automatic recorder data was grouped into two time periods, an 8-hour time period (10:00 am - 6:00 pm) and a 24-hour time period (12:00 am - 12:00 am). The manual counts were recorded for only part of the full 24 hours, so they were grouped into an 8-hour time period and a 15-hour time period. The manual count time period started at approximately 6:00 am and terminated at approximately 9:00 pm of the same day. For the purpose of this study, all field counts were also divided into three vehicle classifications: cars, cycles, and trucks. The percentage of trucks within total traffic was thus determined for each count at each location.

The data from the individual location spreadsheet files were used to graphically illustrate the traffic volumes and truck percentages recorded at each station by each counter. These graphs were used to compare the results of the counting mechanisms. Figure 8, on page 31, shows the percent of trucks on the I-295 NB off-ramp at US 130 between 10:00 am and 6:00 pm. Truck percentage in this figure is reported by manual observers and by automatic counters A, B, and C.



Figure 8. Percentage of Truck Traffic for I-295 NB Off-Ramp to US 130

These individual location spreadsheet files were combined into three summary spreadsheet files: one file for northbound-eastbound traffic volumes, one file for southbound-westbound traffic volumes, and one file for total traffic volumes. These files contained the field count data for each location stratified by count (manual or machine A, B, C, D), time period (8-hour, 15-hour, or 24-hour), and vehicle classification (cars, cycles, or trucks).

The spreadsheet files were screened for reasonableness. In some instances, it was clear that the data recorded by a machine, when compared to the manual data, was inaccurate. In other instances, the graphs showed examples of inaccurate machine counts for total volumes and truck percentages. A machine count that was widely divergent from the manual count data was considered inaccurate and was removed from the database. These counts were removed from the files and scheduled to be retaken.

The tables and graphs highlighted a significant problem that produced inaccurate machine classification counts. NJDOT asked DVRPC to set two-lane same direction facilities with one machine. DVRPC's standard practice is to set one classifier per lane on two-lane same direction facilities. The various manufacturers of machine classifiers are non-committal about results obtained from two-lane same direction classification, because facilities with medium to high volumes of traffic were most affected by this layout configuration.

Analysis of the data recorded by this sensor configuration revealed significant undercounting on the two-lane same direction facilities when compared to the manual classification counts. DVRPC and NJDOT agreed to retake classifier counts with one recorder per lane at seven locations. This was done to increase the validity of the comparison with manual data for those locations. It was also agreed to utilize one manufacturer's machine more heavily in order to obtain an acceptable number of samples from this particular unit. Classifier counts were retaken at the following seven locations:

- I-295 between Salem County line and CR 620
- US 130 between I-295 and NJ 44
- NJ 55 between NJ 47 and CR 553
- NJ 70 between Radnor Boulevard and Troth Lane
- NJ 68 between Aaronson Road and White Pine Road
- Hampton Road between Cuthbert Boulevard and Chapel Road
- CR 669 between Conrail tracks and Somerdale Road

Figure 9, shown below, diplays the original and retake machine setups for the above locations. The counts were retaken in April and May 1994.

Figure 9. Machine Setup for Roads with Two Lanes by Direction



VI. SCREENING OF CLASSIFICATION COUNTS

The retakes were grouped in the same manner as the original counts (by count, time period and vehicle classification), and the data was entered into the existing summary spreadsheet files.

A more stringent screening process was then begun. During this process, machine counts were compared to the manual count for each location, according to three criteria. A recorder count was then considered unacceptable if it failed all three criteria. These criteria were:

- The percentage of trucks recorded by each machine for an 8-hour period must fall within 6 percentage points of the percentage of trucks recorded manually for an 8-hour period. These 6 percentage points were derived from one half or 50% of the overall average truck percentage.
- The number of trucks recorded by each machine for an 8-hour period must fall between 80% and 120% of the number of trucks recorded manually for an 8-hour period. The ± 20% represents double the amount of accepted error associated with volume counts. It is doubled because the truck counts only represent a fraction of the total volume count.
- The number of total vehicles recorded by each machine for an 8-hour period must fall between 90% and 110% of the number of vehicles recorded manually for an 8-hour period. The standard ± 10% is the accepted error associated with volume counts.

Seven counts (two taken by Counter A, three taken by Counter B, and two taken by Counter C) recorded at three locations failed all of the above criteria, and therefore were eliminated from the evaluation. An eighth count (taken by counter A) was also discarded due to a machine malfunction. The total number of acceptable records remaining for further analysis and evaluation were thus grouped:

Counter A - 42 counts Counter B - 44 counts Counter C - 40 counts Counter D - 20 counts

Table 3, on the following page, lists the locations and the counters used that were considered in the count analysis and ranking evaluation.

Page 36

Table 3. List of M	Jachine Counts U	sed in	Processing Data
--------------------	-------------------------	--------	------------------------

Location	C	ounte	ers		
US 206 between Stokes Road and Fawn Lake Road	A	в	С		
NJ 70 between Radnor Road and Troth Lane		в		D	
Overbrook Road between Haddonfield Road and Colwick Road		в	С		
Rising Sun Road between I-295 and Old York Road	А	в	С		
I-295 Ramps to and from US 130	Α	в	С		
NJ 68 between Aaronson Road and White Pine Road	А		С	D	
CR 543 between I-295 and Old York Road	Α	в	С		
Van Sciver Parkway between Woodlane Road and Charleston Road	А	в	С		
Union Mills Road between Ark Road and NJ 38	А		С		
CR 674 between Ark Road and Fostertown Road	А	в	С		
NJ 90 between NJ 73 and Haddonfield Road	А	в			
Hampton Road between Cuthbert Road and Chapel Road	А	в	С	D	
US 322 between NJ 55 and Lambs Road		в		D	
NJ 168 between Davistown Road and Gloucester Lane	Α	в			
CR 669 between Conrail Tracks and Somerdale Road	А	в	С	D	
CR 641 between Elm Avenue and Kings Highway	Α	в			
NJ 55 between Cumberland County Line and US 40	А	в			
US 40 between NJ 55 and Salem County Line	А	в	С		
CR 667 between NJ 45 and CR 551 Spur	А	в	С		
I -295 between Salem County Line and CR 620	Α	в	С		
US 322 between CR 671 and CR 653		в	С		
US 130 between I-295 and NJ 44		в	С	D	
CR 607 between CR 653 and I-295	А	в		D	
CR 653 between Harmony Road and NJ 44	Α		С	•	
Mantua Avenue between 5th Street and 6th Street	Α		С	D	
NJ 55 between CR 553 and NJ 47	А		С	D	
CR 553 between Cedar Avenue and Hunter Street		в	С	D	
					25.

VII. ANALYSIS AND EVALUATION OF FIELD COUNTS

1. Analysis of Time Period

The first round of analysis involved comparing the percentage of trucks for an 8-hour period to the percentage of trucks for a 24-hour period (15-hour period for manual counts). Table 4 shows the percentage of trucks for these time periods for each counting method. These values represent the percentage of trucks on all roads counted for the study and reflect the NJDOT methodology for computing them.

	Percent of Trucks											
Classifier Manual A B C	8-Hour	24-Hour	Difference									
Manual	19.4	19.0*	0.4									
A	25.8	25.4	0.4									
В	29.1	28.1	1.0									
C	25.1	23.9	1.2									
D	17.0	16.6	0.4									

Table 4. Comparison of 8-Hour and Daily Percent of Trucks for All Locations

Percentages computed by considering class 3 in the truck category.

* This percent was calculated from a 15-hour count.

From a review of the above table, one can see that the percentage of trucks during the 8hour period closely approximates the percentage of trucks recorded during the 24-hour period for machines and observed during the 15-hour period for the manual count.

2. Analysis of Automatic Counters

Further analysis and evaluation was carried out for those recorder counts that were considered acceptable. The analysis involved comparing the results of the automatic counts against the results of the manual counts. The two sets of data were compared according to two criteria. The first comparison evaluated machine counts against manual counts by individual location. The second comparison analyzed the machine against the manual counts by functional class.

Page 38

A. Analysis by individual location

Two different measures were used when analyzing the traffic counts by location. The first measure was used to compare machine counts to manual counts for the following information: number of trucks in an eight hour period, percentage of trucks in an eight hour period, and number of total vehicles in an eight hour period. At each location, the machine count that was nearest to the manual count was considered most accurate; the machine count that was furthest from the manual count was considered least accurate.

The second measure by individual location was similar to the first. It compared machine counts to manual counts for the same information as the first measure. However, this measure excluded Class 3 (pick-up trucks, panels, and vans). This class of vehicle has a wheelbase that is very similar to Class 2 vehicles (passenger cars), and many machines have difficulty distinguishing between them. For this reason, these vehicles were removed from the truck totals and percentages and added to the passenger car totals. Table 5 presents the percentages computed in this fashion. Again the differences between an 8-hour count and a 24-hour count of both Tables 4 and 5 are small, and for the purpose of this study are considered negligible.

Classifier Manual A	Percent of Trucks												
Classifier	8-Hour	24-Hour	Difference										
Manual	8.9	10.0*	-1.1										
A	12.9	13.1	-0.2										
В	14.0	14.1	-0.1										
C	12.3	11.8	0.5										
D	12.3	12.4	-0.1										

 Table 5. Comparison of 8-Hour and Daily Percent of Trucks for All Locations

Percentages computed by considering class 3 in the passenger car category.

* This percent was calculated from a 15-hour count.

For each location and each measure, the machine and manual counts were compared. The machines were then ranked from 4.00 to 1.00. A ranking of 4.00 was given to the counter which was most accurate for the greatest number of counts. The least-accurate machine received a ranking of 1.00.

B. Analysis by functional classification

The functional class analysis was performed on the basis of four different criteria. These criteria were: percentage of trucks during an eight hour period, number of trucks during an eight hour period, average number of vehicles during an eight hour period, and daily number of vehicles. These measures were applied on the level of functional classification. The counts represent the total counts for all facilities within the functional class, divided by the number of facilities within that class.

The location counts were sorted by functional class, and the data (total vehicles, total cars, total cycles, total trucks, and percent of trucks) were added for each functional class and divided by the number of facilities in that class. The counts were compared for each functional classification: interstate, freeway/expressway, principal arterial, minor arterial, and collector.

The 8-hour manual counts for each functional classification were compared to the machine counts. The counter that showed the least difference was considered the most accurate, and the counter with the greatest difference was considered the least accurate.

The daily total number of vehicles was analyzed differently. Since manual counts were taken for 15 hours, comparison with the full 24-hour machine counts was difficult. The manual counts were increased by 15 percent (the approximate difference in traffic volume between 15 and 24 hours), and the machine counts were compared to this number. The machine count that was closest to the manual count for daily number of vehicles was considered most accurate; the count that was furthest from the manual count was considered least accurate.

The counters were ranked according to their performance on each measure for each counter; the counter with the highest total was given the best ranking.

3. Ranking of Automatic Counters

As mentioned above, the most accurate counter was given a ranking of 4.00 for each evaluation measure, and the counter that was least accurate was given a 1.00. A ranking of 4.00 indicates a very good performance by the machine counter; 3.00 indicates a good performance; 2.00 indicates an average performance; and 1.00 indicates a poor or unacceptable performance.

Table 6, shown on page 41, presents summaries of performance rankings for the four recorders by different manufacturers and by all criteria applied in this study. The rankings were averaged to determine an overall performance ranking. The results indicate that all classifiers performed in the range of average to good. No counter received a superior ranking, nor did any rate inferior to the rest. Figure 10, also shown on page 41, displays the final rankings for the four counting devices in a graphical form. The results of the statistical analysis leading to these rankings are summarized in the forms included in the Appendix.

The first table in the Appendix (pp. A-9 through A-11) shows the manual and machine classification counts sorted by highway functional class for all locations. The five counts (one manual count and four machine counts per location) show the total number of vehicles, number of cars, number of motorcycles, and number of trucks for an 8-hour period and a daily period. The daily period for manual counts consists of a 15-hour count; the daily period for all machine counts is 24 hours. These data items were taken from the actual vehicle classification counts. The percent of trucks was derived by dividing the number of trucks by the total number of vehicles. An empty cell indicates that no count was taken successfully at that location for that specific machine.

At the bottom of each functional classification grouping, there are six rows. The first and second row show the 8-hour total and daily total number of vehicles, number of cars, number of cycles, and number of trucks. The percent of trucks for the 8-hour and daily total was again derived by dividing the number of trucks by the total number of vehicles. The third row shows the 8-hour mean for each data item, and the fourth row shows the 8-hour standard deviation. The fifth row shows the daily mean, and the sixth row shows the daily standard deviation.

The last six rows of the table (pp. A-11) show the 8-hour total, 8-hour mean, 8-hour standard deviation, daily total, daily mean, and daily standard deviation for all location counts. These items were computed for analyzing the results of each manual or machine count. The 8-hour and daily manual means were compared to the 8-hour and daily mean for each machine count of total traffic, number of trucks, and percent of trucks.

The second and third tables present the raw data by direction. The second table (pp. A-13 through A-15) shows the one-way counts that were taken directly from the manual and machine count data for traffic moving in a northbound or eastbound direction. Again, the five counts each have five data items: total number of vehicles, number of cars, number of cycles, number of trucks, and percent of trucks. The 8-hour count was found by adding the count data for 10:00 am through 6:00 pm. The daily count represents 15 hours for manual counts and 24 hours for machine counts.

The third table (pp. A-17 through A-19) presents information in the same format as the second table. This table, however, presents information for traffic moving in a southbound or westbound direction.

Measures	Counter A Ranking	Counter B Ranking	Counter C Ranking	Counter D Ranking
8-Hour Number of trucks, percent of trucks, and total vehicles by individual location	3.80	1.20	3.00	2.00
8-Hour Number of trucks and percent of trucks (excluding Class 3 vehicles), and total vehicles by individual location	3.20	3.80	2.00	1.00
8-hour Percent of trucks by functional classification	3.20	1.00	3.00	3.80
8-Hour Number of trucks by functional classification	2.60	1.00	3.40	3.00
8-Hour Number of vehicles by functional classification	2.00	2.80	2.00	3.20
Daily Total Number of vehicles by functional classification	1.60	3.20	2.60	2.60
Overall Ranking	2.57	2.17	2.67	2.60

Table 6. Ranking of the Four Automatic Classifiers

1-Poor, 2-Average, 3-Good, 4-Very Good





VIII. CONCLUSIONS

The focus of the New Jersey Truck Research Study was twofold: to test the validity of an 8-hour manual traffic classification count versus a 24-hour count, and to evaluate the performance of certain automatic vehicle classification counters. The results of the study confirm the hypothesis that 8-hour manual classification counts are as valid as the 24-hour counts, and that all automatic counters produce acceptable and comparable results.

Upon analysis of the classification counts, the results indicated that the 8-hour percentage of trucks was slightly higher than that of the 24-hour period. However, the difference between the 8-hour and the 24-hour counts was minimal, ranging from 0.4% to 1.2%. On the overall average, the 8-hour count resulted in overstating the daily trucks by less than one percentage point, which is well within the validity range for vehicle classification counts.

Analysis of the second objective of the study indicates that all four classifiers produce reasonable results, if installed according to the manufacturers specifications concerning sensor configuration and distance between sensors. As the results indicated, Classifiers C and D produced more accurate results than Classifiers A and B, with Classifier C receiving the highest ranking. However, all classifiers fell within the average to good performance range. As shown in Figure 10 on page 41, none of the devices tested performed in a superior manner when compared to the others. Each classifier demonstrated unique advantages and disadvantages. The benefits and limitations vary from raw data, speed, and classification available from Counter C to overcounting a specific class of vehicles in Counter D.

The study produced several other findings of interest. For instance, it became apparent during the study that all of the classifiers have difficulty differentiating between Class 2 (passenger cars) and Class 3 (other 2-Axle/4-Tire vehicles), since the wheelbases of these vehicles are so similar. Therefore, when Class 3 vehicles are included with trucks in the analysis, it may tend to overstate the truck percentage.

The study also confirmed that counters should be installed to classify vehicles for one lane rather than two lanes in the same direction. None of the counters produced acceptable results when installed across two lanes of heavy traffic flowing in the same direction. This configuration verified the manufacturers' claim that the classifiers work across two lanes only at low traffic volumes spread out uniformly during the 24-hour period.

This study also indicated that manual classification counts are more accurate than machine classification counts taken by portable road tube classifiers. Machines, however, are more cost-effective. The expenditures in terms of dollars and person-hours are far less with machine classification counts than with comparable manual classification counts. Results from machine classifiers are generally reasonable and useful for determining truck percentage, but they are less accurate than manual classification counts. The manual count produces a better result in classifying vehicle type than our current method of portable road tube machine classification.

Despite the efficiency of machine classifiers, there are conditions where it is more appropriate to use manual classifiers rather than machine classifiers. It is more appropriate to use manual classification on particularly high volume roads, even though high volume facilities are taxing to the enumerator, and fatigue may have a detrimental effect on accuracy. In addition, highway facilities without a median prohibit setting of machine classifiers, and require manual classification regardless of volume levels. For most other conditions, portable road tube classifying machines can provide a reasonable estimate of truck percentage.

In summary, despite various minor difficulties, the overall results of this study indicated that performing manual 8-hour classification counts is an acceptable way to obtain 24-hour truck percentages, and that any of the automatic vehicle classifiers could be used to provide adequate results, as far as truck percentage characteristics and volumes are concerned.

APPENDIX

- Sample Size Estimation Formula
- Count Locations by County
- Retake Locations
- Analysis Summary Tables

SAMPLE SIZE ESTIMATION FORMULA

The sample size for estimating the percent of trucks is computed as follows:

$$h = Z_{\sqrt{\frac{P(1-P)}{n}}}$$

Where: $\mathbf{h} =$ the sampling error or precision rate (assumed 10%)

- z = value of the standard normal statistic for confidence level (assumed 95%)
- \mathbf{p} = the percent of trucks obtained from the sample (assumed 20%)
- n = sample size or the number of manual or machine counts (n is estimated to be 60 counts)

COUNT LOCATIONS BY COUNTY

Burlington County Classification Count Locations by Functional Class

Route	ID	Between	Functional Class
I-295	B-7U*	Ramps to/from US 130	Interstate, Freeway, Expressway
NJ 70	B-16U	Radnor BlvdTroth Lane	Principal Arterial
NJ 73	B-17U	Brick Rd-Evesham Rd	u u
NJ 68	B-18R	Aaronson Rd- White Pine Rd	
US 206	B-25R	Stokes Rd-Fawn Lakes Rd	Minor Arterial
Rising Sun Road	B-26R	I-295- NJ Tpke	
CR 674	B-27U	Ark Rd-Fostertown Rd	
CR 543	B-34U	I-295-Old York Road	Collector
Van Sciver Parkway	B-35U	Woodlane Rd-Charleston Rd	"
Union Mills Road	B-36U	Ark Rd-NJ 38	u

*(B = county initial, 7 = identifier coding #, U = urban area type, R = rural area type)

Camden County Classification Count Locations by Functional Class

<u>Route</u>	ID	Between	Functional Class
NJ 90	C-6U	US 130 - NJ 73	Interstate, Freeway, Expressway
NJ 73	C-13U	US 30 - CR 536 Spur	Principal Arterial
NJ 70	C-14U	CR 673 - Springdale Rd	u u
NJ 168	C-15U	Davistown Rd - Gloucester Co	н ц
CR 623	C-23U	Cuthbert Rd - Chapel Rd	Minor Arterial
CR 669	C-24U	Conrail Tracks - Somerdale Rd	" "
Overbrook Road	C-32U	Haddonfield Rd-Colwick Rd	Collector
CR 641	C-33U	Elm Ave - NJ 41	11

COUNT LOCATIONS BY COUNTY(continued)

Gloucester County Classification Count Locations by Functional Class

Route	ID	Between	Functional Class						
I-295	G-1R*	Salem Co - CR 620	Interstat Express	te, Freeway, way					
US 130	G-2R	I-295 - NJ 44	"						
NJ 55	G-3U	NJ 46 - CR 553	"	11					
NJ 55	G-4U	Cumberland Co - US 40	n	п					
US 322	G-10R	NJ 55 - CR 667	Principa	l Arterial					
US 322	G-11R	CR 671 - CR 653	"						
US 40	G-12U	NJ 55 - CR 613	n	n					
CR 553	G-20U	Cedar Ave - Hunter St	Minor A	Arterial					
CR 653	G-21U	NJ 44 - CR 680		H					
CR 667	G-22U	NJ 65 - Mickleton - Jefferson	"	. 11					
Mantua Ave	G-30U	2nd St - 7th St	Collecto	or					
CR 607	G-31U	I-295 - CR 653	"						

*(G = county initial, 1 = identifier coding #, U = urban area type, R = rural area type)

RETAKE LOCATIONS

LOCATION

Interstate, Freeway, Expressway

I-295 between Salem County Line and CR 620 US 130 between I-295 and NJ 44 NJ 55 between NJ 47 and CR 553

Principal Arterial

NJ 70 between Radnor Boulevard and Troth Lane	Two lane problem
NJ 68 between Aaronson Road and White Pine Road	Two lane problem

Minor Arterial

Hampton Rd. between Cuthbert Boulevard and Chapel Road	Machine malfunction
CR 669 between Conrail Tracks and Somerdale Road	Machine malfunction

Reason for Retake

Two lane problem Two lane problem Two lane problem .

New Jersey Truck Research Study

INTERSTATE									ana gana ana ana an											000124000			Colorest (
Locations and # of Lanes	Totals	Cars	Cycles	Trucks	%Trucks	Totals Counter A	Cars	Cycles	Trucks	%Trucks	Counter B	Cars	Cycles	Trucks	%Trucks	Totals	Cars	Cycles	Trucks	%Trucks	Totais	Cars	Cycles	Trucke	%Trucks
-290 Hamp to and toni US 100	13142	0 01 0	40	3183	2422%	12 269	8 928	81	3260	26 57 %	11.307	7 7 39	33	3 555	31 20%	11 62 0	9 955	80	0.004		CounterD		St.		
(14)	23251	18.098	77	5.076	21.83%	24.775	18202	197	6.376	25.74%	22,412	15,739	ศ	6.612	29.50%	24 937	18 704	170	5,063	28.33%					
J 90 Between NJ 73 & Haddonfield Rd	Manual Court	0	and the second secon			Counter A		Treasure and			Counter B	and the second				CounterC			0,000	24.01 /0	CounterD				
4	9,1 41	7,202	38	1,901	20.80%	8,073	5,829	34	2,210	27.38%	8,170	5,880	14	2,276	27.86%						O'CHAST D				27 21
(1	5 17,719	14,283	48	3,388	19.12%	17,686	13,088	75	4,523	25.57%	17,989	13,386	31	4,572	25.42%										
NJ 55 Between Cumberland Co. Line and US 40	Manual Count	6	anning a suit as suit	3		Counter A			Service of the servic		Counter B		I STATE CARE AND AND COM			Counter C					CounterD				
4	12,686	9,957	29	2,700	21.28%	12,721	9,397	55	3,269	25.70%	12,149	8,232	38	3,879	31.93%										
(1	5 21286	16,888	43	4,355	20.46%	24,832	18,260	122	6,450	25.97%	23,484	16,211	69	7,204	30.68%										
I - 295 Between Salem Co. Line and CR 620	Manual Count	7 00	25	4 050	24 64 9	CounterA	7 204	46	1.051	25 49 9	Counter B	7181	00	1705	00 54 94	CounterC		202	2222		CounterD				
4	5 20,000	13 652	52	7 205	34.01 %	24.056	14863	116	9,001	3773%	25 506	14 937	30	4,705	41 07 %	11,804	1,5/3	46	4,185	35.45%					
US 130 Between L-295 and N 144	Manual Count	10,002	UC.	1,230	M P 1. PO	Counter &	14,000	110	3,017	01.1070	Counter B	14,307	34	10,47 5	41.07 /6	20,101	15,610	124	9,44/	37.52%	0				And the second second second
4	8.364	6,766	13	1.585	18.95%						8262	5,782	21	2,459	2976%	8159	6210	34	1 01 5	22 17 %	S 154	6106	750	1 050	1 - 1 - 1 - 1
	5 16,061	13 331	19	2,711	16.88%						17 92 0	12,894	54	4,972	27.75%	17.653	13,669	66	3 918	22 1 9%	18 178	13713	1 272	1259	17.500
NJ 55 between County 553 & NJ 47	Manual Coun	6				Counter A			CTANCE IN THE OWNER	o Grandel e a conse	Counter B					CounterC			0,0,0		CounterD	10,110	1213	3,192	17.00%
4	21,308	18,152	72	3,084	14.47%	21,538	15,977	55	5,506	25.56%	100-0100-000000-0000					21,035	16,576	61	4,398	20.91 %	21,622	17230	338	4.054	18 75%
1	5 38,228	32,61.0	112	5,506	14.40%	44,008	33,277	101	10,630	24.15%				Ciplinit de service		43,954	35,228	106	8,620	19.61%	46,668	37,841	793	8.034	17.22%
8-HOURTOT	AL 76,347	59,61 5	227	16,505	21.62%	66,01 9	47,452	271	18,296	27.71%	51,815	34,797	144	16,874	32.57%	52,627	38,614	221	13,792	2621%	29,776	23,366	1,097	5 31 3	17.84%
DAILY TOT	137,544	108,862	351	28,331	20.60%	135,357	97,690	611	37,056	27.38%	107,311	73,167	309	33,835	31.53%	111,725	83,211	466	28,048	25.10%	64,846	51,554	2,066	11,226	17.31%
8-HOUR MEA	12,725	9,936	38	2,751	21.02%	13204	9,490	54	3,009	21.11%	10,363	6,959	29	3,3/5	32.57%	13,157	9,654	55	3,448	2621%	14,888	11,683	549	2,657	17.84%
8-HOUR STANDARD DEVIATIK	4,020	4232	50	4700	20.60%	27.071	10,529	100	7 411	07 28 %	21 462	14622		1,013	4.44%	5,514	4,693	20	1,128	6.40%	9,523	7,845	298	1,976	2.34%
DAKY STANDARD DEVIATION	N 7936	7 336	39	1 620	7 12%	9929	7 994	46	2 402	5.58%	3 389	1 448	23	2 345	6.03%	11 038	20,803	117	7,02	25.10%	32,423	25,777	1,045	5,601	17 27%
CALT STATEARD DETAIL		Contrast	- Constant of the owner			0,020	1,001		The second second		0,000			2,040	0.0070	11200	9,000	40	2,010	1.91%	20,145	17,061	356	3,441	0.15%
PRNCPAL ARTERIAL		60 					1																		
Locations and # of Lanes	Totals	Cars	Cycles	Trucks	%Trucks	Totals	Cars	Cycles	Trucks	%Trucks	Totals	Cars	Cycles	Trucks	%Trucks	Totals	Cars	Cycles	Trucks	%Trucks	Totals	Cars	Cycles	Trucks	STrucke
NJ 73 between Brick Rd and Evesham Rd	Manual Coun	ts				CounterA				1	CounterB				and the second second second	CounterC					CounterD		22		
4	28,148	24,842	26	3,280	11.65%											0.									
	5) 49,777	43,999	110	5,008	11.39%	Country		(1			Courter P		-			Ôt.o									
NU /U Detween Hadhor Ha & Irouilane	14.041	11 01 4	18	2100	15 02%	COUNCIA					14 443	11 11 3	18	3 21 2	22 03%	CounterC					CounterD	44.004	112441114	STOTES	
	4 23.328	19760	31	3.537	15.16%	-					29.021	22,760	40	6221	21 44%						13,390	11,331	1 570	1,395	10.44%
NJ 68 Between Aaronson & White Pine	Manual Cour	ntos	and the statement			Counter A					Counter B					Counter C					Counter D	23225	1,0/9	3,122	11.14%
4	4,592	3,497	13	1,082	23.56%	4,775	3,725	37	1,013	21 21 %						4,752	3,726	40	986	20.75%	4,790	3185	367	1 2 38	25 85%
(1	4 7,885	6,032	20	1,833	2325%	10,092	7,987	76	2,029	20.11%				and the second second second	-	9,901	8,034	75	1,792	18.10%	10,539	6,920	1.017	2.602	24.69%
US 322 Between NJ 55 & Lambs Rd	Manual Coun	nts	2007	1245 9529V	150 0.00000000000	CounterA					CounterB	12/12/2/10	2727	200022003	\$4855000 ST	CounterC			MARLE-COMP. STR.		CounterD				
2	9,433	6,925	34	2,474	2623%			2			8,696	5,904	33	2,759	31.73%						9,852	7,422	146	2,284	23.18%
(15 16,177	11,854	59	4,264	26.36%						17,317	11,993	66	5,258	30.36%			·····			20,761	16,245	330	4,186	20.16%
NJ 168 Between Davistown Rd. & Gloucester Lane	Manual Cour	15 5202	22	1 526	20 70%	Counter A	4874	21	1 007	17 31 %	ZCIO	5730	20	1 0 40	17 000	CounterC					CounterD				
2	15 10838	8 302	36	2 480	22 88%	10878	9 007	68	1 783	16.39%	12,451	10276	48	2 127	17 08%										3
NJ 73 Between US 30 & Haves Mill Bd	Manual Cour	to,ucc		E1100	22.0070	Counter A	0,027				Counter B			2,127	17.0070	CounterC				94 <u></u>	CounterD				
4	8,356	6.976	16	1.364	16.32%																counter D				
	14,610	12,204	31	2,375	1626%						<u> </u>												£		
US 40 Between NJ 55 and Salem Co. Line	Manual Cour	nto	21.200			CounterA	COST & MARKET	25/2	19400 (AMERICA)	100000000000000000000000000000000000000	Counter B	1////2020///00			G. CENTRAL	CounterC	1				CounterD				
2	6,819	4,934	16	1,869	27.41%	6,075	4,477	51	1,547	25.47%	7,278	4,230	19	3,029	41.62%	6,812	5,004	33	1,775	26.06%	12.00.000000000000000000000000000000000				
	15 11,184	8,058	34	3,092	27.65%	11,522	8,448	99	2,975	25.82%	13,322	7,822	48	5,452	40.92%	12,866	9,560	89	3,217	25.00%					
US 322 Between Co 671 and CR 653	Manual Cour	nts .				Counter A					Counter B	1 00 1	22075	100000000	10000000000	CounterC		Wang	CONTRACTOR -	1969 0 000	CounterD				1
2	6,911	5,299	18	1,594	23.06%						0,/ 39	4,984	14	1,741	25.83%	5,855	4,146	167	1,542	26.34%	-				
	14 11,436	0,911	34	2,49	21./0%	Countrat	Constant of the second				Countre P	10264	30	3,/21	20.54%	12,297	9,026	289	2,982	2425%					
NJ 70 between SpringdaleHd. and Burl. Co.	Manual Cour	10.09.0	21	0 000	11 11 1	CounterA	26				Counere					CounterC					CounterD				1
4	15 37 445	33143	51	4 251	11 35%	1																			1
	AL 106.560	88.670	194	17.696	16.61%	16,782	13.076	119	3.587	21.37%	44.166	31,970	106	12 090	27 37%	17 41 9	12876	240	4 303	24704	28 025	01 020	1 1 9 0	1000	TTEE
	A 182,680	152283	406	29,991	16.42%	32,492	25,462	243	6.787	20.89%	86,132	63,115	238	22,779	26.45%	35.064	26.620	453	7 901	22 79%	50 30 4	46 300	1,100	4,520	16704
8-HOUR ME	AN 11.834	9,852	22	1,961	16.57%	5,594	4,359	40	1,196	21.37%	8,833	6,394	21	2,418	27.37%	5.806	4292	80	1.434	24.70%	9346	7 31 3	303	1 640	17.55%
8-HOUR STANDARD DEVIAT	ON 7,976	7,398	7	673	625%	713	584	10	304	4.08%	3,226	2,721	7	882	9.1 3%	1,031	651	75	405	3.15%	4,325	4.074	261	563	824%
DAILY ME	AN 20298	16,920	45	3,332	16.42%	10,831	8,487	81	2,262	20.89%	17,262	12,623	48	4,592	26.60%	11,688	8,873	151	2,664	22.79%	19,775	15,463	1.009	3.303	16.70%
DAILY STANDARD DEVIATI	ON 14260	13,170	27	1,218	6.18%	716	521	16	629	4.75%	6,825	5,858	12	1,612	9.13%	1,574	774	120	764	3.79%	8,785	8,181	675	807	6.90%
			and the second sec								2		100 C 100		199								Non-Superior and Super-Super-		

Legend : * = total number of 2-way lanes, ** = total number of hours counted manually

Page A-9

• .



New Jersey Truck Research Study

Control Coll and La Linear Table for the control La Linear Table for the contr	MINOR ARTERIAL																									
2020Exemption Max. Loss Trans. Trans. Trans. Trans. Control Trans	Locations and # of Lanes	Totals	Cars	Cycles	Trucks	%Trucks	Totals	Cars	Cycles	Trucks	%Trucks	Totals	Cars	Cycles	Trucks	%Trucks	Totals	Cars	Cycles	Trucks	Trucks	Totals	Cars	Curlen	Trucke	of Trumber
2** 101 0.000 0.24/2 <t< td=""><td>US 206 between Stokes Ad and Fawn Lake Ad</td><td>Manual Count</td><td>10</td><td>-</td><td></td><td></td><td>Counter A</td><td></td><td></td><td></td><td></td><td>Counter B</td><td></td><td></td><td></td><td></td><td>CounterC</td><td></td><td></td><td></td><td></td><td>Counter D</td><td></td><td>01000</td><td>ILLAS</td><td>Allucko</td></t<>	US 206 between Stokes Ad and Fawn Lake Ad	Manual Count	10	-			Counter A					Counter B					CounterC					Counter D		01000	ILLAS	Allucko
Bang Bang Marging Margi	2* //51	5,498	3,119	6	1,/12	31.14%	4,525	3,145	23	1,35/	29.99%	5,501	3,655	23	1,823	33.14%	4,723	2,969	80	1,674	35.44%					
control control <t< td=""><td>Dicing Sun FB Between I-295 & Old York Bd</td><td>Manual Court</td><td>0,000</td><td></td><td>2,900</td><td>51.10 %</td><td>Counter &</td><td>0,312</td><td>31</td><td>2,004</td><td>23.1370</td><td>Counter B</td><td>7,140</td><td>34</td><td>3,448</td><td>32.44%</td><td>9,690</td><td>6,350</td><td>1 41</td><td>3,199</td><td>33.01 %</td><td></td><td></td><td></td><td>and the second second</td><td></td></t<>	Dicing Sun FB Between I-295 & Old York Bd	Manual Court	0,000		2,900	51.10 %	Counter &	0,312	31	2,004	23.1370	Counter B	7,140	34	3,448	32.44%	9,690	6,350	1 41	3,199	33.01 %				and the second second	
Control Of Distance Schemaning Control	2	4.966	2247	5	2.714	54.65%	4.884	2200	307	2.377	48.67%	5230	2.301	9	2000	55 83%	4155	1 622	000	0.000		Counter D				
Control of Lange (1) Monal Courter, result Courter, result <th< td=""><td>(14</td><td>7,787</td><td>3,399</td><td>7</td><td>4,381</td><td>5626%</td><td>9,807</td><td>4,051</td><td>713</td><td>5,043</td><td>51.42%</td><td>9,165</td><td>3,909</td><td>16</td><td>5240</td><td>57.17%</td><td>9,963</td><td>3.621</td><td>550</td><td>5790</td><td>58 1 4%</td><td>1</td><td></td><td></td><td></td><td></td></th<>	(14	7,787	3,399	7	4,381	5626%	9,807	4,051	713	5,043	51.42%	9,165	3,909	16	5240	57.17%	9,963	3.621	550	5790	58 1 4%	1				
2 2 2 2 2 4 4 6 6 1 1 6 6 1 1 4 0 1 4 0 1 4 0 1 4 0 1 1 4 0 1 4 0 1 4 0	County 674 Between Ark & Fostertown Rd	Manual Coun	ts .				Counter A					Counter B		The second s			CounterC	0,001	000	0,1 32	30.1470	CounterD				
Unrepties food Behavior Cather (Be As Charger) Unrepties food Behavior Cather (Be As C	2	2,295	1,797	8	490	21.35%	2,170	1,682	14	474	21.84%	2,252	1,694	13	545	2420%	2,076	1,635	11	430	20.71%	overhere				
Number of a large of	(1	4,024	3206	14	804	19.98%	4,354	3,505	29	820	18.83%	4,504	3,503	43	958	21 27%	4,475	3,685	47	743	16.60%					
$\frac{1}{2} + \frac{1}{2} + \frac{1}$	Hampton Hoad Between Cuthbert Blvd & Chapel Hd	Manual Count	TS anon		297	10 51 9	CounterA	2110	10	460	10 0 40	CounterB	0.004				CounterC		A CONTRACTOR OF THE OWNER			CounterD				Telan tert
Constrat Description Description <thdescription< th=""> <thdescription< th=""> <t< td=""><td>2 14</td><td>5,002</td><td>5 069</td><td>12</td><td>609</td><td>1070%</td><td>6 586</td><td>5 663</td><td>21</td><td>900</td><td>1370%</td><td>6317</td><td>5.004</td><td>20</td><td>1 001</td><td>10.84%</td><td>3,431</td><td>3,046</td><td>30</td><td>355</td><td>10.35%</td><td>3,606</td><td>3,222</td><td>52</td><td>332</td><td>921%</td></t<></thdescription<></thdescription<>	2 14	5,002	5 069	12	609	1070%	6 586	5 663	21	900	1370%	6317	5.004	20	1 001	10.84%	3,431	3,046	30	355	10.35%	3,606	3,222	52	332	921%
2 7.464 6.856 2 1.18 1.12 1.564 6.874 0.785 1.62 7.865 6.67 2.20 1.285 1.295 1.205	County 669 Retween Corrail Tracks and Somerdale F	Manuel Cour	1000		000	10.1010	Counter A	0,000	-1		10.1070	Counter B	0,210	20	1,021	10.10%	CounterC	5,486	50	649	10,49%	6,925	6,176	95	654	9.44%
(c) (c) <td>2</td> <td>7,994</td> <td>6,836</td> <td>22</td> <td>1,136</td> <td>1421%</td> <td>7,581</td> <td>6,069</td> <td>29</td> <td>1,483</td> <td>19.56%</td> <td>8,324</td> <td>6,779</td> <td>20</td> <td>1.525</td> <td>18.32%</td> <td>7.926</td> <td>6 691</td> <td>30</td> <td>1 203</td> <td>1518%</td> <td>CounterD</td> <td>7 504</td> <td>450</td> <td></td> <td></td>	2	7,994	6,836	22	1,136	1421%	7,581	6,069	29	1,483	19.56%	8,324	6,779	20	1.525	18.32%	7.926	6 691	30	1 203	1518%	CounterD	7 504	450		
County of and Fight Busen Number of and Start Total County Total County Total County County of an and Counts Total Counts <th< td=""><td>(1</td><td>15,078</td><td>12,995</td><td>• 40</td><td>2,043</td><td>13.55%</td><td>16,138</td><td>13,258</td><td>76</td><td>2,804</td><td>17.38%</td><td>18,056</td><td>14,955</td><td>57</td><td>3,044</td><td>16.86%</td><td>17,216</td><td>14,775</td><td>76</td><td>2.365</td><td>1374%</td><td>19191</td><td>16770</td><td>100</td><td>2 059</td><td>9.50%</td></th<>	(1	15,078	12,995	• 40	2,043	13.55%	16,138	13,258	76	2,804	17.38%	18,056	14,955	57	3,044	16.86%	17,216	14,775	76	2.365	1374%	19191	16770	100	2 059	9.50%
2 0.2 <th0.2< th=""> <th0.2< th=""> <th0.2< th=""></th0.2<></th0.2<></th0.2<>	County 667 Between NJ 45 and CR 551 Spur	Manual Court	to				Counter A					Counter B					Counter C					CounterD	10,110	303	2,000	10.723
Marku Ale below in the large (19) (19) (10)	2	2,663	1,762	15	886	3327%	2,554	1,724	13	817	31.99%	2,687	1,760	11	916	34.09%	2,348	1,580	14	754	32.11%					
Markal Are Markal Are Markal Are Markal Are Markal Are Markal Are Control O Markal Are Control Are Contro Are Contro Are Cont	(1)	5,115	3,40/	10	1,040	32.00%	5,000	3,855	35	1,705	31 25%	5,968	4,032	35	1,921	32.08%	5,481	3,885	40	1,556	28.39%					
- (no. 2.36 1.8 1.0 5 2.2 773 1.98 1.00 77 398 3.00 77 398 3.00 77 398 3.00 77 398 3.00 77 398 3.00 77 398 3.00 77 398 3.00 77 398 3.00 77 398 3.00 77 398 3.00 77 398 3.00 2.07 1.00 1.00 3.00 7.00 5.00 77 1.00	Manua Ave between Str Stand our St	1 384	. 003	9	382	27 60%	1 383	955	20	408	29 50%	Couners					CounterC	7.00	-			CounterD			and the second	
County GSD lower 0. Counter 0. <t< td=""><td>- · · · · · · · · · · · · · · · · · · ·</td><td>2,305</td><td>1.619</td><td>11</td><td>675</td><td>2928%</td><td>2,781</td><td>1,965</td><td>42</td><td>774</td><td>27.83%</td><td>4</td><td></td><td></td><td></td><td></td><td>2,628</td><td>1 806</td><td>07</td><td>399</td><td>34.76%</td><td>1,519</td><td>1,068</td><td>57</td><td>394</td><td>25.94%</td></t<>	- · · · · · · · · · · · · · · · · · · ·	2,305	1.619	11	675	2928%	2,781	1,965	42	774	27.83%	4					2,628	1 806	07	399	34.76%	1,519	1,068	57	394	25.94%
2 9766 9,500 23 14.49 147.8 10,061 7,506 37 2,140 2,128 15,869 7,264 61,161 1,500 </td <td>County 553 between Cedar Ave and Hunter St</td> <td>Manual Coun</td> <td>to Ch</td> <td></td> <td></td> <td></td> <td>Counter A</td> <td></td> <td></td> <td></td> <td></td> <td>Counter B</td> <td>1</td> <td></td> <td></td> <td></td> <td>CounterC</td> <td>1,000</td> <td>. 21</td> <td>795</td> <td>3020%</td> <td>3,313</td> <td>2211</td> <td>195</td> <td>841</td> <td>25.38 %</td>	County 553 between Cedar Ave and Hunter St	Manual Coun	to Ch				Counter A					Counter B	1				CounterC	1,000	. 21	795	3020%	3,313	2211	195	841	25.38 %
LHCUT 11/109 14/000 2/2 2/2 1/2 <th< td=""><td>2</td><td>9,766</td><td>8,300</td><td>23</td><td>1,443</td><td>14.78%</td><td></td><td></td><td></td><td></td><td></td><td>10,091</td><td>7,906</td><td>37</td><td>2,148</td><td>21 29%</td><td>8,969</td><td>7204</td><td>84</td><td>1.681</td><td>18.74%</td><td>10.146</td><td>8 082</td><td>50</td><td>2012</td><td>10829</td></th<>	2	9,766	8,300	23	1,443	14.78%						10,091	7,906	37	2,148	21 29%	8,969	7204	84	1.681	18.74%	10.146	8 082	50	2012	10829
B-HCLR D/CH B/46 2003 2012 21420 1000 21420 <	(1	17,109	14,400	37	2,672	15.62%						18,849	14,805	63	3,981	21.12%	17,773	14,510	158	3,105	17.47%	20,332	16209	113	4 010	1972%
1 1	8-HOUR TOTA	4 38,248	29,006	92	9,150	23.92%	26,6/9	18,885	418	7,376	27.65%	37,564	26,979	122	10,463	27.85%	34,776	25,499	491	8,786	2526%	23,732	19,873	317	3,542	14.92%
6 +HOLE FARIAL CODE CEVINTICIA 2 / 207 3 100 1 / 208 2 / 207 1 / 208 2 / 207 1 / 208 2 / 207 1 / 208 2 / 207 1 / 208 2 / 207 1 / 208 2 / 207 1 / 208 2 / 207 1 / 208 2 / 207 1 / 207 1 / 208 1 / 208 1 / 208 1 / 208 1 / 208 1 / 208 1 / 208 1 / 208 1 / 208 2 / 207 1 / 208 208 1 / 208 208 1 / 208 208	B-UCIPICA	4 781	3,606	140	1144	23.10%	3,811	2 608	94/	1 054	27 65%	73,509	33,020	208	19,613	25.68%	73,411	54,118	1,089	18,204	24.80%	49,761	41,432	766	7,563	1520%
DALY Statuce No. Solar Max	8-HOUR STANDARD DE VIATIO	N 2,907	2 617	8	804	1429%	2.085	1.683	109	729	11.46%	2,931	2 497	10	1,490	13 58 %	4,34/	3,187	61	1,098	2526%	5,933	4,968	79	886	14.92%
DALY STANDARD DEVIATION 5268 4781 13 1.28 14.75% 4.438 3.700 255 1,551 12.84% 5,606 17.2 17.55 17.53 17.55 17.55	DALYMEA	N 8,328	6,335	19	1,974	23.70%	7,764	5,516	135	2,114	27 22%	10,501	7.661	38	2.802	26.68%	9176	6765	136	2 276	14.48%	4,043	3,385	51	780	820%
COLLECTOR Date	DALY STANDARD DEVIATIO	N 5,298	4,781	13	1,326	14.75%	4,438	3,700	255	1,551	12.64%	5,808	5,078	18	1,589	14.40%	5,695	5.046	174	1757	15.30%	A 504	7 260	192	1,891	1520%
Collection Collection Collection Correr Loss Trucks Strucks			C		- 10							18.1						and the second second		the ratio		the second second second	12.00	166	1,044	1.00 %
Occurrency Gene Option Control for and 2 of Lances Trucke Strucke Touling Strucke Strucke Strucke Touling Strucke <	COLLECTOR																									
Overbrook Rd Detween Hadorini d & Cowier Rd Manual counts Counter A	Locations and # of Lanes	Totals	Cars	Cycles	Trucks	%Trucks	Totals	Cars	Cycles	Trucks	%Trucks	Totals	Cara	Cuclen	Trucke	STricks	Totale	Caro	Cooleo	Truples	O Taxanlar		The local division of			
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Overbrook Rd between Haddonfield & Colwick Rd	Manual Coun	nts				CounterA					CounterB			II CONO	7011 CENS	CounterC	Vas	CYCles	II LEKS	76 IT UCKS	Countrals	Cars	Cycles	Trucke	%Trucks
(16) 544 407 6 131 24,08% 7 131 24,08% 7 11 107 15,40% Currly 543 Balween 1-295 & Old York Rd 1204 824 8 7 2 107 15,40% Courter 1/2 Courter 1/2 Courter 1/2 23,50% Courter 1/2 Courter 1/2 <td>2</td> <td>344</td> <td>262</td> <td>4</td> <td>78</td> <td>22.67%</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>394</td> <td>294</td> <td>4</td> <td>96</td> <td>24.37%</td> <td>330</td> <td>262</td> <td>6</td> <td>62</td> <td>18,79%</td> <td>Counterb</td> <td></td> <td></td> <td></td> <td></td>	2	344	262	4	78	22.67%						394	294	4	96	24.37%	330	262	6	62	18,79%	Counterb				
County 54: Between I-295 & Old York Rd Menual Counter D Counter RA cent ref A cent ref A cent ref A cent ref A cent ref B c	(1	5 544	407	6	131	24.08%						783	613	8	162	20.69%	695	577	11	107	15.40%					
2 12/3 12/3 12/3 62/3 2/2 2/2/3 12/3 <t< td=""><td>County 543 Between I-295 & Old York Rd</td><td>Manual Cour</td><td>nts ma</td><td></td><td>070</td><td></td><td>Counter A</td><td>004</td><td>-</td><td></td><td>10070</td><td>Counter B</td><td></td><td></td><td></td><td></td><td>CounterC</td><td></td><td></td><td></td><td></td><td>CounterD</td><td>the second s</td><td></td><td></td><td>Chester Street</td></t<>	County 543 Between I-295 & Old York Rd	Manual Cour	nts ma		070		Counter A	004	-		10070	Counter B					CounterC					CounterD	the second s			Chester Street
Van Scker Plowy Be ween Woodane Rd. & Charler A Manual Counte 1/10 1/1	2	2 034	1 542	14	478	23 50%	2 337	1867	16	454	1043%	2 378	1 717	10	381	30.12%	1,192	905	11	276	23.15%					
2 3,468 3,059 15 333 9,75% 31,49 2,777 14 358 11,37% 32,22 2,688 7 597 18,13% 30,505 25 438 12,44% Counter D Union Mills Rd. Balween Ark Rd. & NJ 38 Manual Counts -	Van Scher Plany Between Woodlane Ed. & Charledo	ri Manual Cour	1,0%C		470	20.00 %	Counter A	1,007	10	404	18.40 /	Counter B	1,717	10	160	21.30 %	2,445	1,920	28	497	20.33%					-
(14 5634 5031 24 579 60 6762 603 42 717 10.06% 6764 5.673 19 1.072 15.65% 8228 7778 68 8622 10.72% Union Mills Rd. & NJ 38 Menual Counts 906 760 4 142 5.67% 876 752 3 121 13.81% Counter 16 Counter 16 2.064 1,502 13 13.85% Counter 16 2.064 1,622 21.90 91.26% 6.00 mbr 16 2.064 1,862 32.190 91.26% 6.00 mbr 16 Counter 16 Counte	2	3,406	3,058	15	333	9.78%	3,149	2,777	14	358	11.37%	3292	2,688	7	597	18.13%	3.522	3 059	25	428	12 44%	CounterD				
Union Mills Rd. B. NJ 38 Manual Counts. Counter A Counter B Counter B Counter C Count		5,634	5,031	24	579	1028%	6,762	6,003	42	717	10.60%	6,764	5,673	19	1,072	15.85%	8,228	7 278	68	882	10.72%					
2 906 760 4 142 15,67% 876 762 3 121 13,131% 773 654 15 104 13,65% 773 654 15 104 13,65% 773 654 15 104 13,65% 773 654 15 104 13,65% 773 654 15 104 13,65% 773 654 15 104 13,65% 773 654 15 104 13,65% 773 654 15 104 13,65% 773 654 15 104 13,65% 773 654 15 104 13,65% 773 654 15 104 13,65% 773 654 15 104 13,65% 773 733 654 15 104 13,65% 773 733 654 15 104 13,65% 773 733	Union Mills Rd. Between Ark Rd. & NJ 38	Manual Cour	nts.				CounterA					CounterB	and a second second				CounterC					CounterD				
(15) 1,815 1,893 6 216 1,805 2,001 1,805 2,001 1,805 5 167 9,07% 2,004 1,862 32 190 9,12% County 641 Between Elm Ave and Kings Hwy 3,824 3,187 5 332 9,42% 3,228 2,666 14 548 16,39% 3,649 2,813 10 826 2,64% Counter C Count	2	906	760	4	142	15.67%	876	752	3	121	13.81%						773	654	15	104	13.45%					
Country 6/1 detired full we include outling Ave include outling Sign of the serve of the se	()	1,815	1,593	0	210	11.90%	2,001	1,800	8	187	9.07%	Counter D					2,084	1,862	32	190	9.12%					Sur der seren ha
2 0,02 6,102 6 478 8,53% 6,134 5,192 18 924 15,05% 6,757 5,366 120 <	County 641 Detween Elim Ave and Kings Hwy	3 50 4	3187	5	320	9 42%	3228	2 666	14	548	16 08 %	3.649	2813	10	806	00 649	CounterC					Counter D				
County 607 between Co. 663 and I-295 Manual Counts Counter A Counter B Counter B Counter C		4 5.606	5,122	6	478	8.53%	6,134	5,192	18	924	15.06%	6,757	5,366	25	1.366	2022%										
2 334 215 2 117 35.03% 356 236 2 118 33.15% 383 244 1 138 36.03% 0 000000000000000000000000000000000000	County 607 between Co. 653 and 1-295	Manual Cour	nto				Counter A					Counter B	-,		1,000	LULLI	CounterC		And all statements			CounterD				_
(15) 608 399 2 207 34.05% 713 504 4 205 28.75% 780 513 4 263 33.72% 775 466 23 286 36.09% 2 2 2,070 2,052 9 637 23.86% 2,679 2,052 20 607 23.86% 2,679 2,052 20 607 22.66% 2.728 1,992 18 713 50.4 4 20.579 2,052 20 607 22.66% 2.728 1,992 18 713 26.6 23 286 36.90% 2 2,070 2,024 9 637 23.86% 2,079 2,052 20 607 1.153 22.98% Counte r.B <	2	334	215	2	117	35.03%	356	236	2	118	33.15%	383	244	1	138	36.03%						370	221	8	1 41	29 11 9
County 653 between Harmony Rd & NJ 44 Manual Counts Counter A Counter B Counter B Counter B Counter Counter B Counter Counter B Counter C Coun	(1	5 608	399	2	207	34.05%	713	504	4	205	28.75%	780	513	4	263	33.72%						775	466	23	286	36 90%
2 2,670 2,024 9 637 23,85% 2,679 2,052 20 607 22,85% 2,728 1,992 18 718 26,32% (15) 4,591 3,460 17 1,114 24,26% 5,018 3,824 41 1,153 22,98% 5,228 3,905 45 1,277 2,4,3% 8 HOUR TOTAL 12,388 10,430 47 1,911 15,43% 11,518 9,464 60 1,594 17,31% 8,983 6,820 25 2,038 22.69% 8,545 6,177 5 1,58 18,70% 370 221 8 141 38,11% DALY TOTAL 20,832 17,554 75 3,203 15,38% 23,025 19256 129 3,640 15,81% 17,462 13,882 66 3,514 20.12% 186 15,542 185 2,953 15,81% 370 221 8 141 38,11% B-HOUR MEAN 1,770 1,430 75 3,263 1,577 10 322 17,31% 1,574	County 653 between Harmony Rd & NJ 44	Manual Cour	nts	Contraction of the second s			CounterA				00	CounterB	and a series of the second second				CounterC	0.5.00				CounterD			200	
101 4,051 3,400 17 1,114 24,20 m 5,010 3,024 71 1,103 22,20 m 5,228 3,905 45 1,277 24,43% 8-HOUR TOTAL 12,388 10,430 47 1,911 15,43% 11,518 9,464 60 1,994 17,31% 8,983 6,920 25 2,038 22.69% 8,545 6,872 75 1,598 18,70% 370 221 8 141 38,11% DALY TOTAL 20,832 17,554 75 3,203 15,38% 23,025 19,256 129 3,640 15,81% 17,462 13,882 66 3,514 20,12% 18,630 15,542 185 2,953 15,81% 775 468 23 286 36,90% B-HOUR MEAN 1,770 1,490 7 273 15,43% 1,520 1,577 10 332 17,31% 1,797 1,384 5 408 22,58% 1,109 1,374 15 30 18,70% 370 221 8 141 38,11% 8	2	2,670	2,024	9	637	23.86%	2,6/9	2,052	20	1 1 50	22.66%						2,728	1,992	18	718	26.32%					
Control 10,000 12,00		0 4,591	3,400	A7	1 011	154207	11518	9,024	60	1 004	17 21 8	A DAD	6 920	25	9000	00 505	5,228	3,905	46	1,277	24.43%				den alter and	
8-HOUR MEAN 1.770 1.490 7 273 15.43% 1.920 1.577 10 322 17.31% 1.797 1.384 5 408 22.65% 1.709 1.374 15 2.953 15.81% 775 468 23 286 36.90% 8-HOUR STANDARD DEVIATION 1.398 1.266 4 1.91 9.03% 1.250 1.066 7 210 7.76% 1.574 1.273 4 309 6.95% 1.357 1.140 7 268 6.01% 0 0 0 0.00% DALLY MEAN 2.976 2.508 11 458 15.38% 3.838 3.209 22 607 15.81% 3.492 2.776 13 703 20.12% 3.737 3.108 37 592 15.83% 775 466 23 286 36.90% DALY MEAN 2.976 2.500 8 32.09 22 607 15.81% 3.492 2.776 13 7		20832	17.554	75	3203	15.38 %	23.025	19256	129	3,640	15.81%	17,462	13.882	66	3 51 4	20124	18 680	15 542	195	2,050	15.70%	370	221	8	141	38.11%
8-HOUR STANDARD DEVIATION 1,398 1,266 4 191 9.03% 1,250 1,066 7 210 7.76% 1,574 1,273 4 309 6.95% 1,357 1,140 7 268 6.07% 0 0 0 0.00% DALY MEAN 2,976 2,508 11 458 15.38% 3,838 3,209 22 607 15.81% 3,492 2,776 13 703 20.12% 3,737 3,108 37 592 15.83% 775 466 23 286 36.90% DALY STANDARD DE VIATION 2,249 2,030 8 335 9.44% 2,465 2,147 16 393 7.55% 3,054 2,551 9 516 7.01% 3,001 2,617 21 489 6.37% 0 0 0 0.00%	8-HOUR ME	N 1,770	1,490	7	273	15.43%	1,920	1,577	10	332	17.31 %	1,797	1,384	5	408	22.69%	1,709	1.374	105	2,303	18 70%	1/5	466	23	286	36.90%
DALY MEAN 2,976 2,508 11 458 15.33 3209 22 607 15.81 3,492 2,776 13 703 20.12 3,737 3,108 37 592 15.83 775 466 23 286 36.90 37 592 15.83 775 466 23 286 36.90 37 592 15.83 575 466 23 286 36.90 37 592 15.83 575 466 23 286 36.90 37 592 15.83 575 466 23 286 36.90 37 592 15.83 575 466 20 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 595 10 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0 0.00 37 592 15.83 575 10 0 0 0 0 0 0 0 0.00 37 575 10 0 0 0 0 0 0 0.00 37 575 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	8-HOUR STANDARD DEVIATK	N 1,398	1,266	4	191	9.03%	. 1,250	1,066	7	210	7.76%	1,574	1,273	4	309	- 6.95%	1.357	1.140	7	.268	6.01%	3/0	221	0	141	30.11%
DALY STANDARD DE VIATION 2249 2,030 8 335 9,44% 2,465 2,147 16 393 7,55% 3,054 2,551 9 516 7,01% 3,001 2,617 21 489 6,37% 0 0 0 0,00%	DALY ME	N 2,976	2,508	11	458	15.38 %	3,838	3,209	22	607	15.81%	3,492	2,776	13	703	20.12%	3,737	3,108	37	592	15.83%	775	466	23	286	36.90%
	DALY STANDA PD DE VIATI	2249	2.030	8	335	9.44%	2,465	2.147	16	393	7.55%	3,054	2.551	9	516	7.01%	3,001	2,617	21	489	6.37%	- 0	0	0	0	0.00%

Legend : * = total number of 2 -- way lanes, ** = total number of hours counted manually

Page A-11

.

A

New Jersey Truck Research Study

mations and t of area	Totals	Can	Curles	Tanks	Sinchs	Totala	Car	Cuples	Trinks	Stenks	Totala	Cam	Contes	Tanala	8 T			-						-	
NJ73 between Brick Bd and Evenham Bd (NB)	TManual Cour	da .	OFCRE	IICCK	ALLONS	CounterA	Units	CYUIER	ITUCKS	DITCORE	CounterB	CAR	Cycles	IFUCKE	BIRLICKS	lotais	Can	Cycles	Trucks	STrucks	Totals	Care	Cycles	Trucks	STrupka
4*	13,164	11,567	26	1,571	11.93%						COCKIET D					Counterc					CounterD				
(15) *	25,194	22,404	57	2,733	10.85%																				
US 206 between Stokes Rd and Fawn Lake Rd (NB)	ManualCour	ita .		2000		CounterA	1000000				CounterB		- Alexandre			CounterC		and a second de la second de			Counter D				
. 2	2,309	1,556	2	751	32.52%	1,856	1,276	11	569	30.66%	2,304	1,610	11	683	29.54%	2,066	1,314	29	723	35.00%	and the second second				
(13 N120 hat your Perdeau Pd & Tenth Land (5P)	4,338	2,933	2	1,403	32.34%	4,123	2,809	15	1,299	31.51%	4,901	3,397	14	1,490	30.40%	4,783	3,172	57	1,554	32.49%					2
A A A A A A A A A A A A A A A A A A A	7 158	6.065	8	1.085	15.16%	COUNTRYA					7 347	5 757		1 592	01 594	CounterC	1.070				Counter D				
(14	11,034	9,181	14	1,839	16.57%						14,259	11-192	15	3.052	21.40%	8,129	6416	39	477	19.92%	6,526	5,689	76	761	11.66%
Overbrook Rd between Haddonfield & Colwick Rd (EB)	ManualCour	xta				CounterA					CounterB					CounterC		01	INCE	LUNEA	CounterD	11,041	102	1,/35	12.82%
2	215	175	2	38	17.57%						251	197	3	51	20.32%	206	171	. 3	32	15.53%	o outrat o				
	330	263	2	65	19.70%						501	. 401	5	95	18.96%	453	384	5	64	14.13%					
ning 5 un ED between 1-295 & Old Tork na.(CD)	2 144	CAR		1 105	55 74%	2013	872	168	073	18 34 %	2 220	075		1.040		CounterC	-	-	-		CounterD				
1 1	3,539	1,505	2	2,032	57.42%	4,722	1,847	424	2,451	51.91%	4,193	1,801	9	2 383	56 83 %	4 907	1 832	86	958	52.55%					
1-295 Pamp to and from US 130(NB)	ManualCour	tt:	and the second second second			CounterA					Counter B			2,000	00.00 /	CounterC	1,002	212	2,003	20.32%	CounterD				
2	6,218	4,457	16	1,745	28.06%	5,636	3,833	14	1,789	31.74%	5,544	3,943	14	1,587	28.63%	5,638	3,964	39	1.635	29.00%	Counter D				
(14	12,096	9,188	46	2,862	23.66%	12,033	8,270	33	3,730	31.00%	10,973	7,941	28	3,004	27.38%	11,944	8,733	69	3,122	26.14%					
NJ68 Between Aaronzon & White Pine(NB)	ManualCour	1011		817	22 169	CounterA	1 807	10		22 100	CounterB					CounterC					Counter D				
4 (14	4 063	3,168	7	888	21 86%	4 960	3 845	26	1 089	21.96%						2,437	1,855	14	568	23.31%	2,261	1,842	183	236	10.44%
County 543 Between 1-295 & Old York Rd (NB)	ManualCour	ta				CounterA	0,010		1,000		CounterB					CounterC	4,019	28	928	18.65%	4,973	3,958	527	485	9.81%
2	541	413	6	122	22.55%	563	460	4	99	17 58%	554	368	0	186	33.57%	576	427	8	141	24 48%	CounterD				
(14	1,020	760	11	249	24.41%	1,192	953	10	229	19.21%	1,133	783	3	347 -	30.53%	1,249	945	18	286	22.90%					
Van Sciver Pkwy Between Woodlane Rd. & Charleston	Manual Cour	nts . For		101	10 708	Counter A	1 400	-	178		Counter B					Counter C					Counter D			10000	
2 (1)	2 795	2 482	11	302	10.70%	3 399	3 024	22	353	10.84%	1,/40	1,400	17	275	15.75%	1,758	1,497	12	249	14.16%					
Union Mills Rd, Between Ark Rd, & NJ 38 (EB)	ManualCour	tt:			10211	CounterA	0,024	LL	000	10.00 %	CounterB	3,004	17	408	13,02%	CounterC	3,49/	38	490	12.17%	A				
2	423	345	2	76	17.97%	412	340	2	70	16.99%						341	273	11	57	18 72%	CounterD				
(1)	5 715	599	3	113	15.80%	822	715	5	102	12.41%					No.	845	718	22	108	12.53%					
County 674 Between Ark & Fostertown Rd.(EB)	Manual Cour	nts				Counter A		-			Counter B					Counter C					Counter D				-
2	1,111	1 630	12	235	10 46%	1,051	1 601	14	25/	24.45%	1,116	836	9	271	24.28%	1,012	806	3	203	20.06%					
NJ90 Between NJ73 & Heddonfield Bd (EB)	ManuelCour	1,000			10.40 %	CounterA	1,001		440	20.01 %	CounterB	1,7 84	20	4/5	20.75%	2236	1,855	22	361	16.13%	~ ~ ~				
4	5,212	4,259	29	924	17.73%	4,517	3,535	15	967	21.41%	4,733	3,338	5	1.390	- 29 37%	Cochinero					CounterD				
(1)	5 9,411	7,762	34	1,615	17.16%	9,391	7,469	25	1,897	20 20%	9,726	7,064	11	2,651	27 26%							1			-
Hampton Road Between Cuthbert Blvd & Chapel Rd.(I	N Manual Cour	nta			10.000	CounterA					Counter B					CounterC					Counter D				
2	2,248	2,015	2	231	10 28%	2,200	1,912	0	20/	13.01%						2,358	2,090	16	252	10.69%	2,275	2,030	34	211	9 27%
US 322 Between NJ 55 &Lembe Bd (FB)	Manual Cour	2,007		040	10.70 %	CounterA	3,567		34/	15.57 %	CounterB					4,092	3,635	26	431	10.53%	4,216	3,799	62	355	8.42%
2	4,956	3,631	20	1,305	26.33%					±. 1	4.589	3,157	13	1.519	32 39%	2.562	1 914	68	580	22 64 9	CounterD				
(11	8,340	6,134	30	2,176	26.09%						8,832	6,057	25	2,750	31.14%	5,212	4,118	147	947	18.17%	10 827	8 870	40	1.858	17 16%
NJ 168 Between Davistown Rd. & GloucesterLane(NB) Manual Cou	nta	_			CounterA					CounterB					CounterC					CounterD			1,000	11.10 /
2	2,/8/	2,104	19	1 002	22.10%						2,947	2,340	9	598	20.29%										1
N.173 Between US 30 & Haves Mill Bd(NB)	ManualCou	nte .	10	1,002	21.14 %	CounterA					CounterB	4,2.34	20	1,059	19,00 %	Countral									
4	4,214	3,536	5	673	15.97%											Cochiere					CounterD				
(1	5 7,888	6,648	17	1,223	15.50%																				
County 669 Between Conmil Tracks and Somerciale R	d Manual Cou	nta	1000	Nerg /		CounterA					CounterB	The second second				CounterC					CounterD				
2	3,471	3,048	11	412	11.87%						3,715	2,994	12	709	19.08%	3,681	3,156	16	509	13.83%	4,219	3,735	29	455	10.78%
County 641 Batuman Flay Are and Kings Haw (NB)	5 7,494	800,0	20	800	11.20%	Combra					Countre B	7,253	25	1,568	17.72%	8,744	7,574	37	1,133	12.96%	9,968	8,950	77	941	9.44%
County of I between Lim Ave and Kings nwy (ND)	1.519	1.475	1	143	8.83%	1.475	1 309	7	159	10.78%	1.686	1 254	4	428	25 30%	CounterC					CounterD				
- (1	4 2,654	2,447	2	205	7.72%	2,966	2,682	10	274	9 24%	3,263	2,522	13	728	22.31%										
NJ 55 Between Cumberland Co. Line and US 40 (NB)	ManualCou	rite				CounterA					CounterB					CounterC			Contraction of the local diversion of the local diversion of the local diversion of the local diversion of the		Counter D				
4	6,301	4,841	5	1,455	23.09%	6,171	4,407	22	1,742	28.23%	6,141	4,039	15	2,087	33.98%										
(1	5 10,527	8,198	15	2,314	21.98%	11,825	6,452	51	3,322	28.09%	11,792	7,798	30	3,964	33.62%					The state of the s	1				
UO TU Detween NJ 33 and Salem Co. Line (EB)	Machual Cou	2 744	10	024	25 14 4	S 184	2 433	0	740	23 304	Counter B	2 010	1	1 800	17	CounterC	0.000				CounterD				
2 (1	5 5.825	4 273	16	1.536	26.37%	5,747	4.315	27	1.405	24.45%	6,722	3,513	17	3 192	47 40%	5,571	2,035	12	1 662	25.88%					8
											and the second s		The second second second second			0,414	-,/ 14		1,002	20.32%	No. of Concession, Name				

Legend : * = total number of 2-way lanes, ** = total number of hours counted manually

Page A-13

New Jersey Truck Research Study

County 667 Between NJ 45 and CR 551 Spur (NB)	IN	lanual Counta					CounterA					CounterB					CounterC		A CONTRACTOR OF THE OWNER		and the second	CounterD	CONTRACTOR OF THE OWNER.	-		Plan - Drodowa
2*	1	1,169	766	10	393	33.62%	1,083	658	7	418	38.60%	1,148	720	7	421	36.67%	1.040	671	6	363	34 00%	o ocarier o	+			
(15)	**	2,609	1,809	10	790	30.28%	2,904	1,841	17	1,046	36.02%	3,048	2,016	21	1,011	33.17%	2.841	1.958	21	862	30 34%	1.4				
1 - 295 Between Salem Co. Line and CR 620 (NB)	N	Annal Counts	and a second second	and the second	and the second second		CounterA	The second second second	and the second second			Counter B					CounterC			002	00.04 /6	Country		······································		
4 .		6,007	3,999	15	1,993	33.18%	5,809	3,794	29	1,986	34.19%	6,012	3,444	18	2,550	42.42%	6,129	4.017	28	2 084	34 00%	Course D				
(1	15)	10,440	6,788	24	3,628	34.75%	11,818	7 244	60	4,514	38 20%	12,622	6,880	32	5,710	45.24%	12,776	7.903	62	4 811	37 66%					
US 322 Between Co 671 and CR 653 (EB)	N	Anual Counts	a part of the second	a provinsi a second	ALC: NOT A STOLEN		CounterA					Counter B					CounterC			4,211	01.00 %	CountraD				
2		3,142	2,389	7	746	23.74%	2,816	1,474	45	1,297	46.06%	3,323	2,394	6	923	27.78%	3,110	2 197	120	784	25 21 9	Countero				
(1	14)	5,645	4,455	11	1,179	20.89%	6,347	3,402	82	2,863	45,11%	7.674	5,396	21	2 257	29 41%	6.006	4 423	223	1 360	202170	1				
US 130 Between 1-295 and NJ 44 (NB)	N	Anual Counts					CounterA					Counter B					CounterC	4,420	625	1,500	22.04 %	Country D				
4		5,013	4,232	8	773	15.42%	The second second second					4,889	3,253	15	1.621	33.16%	4 905	3 697	23	1 185	24 16%	4.602		704		
	15	8,284	6,955	9	1,320	15,93%						9,061	6,180	37	2 864	31 54%	9 142	6 055	18	2 141	24.10%	4,092	3,229	734	729	15.54%
County 607 between Co. 653 and I-295(NB)	- 1	Manual Counta					CounterA					CounterB		and the second second			CounterC	0,000		2,141	20.46 /0	Courstand D	0,200	1,192	1,400	15.80%
2		151	93	0	58	38.41%	166	102	1	63	37.95%	188	110	1	77	40.96%	· · · · · · · · ·					CounterD	107		2.21	
(1	15)	286	183	0	103	36.01%	352	239	3	110	31 25%	395	247	3	145	36 71%						191	107	3	81	42.A1%
County 653 between Harmony Rd & NJ 44(NB)	IN	Manual Counts					CounterA					CounterB					CounterC					400	210	11	173	43 25%
2		1,156	862	1	293	25.35%	1,183	913	7	263	22.23%						1 202	903	5	204	24 48%	CounterD				
	151	2 275	1,698	3	574	25 23%	2,480	1,903	18	559	22.54%						2 590	1 992	21	577	22 28 4					
Mantua Ave between 5th st and 6th st (NB)	N	Manual Counts					CounterA					CounterB					CounterC	1,000		5/1	64 20 %	ContraD				
2		648	459	5	184	28.40%	679	466	12	201	29.60%						579	363	3	213	36 70%	Counter D	100	10		
(14)	1,060	722	7	331	31 23%	1,361	947	22	392	28.80%						1.306	868	14	424	32 47%	1 637	493	40	224	29.59%
NJ 55 between County 553 & NJ 47 (NB)	IN	Manual Counts					CounterA					Counter B					CounterC				02.47 /0	CountralD	1,075	112	450	27.49%
4		10,107	8,516	34	1,557	15.41%	10,153	7,601	29	2,523	24.85%						9,890	7 702	33	2 155	21 70%	11 023	9 510	007		
(15	19,330	16,438	63	2,829	14.64%	22,023	16,632	- 52	5,339	24 24%						21.963	17 211	57	4 605	21 304	24,020	10,512	297	2,214	20.09%
County 553 between Cedar Ave and Hunter St (NB)	IN	Manual Counts		all and a second			CounterA					Counter B					CounterC		51	4,085	21.00 %	24,029	18,4/4	709	4,846	20.17%
2		4,779	4,053	8	718	15.02%						4,788	3,926	19	843	17 61%	4 341	3 507	48	789	10 15 4	CounterD				1200020
()	151	8,541	7 238	16	1,287	15.07%	The second s					9,472	7,786	30	1.656	17.48%	8,706	7.075	87	1 544	17 73%	4,010	3,285	37	1,196	24.82%
NJ 70 between Springdale Rd. and Burl. Co. (EB)	1	ManualCounts	-				CounterA					Counter B		and the second second second			CounterC			1,044	11.10%	Countra	1205	12	2,557	25.84%
4		11,331	10,011	16	1,304	11.51%	10000 CO.					Constant States and States										CounterD				
	15	17.938	15,608	28	2,302	12.83%																				

Legend : * = total number of 2-way lanes, ** = total number of hours counted manualy

Page A-15
New Jersey Truck Research Study

L contions	Lotale	Care	Corplan	Tanks	STankel	Totals	Cor	Curles	Tanks	Stopkal	Totala	Cam	Contas	Tanalia	84	-	and the second second	and the second second			ACCURATE ON STREET	All and a second second			
NJ73 between Brick Bri and Evention Bd (SB)	Manual Count	Vitie	Ofciera	II CO Ka	DITCONS	CounterA	Cella	UNCRE	IIWAS	DITCERS	CounterB	Vars	Cycles	ILCKS	BILICKS	Iotals	Can	Cycles	Trucks	STrucks	Totals	Cans	Cycles	Trucka	%Truck
	14,984	13,275	0	1,709	11 41%						oounero					Counterc					CounterD				-
(15) **	24,583	21,595	53	2,935	11.94%																				
US 206 between Stocks Rd and Fawn Lake Rd (SB)	Manual Count			000000	TAKE SKIPPE	CounterA					CounterB	10				CounterC					CounterD				
	3,189	2,223	5	961	30.13%	2,669	1,869	12	768	29.52%	3,197	2,045	13	1,139	35.63%	2,657	1,655	51	951	35.79%	······				
(15)	5,175	3,605	1	1,563	30 20%	4,904	3,503	16	1,385	28.24%	5,729	3,751	20	1,958	34.18%	4,907	3,178	84	1,645	33.52%					
NJ/U between hadnor Hd a 1 roth Lane (WD)	ManualCount	5 940	10	1 024	14 89%	CounterA					CounterB	FOFE	10	4 700		CounterC	20220				CounterD				
(14)	12 294	10 579	17	1.698	13.81%						14 762	11 568	10	5 160	24.38%	6,557	5,351	34	1,172	17.87%	6,870	5,642	591	637	9.27%
Overbrook Rd Between Haddonfield & Colwick Rd (WB)	ManualCount					CounterA					CounterB		Ev	0,100	E1.47 /8	CoupterC	11,202	97	2,198	15.90%	14,488	11,584	1,517	1,387	9 57%
	129	87	2	40	31.01%						143	97	1	45	31.47%	124	91	3	30	24 10%	CounterD				
(16	214	144	4	66	30.84%						282	212	. 3	67	23.76%	242	193	6	43	17.77%					
Rising Sun Between 1-295 & Old York Rd. (WB)	Manual Count	-				CounterA	1		-	V6.7 192.017	Counter B	117.00	Alterative and a series of the			CounterC					CounterD				
	2,822	1,299	4	1,519	53.83%	2,871	1,328	139	1,404	48.90%	3,001	1,326	4	1,671	55.58%	2,332	853	147	1,332	57.12%					
[19]	4,248	1,894	5	2,349	55.30%	5,085	2,204	289	2,592	50.97%	4,972	2,108	7	2,857	57.46%	5,056	1,789	338	2,929	57.93%					
	F 924	5 462	24	1 438	20 77%	6 633	5 005	67	1 471	22 18%	Counter D					CounterC				and the second second	CounterD				
(14	11,155	8,910	31	2214	19.85%	12,742	9,932	164	2.646	20.77%						12 003	4 291	41	1,659	27.59%					
NJ68 @ Aaronson & White Pine (SB)	Manual Count	1				CounterA					Counter B					CounterC	8,8/1	01	2,941	22.04%	0				
	2,259	1,686	8	565	25.01%	2,403	1,918	27	458	19.06%						2,315	1,871	26	418	18.06%	CounterD				
(14	3,822	2,864	13	945	24.73%	5,132	4,142	50	940	18.32%						4,926	4,015	47	864	17.54%					
County 543 @ 1-295 & Old York Rd. (SB)	Manual Count					CounterA		-			Counter B			- 11		CounterC		· · · · · ·			CounterD	*****			
114	663	511	2	150	22.02%	007	521	3	143	21.44%	711	513	3	195	27.43%	616	478	3	135	21.92%	£.				
Van Sciver Pkyer @ Woodlane Bd & Charlaston Bd (SB)	Manual Count	102	3	228	22.00%	Counter A	914	0	220	19.00%	Counter B	934	/	304	24.42%	1,196	975	10	211	17.64%					
tanoator r kuj g trobalano ria, a onalostorria. (ob)	1,686	1,530	7	149	8.84%	1,535	1,345	7	183	11.92%	1,546	1,223	1	322	20 83%	1 764	1 550	12	100	10 74 8	Counter D				
(14	2,839	2,549	13	277	9.76%	3,363	2,979	20	364	10.82%	3,174	2,589	2	583	18.37%	4 203	3 781	30	302	0 93 9					
Union Mills Rd. @ Ark Rd. & NJ 38 (WB)	ManualCourt	t				CounterA					Counter B					CounterC			0.00	8.00 %	CounterD				
	483	415	2	66	13.66%	464	412	1	51	10.99%	485	428	1	56	11.55%	432	381	4	47	10.88%	o ocariter D				
(15	1,100	994	3	103	9.36%	1,239	1,151	3	85	6.86%	1,292	1,191	3	98	7 59%	1,238	1,144	10	84	6.79%					
County 6/4 Between Ark & Postertown Ha (WB)	Manual Count	t 020	0	255	21 54%	Lounter A	805	7	217	10 30%	Counter B	050		074		Counter C				Mart -	Counter D				
(15	1.974	1 567	2	405	20.52%	2 201	1.814	15	372	16.90%	2 215	1 709	23	483	24.12%	1,004	629	8	227	21.33%					
NJ90 @ NJ73 & Haddonfield Rd. (WB)	ManualCour	t				CounterA					CounterB	1,000		400	21.01.0	CounterC	1,000	20	382	17.08%	Country D		and a second second		
	3,929	2,943	9	977	24.87%	3,556	2,294	19	1,243	34.96%	3,437	2,542	9	886	25.78%						CounterD				
. (15	8,308	6,521	14	1,773	21.34%	8,295	5,619	50	2,626	31.66%	8,263	6,322	20	1,921	23 25%	Laura and a second									
Hampton Road @ Cuthbert Blvd & Chapel Rd.(SB)	ManualCoun	t			10 000	CounterA		-			CounterB					CounterC					CounterD				
114	1,434	1,2//	1	156	10.88%	1,3/6	1,198	5	1/3	12.57%						1,073	956	14	103	9.60%	1,331	1,192	18	121	9.09%
US 222 Between NJ 55 &Lemits Bd (M/B)	HenvelCoup	6202	4	200	10.03 %	CounterA	2,270	13	334	10.09%	CounterB					2,093	1,851	24	218	10.42%	2,709	2,377	33	299	11.04%
a our between no or a camba na (no)	4 477	3 294	14	1.169	26.11%	VoullerA					4.007	2 747	20	1 240	30 05%	CounterC					CounterD		search.		
(15	7,837	5,720	29	2,088	26.64%						8,485	5,936	41	2 508	29.56%						4,347	3,012	100	1,235	28.41%
NJ 169 @ Davistown Rd. & Gloucester Lane (SB)	ManualCoun	t	1999 - 1999 - 1996 			CounterA		1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 -			CounterB		- con con since			CounterC					CounterD	1,3/5	231	2,328	23 43 %
	3,974	3,039	15	920	23.15%	3,555	2,867	22	666	18.73%	4,063	3,399	13	651	16.02%			-							
(15	6,228	4,727	23	1,478	23.73%	6,371	5,202	46	1,123	17.63%	7,138	6,022	28	1,068	15.24%					and the second second					•
NJ /3 between US 30 & neves Mill Hd (SB)	Manual Coun	R		601	18 80%	CounterA	3 024		677	10 000	CounterB	0.050				CounterC					CounterD				
(15	6,722	5 556	14	1.152	17.14%	6,698	5 541	16	1.141	17.03%	7 296	5 724	20	1 552	22.35%										
County 669 Between Conmil Tracks and Somerclase Rd.	ManualCour	t				CounterA					CounterB	0,724		1,002	2121 10	CounterC					Country D				
	4,523	3,788	11	724	16.01%						4,509	3,785	8	816	17.70%	4 245	3 535	16	694	16 35%	Counser D	0 768	107		
(14	7,584	6,387	20	1,177	15.52%						9,209	7,702	31	1,476	16.03%	8,472	7 201	39	1,232	14.54%	9,223	7 820	286	1 117	12 11%
County 641 Between Elm Ave and Kings Hwy (SB)	Manual Cour	¥.		10/2007	and the second	CounterA	100.000			and the state	CounterB					CounterC					CounterD		200		12.11 /
	1,905	1,712	4	189	9.92%	1,753	1,357	7	389	22.19%	1,963	1,559	6	398	20.28%				*						
N155 Batman Cumbarbard Callina and US 40 (SE)	ManualCaus	2,0/0	4	2/3	\$ 25%	Countred	2,510	0	000	20.52%	3,494	2,844	12	638	18.26%				-						palacian social
11000 Deteret I Culture and Co. Late and Co 10 (00)	6 385	5.116	24	1 245	19.50%	6 550	4 990	33	1 527	23 31%	6 009	4 103	22	1 700	20.824	CounterC					Counter D			2	
(15	10,759	8.690	28	2.041	18.97%	13.007	9,808	71	3,128	24.05%	11.692	8.413	39	3 240	27 71%										
US 40 Between NJ 55 and Salem Co. Line (WB)	Manual Cour	t			- Contraction of the	CounterA					CounterB			0,2-10		CounterC	***				Countral				
	3,142	2,191	6	945	30.08%	2,891	2,044	42	805	27.85%	3,431	2,211	13	1,207	35.18%	3 241	2,369	21	851	26.26%	Joanero				
	EAFA	0 705	10	1 558	20 04 %	5 775	4 193	72	1 570	27 10%	6 600	4 200	01	0.050	04 0404		1		1.000						

Legend : * = total number of hours counted manually

Page A-17

New Jersey Truck Research Study

County 667 Between NJ 45 and CR 551 Spur (SB)	M	anual Count					CounterA					Counter B			-		CounterC					CounterD	And a state of the	the second s	Statement of the local division of the local	Constanting of the local division of the loc
		1,494	996	5	493	33.00%	1,471	1,066	6	399	27.12%	1,539	1,040	4	495	32.16%	1.308	909		301	20 80 8	Courser				
(15)*	+	2,506	1,648	8	850	33.92%	2,754	2,014	18	722	26 22%	2,940	2,016	14	910	30.95%	2,640	1.927	19	604	28 20 %					
1 - 295 Between Salem Co. Line and CR 620 (SB)	M	anualCount					CounterA					CounterB					CounterC	· · · ·			2028 1	CounterD				
		5,699	3,620	20	2,059	36,13%	5,509	3,527	17	2,065	36 82%	5,895	3,720	20	2.155	36.56%	5.675	3 556	18	2 101	37 024	Counter				
(1	15)	10,559	6,864	28	3,667	34.73%	12,238	7,619	56	4,563	37 29%	12,884	8,057	62	4.765	36.98%	12,405	7.707	62	4 636	37 37 %					
US 322 Between Co 671 and CR 653 (WB)	M	anualCount		a			CounterA	2010				CounterB					CounterC		UL	4,000	51 51 %	Countra				-
		3,769	2,910	11	848	22.50%	3,288	2,577	21	690	20.99%	3,416	2,590	8	818	23.95%	2.745	1 949	38	758	27 61 4	Counter				
(1-	41	5,791	4.456	13	1 322	22 83%	5,911	4,698	32	1,181	19.98%	6,347	4.868	15	1.464	23.07%	6 291	4 603	66	1 622	25 78 4					
US 130 Between 1-295 and NJ 44 (SB)	N	anual Count					CounterA					Counter B					CounterC			INCE	20.10 %	CounterD				
		3,351	2,534	5	812	24.23%						3,373	2,529	6	838	24.84%	3 254	2513	11	750	22 43%	3462	2 007	-		
(1	15	7,777	6,376	10	1,391	17.89%						8,839	6,714	17	2,108	23.85%	8,511	6,714	20	1 777	20 88%	0 320	7 447	20	1 700	15.31%
County 607 between Co. 653 and 1-295(SB)	N	anual Count				-	CounterA					Counter B					CounterC			1,111	20.00 %	Countrell	1,441	01	1,/92	19.23%
		183	122	2	59	32.24%	190	134	1	55	28.95%	195	134	0	61	31 28%						170	114			
(1	5)	322	216	2	104	32.30%	361	265	1	95	26.32%	385	266	1	118	30.65%					1	375	250	5	60	33.52%
County 653 between Harmony Rd & NJ 44(SB)	N	anual Count					CounterA					Counter B					CounterC					CounterD	200	12	113	30.13%
	1	1,514	1,162	8	344	22.72%	1,496	1,139	13	344	22.99%						1,526	1.089	13	424	27 79%	Counter D				
(1	15	2,316	1,762	14	540	23.32%	2,538	1,921	23	594	23.40%	240					2,638	1.913	25	700	26 54%					
Mantua Ave between 5th St and 6th St (SB)	N	lanual Count					CounterA	$\begin{array}{c c c c c c c c c c c c c c c c c c c $			CounterD															
		736	534	4	196	26.90%	704	489	8	207	29.40%						569	379	4	186	32 69%	762	575	17	170	
(1	14	1,245	897	4	344	27.53%	1,420	1,018	20	382	26.90%						1,322	938	13	371	28.06%	1.676	1 202	83	301	22.317
NJ 55 between County 553 & NJ 47 (SB)	N	Anual Count		and the second second			CounterA					CounterB					CounterC					CounterD		00		20.00 %
		11,201	9,636	38	1,527	13.63%	11,385	8,376	25	2,983	26.20%						11,145	8,874	28	2243	20.13%	10.599	8718	41	1 840	17 36 4
(1	15)	18,898	16,172	49	2,677	14.17%	21,985	16,645	49	5,291	24.07%						21,991	18,017	49	3.925	17.85%	22 639	19.367	84	3 189	14 00 %
County 553 between Cedar Ave and Hunter St (SB)	N	Anual Count	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~		and the second		CounterA			17-14-18-500		CounterB					CounterC					CounterD			3,100	14.00 %
		4,987	4 247	15	725	14.54%						5,303	3,980	18	1,305	24.61%	4,628	3,697	38	893	19.30%	5.328	4 497	15	816	15 92%
[15	8,568	7,162	21	1,385	16.16%						9,377	7,019	33	2,325	24.79%	9,067	7,435	71	1,561	17 22%	10,438	8,944	41	1 453	13 92%
NJ 70 between Springdale Rd, and Burl. Co. (WB)	h	Aanual Count	and a second				CounterA					Counter B					CounterC					CounterD				IG AL A
		10,168	9,069	15	1,084	10.56%						9,139	6,495	24	2,520	28.67%	9,473	7,046	31	2,396	25 29%					
[15	19,507	17,535	23	1,949	9.99%						18,977	13,669	59	5249	27.66%	19,717	14,831	86	4 800	24 34%					

Lagend : * = total number of hours counted manually

Page A-19

.