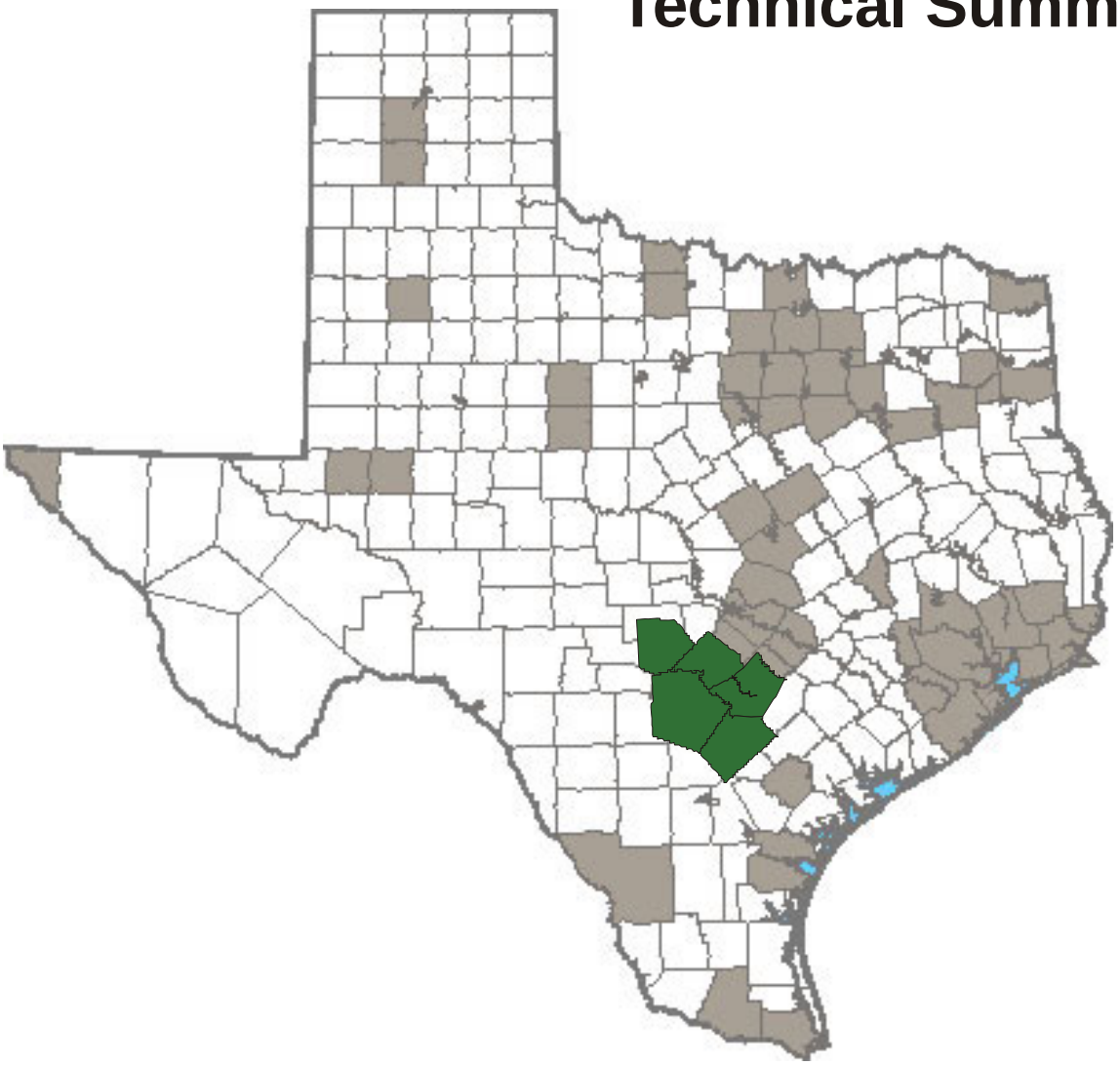
2006 San Antonio Area Commercial Vehicle Survey
Technical Summary



Texas Department of Transportation

Prepared by the
Texas Transportation Institute
October 2007
Revised February 2008

2006 San Antonio Commercial Vehicle Survey

TECHNICAL SUMMARY

Texas Department of Transportation Travel Survey Program

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DISCLAIMER

The contents of this report reflect the views of the author who is responsible for the data, findings, and conclusions presented herein. The contents do not necessarily reflect the official views or policies of the Federal Highway Administration or the Texas Department of Transportation (TxDOT). This report does not constitute a standard, specification, or regulation. Stella Amor Nepal and Stephen P. Farnsworth were the authors of this report and David F. Pearson, Ph.D., P.E., was the study supervisor. Charlie Hall of the TxDOT Planning and Programming Division was the project director.

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INTRODUCTION

In 2006, the Texas Department of Transportation (TxDOT) funded a Commercial Vehicle Survey in the San Antonio Metropolitan Planning Organization (MPO) study area. The purpose of this survey was to provide data that would enable TxDOT to forecast total commercial vehicle travel demand within the urban area.

This report presents a Technical Summary of the 2006 San Antonio Commercial Vehicle Survey and documents the data collected and the analysis results for the study area. The survey forms utilized are presented in the Appendix.

The San Antonio Study Area is located in the northern portion of south Texas. As Figure 1 shows, it covers five counties — Bexar, Comal, Guadalupe, Kendall, and Wilson. Total land area of this five-county region is nearly 4,000 square miles, with a population density of approximately 405 persons per square mile. The city of San Antonio is the study area's population center, which has an estimated population of about 1.15 million based on the 2000 Census.

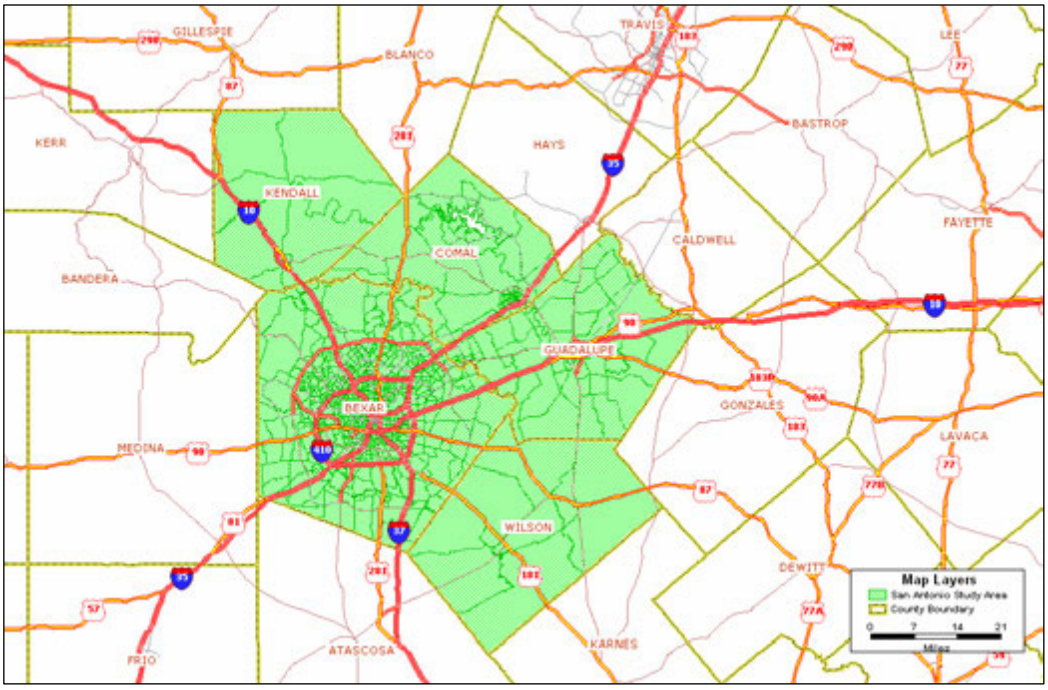

Figure 1. San Antonio Study Area.

SURVEY METHODOLOGY

The Commercial Vehicle Survey was conducted during the spring of 2006 (March – April). A total of 329 commercial vehicles were surveyed. Field observations were conducted to identify companies operating qualifying commercial vehicles in the study area. The information was then used to supplement the Vehicle Registration, Motor Carrier, and Employer databases provided by TxDOT. The combined database was sorted according to a list of random numbers assigned to each record to ensure a random sample (ATG, 2006).

SURVEY SUMMARIES

Vehicle Characteristics

As part of the survey, sample data on the year, make and model, odometer reading, classification, and fuel type use were collected to examine the type and condition of commercial vehicles traveling within the study area.

In 2006, there were 17,486 diesel-fueled trucks and 5,445 gasoline-fueled trucks registered in the study area (TxDOT, 2007). Approximately 79 percent of the diesel trucks were between 0 and 10 years old, 17 percent were between 11 and 20 years and 4 percent were above 20 years. For gasoline trucks, 57 percent were between 0 and 10 years old, 25 percent were between 11 and 20 years and 18 percent were above 20 years. The average number of vehicles registered per county was estimated at 3,497 for diesel-fueled trucks and 1,089 for gasoline-fueled trucks.

Table 1 and Figure 2 show the distribution of registered trucks in the study area and average per county by age (based on the model year).

Table 1. Distribution of Registered Trucks by Age.

Model Year	Age of Vehicle (Years)	Diesel Trucks	Percent of Total	Gasoline Trucks	Percent of Total	Average Number of Trucks Registered per County	
						Diesel	Gasoline
2007	0	764	4.4	53	1.0	153	11
2006	1	2,301	13.2	323	5.9	460	65
2005	2	2,246	12.8	458	8.4	449	92
2004	3	1,631	9.3	279	5.1	326	56
2003	4	1,343	7.7	267	4.9	269	53
2002	5	1,086	6.2	287	5.3	217	57
2001	6	1,195	6.8	323	5.9	239	65
2000	7	1,170	6.7	340	6.2	234	68
1999	8	1,002	5.7	331	6.1	200	66
1998	9	621	3.6	193	3.5	124	39
1997	10	490	2.8	275	5.1	98	55
1996	11	462	2.6	160	2.9	92	32
1995	12	426	2.4	329	6.0	85	66
1994	13	462	2.6	151	2.8	92	30
1993	14	403	2.3	144	2.7	81	29
1992	15	207	1.2	117	2.1	41	23
1991	16	262	1.5	89	1.6	52	18
1990	17	256	1.5	103	1.9	51	21
1989	18	220	1.3	89	1.6	44	18
1988	19	163	0.9	102	1.9	33	20
1987	20	156	0.9	74	1.4	31	15
Older	>20	620	3.6	958	17.6	124	192
Total		**17,486**	**100.0**	**5,445**	**100.0**	**3,497**	**1,089**

Source: TxDOT, 2007.

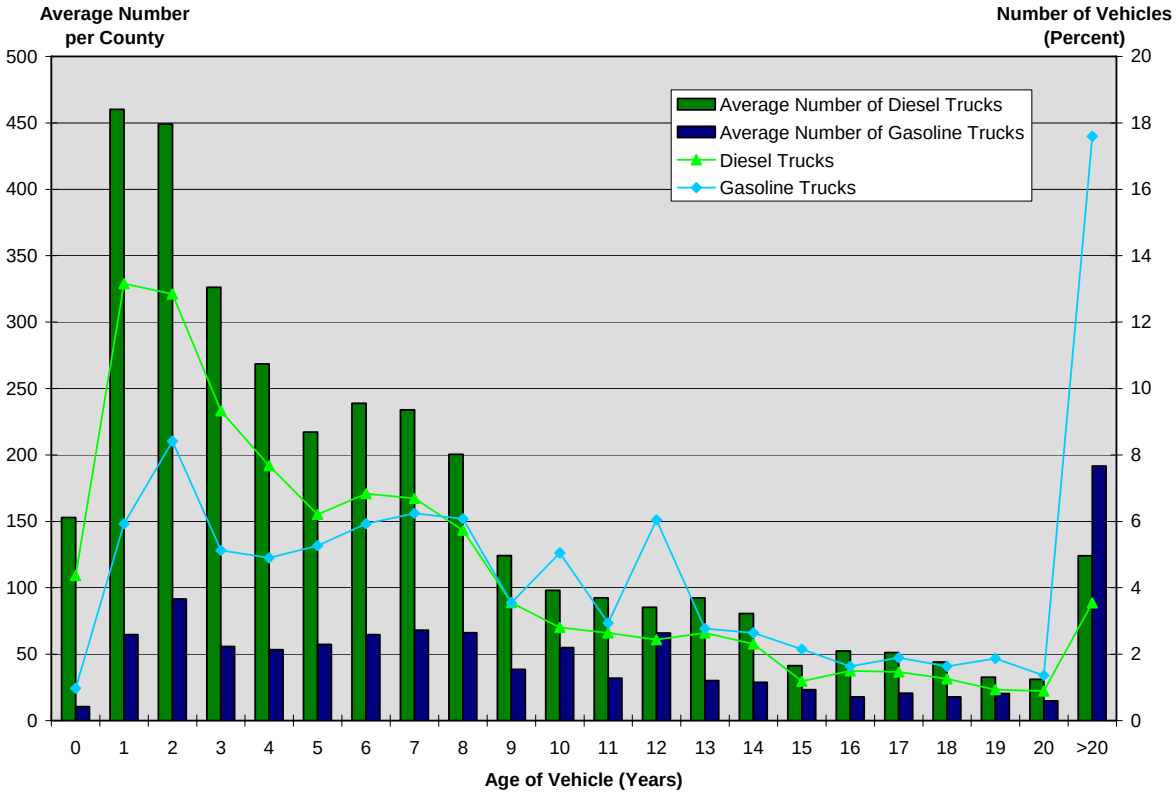

Figure 2. Distribution of Registered Trucks by Age.

Tables 2 and 3 provide the distribution of registered diesel trucks and gasoline trucks in the study area by gross vehicle weight. Approximately 41 percent of the diesel trucks had a gross vehicle weight between 8,500 pounds and 10,000 pounds; 19 percent weighed between 10,000 pounds and 19,500; and 35 percent had weight above 19,500 pounds but not more than 60,000 pounds. Only 5 percent of the trucks weighed more than 60,000 pounds. For gasoline trucks, nearly half (48 percent) had a gross vehicle weight between 8,500 pounds and 10,000 pounds; 33 percent weighed between 10,000 pounds and 19,500; and 18 percent weighed above 19,500 pounds but not more than 60,000 pounds.

Table 2. Distribution of Registered Diesel Trucks by Model Year and Gross Vehicle Weight.

Model Year	Age of Vehicle (Years)	Number of Diesel Trucks by Gross Weight (Thousand Lbs.)									Percent of Total
		>8.5	>10	>14	>16	>19.5	>26	>33	>60	Total	
2007	0	214	43	49	25	230	71	59	73	764	4.4
2006	1	1,250	278	145	113	244	79	96	96	2,301	13.2
2005	2	1,490	150	78	70	213	73	95	77	2,246	12.8
2004	3	1,111	126	64	71	146	43	41	29	1,631	9.3
2003	4	831	86	46	42	128	62	80	68	1,343	7.7
2002	5	638	83	56	46	100	76	81	6	1,086	6.2
2001	6	562	147	53	34	154	89	104	52	1,195	6.8
2000	7	300	138	72	72	233	101	152	102	1,170	6.7
1999	8	248	125	88	61	152	74	179	75	1,002	5.7
1998	9	132	50	40	22	152	83	113	29	621	3.6
1997	10	111	79	45	17	77	28	81	52	490	2.8
1996	11	44	48	51	12	92	48	111	56	462	2.6
1995	12	27	47	23	22	126	31	130	20	426	2.4
1994	13	40	70	25	11	87	35	125	69	462	2.6
1993	14	45	44	18	11	52	51	124	58	403	2.3
1992	15	16	33	13	8	33	34	61	9	207	1.2
1991	16	32	32	11	15	46	40	71	15	262	1.5
1990	17	18	42	8	7	52	41	81	7	256	1.5
1989	18	15	39	6	5	34	29	91	1	220	1.3
1988	19	16	9	7	8	26	20	72	5	163	0.9
1987	20	4	8	8	4	31	31	67	3	156	0.9
1986	21	14	13	0	2	33	25	64	9	160	0.9
1985	22	5	10	3	3	24	14	61	22	142	0.8
1984	23	8	1	2	5	17	19	26	4	82	0.5
1983	24	9	3	2	2	11	13	7	1	48	0.3
1982	25	5	1	0	2	17	7	30	1	63	0.4
Older	>25	1	2	0	5	30	19	65	3	125	0.7
Total		**7,186**	**1,707**	**913**	**695**	**2540**	**1,236**	**2,267**	**942**	**17,486**	**100.0**
Percent of Total		**41.1**	**9.8**	**5.2**	**4.0**	**14.5**	**7.0**	**13.0**	**5.4**	**100.0**	

Source: TxDOT, January 2007.

Table 3. Distribution of Registered Gasoline Trucks by Model Year and Gross Vehicle Weight.

Model Year	Age of Vehicle (Years)	Number of Gasoline Trucks by Gross Weight (Thousand Lbs.)								Total	Percent of Total
		>8.5	>10	>14	>16	>19.5	>26	>33	>60		
2007	0	31	10	8	1	1	1	1	0	53	1.0
2006	1	201	57	19	10	24	7	5	0	323	5.9
2005	2	260	65	13	81	34	4	1	0	458	8.4
2004	3	173	49	23	10	22	1	1	0	279	5.1
2003	4	176	49	21	10	6	2	3	0	267	4.9
2002	5	195	46	21	11	11	1	2	0	287	5.3
2001	6	176	82	35	7	17	4	2	0	323	5.9
2000	7	177	81	27	5	31	9	10	0	340	6.2
1999	8	156	90	35	14	21	12	3	0	331	6.1
1998	9	94	29	17	7	23	14	3	6	193	3.5
1997	10	113	70	31	6	28	9	10	8	275	5.1
1996	11	49	35	28	7	21	12	8	0	160	2.9
1995	12	116	61	25	3	56	24	32	12	329	6.0
1994	13	72	37	9	4	11	11	4	3	151	2.8
1993	14	66	34	4	6	25	4	4	1	144	2.7
1992	15	45	27	3	5	29	6	2	0	117	2.1
1991	16	41	16	4	5	15	2	5	1	89	1.6
1990	17	45	20	7	6	18	3	4	0	103	1.9
1989	18	35	27	4	7	9	3	4	0	89	1.6
1988	19	41	17	8	14	17	4	1	0	102	1.9
1987	20	25	10	8	7	16	3	4	1	74	1.4
1986	21	40	14	4	3	25	3	2	0	91	1.7
1985	22	57	10	3	6	32	4	2	0	114	2.1
1984	23	40	9	12	8	15	4	3	0	91	1.7
1983	24	22	11	3	2	16	2	1	0	57	1.1
1982	25	26	8	7	5	20	1	5	0	72	1.3
Older	>25	155	107	49	40	122	25	33	2	533	9.8
Total		**2,627**	**1,071**	**428**	**290**	**665**	**175**	**155**	**34**	**5,445**	**100.0**
Percent of Total		**48.2**	**19.7**	**7.9**	**5.3**	**12.2**	**3.2**	**2.9**	**0.6**	**100.0**	

Source: TxDOT, January 2007.

The surveyed vehicle data shows that only 2 percent of the vehicles had a gross vehicle weight between 8,500 pounds and 10,000 pounds; 17 percent weighed between 10,000 pounds and 19,500; and 49 percent weighed above 19,500 pounds but not more than 60,000 pounds. Approximately 30 percent of the vehicles had a gross vehicle weight over 60,000 pounds. Table 4 shows the distribution of surveyed vehicles in the study area by age and gross vehicle weight.

Table 4. Distribution of Surveyed Vehicles by Model Year and Gross Vehicle Weight.

Model Year	Age of Vehicle (Years)	Number of Vehicles by Gross Weight (Thousand Lbs.)								
		<8.5	>8.5	>10	>14	>16	>19.5	>26	>33	>60
2007	0	0	0	0	0	0	0	0	3	0
2006	1	0	1	1	0	0	1	0	1	4
2005	2	0	1	1	0	0	4	1	2	6
2004	3	0	2	0	1	0	1	4	6	14
2003	4	1	1	1	4	0	3	1	9	14
2002	5	0	0	2	1	4	5	0	5	9
2001	6	0	0	3	0	3	6	5	2	4
2000	7	0	0	2	1	1	4	0	11	4
1999	8	0	0	3	1	1	1	4	10	9
1998	9	1	0	2	1	1	1	2	8	10
1997	10	2	1	1	0	0	3	3	6	2
1996	11	0	0	2	1	2	2	0	6	6
1995	12	1	0	0	1	0	1	0	11	3
1994	13	0	0	1	0	1	0	0	2	2
1993	14	0	1	2	2	0	0	0	3	2
1992	15	0	0	0	0	0	3	1	1	4
1991	16	0	0	0	0	0	1	1	2	0
1990	17	0	0	1	1	0	0	2	2	1
1989	18	0	0	1	0	0	0	2	2	1
1988	19	0	0	0	0	0	0	1	0	0
1987	20	0	1	0	0	1	0	0	0	1
Older	>20	0	0	3	0	1	2	1	2	3
Unknown		0	0	0	0	1	1	0	0	0
Total		**5**	**8**	**26**	**14**	**16**	**39**	**28**	**94**	**99**
Percent of Total		**1.5**	**2.4**	**7.9**	**4.3**	**4.8**	**11.9**	**8.5**	**28.6**	**30.1**

In terms of age (calculated based on the model year of the vehicle), nearly 71 percent of the surveyed vehicles were less than 10 years old and only 4 percent were more than 20 years old. The remaining 25 percent were between 11 and 20 years. The average age of the vehicles was 8.4 years. About 77 percent of the vehicles reported odometer readings at the beginning of the trip survey, indicating an average odometer reading of 256,290 miles. Table 5 and Figure 3 show the distribution by age and odometer reading.

Table 5. Distribution of Surveyed Vehicles by Age and Average Odometer Readings.

Age of Vehicle (Years)	Number of Vehicles	Percent of Total	Cumulative Percent of Total	Number of Vehicles that Reported Odometer Readings	Percent of Total	Average of Reported Odometer Readings
0	3	0.9	0.9	3	1.2	1,000
1	8	2.4	3.3	6	2.4	23,153
2	15	4.6	7.9	5	2.0	53,873
3	28	8.5	16.4	26	10.2	96,955
4	34	10.3	26.7	30	11.8	122,364
5	26	7.9	34.6	15	5.9	148,703
6	23	7.0	41.6	16	6.3	159,011
7	23	7.0	48.6	19	7.5	198,378
8	29	8.8	57.4	18	7.1	358,365
9	26	7.9	65.3	23	9.0	679,769
10	18	5.5	70.8	14	5.5	230,088
11	19	5.8	76.6	15	5.9	334,663
12	17	5.2	81.8	16	6.3	360,898
13	6	1.8	83.6	3	1.2	342,556
14	10	3.1	86.7	9	3.5	323,364
15	9	2.7	89.4	5	2.0	276,352
16	4	1.2	90.6	4	1.6	495,825
17	7	2.1	92.7	7	2.8	355,409
18	6	1.8	94.5	4	1.6	138,275
19	1	0.3	94.8	1	0.4	127,942
20	3	0.9	95.7	2	0.8	129,320
>20	12	3.7	99.4	11	4.3	266,640
Unknown	2	0.6	100.0	2	0.8	93,118
Total	**329**	**100.0**		**254**	**100.0**	**256,290**

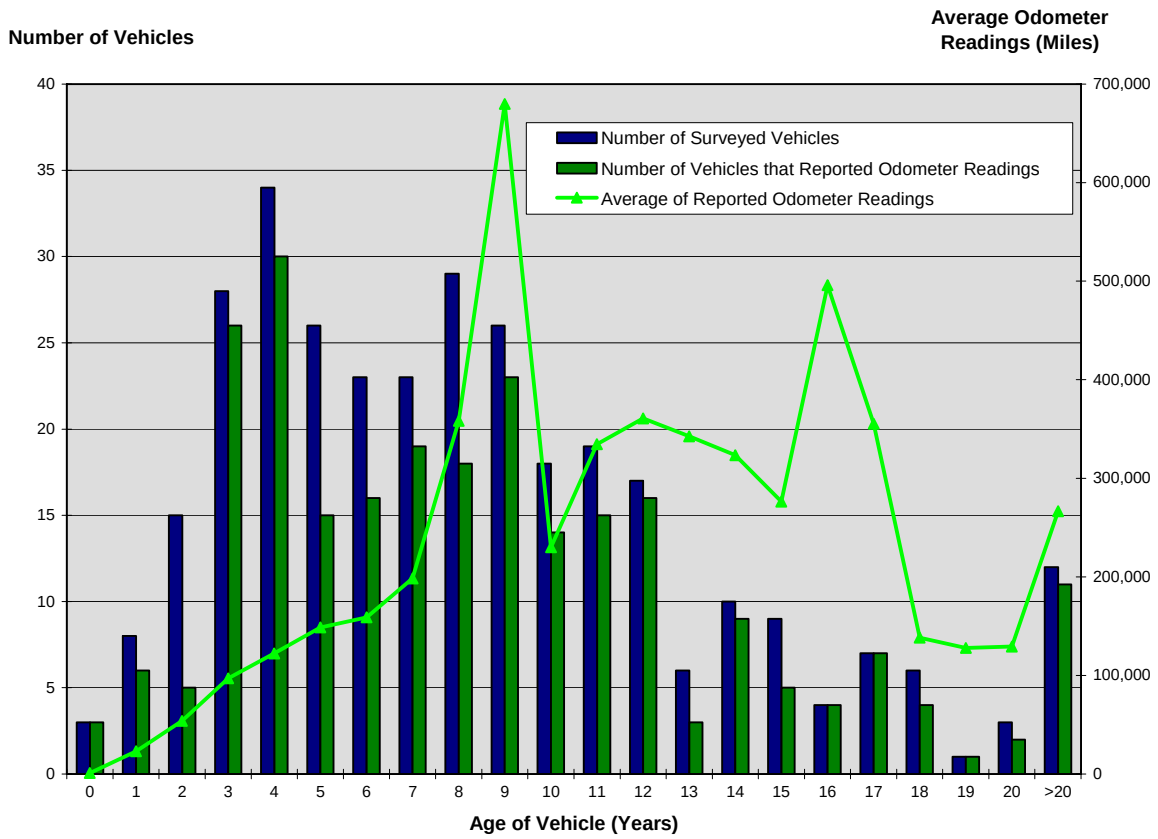

Figure 3. Distribution of Surveyed Vehicles by Age and Average Odometer Readings.

Table 6 shows the distribution of surveyed vehicles based on the Texas 6 classification of vehicles system. About 44 percent of the vehicles were single unit, 2-axle vehicles, 24 percent were single unit, 3-axle vehicles, and 29 percent were semi tractor-trailers.

Table 6. Distribution of Surveyed Vehicles by Vehicle Classification.

Vehicle Classification	Number of Vehicles	Percent of Total	Cumulative Percent of Total
Single Unit, 2-axle (6 wheels)	145	44.1	44.1
Single Unit, 3-axle (10 wheels)	79	24.0	68.1
Single Unit, 4-axle (14 wheels)	9	2.7	70.8
Semi (all Tractor-Trailer Combinations)	96	29.2	100.0
Total	**329**	**100.0**	

Due to similarities among certain classes of vehicles, the classification groups provided in the above table were aggregated into three new groups. All of the single unit, multi-axle vehicles were classified as "Small and Medium," semi/tractor-trailer combinations were classified as "Large," and any vehicles listed as other were classified as "Other." Figure 4 indicates that nearly 71 percent of the surveyed vehicles were small and medium and 29 percent were large.

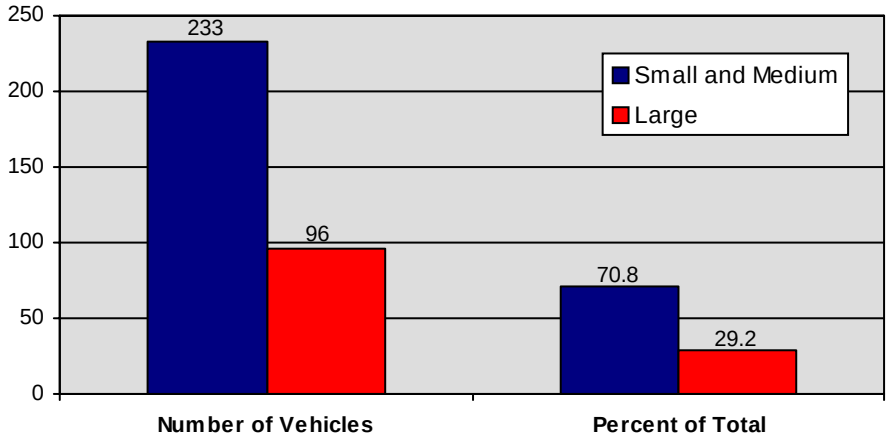

Figure 4. Distribution of Surveyed Vehicles by Vehicle Classification.

In terms of commercial type, 81.5 percent of the surveyed vehicles were used for cargo or freight transport, and the remaining 18.5 percent were for local services (see Figure 5).

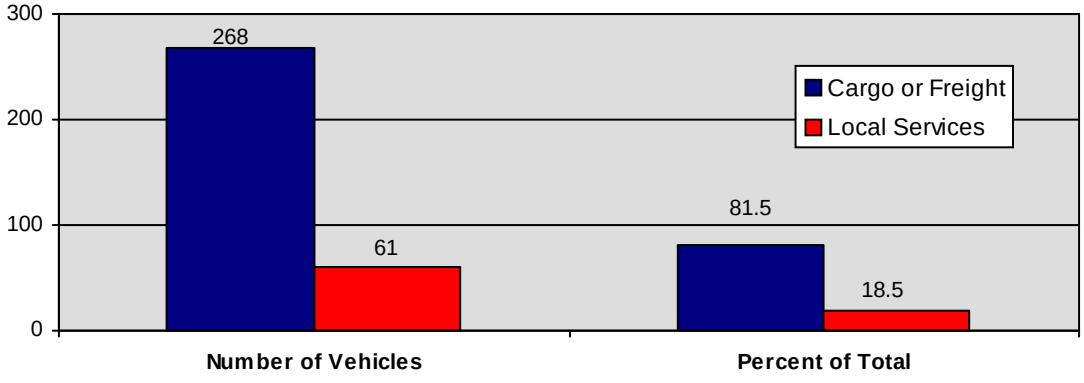

Figure 5. Distribution of Surveyed Vehicles by Commercial Type.

In terms of fuel type utilized by the surveyed vehicles, the majority (91 percent) used diesel, and only 8 percent used unleaded gasoline and almost 1 percent used propane (see Figure 6).

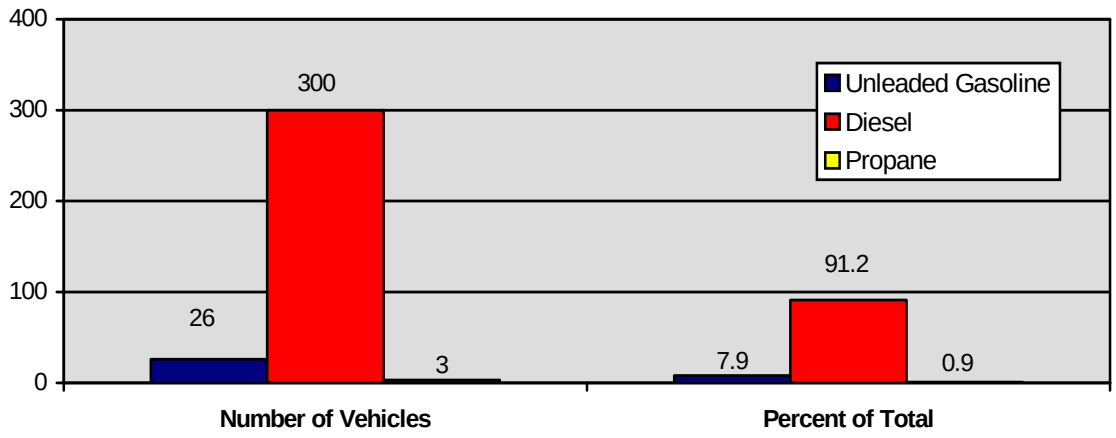

Figure 6. Distribution of Surveyed Vehicles by Fuel Type.

Trip Frequency

Table 7 shows the total number of trips made by the surveyed vehicles. Approximately 10 percent of the vehicles made at least 2 trips. More than half (54 percent) of the vehicles made 5-to-10 trips per day, and approximately 14 percent made more than 10 trips. Overall, 2,247 trips were generated. These included internal trips as well as external trips.

Table 7. Distribution of Surveyed Vehicles by Total Number of Trips.

Number of Trips	Number of Vehicles	Percent of Total	Cumulative Percent of Total	Total Number of Trips	Percent of Total
2	33	10.1	10.1	66	2.9
3	29	8.8	18.9	87	3.9
4	43	13.1	32.0	172	7.7
5	32	9.7	41.7	160	7.1
6	31	9.4	51.1	186	8.3
7	34	10.3	61.4	238	10.6
8	42	12.8	74.2	336	15.0
9	18	5.5	79.7	162	7.2
10	20	6.1	85.8	200	8.9
11	16	4.9	90.7	176	7.8
12	6	1.8	92.5	72	3.2
13	4	1.2	93.7	52	2.3
14	6	1.8	95.5	84	3.7
15	2	0.6	96.1	30	1.3
16	4	1.2	97.3	64	2.9
17	3	0.9	98.2	51	2.3
18	3	0.9	99.1	54	2.4
19	3	0.9	100.0	57	2.5
Total	**329**	**100.0**		**2,247**	**100.0**

Internal trips were those trips made within the study area. These were further distinguished by travel within or between zones; referred to as inter-zonal trips, those trips made from one zone to another, or intra-zonal, trips made within the same zone. External trips were those trips made outside of the study area.

Table 8 shows the distribution of internal and external trips made by the surveyed vehicles. Approximately 92 percent (2,065 trips) of the total trips generated by the vehicles were internal, and the remaining 8 percent (182 trips) were external travel. Of the total internal trips, approximately 83 percent were inter-zonal and only 3 percent were intra-zonal. Some of the logged trips made within the study area (5 percent) did not have identified zones. These unknown trips were included in the analysis as internal travel, but were not included in the analyses of travel distances, time and speed.

Table 8. Frequency of Internal and External Trips.

Trip Type	Number of Trips	Percent of Total
Inter-zonal	1,875	83.4
Intra-zonal	73	3.3
Unknown zones	117	5.2
Total Internal	**2,065**	**91.9**
External	182	8.1
Total Trips	**2,247**	**100.0**

Table 9 shows the distribution of total number of internal trips. Approximately 7 percent of the surveyed vehicles made 1 internal trip (just over 1 percent of the total internal trips); compared to the 2 trips made at the minimum by approximately 10 percent of the vehicles (see Table 7). This difference is attributable to the inclusion of external trips in Table 7. The distribution of trips changed when external trip counts were excluded and only internal trips were counted.

Table 9. Distribution of Surveyed Vehicles by Total Number of Internal Trips.

Number of Trips	Total Number of Vehicles	Percent of Total	Cumulative Percent of Total	Total Internal Trips	Percent of Total
1	22	6.8	6.8	22	1.1
2	41	12.6	19.4	82	4.0
3	30	9.2	28.6	90	4.4
4	38	11.7	40.3	152	7.4
5	22	6.8	47.1	110	5.3
6	29	8.9	56	174	8.4
7	28	8.6	64.6	196	9.5
8	36	11.1	75.7	288	13.9
9	15	4.6	80.3	135	6.5
10	19	5.8	86.1	190	9.2
11	16	4.9	91	176	8.5
12	5	1.5	92.5	60	2.9
13	4	1.2	93.7	52	2.5
14	6	1.8	95.5	84	4.1
15	2	0.6	96.1	30	1.5
16	4	1.2	97.3	64	3.1
17	4	1.2	98.5	68	3.3
18	3	0.9	99.4	54	2.6
19	2	0.6	100.0	38	1.8
Total	**326**	**100.0**		**2,065**	**100.0**

Figure 7 shows the distribution of internal trips by vehicle classification. Approximately 71 percent of the trips were made by small and medium vehicles, averaging 6.8 trips per vehicle. For large vehicles, which accounted to 29 percent of the trips, the average number of trips per day was 5.2.

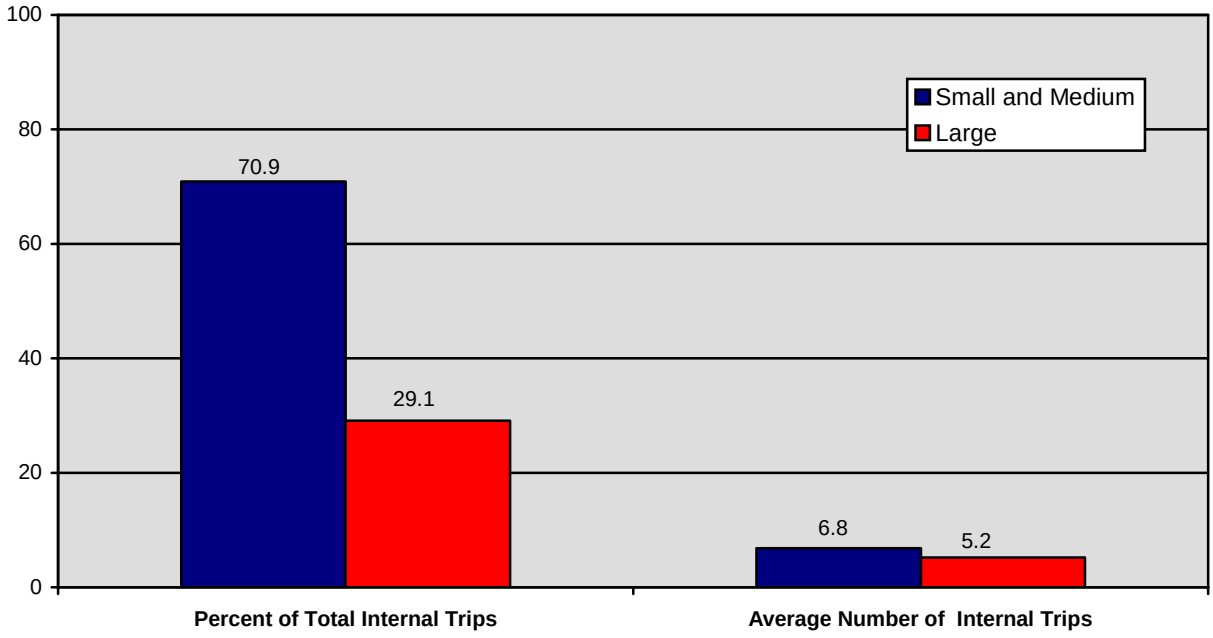

Figure 7. Percent of Total and Average Number of Internal Trips by Vehicle Classification.

Table 10 shows the distribution of internal trips by commercial type. Roughly 81 percent of the trips were made for cargo or freight transport, averaging 6 trips-per-day. The remaining 19 percent were made for local services; averaging 7.9 trips-per-day (see Figure 8).

Table 10. Frequency of Internal Trips by Commercial Vehicle Type.

Number of Trips	Cargo or Freight	Percent of Total	Local Services	Percent of Total	Total	Percent of Total
1	22	8.3	0	0.0	22	6.8
2	32	12.1	9	14.7	41	12.6
3	25	9.4	5	8.2	30	9.2
4	30	11.3	8	13.1	38	11.7
5	17	6.4	5	8.2	22	6.8
6	27	10.1	2	3.3	29	8.9
7	23	8.7	5	8.2	28	8.6
8	34	12.8	2	3.3	36	11.1
9	12	4.5	3	4.9	15	4.6
10	16	6.0	3	4.9	19	5.8
11	11	4.2	5	8.2	16	4.9
12	3	1.1	2	3.3	5	1.5
13	2	0.8	2	3.3	4	1.2
14	4	1.5	2	3.3	6	1.8
15	2	0.8	0	0.0	2	0.6
16	2	0.8	2	3.3	4	1.2
17	2	0.8	2	3.3	4	1.2
18	0	0.0	3	4.9	3	0.9
19	1	0.4	1	1.6	2	0.6
Total	**265**	**100.0**	**61**	**100.0**	**326**	**100.0**

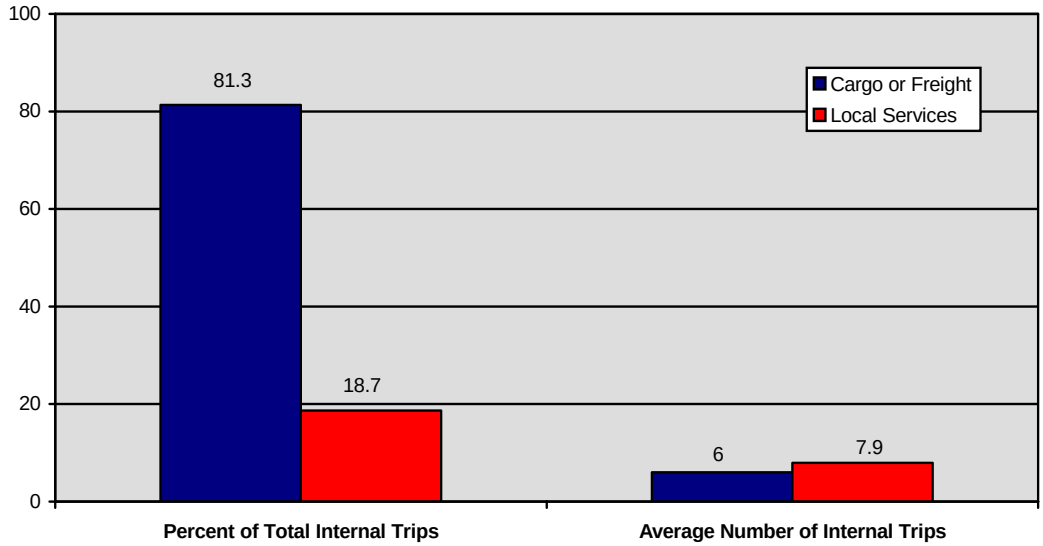

Figure 8. Percent of Total and Average Number of Internal Trips by Commercial Type.

In the succeeding sections, the analyses of trips in terms of land use activity, purpose, and cargo, were focused mainly on internal trips. Trip-related characteristics for vehicles making external trips were only included in the analysis of trip tours presented in a latter section of this report.

Trip Characteristics

The frequency of trips at origin and destination, as disaggregated by land use type, indicated the five most common sites were: construction site (22 percent), other (16 percent), retail/shopping (15 percent), industrial and manufacturing (14 percent), and residential (10 percent). These comprised a combined total of 77 percent of the internal trips made by the vehicles. Table 11 shows the distribution of trip origins and destinations by land use type. Since the distribution of trips at the origin and destination was similar, the succeeding tables present trips made at the destination only.

Table 11. Distribution of Trip Origins and Destinations by Land Use Type.

Land Use Type	Origin	Percent of Total	Destination	Percent of Total
Office Building (Non-Government)	42	2.0	45	2.2
Retail/Shopping	315	15.3	320	15.5
Industrial/Manufacturing	307	14.9	282	13.7
Medical/Hospital	12	0.6	12	0.6
Education (12th Grade or Less)	5	0.2	6	0.3
Government Office/Building	134	6.5	131	6.3
Residential	199	9.6	196	9.5
Airport	5	0.2	5	0.2
Intermodal Facility	1	0.1	1	0.1
Warehouse	125	6.1	137	6.6
Distribution Center	98	4.7	108	5.2
Construction Site	446	21.6	445	21.6
Other	345	16.7	337	16.3
Refused/Unknown	31	1.5	40	1.9
Total	**2,065**	**100.0**	**2,065**	**100.0**

As Table 12 shows, the majority (76 percent) of trips at the destinations were made by small and medium vehicles. The remaining 24 percent were by large vehicles.

Table 12. Distribution of Trips by Vehicle Classification.

Land Use Type	Small and Medium	Percent of Total	Large	Percent of Total	Total	Percent of Total
Office Building (Non-Government)	41	2.6	4	0.8	45	2.2
Retail/Shopping	287	18.2	33	6.7	320	15.5
Industrial/Manufacturing	235	14.9	47	9.6	282	13.7
Medical/Hospital	10	0.6	2	0.4	12	0.6
Education (12th Grade or Less)	4	0.3	2	0.4	6	0.3
Government Office/Building	96	6.1	35	7.2	131	6.3
Residential	175	11.1	21	4.3	196	9.5
Airport	3	0.2	2	0.4	5	0.2
Intermodal Facility	1	0.1	0	0.0	1	0.1
Warehouse	88	5.6	49	10.0	137	6.6
Distribution Center	53	3.3	55	11.2	108	5.2
Construction Site	308	19.6	137	28.0	445	21.6
Other	238	15.1	99	20.2	337	16.3
Refused/Unknown	36	2.3	4	0.8	40	1.9
Total	**1,575**	**100.0**	**490**	**100.0**	**2,065**	**100.0**
Percent of Total	**76.2**		**23.7**		**100.0**	

By commercial type, approximately 77 percent of the trips were made for cargo or freight transport and the remaining 23 percent for local services (see Table 13).

Table 13. Distribution of Trips by Commercial Vehicle Type.

Land Use Type	Cargo or Freight	Percent of Total	Local Services	Percent of Total	Total	Percent of Total
Office Building (Non-Government)	18	1.1	27	5.6	45	2.2
Retail/Shopping	194	12.3	126	26.2	320	15.5
Industrial/Manufacturing	254	16.0	28	5.8	282	13.7
Medical/Hospital	9	0.6	3	0.6	12	0.6
Education (12th Grade or Less)	3	0.2	3	0.6	6	0.3
Government Office/Building	105	6.6	26	5.4	131	6.3
Residential	99	6.2	97	20.1	196	9.5
Airport	2	0.1	3	0.6	5	0.2
Intermodal Facility	1	0.1	0	0.0	1	0.1
Warehouse	123	7.8	14	2.9	137	6.6
Distribution Center	105	6.6	3	0.6	108	5.2
Construction Site	435	27.5	10	2.1	445	21.6
Other	224	14.2	113	23.5	337	16.3
Refused/Unknown	11	0.7	29	6.0	40	1.9
Total	**1,583**	**100.0**	**482**	**100**	**2,065**	**100.0**
Percent of Total	**76.7**		**23.3**		**100.0**	

Table 14 shows a summary of trip purposes at the origin and destination. The results indicated that delivery (36 percent), pick up (21 percent), service-related business (20 percent), and return to base location (15 percent) were the main purposes, comprising 92 percent of the total trips (see Figure 9).

By vehicle classification, small and medium vehicles made approximately 34 percent of the trips for delivery, 25 percent for service-related business, 18 percent for pick up, and 15 percent for return to base location (see Table 15 and Figure 10). For large vehicles, delivery (43 percent), pick up (32 percent), and return to base location (17 percent) were the main trip purposes (see Table 16 and Figure 11).

By commercial type, delivery (47 percent), pick up (28 percent), and return to base location (16 percent) were the main purposes for major cargo or freight transport. For local services, the majority of trips (76 percent) were for service-related business purposes, 12 percent were for return to base location, and 8.5 percent were for other purposes (see Tables 17 and 18, and Figures 12 and 13).

Table 14. Trip Purposes by Origin and Destination Summary.

Trip Purpose at Origin	Trip Purpose at Destination											
	Base/ Return to Base Location	Delivery	Pick Up	Pick Up and Delivery	Maint. (Fuel, Oil, Etc.)	Driver Needs	To Home	Service-Related Business	Other	Unknown	Total	Percent of Total
Base Location/Return to Base Location	1	166	83	6	7	1	0	66	9	0	339	16.4
Delivery	197	190	311	5	7	20	3	4	3	0	740	35.8
Pick Up	21	358	21	15	3	6	0	7	1	0	432	20.9
Pick Up and Delivery	3	19	0	7	0	2	0	1	0	1	33	1.6
Maintenance (Fuel, Oil, Etc.)	9	1	6	0	1	1	0	3	0	0	21	1.1
Driver Needs (Lunch, Etc.)	4	11	14	0	1	1	0	7	3	0	41	2.0
Service-Related Business	67	1	3	0	4	8	0	314	5	0	402	19.5
Other	14	2	2	0	0	2	0	3	26	1	50	2.4
Unknown	0	2	4	0	0	0	0	0	1	0	7	0.3
Total	**316**	**750**	**444**	**33**	**23**	**41**	**3**	**405**	**48**	**2**	**2,065**	**100.0**
Percent of Total	**15.3**	**36.3**	**21.5**	**1.6**	**1.1**	**2.0**	**0.2**	**19.6**	**2.3**	**0.1**	**100**	

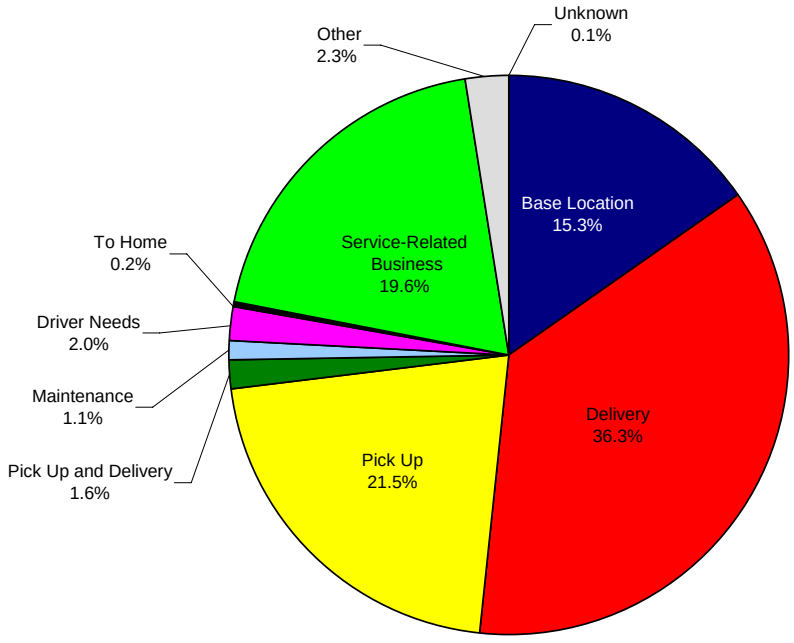

Figure 9. Distribution of Trip Purposes at Destination.

Table 15. Distribution of Trip Purposes at Origin and Destination by Small and Medium Vehicles.

Trip Purpose at Origin	Trip Purpose at Destination (Small and Medium Vehicles)											
	Base/ Return to Base Location	Delivery	Pick Up	Pick Up and Delivery	Maint. (Fuel, Oil, Etc.)	Driver Needs	To Home	Service-Related Business	Other	Unknown	Total	Percent of Total
Base Location/Return to Base Location	1	123	41	4	5	1	0	64	9	0	248	15.7
Delivery	133	161	209	4	6	11	2	2	2	0	530	33.7
Pick Up	10	236	21	7	2	1	0	7	1	0	285	18.1
Pick Up and Delivery	1	11	0	6	0	1	0	1	0	1	21	1.3
Maintenance (Fuel, Oil, Etc.)	6	1	4	0	1	1	0	3	0	0	16	1.0
Driver Needs (Lunch, Etc.)	2	5	6	0	1	1	0	7	3	0	25	1.6
Service-Related Business	66	0	3	0	3	8	0	313	5	0	398	25.3
Other	14	2	2	0	0	1	0	3	26	1	49	3.1
Unknown	0	1	1	0	0	0	0	0	1	0	3	0.2
Total	**233**	**540**	**287**	**21**	**18**	**25**	**2**	**400**	**47**	**2**	**1,575**	**100.0**
Percent of Total	**14.8**	**34.3**	**18.2**	**1.3**	**1.2**	**1.6**	**0.1**	**25.4**	**3.0**	**0.1**	**100.0**	

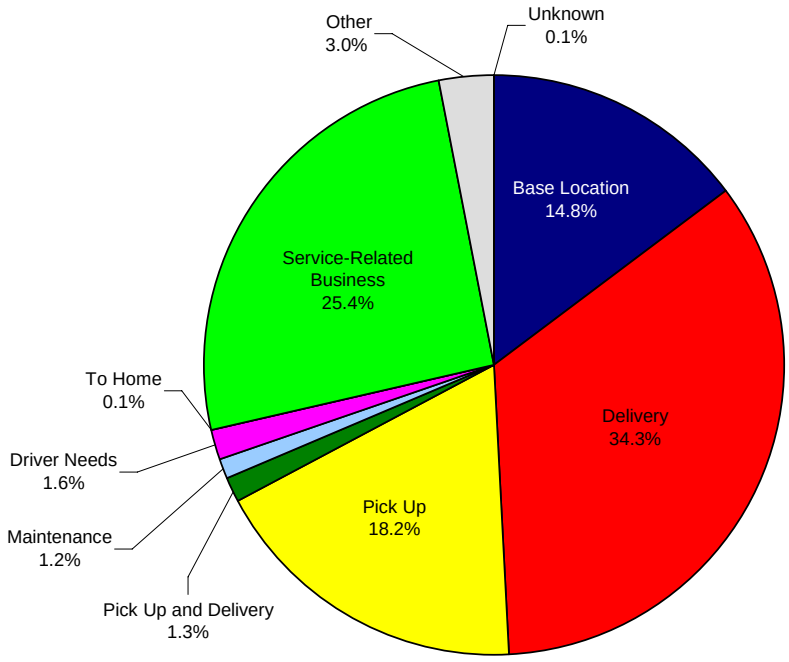

Figure 10. Distribution of Trip Purposes at Destination by Small and Medium Vehicles.

Table 16. Distribution of Trip Purposes at Origin and Destination by Large Vehicles.

Trip Purpose at Origin	Trip Purpose at Destination (Large Vehicles)											
	Base/ Return to Base Location	Delivery	Pick Up	Pick Up and Delivery	Maint. (Fuel, Oil, Etc.)	Driver Needs	To Home	Service-Related Business	Other	Unknown	Total	Percent of Total
Base Location/Return to Base Location	0	43	42	2	2	0	0	2	0	0	91	18.6
Delivery	64	29	102	1	1	9	1	2	1	0	210	42.9
Pick Up	11	122	0	8	1	5	0	0	0	0	147	30.0
Pick Up and Delivery	2	8	0	1	0	1	0	0	0	0	12	2.4
Maintenance (Fuel, Oil, Etc.)	3	0	2	0	0	0	0	0	0	0	5	1.0
Driver Needs (Lunch, Etc.)	2	6	8	0	0	0	0	0	0	0	16	3.3
Service-Related Business	1	1	0	0	1	0	0	1	0	0	4	0.8
Other	0	0	0	0	0	1	0	0	0	0	1	0.2
Unknown	0	1	3	0	0	0	0	0	0	0	4	0.8
Total	**83**	**210**	**157**	**12**	**5**	**16**	**1**	**5**	**1**	**0**	**490**	**100.0**
Percent of Total	**16.9**	**42.9**	**32.0**	**2.5**	**1.0**	**3.3**	**0.2**	**1.0**	**0.2**	**0.0**	**100.0**	

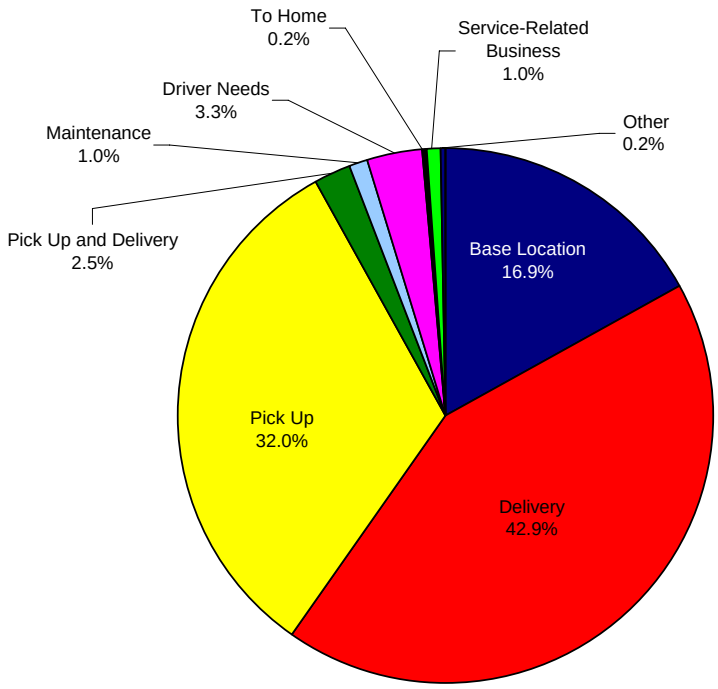

Figure 11. Distribution of Trip Purpose at Destination by Large Vehicles.

Table 17. Distribution of Trip Purposes at Origin and Destination by Cargo or Freight Transport.

Trip Purpose at Origin	Trip Purpose at Destination (Cargo or Freight)											
	Base/ Return to Base Location	Delivery	Pick Up	Pick Up and Delivery	Maint. (Fuel, Oil, Etc.)	Driver Needs	To Home	Service-Related Business	Other	Unknown	Total	Percent of Total
Base Location/Return to Base Location	0	166	83	6	5	1	0	15	1	0	277	17.5
Delivery	197	190	311	5	7	20	3	4	3	0	740	46.7
Pick Up	21	358	21	15	3	6	0	7	1	0	432	27.3
Pick Up and Delivery	3	19	0	7	0	2	0	1	0	1	33	2.1
Maintenance (Fuel, Oil, Etc.)	8	1	6	0	1	1	0	0	0	0	17	1.1
Driver Needs (Lunch, Etc.)	3	11	14	0	1	1	0	1	2	0	33	2.1
Service-Related Business	21	1	3	0	1	1	0	10	0	0	37	2.3
Other	3	2	2	0	0	1	0	0	0	0	8	0.5
Unknown	0	2	4	0	0	0	0	0	0	0	6	0.4
Total	**256**	**750**	**444**	**33**	**18**	**33**	**3**	**38**	**7**	**1**	**1,583**	**100.0**
Percent of Total	**16.1**	**47.4**	**28.1**	**2.1**	**1.1**	**2.1**	**0.2**	**2.4**	**0.4**	**0.1**	**100.0**	

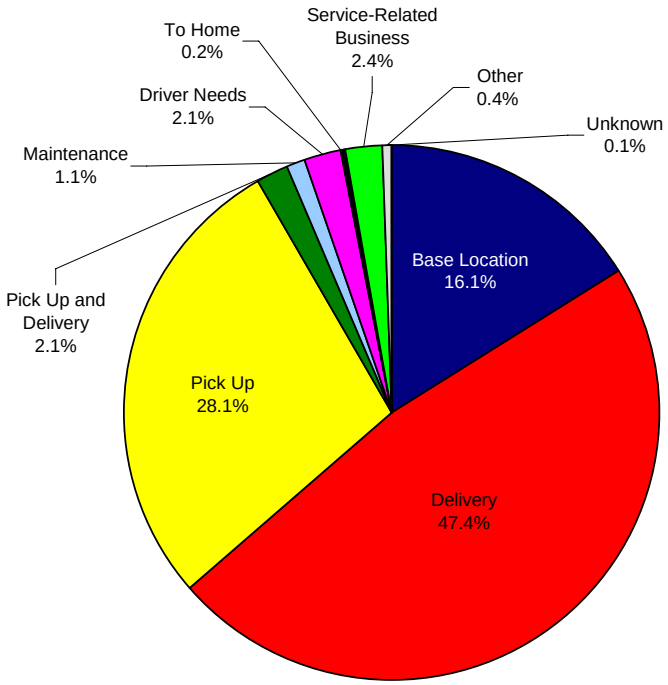

Figure 12. Distribution of Trip Purposes at Destination by Cargo or Freight Transport.

Table 18. Distribution of Trip Purposes at Origin and Destination by Local Services.

Trip Purpose at Origin	Trip Purpose at Destination (Local Services)											
	Base/ Return to Base Location	Delivery	Pick Up	Pick Up and Delivery	Maint. (Fuel, Oil, Etc.)	Driver Needs	To Home	Service-Related Business	Other	Unknown	Total	Percent of Total
Base Location/Return to Base Location	1	0	0	0	2	0	0	51	8	0	62	12.9
Delivery	0	0	0	0	0	0	0	0	0	0	0	0.0
Pick Up	0	0	0	0	0	0	0	0	0	0	0	0.0
Pick Up and Delivery	0	0	0	0	0	0	0	0	0	0	0	0.0
Maintenance (Fuel, Oil, Etc.)	1	0	0	0	0	0	0	3	0	0	4	0.8
Driver Needs (Lunch, Etc.)	1	0	0	0	0	0	0	6	1	0	8	1.7
Service-Related Business	46	0	0	0	3	7	0	304	5	0	365	75.7
Other	11	0	0	0	0	1	0	3	26	1	42	8.7
Unknown	0	0	0	0	0	0	0	0	1	0	1	0.2
Total	**60**	**0**	**0**	**0**	**5**	**8**	**0**	**367**	**41**	**1**	**482**	**100.0**
Percent of Total	**12.5**	**0**	**0**	**0**	**1.0**	**1.7**	**0**	**76.1**	**8.5**	**0.2**	**100.0**	

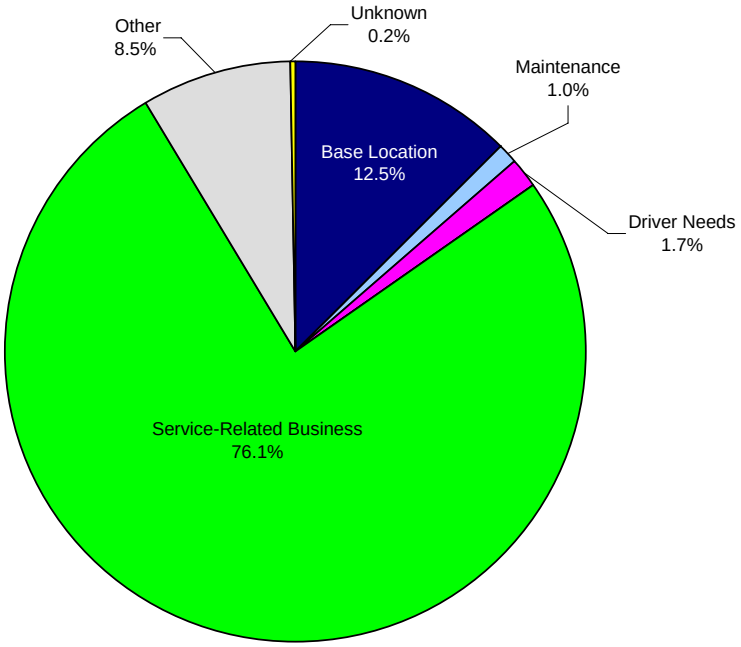

Figure 13. Distribution of Trip Purposes at Destination by Local Services.

Surveyed Cargo Characteristics

Survey respondents were asked to provide the type of cargo being delivered or picked up at each stop. The respondents reported that a considerable portion of their vehicles were empty at the origin (44 percent) and destination (41 percent) locations. The more common cargo types included clay/concrete/glass or stone, manufactured goods and equipment, transportation, farm products, wastes, food/health/beauty products, and miscellaneous shipments, which had a combined total of 34 percent of the reported cargo at the destination. Approximately 8 percent of the cargo was unclassified. Table 19 shows a breakdown of the surveyed cargo at origin and destination.

Table 19. Distribution of Surveyed Cargo by Origin and Destination.

Cargo Type	Number of Trips at Origin	Percent of Total	Number of Trips at Destination	Percent of Total
Farm Products	111	5.4	113	5.5
Forest Products	45	2.2	46	2.2
Marine Products	-	-	-	-
Metals and Minerals	21	1.0	19	0.9
Food, Health, and Beauty Products	89	4.4	91	4.4
Tobacco Products	0	0.0	0	0.0
Textiles	0	0.0	0	0.0
Wood Products	27	1.3	28	1.4
Printed Matter	37	1.8	40	1.9
Chemical Products	7	0.3	8	0.4
Refined Petroleum or Coal Products	47	2.3	49	2.4
Rubber, Plastic, and Styrofoam Products	-	-	-	-
Clay, Concrete, Glass, or Stone	182	8.8	186	9.0
Manufactured Goods/Equipment	112	5.4	120	5.8
Wastes	93	4.5	101	4.9
Miscellaneous Shipments	84	4.1	84	4.1
Hazardous Materials	11	0.5	13	0.6
Transportation	106	5.1	114	5.5
Unclassified/Other Cargo	170	8.2	180	8.7
Driver Refused to Answer	12	0.6	16	0.8
Unknown to Driver	4	0.2	5	0.2
Empty	907	43.9	852	41.3
Total	**2,065**	**100.0**	**2,065**	**100.0**

Approximately 29 percent of the transported goods at pick up and 42 percent at drop off locations had cargo weights less than 10,000 pounds. Figure 14 and Table 20 show the distribution of cargo weight at pick up and at drop off locations.

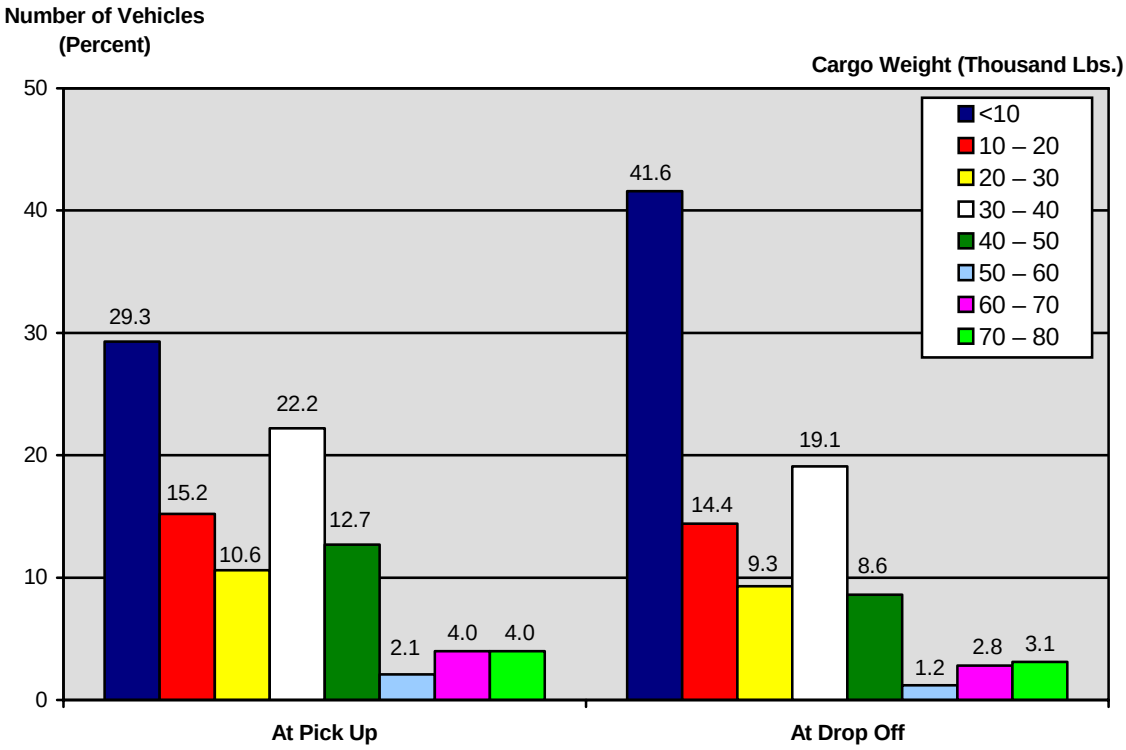

Figure 14. Surveyed Cargo Weight at Pick Up and Drop Off.

Table 20. Distribution of Surveyed Cargo Weight at Pick Up and Drop Off Locations.

Cargo Weight (Lbs.)	Number of Trips at Pick Up	Percent of Total	Number of Trips at Drop Off	Percent of Total
<10,000	141	29.3	310	41.6
10,000 – 20,000	73	15.2	107	14.4
20,000 – 30,000	51	10.6	69	9.3
30,000 – 40,000	107	22.2	142	19.2
40,000 – 50,000	61	12.6	64	8.6
50,000 – 60,000	10	2.1	9	1.2
60,000 – 70,000	19	4.0	21	2.8
70,000 – 80,000	19	4.0	23	3.1
Total	**481**	**100.0**	**745**	**100.0**

In the analysis of surveyed cargo, the cargo classification was grouped according to the Texas Statewide Analysis Model (SAM) Commodity Groups (see Table 21), and the land use types were grouped into eight Land Use Categories (see Table 22) to determine the distribution of trips and average cargo weights by commodity group and land use.

Table 21. Equivalency between SAM Commodity Groups and Survey Classifications.

Commodity Group	Survey Cargo Classification
Agriculture	Farm Products, Forest Products, Marine Products
Raw Materials	Metals and Minerals, Chemical Products, Refined Petroleum or Coal Products
Food	Food, Health and Beauty Products, Tobacco Products
Textiles	Textiles, Rubber, Plastic, and Styrofoam Products
Wood	Wood Products, Printed Matter
Building Materials	Clay, Concrete, Glass or Stone Products
Machinery	Manufactured Goods/Equipment
Miscellaneous	Wastes, Miscellaneous Shipments
Secondary	Unclassified Cargo
Hazardous Materials	Hazardous Materials
Transportation	*Transportation*
Empty	*Empty*
Unknown	*Unknown to Driver/ Driver Refused to Answer*

Table 22. Equivalency between Land Use Category and Survey Type of Place Options.

Land Use Category	Type of Place Options
Office	Office Building
Retail	Retail/Shopping
Industrial	Industrial/Manufacturing
Medical	Medical/Hospital
Education	Educational (12th Grade or Less and College, Trade, Etc.)
Government	Government Office/Building
Residential	Residential
Other	*Airport, Inter-Modal Facility, Warehouse, Distribution Center, Construction Site, Other*

Those cargo types (in italics) that did not have equivalents in the commodity grouping were included in the data processing and analysis. Those land use types that did not have equivalents in the category were grouped together as "Other."

As Table 23 shows, over half (52 percent) of the total surveyed cargo was attracted to the other land use type category, 16 percent was attracted to the retail category, and 14 percent was attracted to the industrial land use category. By commodity group, the majority were empty (41 percent), and building materials (9 percent), miscellaneous (9 percent), secondary (8.7 percent), and agriculture (7.7 percent) comprised a combined total of 34.4 percent of the total trips.

Table 23. Distribution of Trips at the Destination by Commodity Group and Land Use.

Commodity Group	Office	Retail	Ind'l.	Med.	Educ.	Gov't.	Res.	Other	Total	Percent of Total
Agriculture	0	40	2	0	0	2	8	107	159	7.7
Raw Materials	1	12	7	2	0	7	2	45	76	3.7
Food	0	43	0	3	0	10	0	35	91	4.4
Wood	1	12	0	2	0	2	1	50	68	3.3
Building Materials	1	4	4	1	0	0	37	139	186	9.0
Machinery	0	6	25	3	1	4	15	66	120	5.8
Miscellaneous	4	43	19	0	0	13	5	101	185	9.0
Secondary	3	19	14	0	2	15	22	105	180	8.7
Hazardous Materials	0	0	10	0	0	0	0	3	13	0.6
Transportation	3	65	4	0	1	5	12	24	114	5.5
Empty	30	74	192	0	2	70	93	391	852	41.3
Unknown	2	2	5	1	0	3	1	7	21	1.0
Total	**45**	**320**	**282**	**12**	**6**	**131**	**196**	**1,073**	**2,065**	**100.0**
Percent of Total	**2.2**	**15.5**	**13.6**	**0.6**	**0.3**	**6.3**	**9.5**	**52.0**	**100**	

The average weight for all types of surveyed cargo at the destination point was estimated at 8,000 pounds at drop off, with building materials as the most transported cargo to medical, retail, residential, industrial, and other types of land use (see Table 24). At pick up, the average cargo weight was estimated at 6,400 pounds, with raw materials showing the highest average cargo weight of 78,000 pounds being picked up at the medical land use type, followed by building materials (33,500 pounds) being picked up at the industrial land use type (see Table 25).

Table 24. Average Cargo Weight at Drop Off by Commodity Group and Land Use.

Commodity Group	Average Cargo Weight at Drop Off by Land Use (Thousand Lbs.)							
	Office	Retail	Ind'l.	Med.	Educ.	Gov't.	Res.	Other
Agriculture	0.0	1.4	0.5	0.0	0.0	0.0	2.1	16.3
Raw Materials	0.0	34.1	0.0	0.0	0.0	0.7	0.0	12.8
Food	0.0	2.9	0.0	4.1	0.0	13.0	0.0	13.9
Wood	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0
Building Materials	0.0	32.5	20.9	40.0	0.0	0.0	22.1	34.6
Machinery	0.0	0.0	6.9	9.2	13.6	12.3	3.9	21.6
Miscellaneous	0.0	0.0	9.8	0.0	0.0	5.1	12.2	25.3
Secondary	1.0	1.1	15.5	0.0	1.0	6.3	0.6	12.2
Hazardous Materials	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.8
Transportation	2.3	0.2	0.6	0.0	0.0	0.0	0.0	3.0
Empty	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5

Table 25. Average Cargo Weight at Pick Up by Commodity Group and Land Use.

Commodity Group	Average Cargo Weight at Pick Up by Land Use (Thousand Lbs.)							
	Office	Retail	Ind'l.	Med.	Educ.	Gov't.	Res.	Other
Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6
Raw Materials	0.0	0.0	0.0	78.0	0.0	0.0	0.0	2.4
Food	0.0	0.0	0.0	0.4	0.0	0.0	0.0	1.8
Wood	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7
Building Materials	0.0	0.0	33.5	0.0	0.0	0.0	0.0	1.8
Machinery	0.0	1.0	0.2	0.0	0.0	0.0	2.9	5.3
Miscellaneous	2.2	0.1	4.9	0.0	0.0	1.2	0.0	1.5
Secondary	0.3	0.0	3.2	0.0	0.0	2.6	0.0	3.7
Hazardous Materials	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.2
Empty	4.6	1.6	24.2	0.0	1.8	5.6	0.4	12.2
Unknown	0.0	0.6	8.0	0.0	0.0	31.3	0.0	9.4

Trip Length Characteristics

Odometer readings at the beginning and end of the trip would have been useful in estimating the trip lengths of external and intra-zonal trips. However, in the survey, only odometer readings at the beginning of the trip were provided. Therefore, trip length, travel time, and speed of the internal trips generated by the surveyed vehicles were measured based on network travel time and distance matrices. Only inter-zonal trips made by the surveyed vehicles were included in the analysis.

Approximately 22 percent of the trips made by the surveyed vehicles had trip lengths of less than five miles in length, and a combined total of 60 percent had trip lengths between 6-to-20 miles. Approximately 64 percent of these trips were generated by small and medium vehicles. By commercial type, 60 percent were for cargo or freight transport, and 22 percent were for local services. Tables 26 and 27 provide the trip length frequency distribution by vehicle classification and commercial types.

Table 26. Trip Length Frequency Distribution by Vehicle Classification.

Trip Length (Miles)	Small and Medium	Percent of Total	Large	Percent of Total	Total	Percent of Total
0-5	369	25.9	50	11.1	419	22.4
6-10	392	27.5	114	25.3	506	27.0
11-15	300	21.1	103	22.8	403	21.5
16-20	155	10.8	65	14.4	220	11.7
21-25	113	7.9	33	7.3	146	7.8
26-30	64	4.5	54	12.0	118	6.3
31-35	21	1.5	17	3.8	38	2.0
36-40	7	0.5	9	2.0	16	0.9
41-45	1	0.1	3	0.7	4	0.2
46-50	1	0.1	1	0.2	2	0.1
51-55	1	0.1	0	0.0	1	0.1
56-60	0	0.0	2	0.4	2	0.1
Total	**1,424**	**100.0**	**451**	**100.0**	**1,875**	**100.0**

Table 27. Trip Length Frequency Distribution by Commercial Vehicle Type.

Trip Length (Miles)	Cargo or Freight	Percent of Total	Local Services	Percent of Total	Total	Percent of Total
0-5	259	18.1	160	36.3	419	22.3
6-10	371	25.9	135	30.6	506	27.0
11-15	319	22.2	84	19.0	403	21.5
16-20	184	12.8	36	8.2	220	11.7
21-25	129	9.0	17	3.9	146	7.8
26-30	113	7.9	5	1.1	118	6.3
31-35	36	2.5	2	0.5	38	2.0
36-40	15	1.0	1	0.2	16	0.9
41-45	4	0.3	0	0.0	4	0.2
46-50	1	0.1	1	0.2	2	0.1
51-55	1	0.1	0	0.0	1	0.1
55-60	2	0.1	0	0.0	2	0.1
Total	**1434**	**100.0**	**441**	**100.0**	**1875**	**100.0**

Figures 15 and 16 show the trip length frequency distributions by vehicle classification and commercial types. Table 28 shows the ungrouped trip length frequency distribution.

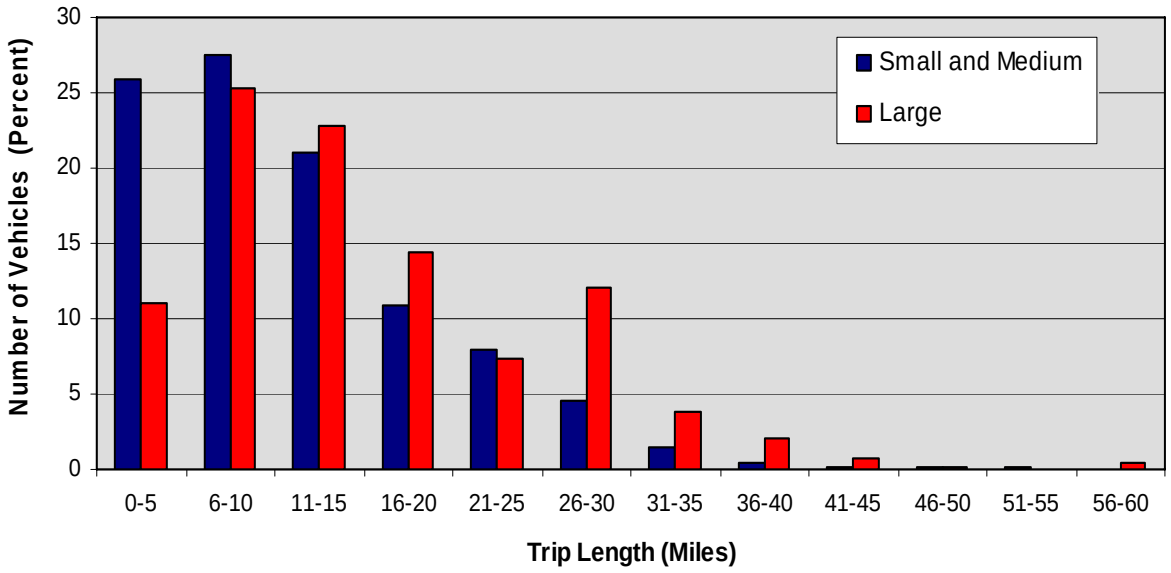

Figure 15. Trip Length Frequency Distribution by Vehicle Classification.

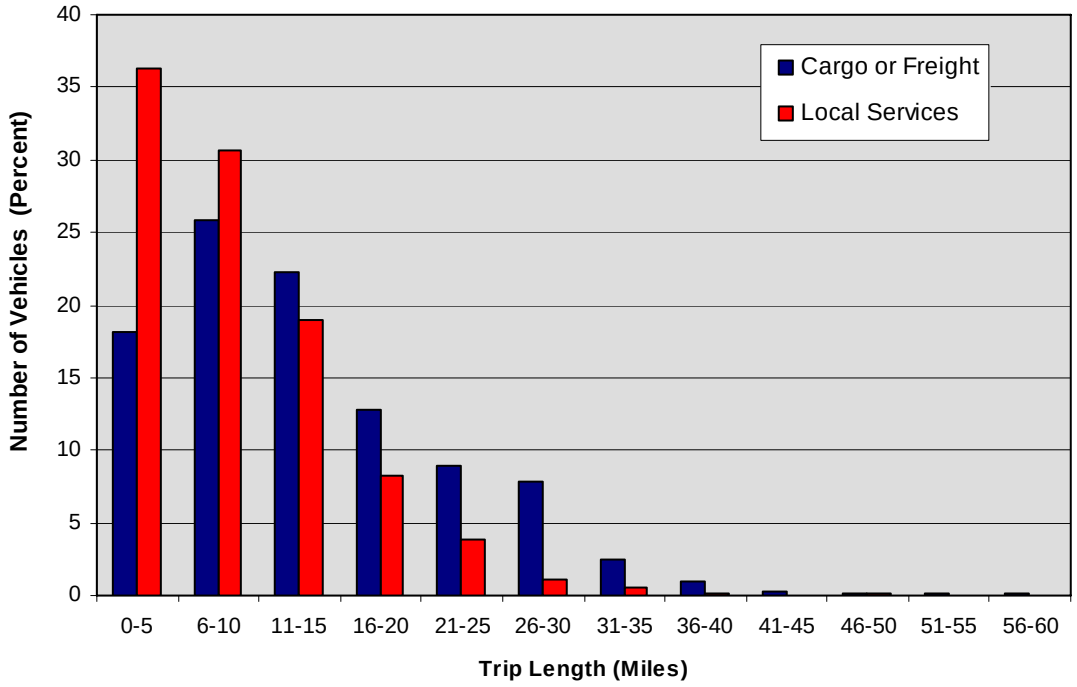

Figure 16. Trip Length Frequency Distribution by Commercial Vehicle Type.

Table 28. Trip Length Frequency Distribution (Ungrouped).

Trip Length (Miles)	Number of Vehicles	Percent of Total	Trip Length (Miles)	Number of Vehicles	Percent of Total	Trip Length (Miles)	Number of Vehicles	Percent of Total
1	60	3.2	16	52	2.8	31	17	0.9
2	63	3.4	17	43	2.3	32	6	0.3
3	82	4.4	18	33	1.8	33	7	0.4
4	105	5.6	19	61	3.3	34	8	0.4
5	109	5.8	20	31	1.7	36	5	0.3
6	110	5.9	21	38	2.0	37	6	0.3
7	101	5.4	22	28	1.5	38	4	0.2
8	100	5.3	23	37	2.0	40	1	0.0
9	109	5.8	24	26	1.4	41	1	0.0
10	86	4.6	25	17	0.9	42	1	0.0
11	82	4.4	26	14	0.8	43	2	0.1
12	72	3.9	27	25	1.3	47	1	0.0
13	74	4.0	28	63	3.4	49	1	0.0
14	105	5.6	29	14	0.8	54	1	0.0
15	70	3.7	30	2	0.1	56	1	0.0
						57	1	0.0
						Total	**1,875**	**100.0**

Overall, average distances traveled by all surveyed vehicles were 13 miles, 15.9 miles for small and medium vehicles, and 12 miles for large vehicles (Table 29). By commercial type, the distance traveled for cargo or freight transport averaged 14 miles, and the distance traveled for local services average 9.5 miles (Table 30).

Table 29. Mean Trip Length to Destination by Land Use Type.

Land Use Type	Overall Mean Trip Length (Miles)	Mean Trip Length (Miles)	
		Small and Medium	Large
Office Building (Non-Government)	10.8	17.0	10.2
Retail/Shopping	9.2	15.4	8.5
Industrial/Manufacturing	15.6	18.4	15.0
Medical/Hospital	17.4	16.4	17.6
Education (12th Grade or Less)	16.8	38.7	11.3
Government Office/Building	12.5	13.0	12.3
Residential	13.2	29.2	11.7
Airport	11.2	15.1	7.3
Intermodal Facility	7.4	-	7.4
Warehouse	11.1	10.7	11.4
Distribution Center	11.7	12.2	11.2
Construction Site	13.4	14.4	12.9
Other	15.5	20.8	13.2
Refused/Unknown	9.5	12.5	9.2
Average	**13.0**	**15.9.0**	**12.0**

Table 30. Mean Trip Length to Destination by Land Use Type and Commercial Vehicle Type.

Land Use Type	Overall Mean Trip Length (Miles)	Mean Trip Length (Miles)	
		Cargo or Freight	Local Services
Office Building (Non-Government)	10.8	12.6	9.7
Retail/Shopping	9.2	9.8	8.3
Industrial/Manufacturing	15.6	15.8	13.1
Medical/Hospital	17.4	17.5	17.3
Education (12th Grade or Less)	16.8	26.1	10.6
Government Office/Building	12.5	13.0	9.9
Residential	13.2	17.6	9.4
Airport	11.2	15.1	7.3
Intermodal Facility	7.4	7.4	-
Warehouse	11.1	11.6	7.0
Distribution Center	11.7	11.8	8.6
Construction Site	13.4	13.4	10.4
Other	15.5	18.1	10.5
Refused/Unknown	9.5	13.1	8.0
Average	**13.0**	**14.0**	**9.5**

Table 31 shows the average trip length by commodity group. The travel distance for most of the cargo types exceeded the overall average trip length.

Table 31. Mean Trip Length by Commodity Group.

Commodity Group	Mean Trip Length (Miles)
Agriculture	13.7
Raw Materials	14.6
Food	10.2
Wood	9.0
Building Materials	14.1
Machinery	13.4
Miscellaneous	13.9
Secondary	13.6
Hazardous Materials	12.0
Transportation	9.0
Empty	13.3
Unknown/Refused	10.8
All Combined	**13.0**

Travel Time and Speed Characteristics

Survey respondents were also asked to provide arrival and departure times for each logged trip on the day of the survey. The travel logs could be compared to travel times provided in network travel time and distance matrices. However, in this analysis, reported travel time data were not utilized due to some inconsistencies observed during data processing. Hence, all travel time results were based on network and travel time matrices for inter-zonal trips. Results of this analysis are shown by vehicle classification (Table 32) and by commercial type (Table 33).

The majority of trips took less than half an hour, of which approximately 22 percent occurred within 10 minutes, 34 percent were between 10 and 20 minutes and 24 percent were between 20 and 30 minutes. Nearly 63 percent of these trips were made by small and medium vehicles. By commercial type, these trips comprised approximately 59 percent for cargo or freight, and 21 percent were for local services.

Table 32. Frequency Distribution of Travel Time by Vehicle Classification.

Travel Time (Minutes)	Small and Medium	Percent of Total	Large	Percent of Total	Total Number of Vehicles	Percent of Total
0-5	93	6.5	14	3.1	107	5.7
6-10	253	17.8	53	11.8	306	16.3
11-15	257	18.0	66	14.6	323	17.2
16-20	246	17.3	68	15.1	314	16.8
21-25	199	14.0	69	15.3	268	14.3
26-30	127	8.9	57	12.6	184	9.8
31-35	122	8.6	37	8.2	159	8.5
36-40	39	2.7	26	5.8	65	3.5
41-45	47	3.3	39	8.6	86	4.6
46-50	28	2.0	9	2.0	37	2.0
51-55	8	0.6	4	0.9	12	0.6
56-60	3	0.2	6	1.3	9	0.5
>60	2	0.1	3	0.7	5	0.3
Total	**1,424**	**100.0**	**451**	**100.0**	**1,875**	**100.0**

Table 33. Frequency Distribution of Travel Time by Commercial Vehicle Type.

Travel Time (Minutes)	Cargo or Freight	Percent of Total	Local Services	Percent of Total	Total Number of Vehicles	Percent of Total
0-5	66	4.6	41	9.3	107	5.7
6-10	204	14.2	102	23.1	306	16.3
11-15	237	16.5	86	19.5	323	17.2
16-20	238	16.6	76	17.2	314	16.8
21-25	210	14.6	58	13.2	268	14.3
26-30	149	10.4	35	7.9	184	9.8
31-35	138	9.6	21	4.8	159	8.5
36-40	54	3.8	11	2.5	65	3.5
41-45	79	5.5	7	1.6	86	4.6
46-50	35	2.5	2	0.5	37	2.0
51-55	11	0.8	1	0.2	12	0.6
56-60	9	0.6	0	0.0	9	0.5
>60	4	0.3	1	0.2	5	0.2
Total	**1,434**	**100.0**	**441**	**100.0**	**1,875**	**100.0**

Figures 17 and 18 show the distributions of travel time by vehicle classification and by commercial vehicle type. Table 34 provides the ungrouped distribution of travel time.

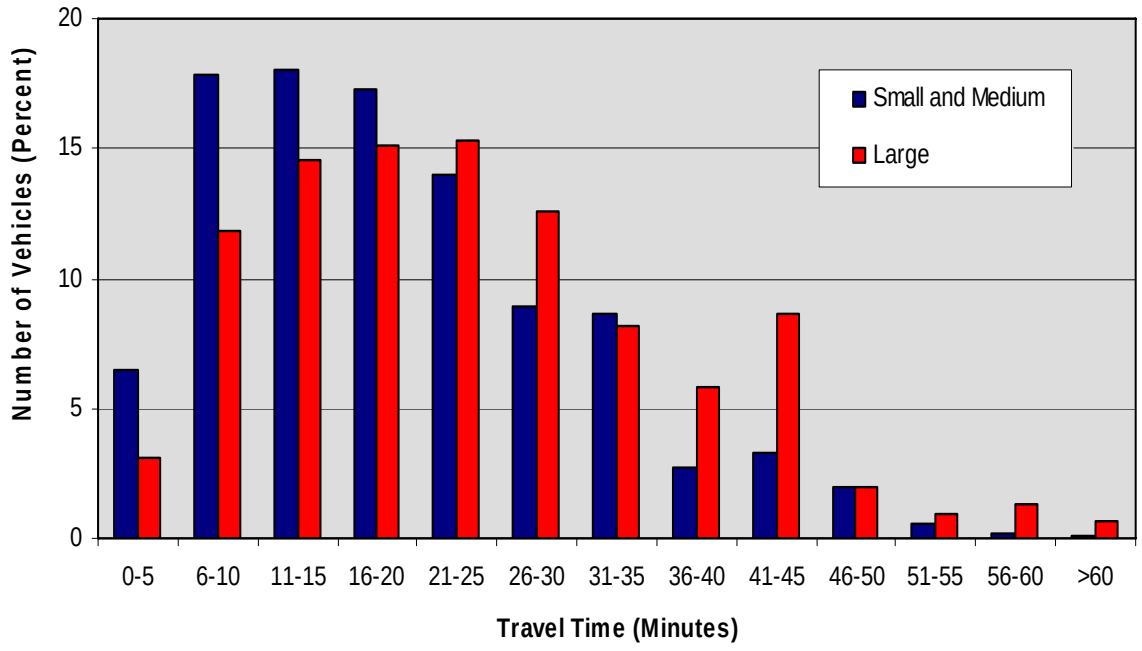

Figure 17. Frequency Distribution of Travel Time by Vehicle Classification.

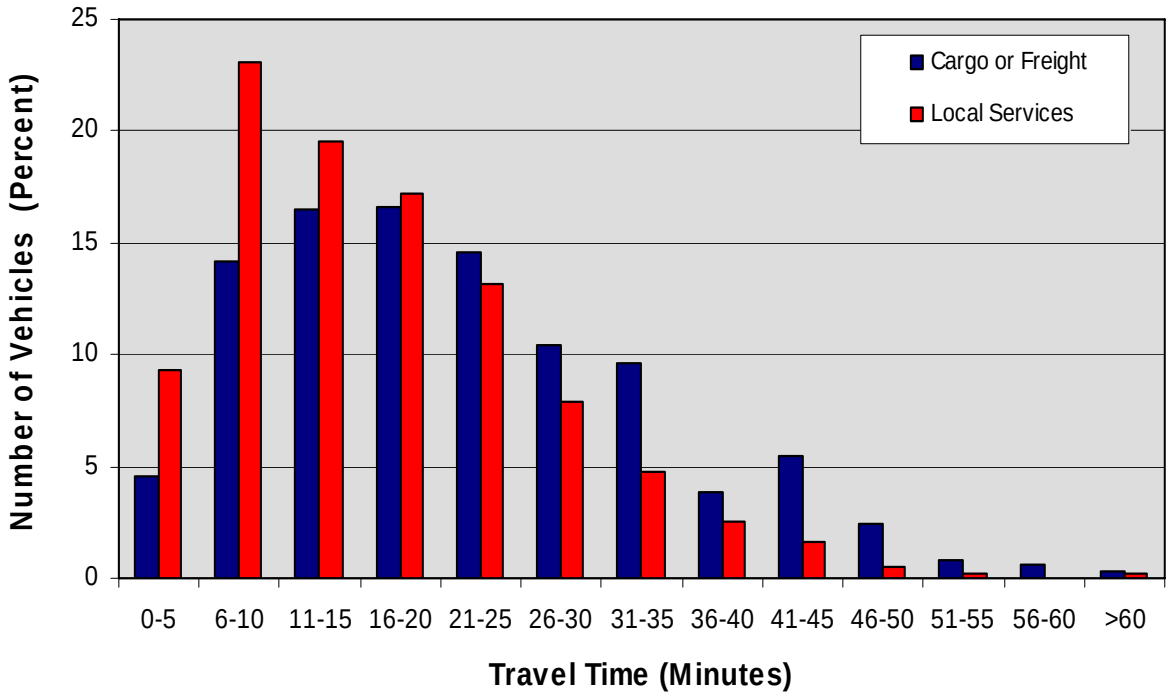

Figure 18. Frequency Distribution of Travel Time by Vehicle Classification.

Table 34. Frequency Distribution of Travel Time (Ungrouped).

Travel Time (Minutes)	Number of Vehicles	Percent of Total	Travel Time (Minutes)	Number of Vehicles	Percent of Total	Travel Time (Minutes)	Number of Vehicles	Percent of Total
1	10	0.5	22	57	3.0	43	6	0.3
2	10	0.5	23	50	2.6	44	5	0.3
3	28	1.5	24	41	2.2	45	13	0.7
4	26	1.4	25	39	2.1	46	13	0.7
5	33	1.8	26	42	2.2	47	6	0.3
6	38	2.0	27	42	2.2	48	6	0.3
7	56	3.0	28	30	1.6	49	2	0.1
8	60	3.2	29	34	1.8	50	10	0.5
9	66	3.5	30	36	1.9	51	7	0.4
10	86	4.6	31	33	1.8	52	2	0.1
11	69	3.7	32	22	1.2	53	2	0.1
12	79	4.2	33	25	1.3	55	1	0.1
13	50	2.6	34	34	1.8	56	2	0.1
14	42	2.2	35	45	2.4	57	3	0.2
15	83	4.4	36	22	1.2	58	3	0.2
16	48	2.6	37	17	0.9	60	1	0.1
17	61	3.3	38	8	0.4	65	1	0.1
18	57	3.0	39	11	0.6	70	1	0.1
19	61	3.3	40	7	0.4	71	1	0.1
20	87	4.6	41	47	2.5	80	2	0.1
21	81	4.3	42	15	0.8	**Total**	**1,875**	**100.0**

Overall, the mean travel time to destination was estimated at 21 minutes; 20 minutes for small and medium vehicles and 24 minutes for large vehicles. By commercial type, the average travel time was 22 minutes for cargo or freight transport and 17 minutes for local services (see Tables 35 and 36).

Table 35. Mean Travel Time to Destination by Land Use Type and Vehicle Classification.

Land Use Type	Overall Mean Travel Time (Minutes)	Mean Travel Time (Minutes)	
		Small and Medium	Large
Office Building (Non-Government)	19.2	18.5	26.5
Retail/Shopping	16.3	15.5	23.7
Industrial/Manufacturing	25.0	24.4	27.8
Medical/Hospital	27.0	27.7	23.5
Education (12th Grade or Less)	26.4	18.7	57.0
Government Office/Building	19.8	19.8	42.3
Residential	21.8	13.2	23.4
Airport	18.3	14.1	-
Intermodal Facility	14.1	19.1	17.6
Warehouse	18.6	19.4	19.6
Distribution Center	19.5	20.9	22.5
Construction Site	21.4	21.3	30.4
Other	24.1	-	-
Refused/Unknown	16.7	16.5	19.1
Average	**21.1**	**20.0**	**24.4**

Table 36. Mean Travel Time at the Destination by Land Use Type and Commercial Vehicle Type.

Land Use Type	Overall Mean Travel Time (Minutes)	Mean Travel Time (Minutes)	
		Cargo or Freight	Local Services
Office Building (Non-Government)	19.2	21.4	17.9
Retail/Shopping	16.3	16.9	15.4
Industrial/Manufacturing	25.0	25.2	23.0
Medical/Hospital	27.0	25.6	31.2
Education (12th Grade or Less)	26.4	39.9	17.4
Government Office/Building	19.8	20.3	17.8
Residential	21.8	27.4	16.9
Airport	18.3	23.4	13.2
Intermodal Facility	14.1	14.1	-
Warehouse	18.6	19.4	11.8
Distribution Center	19.5	19.6	14.7
Construction Site	21.4	21.4	20.5
Other	24.1	27.0	18.4
Refused/Unknown	16.7	20.8	15.2
Average	**21.1**	**22.3**	**17.2**

Table 37 shows the mean travel time by commodity group. The results indicate that the average travel time varied from 16 minutes for wood type of cargo to 23 minutes for agriculture.

Table 37. Mean Travel Time by Commodity Group.

Commodity Group	Mean Travel Time (Minutes)
Agriculture	22.6
Raw Materials	22.1
Food	18.2
Wood	15.8
Building Materials	22.4
Machinery	21.2
Miscellaneous	22.1
Secondary	22.0
Hazardous Materials	19.8
Transportation	16.5
Empty	21.5
Unknown/Refused	18.3
All Combined	**21.1**

Table 38 shows an average travel speed of 35 mph for all vehicles; 34 mph for small and medium vehicles and 38 mph for large vehicles. By commercial type, the average speed was 36 mph for cargo or freight transport and 32 mph for local services (Table 39).

Table 38. Mean Travel Speed to Destination by Land Use Type and Vehicle Classification.

Land Use Type	Overall Mean Travel Speed (mph)	Mean Travel Speed (mph)	
		Small and Medium	Large
Office Building (Non-Government)	32.1	31.4	38.2
Retail/Shopping	31.5	31.0	35.8
Industrial/Manufacturing	36.3	35.8	39.3
Medical/Hospital	38.5	37.9	41.9
Education (12th Grade or Less)	36.8	35.8	40.7
Government Office/Building	36.0	36.1	36.0
Residential	34.4	33.8	40.4
Airport	35.6	32.6	38.7
Intermodal Facility	31.5	31.5	-
Warehouse	34.7	34.2	35.7
Distribution Center	34.6	33.4	35.7
Construction Site	36.1	35.6	37.2
Other	36.9	35.4	40.1
Refused/Unknown	32.3	31.8	38.4
Average	**35.1**	**34.3**	**37.6**

Table 39. Mean Travel Speed to Destination by Land Use Type and Commercial Vehicle Type.

Land Use Type	Overall Mean Travel Speed (mph)	Mean Travel Speed (mph)	
		Small and Medium	Large
Office Building (Non-Government)	32.1	33.7	31.0
Retail/Shopping	31.5	31.9	30.8
Industrial/Manufacturing	36.3	36.6	33.7
Medical/Hospital	38.5	40.7	32.1
Education (12th Grade or Less)	36.8	38.1	35.9
Education (College, Trade)	36.0	37.0	31.8
Government Office/Building	34.4	37.2	31.9
Residential	35.6	38.7	32.6
Airport	31.5	31.5	-
Intermodal Facility	34.7	34.8	34.3
Warehouse	34.6	34.5	34.7
Distribution Center	36.1	36.3	28.1
Construction Site	36.9	39.4	32.0
Refused/Unknown	32.3	36.8	30.6
Average	**35.1**	**36.1**	**31.7**

Table 40 shows the mean travel speed by commodity group. The results indicate that the average travel speed ranged from approximately 32 mph for food cargo, to 39 mph for raw materials.

Table 40. Mean Travel Speed by Commodity Group.

Commodity Group	Mean Travel Speed (mph)
Agriculture	34.0
Raw Materials	38.6
Food	31.9
Wood	33.0
Building Materials	36.4
Machinery	37.0
Miscellaneous	36.0
Secondary	35.5
Hazardous Materials	34.1
Transportation	31.3
Empty	35.2
Unknown/Refused	32.9
All Combined	**35.1**

Trip Tour Characteristics

Trip tours may be defined as a combination (or chaining) of trips in which a vehicle leaves and returns to a common point, typically its base location. To accurately analyze the trip tours, external trips were included in the analysis. This was performed since it was possible for trip tours to begin within the study area, travel outside of the study area, and return back during the one-day survey period.

For each trip recorded, information was provided on whether or not the trip origin location was the vehicle's base location. This served as the basis for determining if the trip was a base trip or a non-base trip. For a trip to be a base trip, either the origin or destination of the trip had to be at the base location. If the trip did not start and end at the base location, then the trip was considered a non-base trip.

Table 41 shows the distribution of base and non-base trips by vehicles. Approximately 48 percent of the total trips made by the surveyed vehicles were non-base and 52 percent were base trips. Small and medium vehicles had almost equal proportion of base trips (49.8 percent) and non-base trips (50.2 percent). For large vehicles, 56.5 percent of the trips were base trips and 43.5 percent were non-base.

Table 41. Number of Base and Non-Base Trips.

Trip Type	Small-Medium		Large		Total	
	Number of Trips	Percent of Total	Number of Trips	Percent of Total	Number of Trips	Percent of Total
Base	822	49.8	336	56.5	1,158	51.5
Non-Base	830	50.2	259	43.5	1,089	48.5
Total	**1,652**	**100.0**	**595**	**100.0**	**2,247**	**100.0**

In the analysis of trips made by the surveyed vehicles, the number of trip tours was counted to determine how many of the trips that began at the base location indeed ended at the base. The results indicated that of the total 329 vehicles, 323 made 579 trip tours. There were 6 open tours, those trips that did not begin and end at the base location.

The number of trip tours ranged between 1 and 6, of which approximately 62 percent of the surveyed vehicles only made one tour. This comprised 35 percent of the total number of trip tours. Table 42 shows a breakdown of the number of trip tours per vehicle.

Table 42. Number and Percent of Trip Tours per Vehicle.

Number of Trip Tours	Number of Vehicles	Percent of Total	Total Number of Trip Tours	Percent of Total
0	6	1.8	0	0.0
1	203	61.7	203	35.0
2	48	14.6	96	16.6
3	27	8.2	81	14.0
4	28	8.5	112	19.3
5	15	4. 6	75	13.0
6	2	0.6	12	2.1
Total	**329**	**100.0**	**579**	**100.0**

Several inconsistencies were observed during the analysis of trip data. For instance, there were six vehicles that reported one trip that began and ended at the base location. These trips were included in the analysis with the presumption that the respondent failed to log in the location where the responded stopped prior to returning to the base location. There were three vehicles whose trip origins were logged in as non-base but the address information and destination addresses indicated these to be the base location. The data were corrected in these instances.

By vehicle classification, approximately 64 percent of small and medium vehicles made 1 tour, and 31 percent made 2-to-4 tours. For large vehicles, 57 percent made only 1 tour, and 33 percent made 2-to-4 tours (see Table 43).

Table 43. Number and Percent of Trip Tours by Vehicle Classification.

Number of Trip Tours	Small and Medium		Large	
	Number of Vehicles	Percent of Total	Number of Vehicles	Percent of Total
0	2	0.9	4	4.2
1	148	63.5	55	57.3
2	30	12.9	18	18.8
3	23	9.8	4	4.1
4	18	7.7	10	10.4
5	10	4.3	5	5.2
6	2	0.9	0	0.0
Total	**233**	**100.0**	**96**	**100.0**
Percent of Total	**70.8**		**29.2**	

By commercial type, approximately 58 percent of the trips for cargo or freight transport and 80 percent of the trips for local services consisted of 1 trip tour (see Table 44).

Table 44. Number and Percent of Trip Tours by Commercial Vehicle Type.

Number of Trip Tours	Cargo or Freight		Local Services	
	Number of Vehicles	Percent of Total	Number of Vehicles	Percent of Total
0	4	1.5	2	3.3
1	154	57.5	49	80.3
2	40	14.9	8	13.1
3	25	9.3	2	3.3
4	28	10.5	0	0.0
5	15	5.6	0	0.0
6	2	0.7	0	0.0
Total	**268**	**100.0**	**61**	**100.0**
Percent of Total	**81.5**		**18.5**	

In the analysis of trip tours, the number and type of trips that were made within the tour were measured to examine the total amount and type of travel that occurred during the course of the tour. Therefore, the review of trip tour data was divided into three components: the number of non-base trips within trip tours, the number of external trips within trip tours, and the number of inter-zonal and intra-zonal trips within trip tours.

Figure 19 shows the distribution of these trips by trip type and Tables 45 through 48 show the detailed breakdown of these trips.

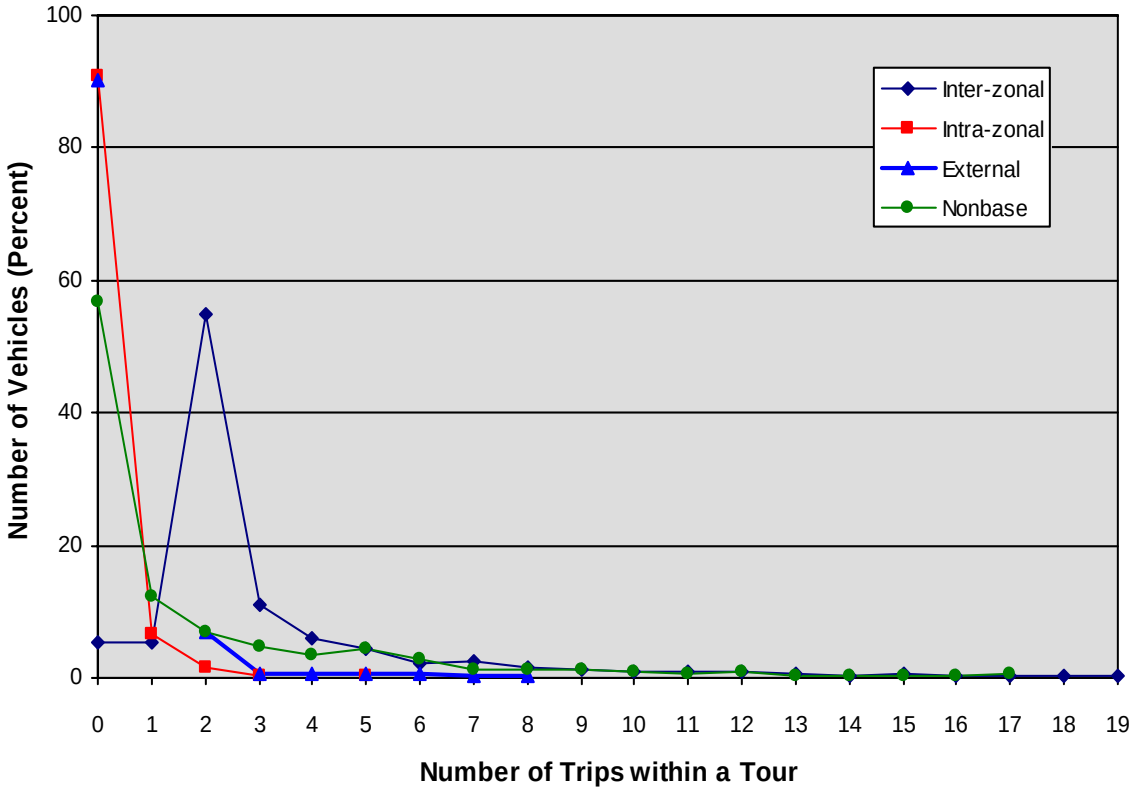

Figure 19. Distribution of Trips within Trip Tours by Trip Type.

The results indicate that 43 percent of the trips that occurred within the trip tours were non-base, and the number of trips made by the surveyed vehicles varied from 1-to-17 trips (see Table 45).

Table 45. Number and Percent of Non-Base Trips within Trip Tours.

Number of Non-Base Trips	Number of Vehicle Trips	Percent of Total	Cumulative Number of Vehicle Trips	Cumulative Percent of Total
0	329	56.8	329	56.8
1	72	12.4	401	69.2
2	40	6.9	441	76.1
3	28	4.8	469	80.9
4	20	3.5	489	84.4
5	26	4.5	515	88.9
6	17	2.9	532	91.8
7	8	1.4	540	93.2
8	7	1.2	547	94.4
9	8	1.4	555	95.8
10	5	0.8	560	96.6
11	3	0.5	563	97.1
12	5	0.8	568	97.9
13	2	0.4	570	98.3
14	2	0.4	572	98.7
15	2	0.4	574	99.1
16	2	0.4	576	99.5
17	3	0.5	579	100.0

The data also shows that 90 percent of the trips were not external. Only 7 percent of the trips that occurred within the trip tour had 2 external trips, and 3 percent of the tours had 3-to-8 external trips (see Table 46).

Table 46. Number and Percent of External Trips within Trip Tours.

Number of External Trips	Number of Vehicle Trips	Percent of Total	Cumulative Number of Vehicle Trips	Cumulative Percent of Total
0	522	90.1	522	90.1
2	40	6.9	562	97.0
3	4	0.7	566	97.7
4	4	0.7	570	98.4
5	3	0.5	573	98.9
6	4	0.7	577	99.6
7	1	0.2	578	99.8
8	1	0.2	579	100.0

The results also indicate that only 5 percent of the trips that occurred within the internal trip tour were not inter-zonal. Nearly 55 percent of the vehicles trips made 2 inter-zonal trips (see Table 47). Approximately 91 percent of the trips were not intra-zonal trips. About 7 percent of the surveyed vehicles made 1 intra-zonal trip and only 2 percent made 2 intra-zonal trips within the tour (see Table 48).

Table 47. Number and Percent of Inter-Zonal Trips within Internal Trip Tours.

Number of Inter-Zonal Trips	Number of Vehicle Trips	Percent of Total	Cumulative Number of Vehicle Trips	Cumulative Percent of Total
0	31	5.4	31	5.4
1	31	5.4	62	10.8
2	318	54.9	380	65.7
3	63	10.8	443	76.5
4	35	6.0	478	82.5
5	26	4.5	504	87.0
6	13	2.2	517	89.2
7	15	2.6	532	91.8
8	9	1.6	541	93.4
9	8	1.4	549	94.8
10	5	0.8	554	95.6
11	5	0.8	559	96.4
12	5	0.8	564	97.2
13	4	0.7	568	97.9
14	2	0.4	570	98.3
15	3	0.5	573	98.8
16	2	0.4	575	99.2
17	1	0.2	576	99.4
18	1	0.2	577	99.6
19	2	0.4	579	100.0

Table 48. Number and Percent of Intra-Zonal Trips within Internal Trip Tours.

Number of Intra-Zonal Trips	Number of Vehicle Trips	Percent of Total	Cumulative Number of Vehicle Trips	Cumulative Percent of Total
0	527	91.0	527	91.0
1	39	6.7	566	97.7
2	10	1.7	576	99.4
3	2	0.4	578	99.8
5	1	0.2	579	100.0

Figure 20 shows the location of the trips made by the surveyed vehicles within the study zones. The points indicate the base locations of the surveyed vehicles, and the colored polygons denote the active zones where these vehicle trips were made.

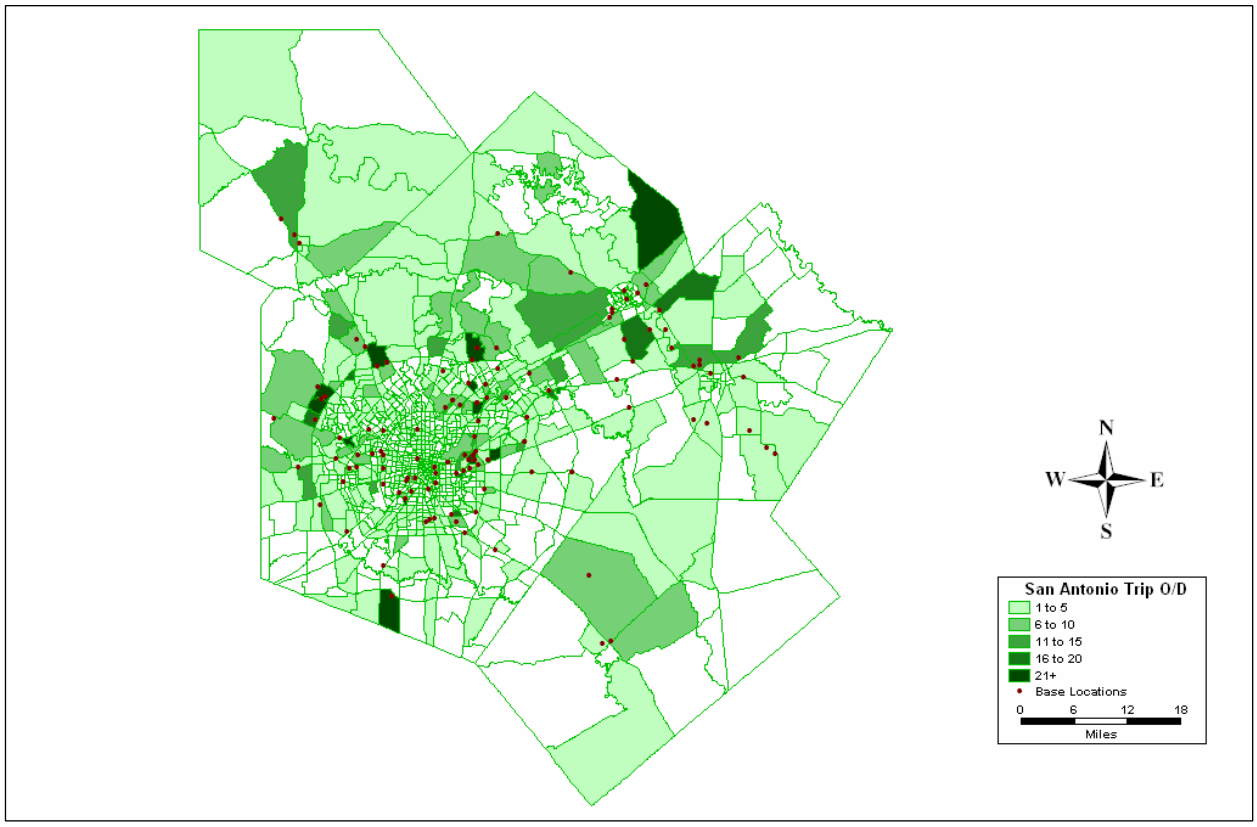

Figure 20. Location of Trip Origins and Destinations.

Survey Expansion

Expansion of the commercial vehicle survey data was performed in an indirect manner. Typically, an estimate of the population being sampled is known and the survey data are expanded to represent that population. However, the total number of commercial vehicles operating in the San Antonio study area is not known. Vehicle registration is not considered a viable basis to estimate the number of commercial vehicles in the study area because other vehicles operating within the area may be registered in neighboring counties. In the analysis, the survey data was compared with the vehicle registration data.

The methodology used for expanding the survey data was vehicle miles of travel (VMT) estimates from the Highway Performance Monitoring System (HPMS), combined with vehicle classification counts by functional classification. Essentially, an estimate of the commercial VMT is developed from the HPMS data and is then used to expand the VMT observed from sampled commercial vehicles. HPMS data contains annual average daily traffic (AADT) estimates of the total VMT by functional class facilities. Since AADT includes weekend traffic, a correction factor is applied to the data to obtain average weekday VMT by functional classification (freeway, arterial, collector, and local).

Table 49 provides the adjusted 2005 HPMS VMT estimates for the San Antonio five-county study area.

Table 49. 2005 HPMS Estimates of Weekday VMT in San Antonio Five-County Study Area.

Functional Classification	Total Weekday VMT
Freeway	22,839,402
Arterial	16,140,046
Collector	6,449,001
Local	3,465,404
Total	**48,893,852**

Commercial vehicle counts from the 2005 External Survey and vehicle classification counts conducted at 171 randomly selected locations within the San Antonio study area were used to determine the percentage of commercial and non-commercial vehicles by functional classification. The percentage of commercial vehicles for internal sites for each functional classification was combined with the corresponding percentage for external sites based on the percentage of regional VMT estimated to be external travel. External VMT was estimated at 14 percent of the HPMS estimate of total VMT. Hence, it was assumed that 86 percent of the total VMT was internal. These percentages were applied to obtain the weighted average for each functional classification. Table 50 provides the internal, external, and weighted percentage of commercial and non-commercial vehicles by functional classification as determined from the vehicle classification counts and external surveys performed in 2005.

Table 50. Vehicle Classification Counts by Functional Classification.

Functional Classification	Percent of Commercial Vehicles			Percent of Non-Commercial Vehicles		
	Internal Sites (86%)	External Sites (14%)	Weighted Average	Internal Sites (86%)	External Sites (14%)	Weighted Average
Freeway	9.05	22.30	10.91	90.95	77.70	89.10
Arterial	5.85	14.72	7.09	94.15	85.28	92.91
Collector	5.82	14.83	7.08	94.18	85.17	92.92
Local	4.49	N/A	4.49	95.51	N/A	95.51

The weighted percentage of commercial and non-commercial vehicles by functional classification (as shown in Table 50) was then applied to the HPMS estimated weekday VMT to calculate the total VMT for commercial and non-commercial vehicles operating in the study area. The resulting VMT estimate was 4,246,010 miles. Table 51 provides the estimated VMT for commercial and non-commercial vehicles operating in the study area.

Table 51. Estimated VMT for Commercial and Non-Commercial Vehicles.

Functional Classification	Commercial VMT	Non-Commercial VMT
Freeway	2,489,495	20,349,907
Arterial	1,144,329	14,995,716
Collector	456,589	5,992,412
Local	155,597	3,309,807
Total	**4,246,010**	**44,647,842**

This estimate represented all commercial vehicles. To properly expand the data, it was necessary to remove the VMT estimates obtained in the external survey to avoid double counting. The VMT estimated for commercial vehicles in the 2005 external station survey was 1,677,840 miles. This estimate was subtracted from the total commercial vehicle VMT to calculate the internal commercial VMT. The resulting VMT estimate was 2,568,170 miles.

The internal VMT observed in the 2006 commercial vehicle survey was 24,375. This was based on 1,875 observed internal trips (those where the trip length could be estimated), multiplied by the average trip length made by the surveyed vehicles, estimated at 13 miles.

To estimate the total internal commercial vehicle trips, the survey expansion factor was then calculated by dividing the total VMT (2,568,170) by the sample internal VMT (24,375). The resulting expansion factor was 105.36, which was then multiplied by the survey internal trips (1,875) producing 197,552 total internal commercial vehicle trips. With the number of internal trips per vehicle averaging at 6.3 trips, the number of commercial vehicles operating in the San Antonio region on a daily basis totaled 31,357. This estimate is 37 percent higher than the 22,931 registered trucks in the study area in 2006.

Data Comparison

To assess the changes that occurred in terms of commercial vehicle flow in the study area, a comparison was made with the results from the commercial vehicle survey done in 1991. The previous study did not have the information to indicate the number of commercial trucks from which the sample was drawn. Hence, the data comparison between the 1991 and 2006 surveys was limited to the reported trip data. The 1991 study reported a sample size of 397 trucks (Pearson, 1996). The observed internal trips were estimated at 3,271. The average trips per vehicle were estimated at 8.24. The average trip length was estimated at 4.6 miles (Pearson, 1996).

Table 52 provides a summary of the trip data between the two commercial survey periods. No conclusion could be drawn from the data comparison except that the average trip length has considerably increased since 1991. The 1991 survey area included Bexar county and a small portion of Comal and Guadalupe counties within the Randolph sub-region. The 2006 survey area covered five counties, which included Kendall and Wilson in addition to Bexar, Comal, and Guadalupe. The difference in average trip length is possibly attributable to the difference in size of the study areas.

Table 52. Commercial Vehicle Survey Data Comparison.

Survey Indicator	1991Commercial Vehicle Survey	2006 Commercial Vehicle Survey
Study Area Coverage	Bexar County and a small portion of Comal and Guadalupe counties	Five counties — Bexar, Comal, Guadalupe, Kendall, Wilson
Sample Size	397	329
Observed Internal Trips	3,271	1,875
Average Trip Length (Miles)	4.60	13.00
Average Trips per Vehicle	8.24	6.80

CONCLUSIONS

This Commercial Vehicle Survey has provided information on the characteristics and distribution of commercial vehicles operating in the San Antonio study area. Through the analysis of 329 vehicles that participated in the survey, key indicators such as vehicle age, fuel use, truck classification, commercial type, cargo type, trip purposes, land use, trip length, travel time, travel speed, and types of trips being made were evaluated and quantified. Estimates on the total number of internal trips, average number of trips per vehicle, and average travel distance, combined with HPMS data on VMT by functional classification, facilitated the estimation of the volume of commercial vehicle traffic operating in the study area on a daily basis.

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Alliance Transportation Group (ATG), Inc. *Austin/San Antonio Commercial Vehicle Survey Final Report*. December 2006.

Farnsworth, Stephen P. *2005 San Antonio External Survey Technical Summary*. Texas Department of Transportation (TxDOT) Report 407032-05. Texas Transportation Institute, The Texas A&M University System, College Station, TX, July 2007.

Pearson, David F. *Urban Travel in Texas: An Evaluation of Travel Surveys*. Texas Department of Transportation (TxDOT) Research Report 1099-3F. Texas Transportation Institute, The Texas A&M University System, College Station, TX, January 1996.

Texas Department of Transportation (TxDOT). *Diesel and Gas Truck Counts by County Using Gross Weight*. January 2007.

Texas Department of Transportation (TxDOT). *Rural, Small Urban, and Urbanized Mileage by County and Functional System*. December 2005.

APPENDIX

COMMERCIAL VEHICLE SURVEY
PART 1: VEHICLE INFORMATION
(If you have participated in prior surveys, please fill out this form anyway.)

Vehicle ID#: _____ Vehicle License # : _____

Survey Location (zone): _____ SIC Code: _____

Travel Day: _____
Month / Day

Company or Name of Owner (name on registration):

_____

Address of location where vehicle was based at beginning of travel day:

_____
(Street Address or Nearest Intersection)

_____
City State ZIP

Type of Place vehicle was based at on beginning of travel day. (SEE BELOW)_____

Vehicle Info: Make _____ ;Model:_____; Year:_____

Vehicle Type
1) ☐ Major Cargo / Freight Transport (e.g. regional or long haul, bulk loads/shipments, etc.)
2) ☐ Local Service or Delivery (e.g. plumbing/landscaping contractors, local government fleet or maintenance vehicles, local FedEx/UPS deliveries, etc.)

Vehicle Fuel:
1) ☐ Leaded Gas 2) ☐ Unleaded Gas 3) ☐ Diesel 4) ☐ Propane
5) ☐ Other _____(Specify)

Vehicle Classification:
1) ☐ Single Unit 2-axle (6 wheels)
2) ☐ Single Unit 3-axle (10 wheels)
3) ☐ Single Unit 4-axle (14 wheels)
4) ☐ Semi (all Tractor-Trailer combinations)
5) ☐ Other _____

Gross Vehicle Weight: _____ pounds

Beginning Odometer Reading: _____ **Number of Trips Total:** _____

Type of Place Codes		
(1) Office Building **(2)** Retail / Shopping **(3)** Industrial/Manufacturing (**4)** Medical / Hospital **(5)** Educational (12th grade or less)	**(6)** Educational (College, Trade, etc.) **(7)** Government Office/Building **(8)** Residential **(9)** Airport **(10)** Intermodal Facility	**(11)** Warehouse **(12)** Distribution Center **(13)** Construction Site **(14)** Other (specify) **(99)** Refused/Unknown

Record Type 21

COMMERCIAL VEHICLE TRAVEL SURVEY

VEHICLE LICENSE #: _____

PART 2: Travel Log

THE PLACE MY TRAVEL BEGAN TODAY WAS:

At Work / Base Location? ☐ - YES ☐ - NO What Type of Place is This? (See Options Below) _____

_____ TRAVEL DATE__ _____
(Street address or nearest intersection for place travel began) Month / Day

_____ DEPARTURE TIME: _____ am pm
(City, state, zip co

When you left the above location was your vehicle: ☐ Fully Loaded ☐ Partially Loaded ☐ Empty

If loaded, what is the weight of the cargo being transported? _____ (pounds/lbs.)

	RECORD the following information about each place ***NAME of Place:*** ***Address including city, state, and zip OR Nearest street intersection or Landmark***	**What time did you arrive and depart this location?** (record exact times)	**Activity – What are you doing at this location?** (see options below)	**Is this the work / base location for this vehicle?**	**What type of place is this?** (see options below)	**Type of Cargo What is it?**	**Cargo Weight** (in pounds/lbs)
PLACE 1		Arrive:_____am/pm Depart: _____am/pm		☐ - YES ☐ - NO			_____ Picked-Up _____ Dropped-Off
PLACE 2		Arrive:_____am/pm Depart: _____am/pm		☐ - YES ☐ - NO			_____ Picked-Up _____ Dropped-Off
PLACE 3		Arrive:_____am/pm Depart: _____am/pm		☐ - YES ☐ - NO			_____ Picked-Up _____ Dropped-Off

ACTIVITY OPTIONS		**TYPE OF PLACE OPTIONS**		
(1) Base Location / Return to Base Location	**(6)** Driver Needs (lunch, etc.)	**(1)** Office Building	**(6)** Educational (college, trade)	**(11)** Warehouse
(2) Delivery	**(7)** Other	**(2)** Retail / Shopping	**(7)** Government Office/Building	**(12)** Distribution Center
(3) Pick-up	**(8)** To Home	**(3)** Industrial/Manufacturing	**(8)** Residential	**(13)** Construction Site
(4) Pick-up and Delivery	**(9)** Service Related (to job or work site)	**(4)** Medical / Hospital	**(9)** Airport	**(14)** Other (specify)
(5) Maintenance (fuel, oil, etc.)	**(99)** Refused / Unknown	**(5)** Education (12th grade or less)	**(10)** Intermodal Facility	**(99)** Refused / Unknown

COMMERCIAL VEHICLE TRAVEL SURVEY (con't)

VEHICLE LICENSE #: _____

	RECORD the following information about each place *NAME of Place:* *Address including city, state, and zip OR Nearest street intersection or Landmark*	What time did you arrive and depart this location? (record exact times)	Activity – What are you doing at this location? (see options below)	Is this the work / base location for this vehicle?	What type of place is this? (see options below)	Type of Cargo What is it?	Cargo Weight (in pounds/lbs)
PLACE 4		Arrive:_____am/pm Depart: _____am/pm		☐ - YES ☐ - NO			_____ Picked-Up _____ Dropped-Off
PLACE 5		Arrive:_____am/pm Depart: _____am/pm		☐ - YES ☐ - NO			_____ Picked-Up _____ Dropped-Off
PLACE 6		Arrive:_____am/pm Depart: _____am/pm		☐ - YES ☐ - NO			_____ Picked-Up _____ Dropped-Off
PLACE 7		Arrive:_____am/pm Depart: _____am/pm		☐ - YES ☐ - NO			_____ Picked-Up _____ Dropped-Off
PLACE 8		Arrive:_____am/pm Depart: _____am/pm		☐ - YES ☐ - NO			_____ Picked-Up _____ Dropped-Off
PLACE 9		Arrive:_____am/pm Depart: _____am/pm		☐ - YES ☐ - NO			_____ Picked-Up _____ Dropped-Off

ACTIVITY OPTIONS		TYPE OF PLACE OPTIONS		
(1) Base Location / Return to Base Location	**(6)** Driver Needs (lunch, etc.)	**(1)** Office Building	**(6)** Educational (college, trade)	**(11)** Warehouse
(2) Delivery	**(7)** Other	**(2)** Retail / Shopping	**(7)** Government Office/Building	**(12)** Distribution Center
(3) Pick-up	**(8)** To Home	**(3)** Industrial/Manufacturing	**(8)** Residential	**(13)** Construction Site
(4) Pick-up and Delivery	**(9)** Service Related (to job or work site)	**(4)** Medical / Hospital	**(9)** Airport	**(14)** Other (specify)
(5) Maintenance (fuel, oil, etc.)	**(99)** Refused / Unknown	**(5)** Education (12th grade or less)	**(10)** Intermodal Facility	**(99)** Refused / Unknown

COMMERCIAL VEHICLE TRAVEL SURVEY (con't)

VEHICLE LICENSE #: _____

	RECORD the following information about each place ***NAME of Place:*** ***Address including city, state, and zip OR Nearest street intersection or Landmark***	**What time did you arrive and depart this location?** (record exact times)	**Activity – What are you doing at this location?** (see options below)	**Is this the work / base location for this vehicle?**	**What type of place is this?** (see options below)	**Type of Cargo** **What is it?**	**Cargo Weight** (in pounds/lbs)
PLACE 10		Arrive:_____am/pm Depart: _____am/pm		☐ - YES ☐ - NO			_____ Picked-Up _____ Dropped-Off
PLACE 11		Arrive:_____am/pm Depart: _____am/pm		☐ - YES ☐ - NO			_____ Picked-Up _____ Dropped-Off
PLACE 12		Arrive:_____am/pm Depart: _____am/pm		☐ - YES ☐ - NO			_____ Picked-Up _____ Dropped-Off
PLACE 13		Arrive:_____am/pm Depart: _____am/pm		☐ - YES ☐ - NO			_____ Picked-Up _____ Dropped-Off
PLACE 14		Arrive:_____am/pm Depart: _____am/pm		☐ - YES ☐ - NO			_____ Picked-Up _____ Dropped-Off
PLACE 15		Arrive:_____am/pm Depart: _____am/pm		☐ - YES ☐ - NO			_____ Picked-Up _____ Dropped-Off

ACTIVITY OPTIONS		**TYPE OF PLACE OPTIONS**		
(1) Base Location / Return to Base Location	**(6)** Driver Needs (lunch, etc.)	**(1)** Office Building	**(6)** Educational (college, trade)	**(11)** Warehouse
(2) Delivery	**(7)** Other	**(2)** Retail / Shopping	**(7)** Government Office/Building	**(12)** Distribution Center
(3) Pick-up	**(8)** To Home	**(3)** Industrial/Manufacturing	**(8)** Residential	**(13)** Construction Site
(4) Pick-up and Delivery	**(9)** Service Related (to job or work site)	**(4)** Medical / Hospital	**(9)** Airport	**(14)** Other (specify)
(5) Maintenance (fuel, oil, etc.)	**(99)** Refused / Unknown	**(5)** Education (12th grade or less)	**(10)** Intermodal Facility	**(99)** Refused / Unknown

COMMERCIAL VEHICLE TRAVEL SURVEY (con't)

VEHICLE LICENSE #: ________________

PLACE #	**RECORD the following information about each place** ***NAME of Place:*** ***Address including city, state, and zip OR Nearest street intersection or Landmark***	**What time did you arrive and depart this location?** (record exact times)	**Activity – What are you doing at this location?** (see options below)	**Is this the work / base location for this vehicle?**	**What type of place is this?** (see options below)	**Type of Cargo** **What is it?**	**Cargo Weight** (in pounds/lbs)
		Arrive:__________am/pm Depart: _________am/pm		☐ - YES ☐ - NO			________ Picked-Up ________ Dropped-Off
		Arrive:__________am/pm Depart: _________am/pm		☐ - YES ☐ - NO			________ Picked-Up ________ Dropped-Off
		Arrive:__________am/pm Depart: _________am/pm		☐ - YES ☐ - NO			________ Picked-Up ________ Dropped-Off
		Arrive:__________am/pm Depart: _________am/pm		☐ - YES ☐ - NO			________ Picked-Up ________ Dropped-Off
		Arrive:__________am/pm Depart: _________am/pm		☐ - YES ☐ - NO			________ Picked-Up ________ Dropped-Off
		Arrive:__________am/pm Depart: _________am/pm		☐ - YES ☐ - NO			________ Picked-Up ________ Dropped-Off

ACTIVITY OPTIONS	TYPE OF PLACE OPTIONS
(1) Base Location / Return to Base Location **(2)** Delivery **(3)** Pick-up **(4)** Pick-up and Delivery **(5)** Maintenance (fuel, oil, etc.) **(6)** Driver Needs (lunch, etc.) **(7)** Other **(8)** To Home **(9)** Service Related (to job or work site) **(99)** Refused / Unknown	**(1)** Office Building **(2)** Retail / Shopping **(3)** Industrial/Manufacturing **(4)** Medical / Hospital **(5)** Education (12th grade or less) **(6)** Educational (college, trade) **(7)** Government Office/Building **(8)** Residential **(9)** Airport **(10)** Intermodal Facility **(11)** Warehouse **(12)** Distribution Center **(13)** Construction Site **(14)** Other (specify) **(99)** Refused / Unknown