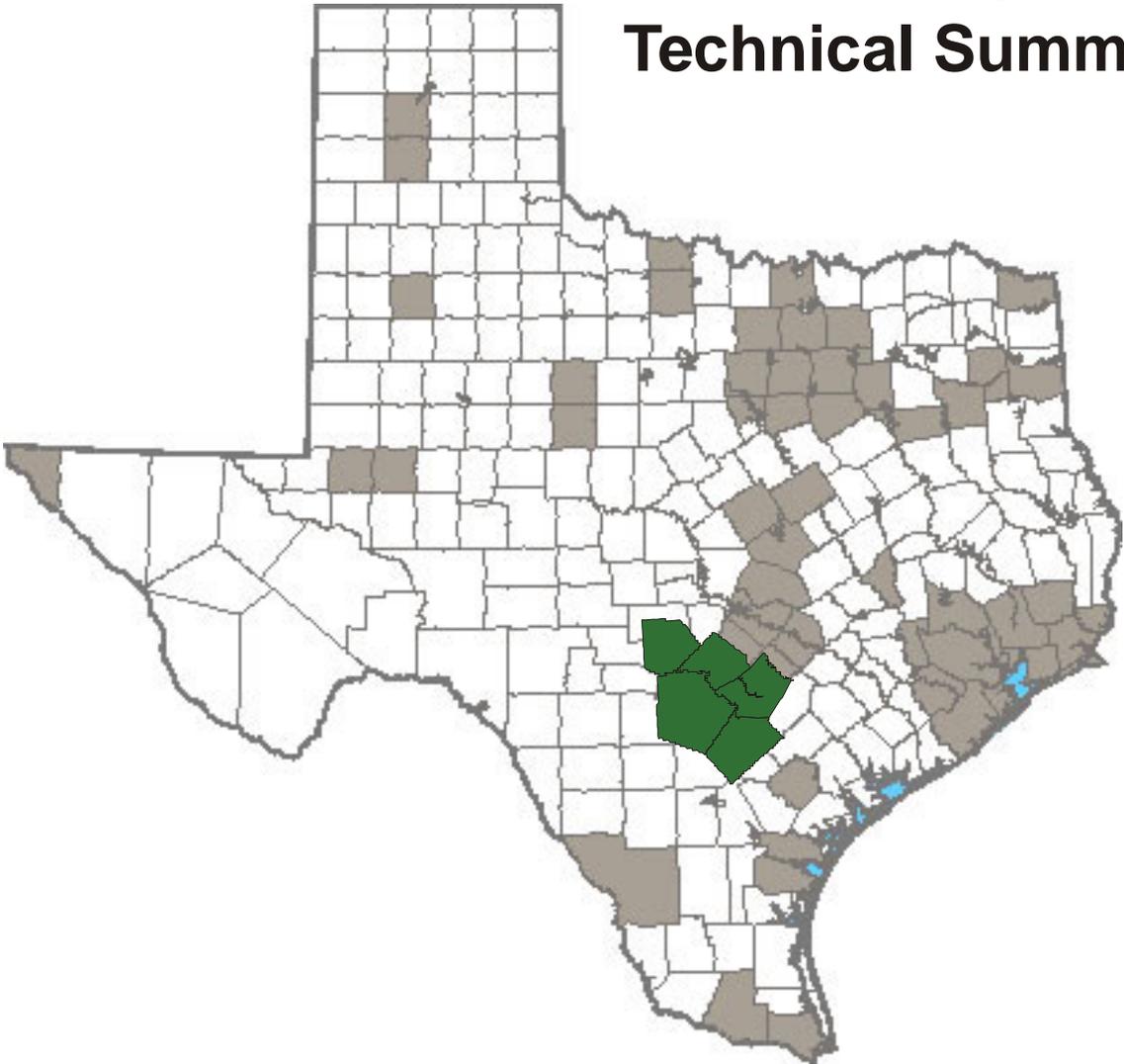


# 2005 San Antonio Area External Survey Technical Summary



Prepared by the  
Texas Transportation Institute  
February 2008



# **2005 San Antonio External Survey**

## **TECHNICAL SUMMARY**

**Texas Department of Transportation Travel Survey Program**

**Prepared by**

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**of the  
Texas Transportation Institute**

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## **INTRODUCTION**

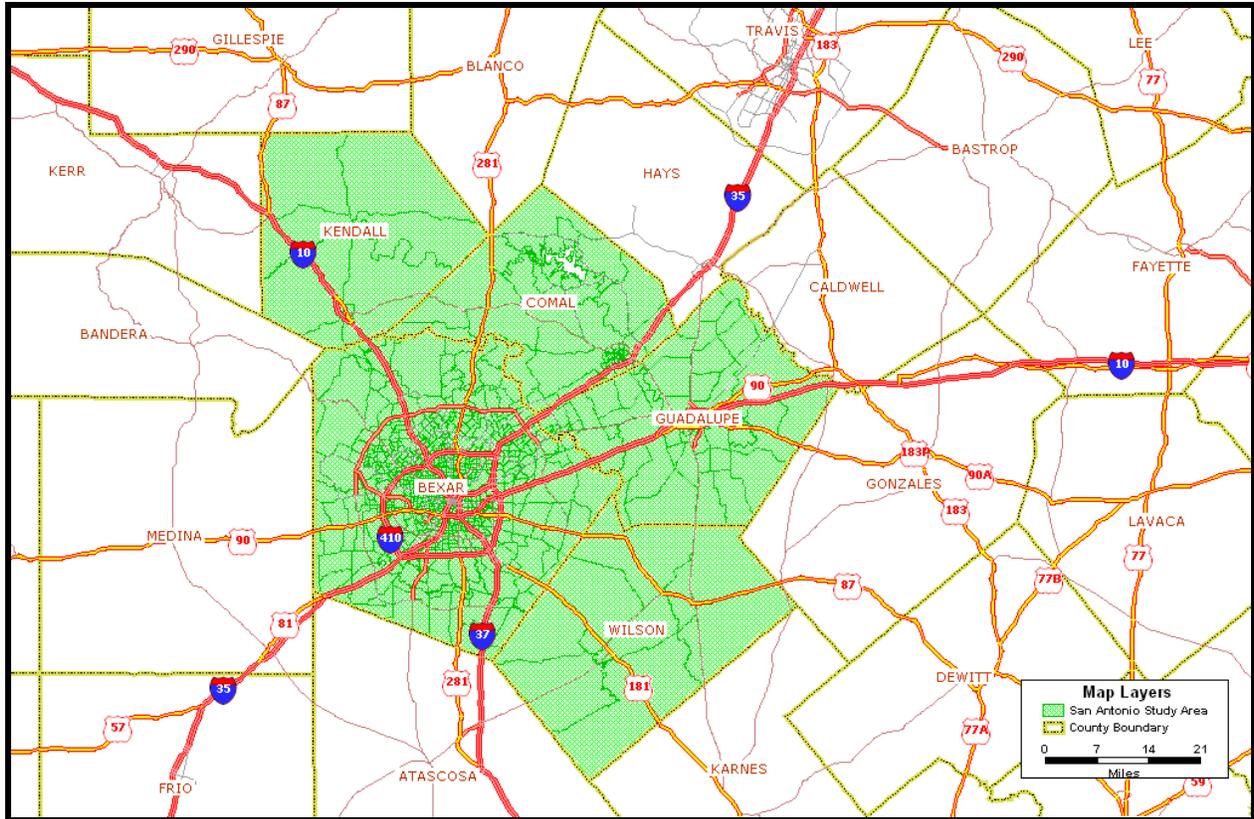
In 2005, the Transportation Planning and Programming (TPP) Division of the Texas Department of Transportation (TxDOT) funded an external station travel survey in the San Antonio Metropolitan Planning Organization (MPO) study area. This survey measured and identified travel patterns into, within, and out of San Antonio metropolitan area, which is comprised of Bexar, Comal, Guadalupe, Kendall, and Wilson counties. This report presents a Technical Summary of the 2005 San Antonio External Station Survey and documents the data collected and the analysis results for the study area.

## **EXTERNAL STATION SURVEY**

An external station survey collects data through personal interviews to measure and identify travel patterns of vehicles and/or pedestrians entering and exiting a particular study area. Surveys are conducted during daylight hours for one day at each designated location. Additionally, 24-hour vehicle classification counts are performed on the same day as the survey at each survey location. These counts provide a basis for expanding the survey data to represent the average weekday movements into and out of the study area. Data are also collected on the movements of the vehicle during the survey day prior to the point at which the vehicle is surveyed. This data provides a basis for estimating the amount of travel occurring in the study area prior to the time of the survey.

## **SAN ANTONIO STUDY AREA**

The study area, as shown in Figure 1, is comprised of Bexar, Comal, Guadalupe, Kendall, and Wilson counties, and it is located in central Texas. The five-county region has a land area of nearly 4,000 square miles and a population density of approximately 405 persons per square mile. The population center of the study area is the city of San Antonio, which according to the 2000 census had a population of approximately 1,145,000 persons. The boundary established for the San Antonio external survey was determined by the local MPO.



**Figure 1. San Antonio Study Area.**

**EXTERNAL STATIONS**

There are 49 locations on the border of the San Antonio study area identified as external stations. These locations are transportation facilities that cross the study area boundary and represent where travelers may enter and exit the study area. Of these 42 locations, 22 were selected for travel surveys. Five of the 22 survey locations bordered the Austin study area, and as a result, these locations were surveyed in both directions. Figure 2 shows the location of the external stations in San Antonio, and Table 1 identifies the external surveys, their general location, whether or not surveys were conducted, and the 24-hour traffic count at the location. Additionally, Table 1 groups the external station locations by direction. The location group aggregated data will be utilized to present external local and through trip information later in the summary.



**Table 1. San Antonio External Stations.**

Station Number	Facility	Location	Surveyed	24-Hour Vehicle Count		Location Group
				Inbound	Outbound	
1250	US 87	at Gillespie Co. line	Yes	2,949	2,840	North
1251	FM 1376	at Gillespie Co. line	No	258	227	
1252	FM 1888	at Gillespie Co. line	No	206	179	
1253	FM 1888	at Blanco Co. line	No	242	257	
1254	FM 473	at Blanco Co. line	No	481	447	
1200	US 281	at Blanco Co. line	Yes	5,885	4,897	
1201	FM 32	at Blanco Co. line	No	750	708	
1202	FM 32	at Hays Co. line	Yes	1,373	1,309	
1203	FM 2439	at Hays Co. line	No	1,550	1,556	
1204	IH 35	at Hays Co. line	High-Volume	29,969	30,838	
1205	SH 123	at Hays Co. line	Yes	5,264	5,296	
1206	FM 621	at Hays Co. line	Yes	2,404	2,560	
1207	FM 1979	at Caldwell Co. line	No	769	744	
1208	FM 1977	at Caldwell Co. line	No	212	249	
1209	FM 20	at Caldwell Co. line	No	1,292	1,382	
1210	US 90	at Caldwell Co. line	Yes	986	982	
1211	SH 80	at Caldwell Co. line	Yes	1,904	1,818	
1212	IH 10	at Caldwell Co. line	High-Volume	11,572	11,659	
1213	SH 80	at Gonzales Co. line	Yes	635	687	
1214	US 90 A	at Gonzales Co. line	Yes	1,205	1,147	
1215	FM 466	at Gonzales Co. line	No	137	124	
1216	FM 1117	at Gonzales Co. line	Yes	716	707	
1217	FM 1681	at Gonzales Co. line	No	548	570	
1218	US 87	at Gonzales Co. line	Yes	1,301	1,358	
1219	SH 80	at Gonzales/Karnes Co. line	No	994	754	
1220	SH 119	at Karnes Co. line	No	451	367	South
1221	SH 123	at Karnes Co. line	Yes	1,330	1,341	
1222	US 181	at Karnes Co. line	Yes	2,217	2,088	
1223	FM 1344	at Karnes Co. line	No	35	44	
1224	FM 541	at Atascosa Co. line	No	84	81	
1225	FM 478	at Atascosa Co. line	No	167	170	
1226	SH 97	at Atascosa Co. line	Yes	916	859	
1227	FM 536	at Atascosa Co. line	No	211	214	
1228	IH 37	at Atascosa Co. line	High-Volume	8,402	8,211	
1229	US 281	at Atascosa Co. line	Yes	1,751	1,676	
1230	SH 16	at Atascosa Co. line	Yes	6,411	6,363	
1231	FM 476	at Atascosa Co. line	Yes	1,431	1,452	
1232	FM 2790	at Atascosa Co. line	No	988	1,000	
1233	IH 35	at Atascosa Co. line	High-Volume	13,535	15,170	

**Table 1. San Antonio External Stations (cont.).**

Station Number	Facility	Location	Surveyed	24-Hour Vehicle Count		Location Group
				Inbound	Outbound	
1234	FM 2790	at Atascosa Co. line	No	1,000	988	West
1235	US 90	at Medina Co. line	High-Volume	8,542	6,901	
1236	FM 1957	at Medina Co. line	Yes	1,359	1,006	
1237	FM 471	at Medina Co. line	Yes	4,783	3,630	
1246	FM 1283	at Medina Co. line	No	2,726	2,512	
1238	SH 211	at Medina Co. line	No	1,092	1,077	
1239	SH 16	at Medina Co. line	Yes	2,764	3,553	
1247	SH 46	at Bandera Co. line	Yes	2,526	2,540	
1248	SH 27	at Kerr Co. line	Yes	2,421	2,449	
1249	IH 10	at Kerr Co. line	High-Volume	5,941	6,842	
Total				144,685	143,829	

## SURVEY METHODOLOGY

Two methodologies were employed in the conduct of the survey. For roadways with low-to-moderate traffic volumes, a roadside intercept interview method was used. For external stations on high-volume roadways, commercial and non-commercial vehicles were surveyed using a license plate match method. Commercial vehicles were also surveyed at weigh stations, rest areas, and truck stops using an intercept interview method. For the purpose of this study, roadways with traffic volumes in excess of 20,000 vehicles per day were considered high-volume.

For each external station surveyed using the roadside intercept interview method, traffic control plans were set up and vehicles in the outbound direction (i.e. leaving the study area) were directed into an area where trained survey personnel interviewed the drivers. Those declining were allowed to continue on their trip. Drivers of commercial and non-commercial vehicles were interviewed using different survey instruments and those forms are provided in the Appendix. Figure 3 shows a typical intercept interview survey at an external station.



**Figure 3. Typical External Survey Station.**

The intercept interview method was also used to conduct commercial vehicle surveys at weigh stations, rest areas, and truck stops located along high-volume facilities. The surveys were conducted by interviewing drivers of commercial vehicles when the driver stopped for gas, to eat, or other personal reasons. Since this method involved surveying the drivers off of the roadways, there was no traffic control required.

Six external stations in the San Antonio study area could not be surveyed using the intercept interview method because traffic volumes were too high to safely stop traffic and interview motorists. In lieu of intercept surveys at these six locations, a license plate match method was used as a means to estimate the amount of non-commercial vehicles traveling through the study area on high-volume facilities. However, non-commercial vehicles on IH 10 at the Kerr/Kendall County line were surveyed at a rest area. A license plate match was also performed at that location.

For a more detailed discussion and description of the survey methodology, see the report, *Austin/San Antonio External Station Travel Survey*, prepared by Gram Traffic Counting, Inc., the vendor selected to conduct the survey.

## **DATA ANALYSIS**

Data analysis for non-commercial and commercial vehicles is developed separately and presented in this section. Non-commercial vehicles are typically personal use passenger cars, trucks, vans, and motorcycles. Commercial vehicles are those used for commercial purposes and, in most cases, consist of heavy-duty trucks.

The analysis is based on information obtained from completed interviews of motorists. In San Antonio, the majority of vehicles surveyed were non-commercial. Approximately 85 percent of the surveys were for non-commercial vehicles. The number of surveys for commercial and non-commercial vehicles by station as well as the outbound traffic volume during the survey period is provided in Table 2. Approximately 23 percent of non-commercial vehicles and 9 percent of commercial vehicles that traveled through the external stations during survey hours were interviewed.

### Trip Types

There are two types of trips identified as part of an external survey; external-local trips and external-through trips. A local trip is one where either the origin or destination of the trip is in the study area and the other trip end is outside the study area. A through trip is one traveling through the study area without stopping. Table 3 presents the survey data for non-commercial and commercial vehicles in terms of trips identified as local or through movements. Nearly 88 percent of non-commercial vehicle trips and nearly 73 percent of commercial vehicle trips were local trips. Approximately 56 percent of the commercial vehicle through trips were made on the six high-volume external sites.

**Table 2. Number of Non-Commercial and Commercial Vehicle Surveys.**

Station Number	Facility	Location	Non-Commercial		Commercial	
			Surveyed	Count*	Surveyed	Count*
1200	US 281	at Blanco Co. line	340	3,660	51	422
1202	FM 32	at Hays Co. line	353	953	24	73
1204^	IH 35	at Hays Co. line	N/A	N/A	119	3,980
1205	SH 123	at Hays Co. line	368	3,502	57	336
1206	FM 621	at Hays Co. line	443	1,728	6	74
1210	US 90	at Caldwell Co. line	309	613	59	154
1211	SH 80	at Caldwell Co. line	310	1,167	50	194
1212^	IH 10	at Caldwell Co. line	N/A	N/A	79	2,163
1213	SH 80	at Gonzales Co. line	349	460	53	96
1214	US 90 A	at Gonzales Co. line	332	682	65	208
1216	FM 1117	at Gonzales Co. line	138	603	1	29
1218	US 87	at Gonzales Co. line	386	767	58	247
1221	SH 123	at Karnes Co. line	322	842	42	104
1222	US 181	at Karnes Co. line	1,095	1,491	44	120
1226	SH 97	at Atascosa Co. line	306	587	54	122
1228^	IH 37	at Atascosa Co. line	N/A	N/A	62	1,059
1229	US 281	at Atascosa Co. line	330	1,017	29	200
1230	SH 16	at Atascosa Co. line	338	4,135	52	596
1231	FM 476	at Atascosa Co. line	307	1,175	17	58
1233^	IH 35	at Atascosa Co. line	N/A	N/A	57	1,962
1235^	US 90	at Medina Co. line	N/A	N/A	109	1,002
1236	FM 1957	at Medina Co. line	334	707	10	78
1237	FM 471	at Medina Co. line	632	2,057	108	864
1239	SH 16	at Medina Co. line	343	2,427	48	233
1247	SH 46	at Bandera Co. line	396	1,880	52	142
1248	SH 27	at Kerr Co. line	369	1,686	52	366
1249^	IH 10	at Kerr Co. line	315	3,808	88	985
1250	US 87	at Gillespie Co. line	404	1,647	53	621
Total			8,819	37,594	1,499	16,488

\* Outbound volumes during approximate time of survey (7 a.m. to 7 p.m.)

^ High-volume location. Commercial Vehicle Surveys only (except station 1249, which was surveyed at rest area).

**Table 3. Survey Results by Trip Type (Non-Commercial and Commercial Vehicles).**

Station Number	Facility	Non-Commercial Vehicles			Commercial Vehicles		
		Local	Through	Total	Local	Through	Total
1200	US 281	334	6	340	50	1	51
1202	FM 32	274	79	353	12	12	24
1204*	IH 35	N/A	N/A	N/A	38	81	119
1205	SH 123	344	24	368	44	13	57
1206	FM 621	360	83	443	5	1	6
1210	US 90	302	7	309	51	8	59
1211	SH 80	226	84	310	30	20	50
1212*	IH 10	N/A	N/A	N/A	44	35	79
1213	SH 80	31	318	349	7	46	53
1214	US 90 A	322	10	332	63	2	65
1216	FM 1117	133	5	138	1	0	1
1218	US 87	358	28	386	46	12	58
1221	SH 123	193	129	322	32	10	42
1222	US 181	1,056	39	1,095	38	6	44
1226	SH 97	254	52	306	39	15	54
1228*	IH 37	N/A	N/A	N/A	48	14	62
1229	US 281	316	14	330	24	5	29
1230	SH 16	328	10	338	48	4	52
1231	FM 476	286	21	307	17	0	17
1233*	IH 35	N/A	N/A	N/A	25	32	57
1235*	US 90	N/A	N/A	N/A	78	31	109
1236	FM 1957	324	10	334	10	0	10
1237	FM 471	619	13	632	101	7	108
1239	SH 16	334	9	343	44	4	48
1247	SH 46	389	7	396	49	3	52
1248	SH 27	364	5	369	48	4	52
1249^	IH 10	273	42	315	51	37	88
1250	US 87	371	33	404	47	6	53
Total		7,791	1,028	8,819	1,090	409	1,499

\*High-volume location. Commercial vehicle surveys only.

^ High-volume location was surveyed at traveler rest area.

The second type of trip identified in the survey is a sub-category of external local trips. These are reported as resident and non-resident trips. A resident is a survey respondent that reported they resided in the San Antonio study area. A non-resident is a respondent that reported they lived outside of the San Antonio study area. Table 4 presents the survey data by residents and non-residents as well as the number of trips made by non-residents within the study area. An

important element of the trips reported by non-residents is the number of trips made prior to being surveyed. Based on the information provided in the survey, these trips are evaluated to estimate the number of internal trips, trips where both the origin and destination are within the study area, made by non-residents. By measuring the number of non-residents that travel in and out of San Antonio and the number of internal trips they make, an estimate of the total internal trips within the study area attributable to non-residents can be developed.

**Table 4. Survey Results by Residency (Non-Commercial Vehicles Only).**

Station Number	Facility	Number of Surveys	Residents	Percent	Non-Residents	Percent	Internal Trips (non-residents)
1200	US 281	340	208	61.18	132	38.82	59
1202	FM 32	353	195	55.24	158	44.76	38
1205	SH 123	368	196	53.26	172	46.74	43
1206	FM 621	443	309	69.75	134	30.25	0
1210	US 90	309	172	55.66	137	44.34	17
1211	SH 80	310	115	37.10	195	62.90	49
1213	SH 80	349	41	11.75	308	88.25	0
1214	US 90 A	332	103	31.02	229	68.98	124
1216	FM 1117	138	35	25.36	103	74.64	82
1218	US 87	386	135	34.97	251	65.03	128
1221	SH 123	322	73	22.67	249	77.33	64
1222	US 181	1,095	414	37.81	681	62.19	414
1226	SH 97	306	154	50.33	152	49.67	44
1229	US 281	330	134	40.61	196	59.39	119
1230	SH 16	338	180	53.25	158	46.75	74
1231	FM 476	307	87	28.34	220	71.66	171
1236	FM 1957	334	152	45.51	182	54.49	198
1237	FM 471	632	283	44.78	349	55.22	338
1239	SH 16	343	156	45.48	187	54.52	122
1247	SH 46	396	158	39.90	238	60.10	46
1248	SH 27	369	205	55.56	164	44.44	31
1249	IH 10	315	104	33.02	211	66.98	92
1250	US 87	404	180	44.55	224	55.45	137
Total		8,819	3,789	42.96	5,030	57.04	2,390

The residency questions were only asked of respondents in non-commercial vehicles. Table 4 illustrates that individuals who do not live in the study area make a sizeable proportion, 57 percent, of the non-commercial travel in and out of San Antonio. The average number of internal trips made by those individuals is 0.48 trips per vehicle.

### Travel Purpose

To understand the reasons people travel, the survey included questions about the driver’s purpose for being at the location where the trip began (i.e., trip origin) and the purpose for traveling to their destination. There were 17 different purposes included on the survey instrument for non-commercial vehicles and nine purposes on the commercial vehicle survey. Table 5 provides the trip purposes for each survey. For the purpose of presenting survey results, the trip purpose categories are combined into a fewer number to reflect the primary purposes of travel.

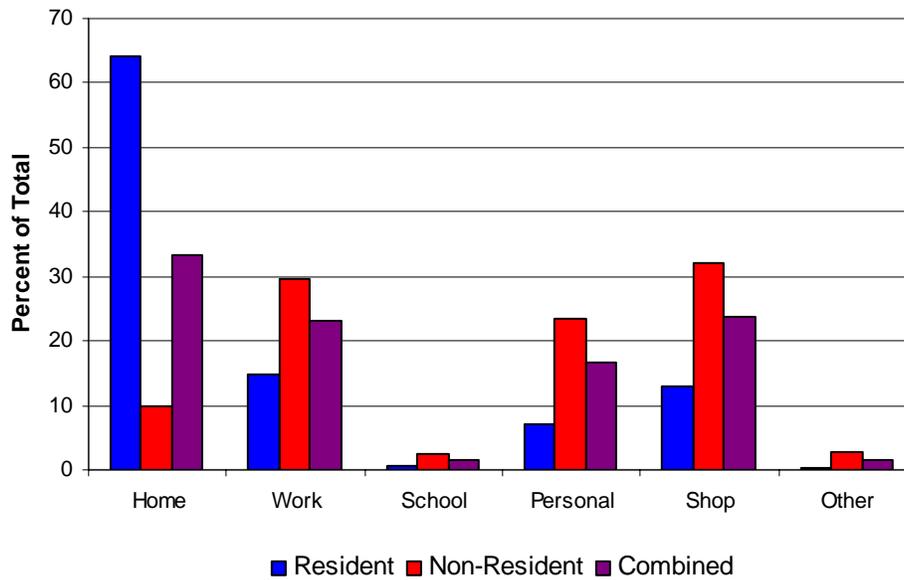
**Table 5. Trip Purpose Categories.**

Code	Non-Commercial Vehicle Trip Purpose	Code	Commercial Vehicle Trip Purpose
1	Home/Return Home	1	Base location/Return to Base location
2	Go/Return to Work	2	Delivery
3	Work Related	3	Pick Up
4	School	4	Maintenance
5	Vacation	5	Driver Needs (lunch, etc)
6	Visit Friends/Family	6	To Home
7	Eat Out	7	Buy Fuel
8	Shop	8	Other (specify)
9	Buy Gas	9	Unknown/Refused
10	Personal Business		
11	Pick Up/Drop Off Passenger		
12	Change Travel Mode		
13	Delivery		
14	Recreation		
15	Overnight Stay		
16	Other		
99	Refused/Do Not Know		

For non-commercial vehicles, the trip purposes listed in Table 5 were combined into the following six categories:

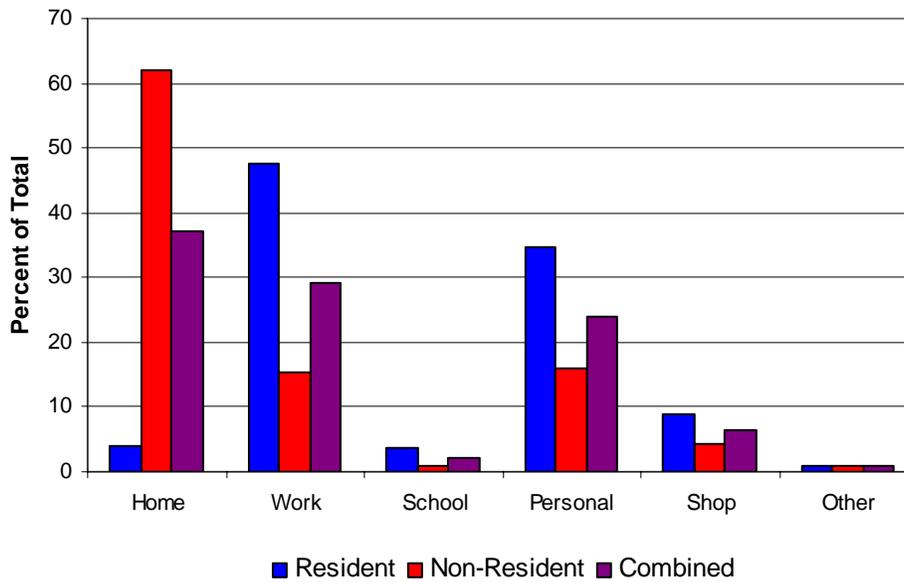
<u>Category</u>	<u>Trip Purpose Codes</u> (from Table 5)
Home	1
Work	2 and 3
School	4
Personal	5, 6, 10, 11, and 14
Shop	7, 8, and 9
Other	12, 13, 15, 16, and 99

Figure 4 presents the distribution of non-commercial vehicles by reported trip purpose at the origin of the trip and Figure 5 shows the distribution at the destination of the trip. Additionally, Table 6 provides the data shown in Figures 4 and 5 in tabular form for comparative purposes. The information is provided for residents, non-residents, and both groups combined. The distribution for the origin purpose shows that the largest percentage of trips for residents (64 percent) began at home, while the most common non-resident trip origin purpose (32 percent) was shopping. For both groups combined, the most common origin purposes were home (33 percent), shopping (24 percent), and work (23 percent).



**Figure 4. Trip Purpose at Origin for Non-Commercial Vehicles.**

Figure 5 shows that the largest distribution of destination purpose for non-residents was home (62 percent). The trip purpose at the destination for residents was primarily comprised of work (48 percent) and personal (35 percent) trips. For both groups combined, home (37 percent), work (29 percent), and personal (24 percent) were the most common trip purposes.



**Figure 5. Trip Purpose to Destination for Non-Commercial Vehicles.**

**Table 6. Percent Distribution of Non-Commercial Vehicle Trip Purpose at Origin and Destination.**

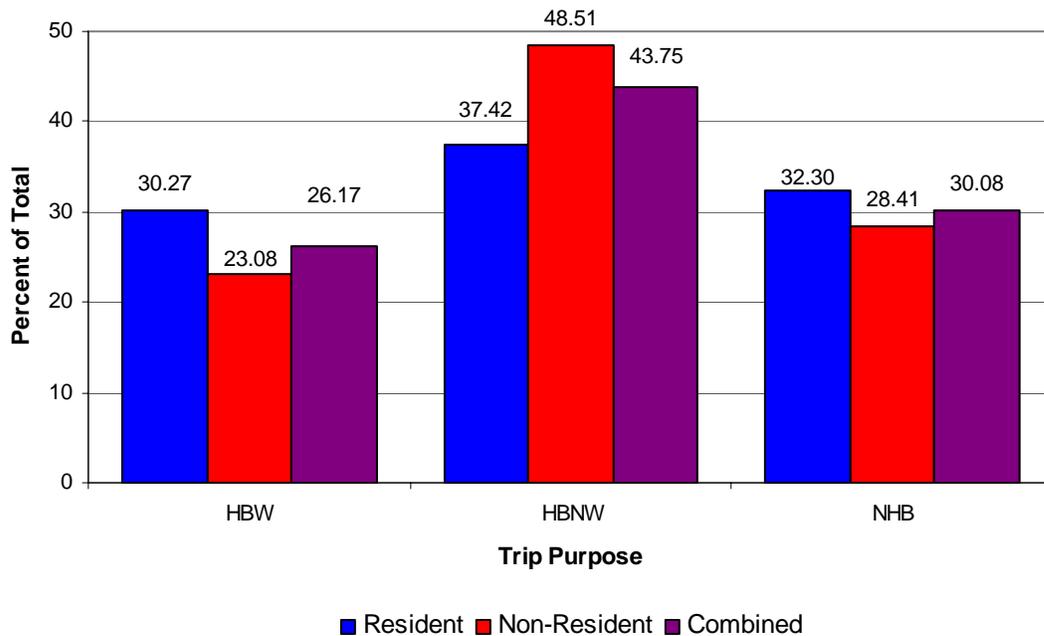
Trip Purpose	Origin			Destination		
	Resident	Non-Resident	Combined	Resident	Non-Resident	Combined
Home	64.19	9.76	33.14	4.14	62.26	37.28
Work	14.67	29.64	23.21	47.56	15.47	29.26
School	0.74	2.41	1.69	3.69	0.89	2.10
Personal	7.18	23.52	16.50	34.69	16.08	24.07
Shop	12.85	32.03	23.79	8.97	4.33	6.33
Other	0.37	2.64	1.67	0.95	0.97	0.96

A detailed analysis of specific subsets of the survey data was performed. Approximately 64 percent of the surveyed study area residents began their trip at home. Of that group of respondents, approximately 45 percent of those home-based trips had a destination purpose that was work or work-related. Since the survey was conducted in the outbound direction, this would indicate that a significant percentage of San Antonio study area residents work outside of the San Antonio study area.

Nearly 62 percent of the surveyed non-residents cited home as the trip purpose for traveling to their destination. Of that group of non-residents, nearly 32 percent of the trip origins were work

or work-related trips and approximately 63 percent of the trip origins were for personal business or shopping purposes. Since only one-third of the non-resident trip origins are work or work-related, this indicates that the majority of non-residents traveling within the San Antonio study area are making trips for either non-work purposes or people are making personal or shopping trips after leaving work and prior to going home.

The trip purposes normally used in travel demand modeling are home-based work (HBW), home-based non-work (HBNW), and non-home based (NHB). HBW trips are those that have one end of the trip at home and the other end of the trip at work. Trips that begin at home and end at work or those that begin at work and end at home are HBW. A HBNW trip is one that one end of the trip is at home and the other trip end is any location other than work. A NHB trip is a trip that does not begin or end at home. A distribution of trips by trip purpose for residents, non-residents, and both groups combined is provided in Figure 6. For residents, the trips were fairly equally distributed among the three trip purposes, with HBNW having the largest percentage (37 percent). For non-residents, HBNW trips accounted for nearly half (49 percent) of the trips. HBNW trips were the most common trip purpose for residents and non-residents combined (44 percent).

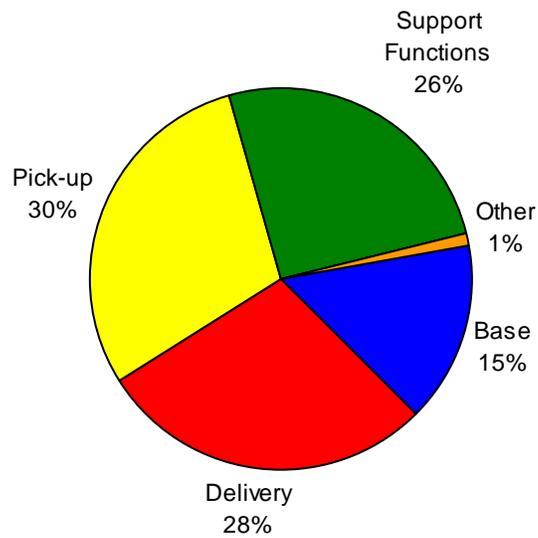


**Figure 6. Distribution of Non-Commercial Vehicle Trips by Trip Purpose.**

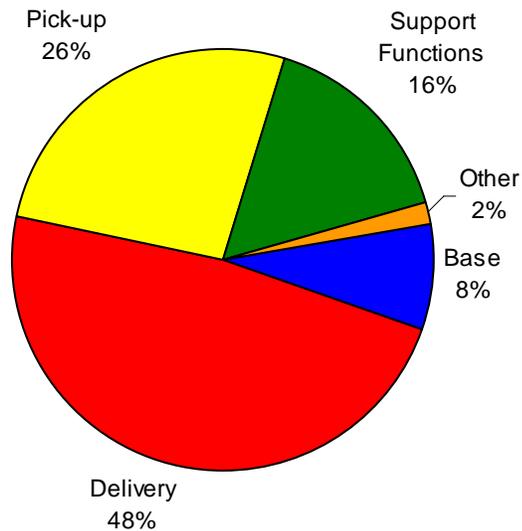
For commercial vehicles, the trip purposes shown in Table 5 were combined into the following five categories:

<u>Category</u>	<u>Trip Purpose Codes</u>
Base Location	1
Delivery	2
Pick Up	3
Support Functions	4, 5, 6, and 7
Other	8 and 9

Figures 7 and 8 present the distribution of commercial vehicle trips by reported trip purpose at the origin and destination of the trip. At the origin, pick-up was the most common origin trip purpose (30 percent). Delivery (28 percent), support functions (26 percent), and base (15 percent) were the other most commonly cited trip purposes at the origin. The distribution for destination trip purpose shows that 48 percent of the trips were destined for delivering cargo and another 26 percent were destined for picking up cargo. Only 16 percent of the trip destinations were for support functions and 8 percent of the destinations were for base operations.



**Figure 7. Trip Purpose at Origin for Commercial Vehicles.**



**Figure 8. Trip Purpose to Destination for Commercial Vehicles.**

In addition to obtaining information on the purpose of travel, questions were asked to identify the type of place associated with the origin of the trip. Table 7 provides the results of the responses provided for both commercial and non-commercial vehicles. For non-commercial vehicles, the largest percentage of respondents listed residential (44 percent) as the type of place at the origin.

An additional 24 percent of the non-commercial vehicles cited retail/shopping/gas as the type of place. For commercial vehicles, over half of the respondents (58 percent) listed industrial/manufacturing as the type of place at the origin. Retail/shopping/gas was the next largest percentage of type of place at the origin for commercial vehicles at 23 percent.

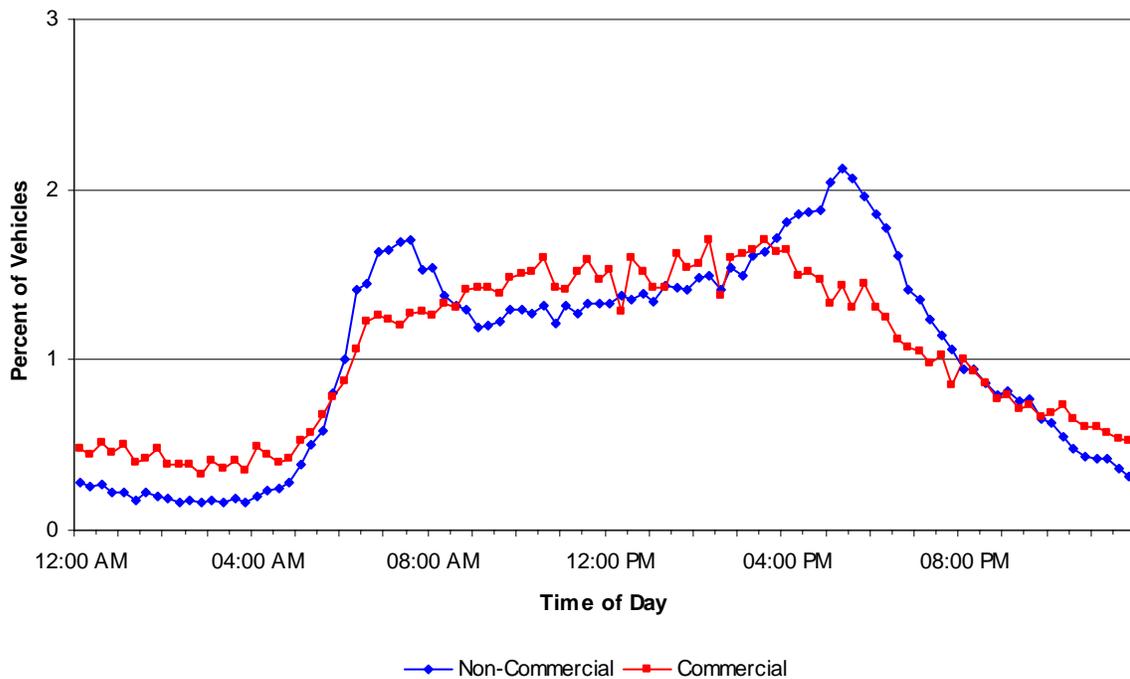
**Table 7. Type of Place at Trip Origin.**

Type of Place	Non-Commercial Vehicles		Commercial Vehicles	
	Number	Percent	Number	Percent
Office Building	714	8.10	19	1.27
Retail/Shopping/Gas	2,080	23.59	340	22.68
Industrial/Manufacturing	870	9.87	864	57.64
Medical	374	4.24	0	0.00
Educational	223	2.53	4	0.27
Government	114	1.29	4	0.27
Residential	3,845	43.60	124	8.27
Airport	28	0.32	3	0.20
Eating Establishment	326	3.70	54	3.60
Hotel/Motel	114	1.29	20	1.33
Other	131	1.49	67	4.47
Total	8,819	100.00	1,499	100.00

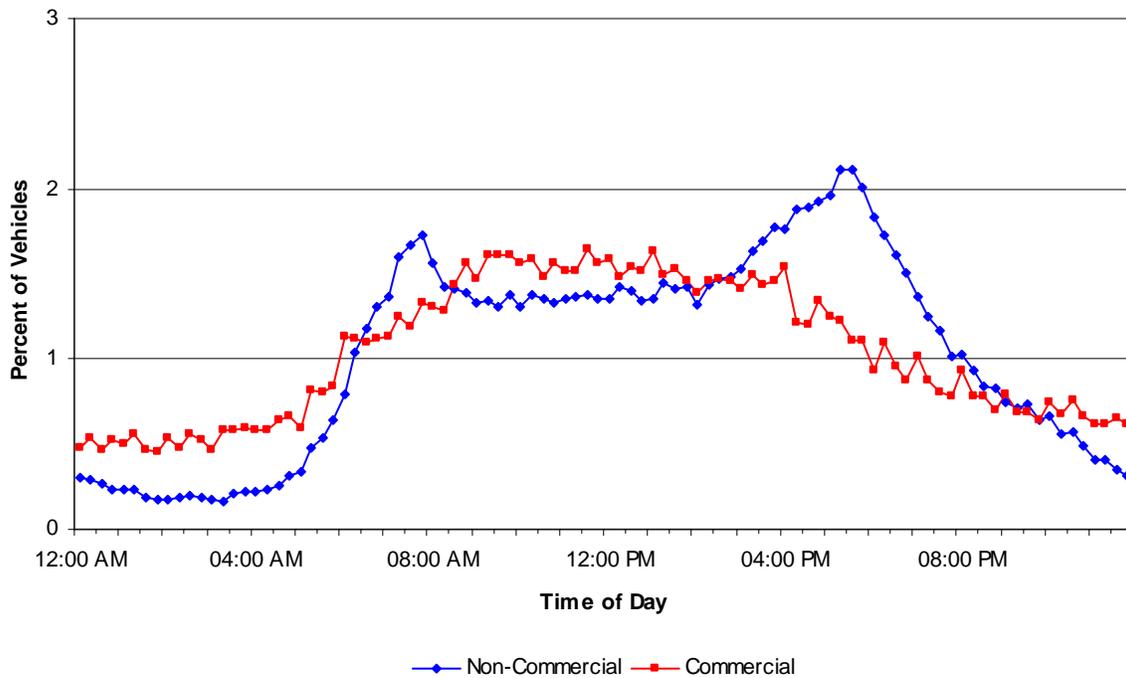
### Time-of-Day

Vehicle classification counts were conducted at each external survey location on the same day as the survey. These counts were for a 24-hour period and they include data by time-of-day and by direction. This information is primarily used for expansion of the survey data, but is also of interest to examine the distribution of vehicles by time-of-day. Figures 9 and 10 provide the distribution of non-commercial and commercial vehicles by time-of-day for all of the external locations by inbound and outbound direction, respectively.

For inbound vehicles (Figure 9), the morning peak occurs between 7:00 a.m. and 8:00 a.m. for non-commercial vehicles. There is an afternoon peak period for non-commercial vehicles between 4:00 p.m. and 6 p.m. Inbound commercial vehicle levels remain fairly constant from the morning peak (7:30 a.m.) through 4 p.m. when the amount of commercial vehicles begins to decline. For outbound traffic (Figure 10), the morning peak period for non-commercial vehicles is not as significant as the peak for the inbound direction, and it occurs between 7:30 a.m. and 8:30 a.m. The afternoon peak for non-commercial vehicles traveling outbound is larger and longer than the inbound afternoon peak. For outbound commercial vehicles, there appears to be no significant peak. The traffic levels remain fairly constant between 9 a.m. and 4 p.m.



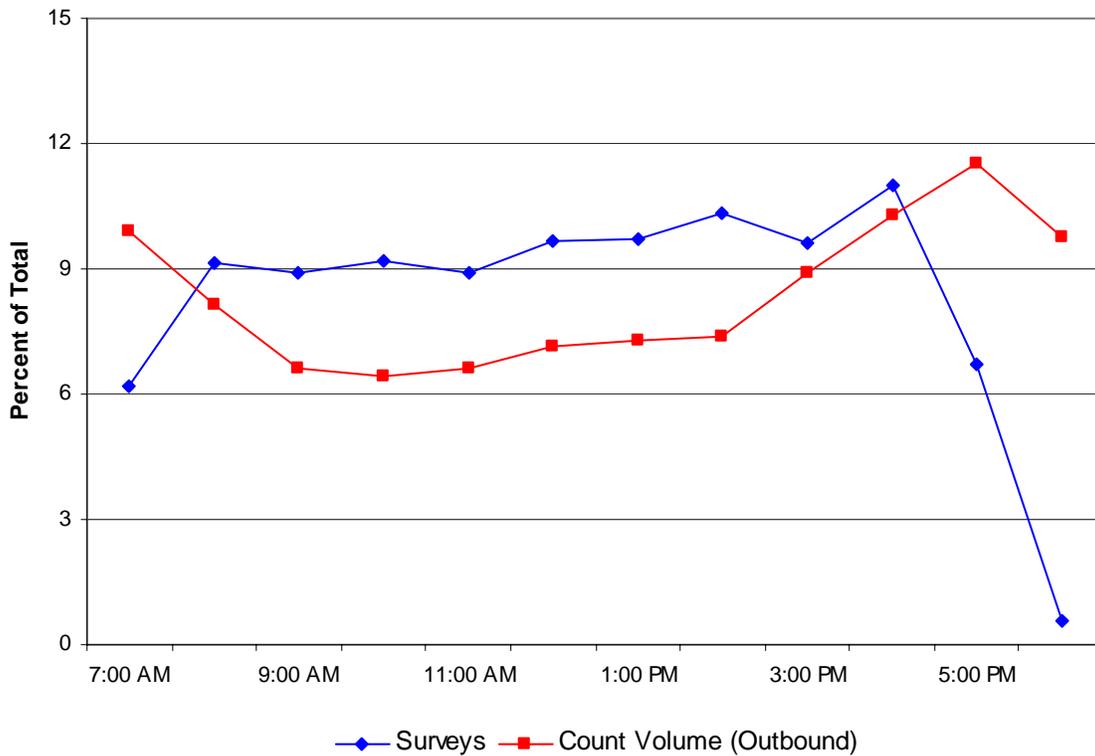
**Figure 9. Distribution of Inbound Vehicles by Time-of-Day.**



**Figure 10. Distribution of Outbound Vehicles by Time-of-Day.**

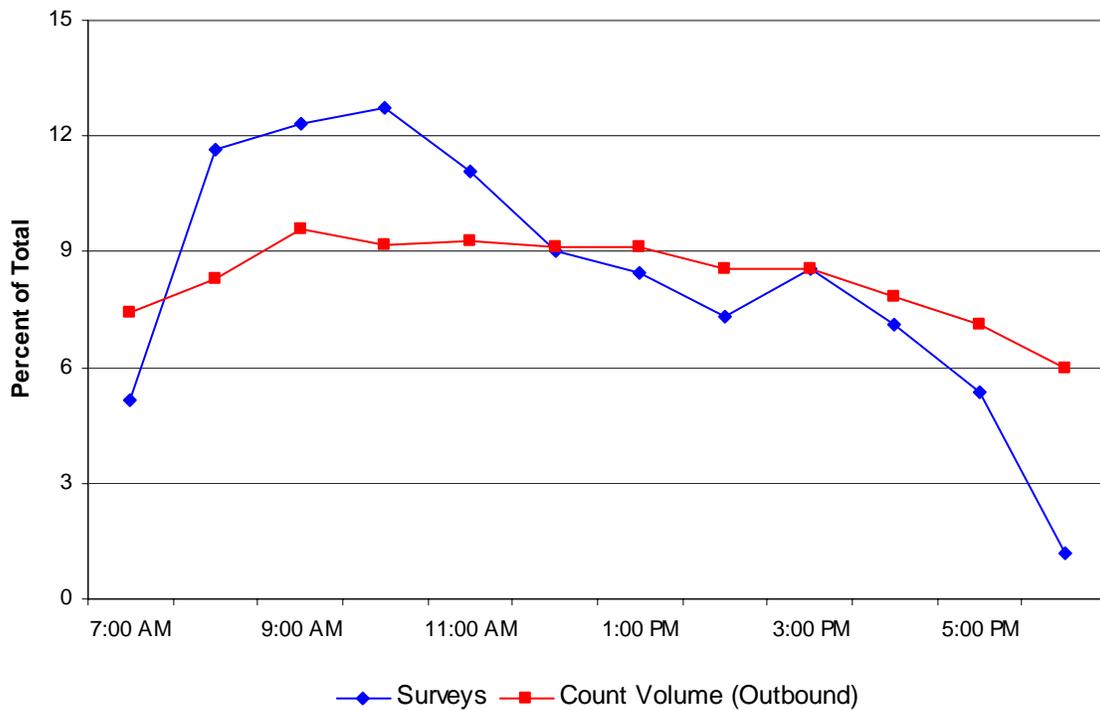
An additional analysis that compared the number of surveys and vehicle counts by time of day was conducted. In this analysis, the percent of vehicles surveyed and the percent of outbound vehicles counted were grouped in hourly increments during the time period in which the survey was conducted. The results for non-commercial vehicles are provided in Figure 11 and commercial vehicles are shown in Figure 12.

For non-commercial vehicles, the percent of surveys completed each hour was fairly constant from 8 a.m. to 4 p.m. The counts for non-commercial vehicles gradually decreased throughout the morning and then began a steady increase through the afternoon. Approximately 24 percent of the non-commercial vehicles that were traveling out of the study area (at surveyed external stations) were successfully interviewed during survey hours.



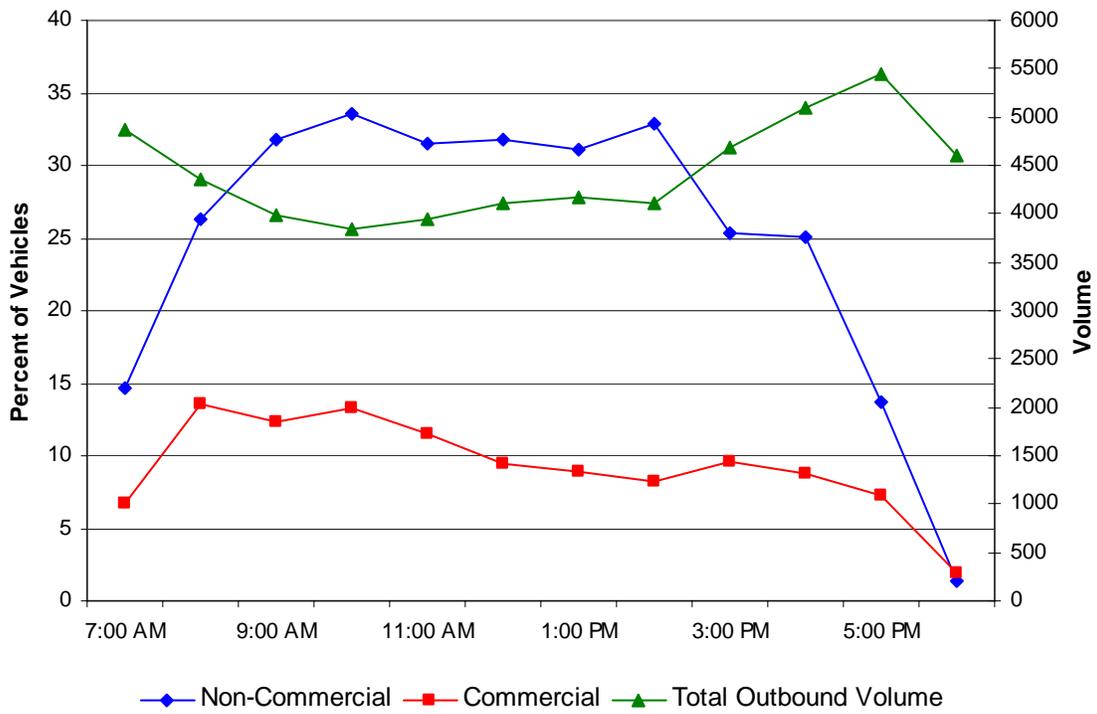
**Figure 11. Distribution of Non-Commercial Vehicles and Surveys by Time-of-Day.**

The trend among commercial vehicles was slightly different than the trend for non-commercial vehicles. The percent of vehicles counted was fairly constant throughout the day, while the percent of completed surveys peaked in the morning between 9 a.m. and 11 a.m. The largest peak of surveys completed occurred between 10 a.m. and 11 a.m. Overall, 10 percent of the commercial vehicles that were counted during the survey period were interviewed.



**Figure 12. Distribution of Commercial Vehicles and Surveys by Time-of-Day.**

A final comparison of the survey and count totals for the survey locations was conducted. In this analysis, the percent of counted vehicles that were surveyed per hour was determined for both non-commercial and commercial vehicles. This data was compared against the total count volumes for the survey period, and the results are provided in Figure 13. Generally, a larger percentage of non-commercial vehicles than commercial vehicles were surveyed throughout the course of the day. These trend lines compared against the total volumes illustrate that as the count volumes decrease, the percentage of surveyed vehicles increase. This is logical since the number of surveyors was constant during the survey period.



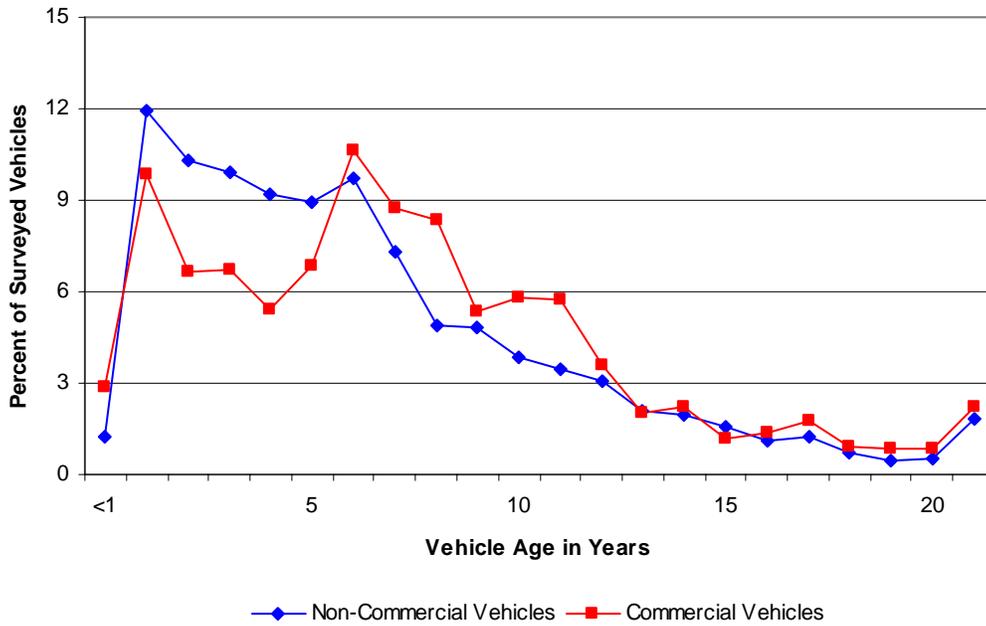
**Figure 13. Distribution of Counted Vehicles Surveyed.**

Vehicle Characteristics

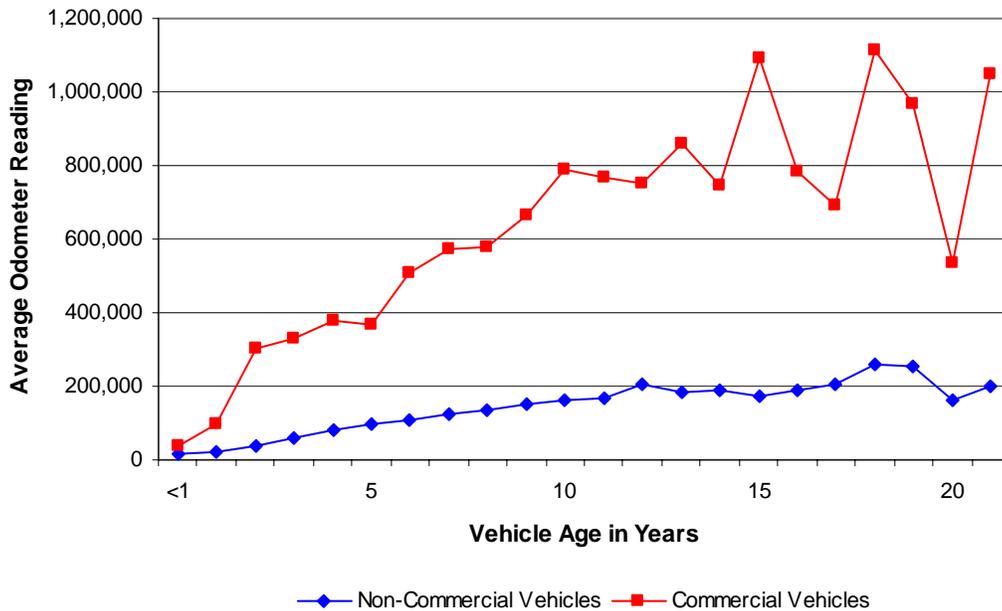
As part of the survey, interviewers collected data on the year, make, odometer readings, and model of each vehicle surveyed. This provides an indication of the distribution of vehicles traveling through the external stations by type, age, and condition (as implied by the number of miles on the vehicle). Figure 14 represents the percent distribution of non-commercial and commercial vehicles by age as reported in the surveys. The average age for surveyed vehicles was approximately 5.4 years for non-commercial vehicles and 6.4 years for commercial vehicles. The median vehicle model year was 2001 for non-commercial vehicles and 1999 for commercial vehicles.

Figure 15 presents the average odometer reading for non-commercial and commercial vehicles by age. This data shows the difference in mileage accumulation rates of commercial vehicles as compared to non-commercial vehicles. Unlike non-commercial vehicles, the data for commercial vehicles do not show smooth trends, especially for vehicles that are more than 13 years old. This

is due in part to the total number of observations in the non-commercial and commercial surveys (8,819 and 1,499, respectively).



**Figure 14. Distribution of Surveyed Vehicles by Age of Vehicle.**



**Figure 15. Average Odometer Readings for Vehicles by Age of Vehicle.**

The average odometer reading for non-commercial vehicles was 102,918 and the average commercial vehicle odometer reading was 519,313. This information indicates that commercial vehicles accumulated mileage at approximately five times the rate of non-commercial vehicles. For more detailed information, Table 8 presents the numerical values for the non-commercial data plotted in Figures 13 and 14. Table 9 provides similar information for commercial vehicles.

**Table 8. Distribution of Non-Commercial Vehicles by Age and Average Odometer Reading.**

Age	Number of Vehicles	Percent of Total	Cumulative Percent of Total	Average Reported Odometer Value
<1	110	1.25	1.25	18,397
1	1,052	11.93	13.18	20,271
2	908	10.30	23.47	37,836
3	875	9.92	33.39	61,582
4	809	9.17	42.57	81,927
5	786	8.91	51.48	97,621
6	856	9.71	61.19	108,190
7	647	7.34	68.52	125,098
8	433	4.91	73.43	135,318
9	424	4.81	78.24	151,300
10	340	3.86	82.10	161,374
11	305	3.46	85.55	165,985
12	268	3.04	88.59	202,943
13	184	2.09	90.68	183,201
14	171	1.94	92.62	190,822
15	136	1.54	94.16	174,645
16	98	1.11	95.27	191,645
17	107	1.21	96.48	205,990
18	62	0.70	97.19	257,498
19	41	0.46	97.65	255,292
20	44	0.50	98.15	162,261
>20	163	1.85	100.00	198,615
Total	8,819	100.00		

**Table 9. Distribution of Commercial Vehicles by Age and Average Odometer Reading.**

Age	Number of Vehicles	Percent of Total	Cumulative Percent of Total	Average Reported Odometer Value
<1	43	2.87	2.87	39,540
1	148	9.87	12.74	99,123
2	100	6.67	19.41	301,065
3	101	6.74	26.15	330,908
4	81	5.40	31.55	380,706
5	103	6.87	38.43	366,926
6	159	10.61	49.03	507,699
7	131	8.74	57.77	570,600
8	125	8.34	66.11	575,929
9	80	5.34	71.45	663,761
10	87	5.80	77.25	787,969
11	86	5.74	82.99	768,105
12	54	3.60	86.59	750,486
13	30	2.00	88.59	857,080
14	33	2.20	90.79	746,470
15	18	1.20	91.99	1,089,230
16	21	1.40	93.40	784,932
17	26	1.73	95.13	693,769
18	14	0.93	96.06	1,112,485
19	13	0.87	96.93	967,560
20	13	0.87	97.80	534,562
>20	33	2.20	100.00	1,049,811
Total	1,499	100.00		

### Vehicle Occupancy

As vehicles were surveyed, one of the data items recorded was the class or type of vehicle and the number of persons in the vehicle. This information provides a means for estimating the number of persons traveling into and out of the San Antonio study area. Table 10 presents the number of observed non-commercial and commercial vehicles by class and average occupancy. Nearly all of the non-commercial vehicles (98 percent) were classified as passenger vehicles. The majority of commercial vehicles (65 percent) were semi/tractor-trailer combinations. The overall average occupancy for non-commercial vehicles was 1.33 and 1.06 for commercial vehicles.

**Table 10. Distribution of Vehicles by Class and Average Occupancy.**

Non-Commercial Vehicles	Observed Vehicles	Average Occupancy	Commercial Vehicles	Observed Vehicles	Average Occupancy
Passenger Vehicle	8,617	1.33	Single Unit 2-axle (6 wheels)	211	1.10
Bus	0	—	Single Unit 3-axle (10 wheels)	215	1.07
Taxi/Paid Limo	0	—	Single Unit 4-axle (14 wheels)	90	1.02
School Bus	2	1.00	Semi (tractor-trailer)	978	1.05
Commercial Vehicle (over 1 ton)	146	1.45	Other	5	1.00
Motorcycle	42	1.17			
Recreational Vehicle	12	1.67			
Other	0	—			
Total	8,819	1.33	Total	1,499	1.06

### COMMERCIAL VEHICLE CARGO CHARACTERISTICS

Commercial vehicles represent a major component of travel into, out of, and through most study areas. Specific questions were included in the commercial vehicle survey to obtain information on the cargo being transported, the type of facility where it was picked up and dropped off, and how the cargo was transported to the vehicle. Table 11 presents data on the number of commercial vehicles surveyed by external station, the number and percent of vehicles not transporting any cargo, and whether or not their cargo was from Mexico.

Nearly one-half of the vehicles (42 percent) reported not carrying any cargo. Of those vehicles transporting cargo, 96 percent of those cargos were not from or headed to Mexico. Only thirty-two vehicles indicated that their cargo was from or destined to Mexico. For those vehicles carrying a cargo, approximately 10 percent reported picking their cargo up at an interpositional transfer or custom brokerage facility and 7 percent indicated that they would be dropping their cargo off at the same type of facility. Interpositional transfer or custom brokerage facilities are sites where cargo may be transferred between several different modes (e.g. rail to truck, ship to truck, etc.).

**Table 11. Commercial Vehicles with Cargo from Mexico.**

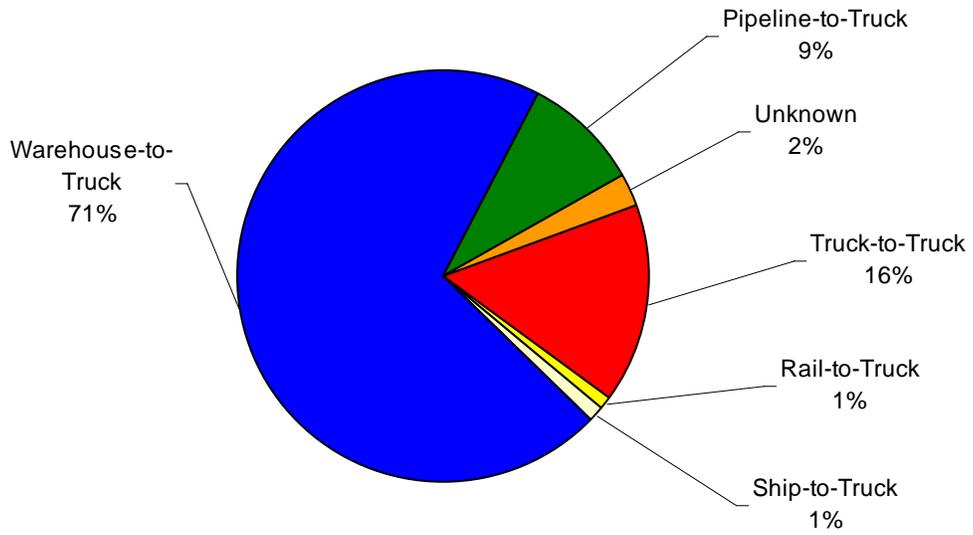
Station Number	Facility	Surveyed Vehicles	Empty Vehicles	Percent Empty	Vehicles with Mexico Cargo	Vehicles without Mexico Cargo
1200	US 281	51	24	47.06	0	27
1202	FM 32	24	14	58.33	0	10
1204	IH 35	119	33	27.73	9	77
1205	SH 123	57	25	43.86	0	32
1206	FM 621	6	1	16.67	0	5
1210	US 90	59	13	22.03	0	46
1211	SH 80	50	27	54.00	0	23
1212	IH 10	79	27	34.18	0	52
1213	SH 80	53	23	43.40	1	29
1214	US 90 A	65	16	24.62	0	49
1216	FM 1117	1	1	100.00	0	0
1218	US 87	58	31	53.45	0	27
1221	SH 123	42	11	26.19	0	31
1222	US 181	44	15	34.09	0	29
1226	SH 97	54	21	38.89	1	32
1228	IH 37	62	22	35.48	4	36
1229	US 281	29	17	58.62	0	12
1230	SH 16	52	36	69.23	0	16
1231	FM 476	17	10	58.82	0	7
1233	IH 35	57	12	21.05	13	32
1235	US 90	109	57	52.29	0	52
1236	FM 1957	10	6	60.00	0	4
1237	FM 471	108	84	77.78	0	24
1239	SH 16	48	11	22.92	0	37
1247	SH 46	52	31	59.62	0	21
1248	SH 27	52	24	46.15	0	28
1249	IH 10	88	16	18.18	4	68
1250	US 87	53	27	50.94	0	26
Total		1,499	635	42.36	32	832

A detailed summary of cargo types reported for commercial vehicles is provided in Table 12. Empty vehicles comprised 42 percent of those surveyed. For vehicles with identified cargo types, 12 percent reported their cargo as manufactured goods/equipment, 9 percent were reported as food, health, and beauty products, and 7 percent reported the cargo as clay, concrete, glass, or stone.

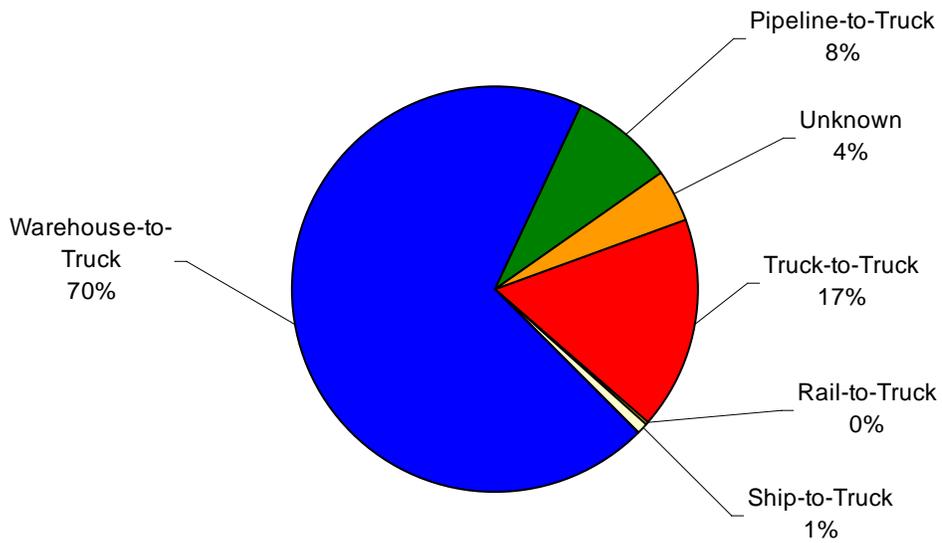
**Table 12. Distribution of Commercial Vehicles by Type of Cargo.**

Cargo Description		Number of Vehicles	Percent of Vehicles
1	— Farm Products	85	5.67
2	— Forest Products	5	0.33
3	— Marine Products	0	0.00
4	— Metals and Minerals	61	4.07
5	— Food, Health, and Beauty Products	135	9.01
6	— Tobacco Products	1	0.07
7	— Textiles	13	0.87
8	— Wood Products	51	3.40
9	— Printer Matter	1	0.07
10	— Chemical Products	16	1.07
11	— Refined Petroleum or Coal Products	54	3.60
12	— Rubber, Plastic, and Styrofoam Products	35	2.33
13	— Clay, Concrete, Glass, or Stone	104	6.94
14	— Manufactured Goods/Equipment	185	12.34
15	— Wastes	10	0.67
16	— Miscellaneous Shipments	49	3.27
17	— Hazardous Materials	0	0.00
18	— Transportation	46	3.07
19	— Unclassified Cargo	3	0.20
20	— Driver Refused to Answer	2	0.13
21	— Unknown to Driver	8	0.53
22	— Empty	635	42.36
Total		1,499	100.00

Figures 16 and 17 present the distribution of surveyed commercial vehicles by the type of cargo transfer at the origin (point of pick-up) and at the destination (point of delivery). Warehouse-to-truck and truck-to-truck accounted for the majority of cargo transfers at both the origin and destination. At the origin, 71 percent of the transfers were warehouse-to-truck and 16 percent were truck-to-truck. At the destination, warehouse-to-truck (70 percent) and truck-to-truck (17 percent) transfers accounted for the majority of the transfers.



**Figure 16. Cargo Transfer at Point of Pick-Up.**



**Figure 17. Cargo Transfer at Point of Drop-Off.**

## HIGH VOLUME LICENSE PLATE MATCH SURVEYS

Six locations in the San Antonio study area had traffic volumes that were too high to safely stop traffic and interview motorists. For these locations, a license plate match method was used as a means to estimate the number of external-local and external-through trips. The license plate matching survey was conducted using high-speed digital cameras which recorded license plates of commercial and non-commercial vehicles entering and exiting the study area at each high-volume location. As previously mentioned, for the purpose of this study, any roadway that had more than 20,000 vehicles per day was considered high-volume. The license plate information for all locations was gathered on the same day. After the plate information was recorded, it was processed through a computer program that determined the number of license plate matches between each license plate survey location. The San Antonio high-volume locations, the number of license plates recorded, and the 24-hour traffic counts for these locations are provided in Table 13.

**Table 13. San Antonio High-Volume Locations.**

Station Number	Facility	Location	License Plates Recorded		24-Hour Vehicle Count	
			Inbound	Outbound	Inbound	Outbound
1204	IH 35	at Hays Co. line	11,819	N/A	24,457	24,570
1212	IH 10	at Caldwell Co. line	2,913	N/A	8,623	8,649
1228	IH 37	at Atascosa Co. line	2,302	N/A	6,261	6,311
1233	IH 35	at Atascosa Co. line	5,130	N/A	9,798	11,972
1235	US 90	at Medina Co. line	4,706	N/A	7,324	5,280
1249	IH 10	at Kerr Co. line	2,319	N/A	4,558	5,236
Commercial Vehicles						
Station Number	Facility	Location	License Plates Recorded		24-Hour Vehicle Count	
			Inbound	Outbound	Inbound	Outbound
1204	IH 35	at Hays Co. line	1,323	N/A	5,512	6,268
1212	IH 10	at Caldwell Co. line	1,488	N/A	2,949	3,010
1228	IH 37	at Atascosa Co. line	572	N/A	2,141	1,900
1233	IH 35	at Atascosa Co. line	1,327	N/A	3,737	3,198
1235	US 90	at Medina Co. line	330	N/A	1,218	1,621
1249	IH 10	at Kerr Co. line	397	N/A	1,383	1,606

Only matches meeting specified criteria that occurred within acceptable time limits between each survey location were considered valid matches. One criterion for license plate data was that at least five of the six characters (in consecutive and positional order) match in order for the plate to be considered valid. Additionally, travel time runs were made for the peak and off-peak periods in order to establish reasonable time limits for an external-through vehicle to travel between license plate survey stations. The travel times were then increased by 20 percent for peak periods and 10 percent for off-peak periods to account for variation in travel speeds among motorists. Table 14 provides the travel times utilized for the analysis of license plate data.

**Table 14. High-Volume Travel Times.**

Movement	Travel Time in Minutes	
	Peak	Off-Peak
Southbound IH 35 (1204) to IH 10 (1212)	102	68
Westbound IH 10 (1212) to IH 35 (1204)	72	55
Southbound IH 35 (1204) to IH 37 (1228)	112	76
Northbound IH 37 (1228) to IH 35 (1204)	78	77
Southbound IH 35 (1204) to IH 35 (1233)	132	88
Northbound IH 35 (1233) to IH 35 (1204)	126	75
Southbound IH 35 (1204) to US 90 (1235)	108	73
Eastbound US 90 (1235) to IH 35 (1204)	92	68
Southbound IH 35 (1204) to IH 10 (1249)	103	99
Eastbound IH 10 (1249) to IH 35 (1204)	120	121
Westbound IH 10 (1212) to IH 37 (1228)	110	80
Northbound IH 37 (1228) to IH 10 (1212)	104	91
Westbound IH 10 (1212) to IH 35 (1233)	120	83
Northbound IH 35 (1233) to IH 10 (1212)	96	79
Westbound IH 10 (1212) to US 90 (1235)	94	94
Eastbound US 90 (1235) to IH 10 (1212)	85	85
Westbound IH 10 (1212) to IH 10 (1249)	125	165
Eastbound IH 10 (1249) to IH 10 (1212)	132	103
Northbound IH 37 (1228) to IH 35 (1233)	61	45
Northbound IH 35 (1233) to IH 37 (1228)	50	45
Northbound IH 37 (1228) to US 90 (1235)	58	66
Eastbound US 90 (1235) to IH 37 (1228)	108	94
Northbound IH 37 (1228) to IH 10 (1249)	96	87
Eastbound IH 10 (1249) to IH 37 (1228)	127	85
Northbound IH 35 (1233) to US 90 (1235)	42	29
Eastbound US 90 (1235) to IH 35 (1233)	42	43
Northbound IH 35 (1233) to IH 10 (1249)	126	87
Eastbound IH 10 (1249) to IH 37 (1228)	102	153
Eastbound US 90 (1235) to IH 10 (1249)	108	68
Eastbound IH 10 (1249) to US 90 (1235)	91	65

\* Station numbers are shown in ( )

Using the travel time estimates provided in Table 14, the total number of license plate matches between the high-volume locations was ascertained. The results of this analysis for non-commercial and commercial vehicles are provided below in Table 15 and Table 16, respectively. The table shows the location, the number of license plates recorded, the number of matches for a

pair of sites, the inbound volume at the recording location, and the expanded number of through trips.

**Table 15. Results of Non-Commercial License Plate Matching for High-Volume Locations.**

From Location	To Location	License Plates Recorded		Expanded Total	
		Recorded	Matches	Inbound Volume	Through Trips
IH 35 at Hays Co. line	IH 10 at Caldwell Co. line	11,819	61	24,457	127
	IH 37 at Atascosa Co. line	11,819	410	24,457	849
	IH 35 at Atascosa Co. line	11,819	375	24,457	775
	US 90 at Medina Co. line	11,819	210	24,457	435
	IH 10 at Kerr Co. line	11,819	94	24,457	196
IH 10 at Caldwell Co. line	IH 35 at Hays Co. line	2,913	78	8,623	231
	IH 37 at Atascosa Co. line	2,913	26	8,623	77
	IH 35 at Atascosa Co. line	2,913	97	8,623	287
	US 90 at Medina Co. line	2,913	81	8,623	240
	IH 10 at Kerr Co. line	2,913	168	8,623	498
IH 37 at Atascosa Co. line	IH 35 at Hays Co. line	2,302	299	6,261	813
	IH 10 at Caldwell Co. line	2,302	20	6,261	54
	IH 35 at Atascosa Co. line	2,302	44	6,261	120
	US 90 at Medina Co. line	2,302	45	6,261	122
	IH 10 at Kerr Co. line	2,302	63	6,261	173
IH 35 at Atascosa Co. line	IH 35 at Hays Co. line	5,130	323	9,798	617
	IH 10 at Caldwell Co. line	5,130	86	9,798	165
	IH 37 at Atascosa Co. line	5,130	43	9,798	82
	US 90 at Medina Co. line	5,130	125	9,798	239
	IH 10 at Kerr Co. line	5,130	49	9,798	94
US 90 at Medina Co. line	IH 35 at Hays Co. line	4,706	186	7,324	289
	IH 10 at Caldwell Co. line	4,706	59	7,324	92
	IH 37 at Atascosa Co. line	4,706	50	7,324	77
	IH 35 at Atascosa Co. line	4,706	102	7,324	159
	IH 10 at Kerr Co. line	4,706	44	7,324	68
IH 10 at Kerr Co. line	IH 35 at Hays Co. line	2,319	111	4,558	218
	IH 10 at Caldwell Co. line	2,319	87	4,558	171
	IH 37 at Atascosa Co. line	2,319	48	4,558	94
	IH 35 at Atascosa Co. line	2,319	38	4,558	75
	US 90 at Medina Co. line	2,319	35	4,558	69

**Table 16. Results of Commercial License Plate Matching for High-Volume Locations.**

From Location	To Location	License Plates Recorded		Expanded Match	
		Recorded	Matches	Inbound Volume	Through Trips
IH 35 at Hays Co. line	IH 10 at Caldwell Co. line	1,323	15	5,512	62
	IH 37 at Atascosa Co. line	1,323	63	5,512	262
	IH 35 at Atascosa Co. line	1,323	159	5,512	663
	US 90 at Medina Co. line	1,323	20	5,512	83
	IH 10 at Kerr Co. line	1,323	10	5,512	42
IH 10 at Caldwell Co. line	IH 35 at Hays Co. line	1,488	18	2,949	36
	IH 37 at Atascosa Co. line	1,488	11	2,949	22
	IH 35 at Atascosa Co. line	1,488	108	2,949	214
	US 90 at Medina Co. line	1,488	18	2,949	36
	IH 10 at Kerr Co. line	1,488	128	2,949	254
IH 37 at Atascosa Co. line	IH 35 at Hays Co. line	572	59	2,141	221
	IH 10 at Caldwell Co. line	572	9	2,141	34
	IH 35 at Atascosa Co. line	572	11	2,141	41
	US 90 at Medina Co. line	572	10	2,141	37
	IH 10 at Kerr Co. line	572	25	2,141	94
IH 35 at Atascosa Co. line	IH 35 at Hays Co. line	1,327	203	3,737	572
	IH 10 at Caldwell Co. line	1,327	71	3,737	200
	IH 37 at Atascosa Co. line	1,327	15	3,737	42
	US 90 at Medina Co. line	1,327	9	3,737	25
	IH 10 at Kerr Co. line	1,327	26	3,737	73
US 90 at Medina Co. line	IH 35 at Hays Co. line	330	19	1,218	70
	IH 10 at Caldwell Co. line	330	9	1,218	33
	IH 37 at Atascosa Co. line	330	6	1,218	22
	IH 35 at Atascosa Co. line	330	13	1,218	48
	IH 10 at Kerr Co. line	330	5	1,218	19
IH 10 at Kerr Co. line	IH 35 at Hays Co. line	397	7	1,383	24
	IH 10 at Caldwell Co. line	397	33	1,383	115
	IH 37 at Atascosa Co. line	397	16	1,383	56
	IH 35 at Atascosa Co. line	397	16	1,383	56
	US 90 at Medina Co. line	397	3	1,383	11

The number of expanded through trips was determined by obtaining the percentage of recorded vehicles for a location that were matched at another location. This percentage was then multiplied by the total inbound volume for the recording location. For example, of the 2,302 inbound non-commercial vehicles recorded at the IH 37 at the Atascosa County line, 299 (12.99 percent) were matched exiting the study area on IH 35 at the Hays County line. Therefore, the total inbound volume at the recording location (6,261) multiplied by the percent matched (12.99 percent) equates to an estimated 813 through trips traveling from IH 37 on the southern side of the study area through to IH 35 on the north side of the study area.

## SURVEY DATA EXPANSION

The vehicle survey data were expanded based on the 24-hour directional vehicle classification counts conducted at each survey site on the day the site was surveyed. The assumption is made that the traffic in the non-surveyed direction is a mirror image of the traffic in the surveyed direction. For example, if 10 percent of the surveyed outbound traffic was through trips, it is assumed that 10 percent of the inbound traffic will be through trips. It is also assumed that the surveyed vehicles are a representative sample of the vehicles at each site for a 24-hour period. Table 17 presents the expanded estimates of external-local and external-through trips for non-commercial and commercial vehicles by site as well as the estimates of trips by residents and visitors (non-residents).

**Table 17. Expanded Survey Results by Station.**

Station Number	Facility	Non-Commercial Vehicles			Residents	Visitors	Commercial Vehicles		
		Local	Through	Total			Local	Through	Total
1200	US 281	9,796	167	9,963	5,993	3,803	742	77	819
1201	FM 32	917	183	1,100	506	411	329	29	358
1202	FM 32	2,091	327	2,418	1,155	936	221	44	264
1203	FM 2439	2,500	0	2,500	1,380	1,120	606	0	606
1204	IH 35	44,229	4,798	49,027	14,595	29,633	9,653	2,127	11,780
1205	SH 123	8,840	582	9,422	4,708	4,132	1,006	132	1,138
1206	FM 621	4,258	476	4,734	2,970	1,288	212	18	230
1207	FM 1979	1,080	314	1,394	754	326	104	15	119
1208	FM 1977	415	0	415	290	125	46	0	46
1209	FM 20	1,956	6	1,962	1,366	591	712	0	712
1210	US 90	1,574	76	1,650	876	698	293	25	318
1211	SH 80	1,945	1,165	3,110	722	1,224	199	413	612
1212	IH 10	14,936	2,336	17,272	4,929	10,007	4,491	1,468	5,959
1213	SH 80	84	859	943	10	74	121	258	379
1214	US 90 A	1,667	108	1,775	517	1,149	533	44	577
1215	FM 466	225	0	225	57	168	36	0	36
1216	FM 1117	1,354	24	1,378	343	1,010	45	0	45
1217	FM 1681	1,000	0	1,000	350	650	118	0	118
1218	US 87	1,865	97	1,962	652	1,212	529	168	697
1219	SH 80	1,384	0	1,384	484	900	364	0	364

**Table 17. Expanded Survey Results by Station (cont.).**

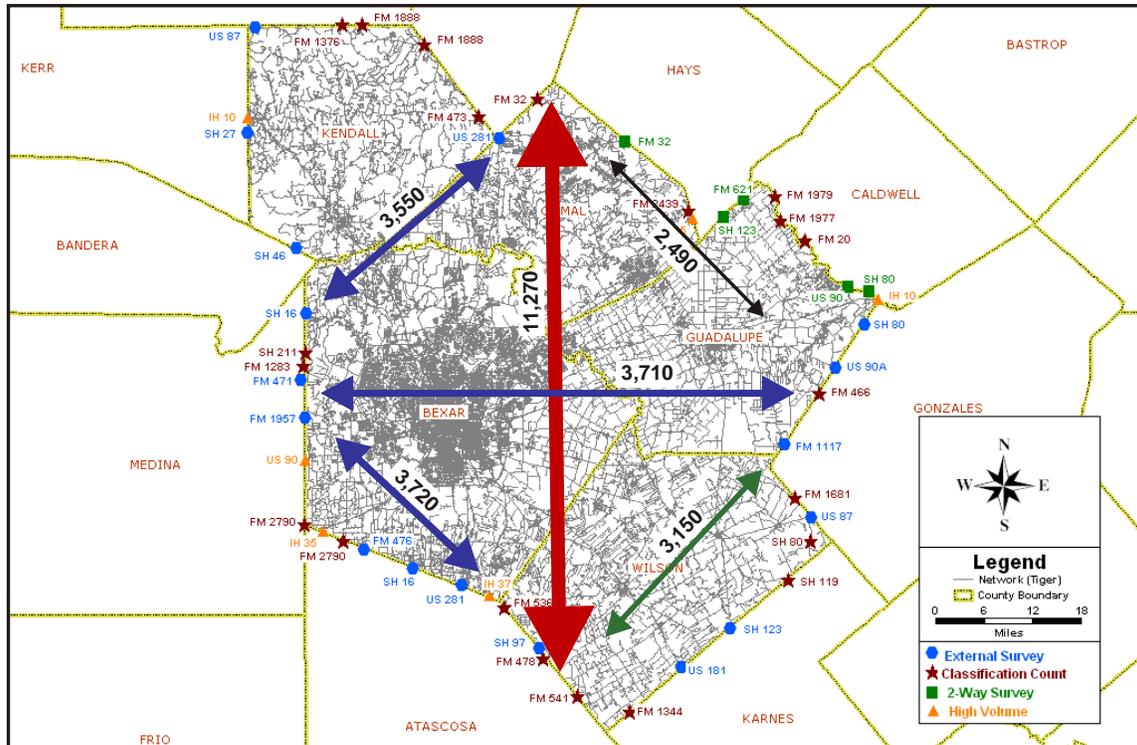
Station Number	Facility	Non-Commercial Vehicles			Residents	Visitors	Commercial Vehicles		
		Local	Through	Total			Local	Through	Total
1220	SH 119	502	9	511	114	388	307	0	307
1221	SH 123	1,766	689	2,455	400	1,366	159	57	216
1222	US 181	3,853	221	4,074	1,457	2,396	164	67	231
1223	FM 1344	53	0	53	20	33	26	0	26
1224	FM 541	131	0	131	66	65	34	0	34
1225	FM 478	264	16	280	133	131	57	0	57
1226	SH 97	1,201	188	1,389	604	596	326	60	386
1227	FM 536	337	0	337	170	167	82	6	88
1228	IH 37	9,926	2,646	12,572	3,275	6,650	3,122	919	4,041
1229	US 281	2,807	123	2,930	1,140	1,667	443	54	497
1230	SH 16	11,233	195	11,428	5,982	5,251	1,273	73	1,346
1231	FM 476	2,607	94	2,701	739	1,868	173	9	182
1232	FM 2790	1,694	173	1,867	479	1,214	121	0	121
1233	IH 35	19,103	2,667	21,770	6,304	12,799	4,853	2,082	6,935
1234	FM 2790	1,867	0	1,867	528	1,339	121	0	121
1235	US 90	10,720	1,884	12,604	3,538	7,183	2,419	420	2,839
1236	FM 1957	2,198	30	2,228	1,000	1,198	137	0	137
1237	FM 471	6,400	99	6,499	2,866	3,534	1,847	67	1,914
1246	FM 1283	1,228	0	1,228	559	669	941	0	941
1238	SH 211	5,665	106	5,771	2,577	3,089	522	24	546
1239	SH 16	4,195	4	4,199	1,879	2,315	1,013	26	1,039
1247	SH 46	4,382	127	4,509	1,748	2,633	548	9	557
1248	SH 27	3,898	122	4,020	2,165	1,732	799	51	850
1249	IH 10	7,382	2,412	9,794	2,437	4,945	2,147	842	2,989
1250	US 87	4,250	237	4,487	1,894	2,357	1,173	129	1,302
1251	FM 1376	433	0	433	193	240	52	0	52
1252	FM 1888	338	0	338	151	187	47	0	47
1253	FM 1888	418	5	423	186	231	76	0	76
1254	FM 473	699	0	699	312	387	229	0	229
Total		211,661	23,570	235,231	85,572	126,088	43,573	9,710	53,283

It should be noted that estimates are included in Table 17 for the non-surveyed sites. For non-surveyed sites, it was assumed that all trips made were local trips. Additionally, the number of residents and visitors for the non-surveyed sites was determined using the percentage of residents and visitors from a proximal surveyed site. For example, the percentage of residents as determined from the survey for FM 471 (station number 1237) was applied to the total number of trips for FM 1283 (station number 1246), which was a non-surveyed location.

The expanded survey data were used to develop zone-to-zone estimates of non-commercial and commercial vehicle trips based on the geocoded origins and destinations for the surveyed trips. Trips for the non-surveyed sites were distributed to the destination zones observed from the surveyed sites on a proportional basis. It is assumed that the surveyed sites are representative of the most likely destination zones for the non-surveyed sites. Since the volume of vehicle trips at the non-surveyed sites is typically low, the amount of error that may be generated by that assumption is believed to be small.

Figure 18 shows the estimates of external-local trip movements by direction and location group. The North group had the largest estimated number of external-local trip movements, with over 93,100 total daily trips. The South group had the second highest estimated number of external-local trip movements with nearly 66,600 daily trips.





**Figure 19. Estimates of External-Through Trip Movements by Location Group.**

**SURVEY SUMMARY**

Nearly 290,000 vehicles enter and leave the San Antonio study area daily. Nearly 18 percent are commercial vehicles. Approximately 11 percent of the nearly 290,000 vehicles make through trips. Approximately 55 percent of the non-commercial and commercial vehicles enter or leave the San Antonio study area via one of the six high-volume facilities. Based on the average vehicle occupancy observed in the survey, an estimated 313,000 persons are entering and leaving the study area daily by non-commercial vehicle and nearly 56,500 persons are entering and leaving by commercial vehicle. The estimated number of non-residents (persons that do not live in the study area) in non-commercial vehicles that enter the study area daily is approximately 126,200. Non-residents account for approximately 59,800 internal trips within the study area.

Approximately 33 percent of non-commercial trip origins were leaving home and 37 percent of non-commercial trip destinations were returning to home. HBNW trips accounted for nearly 44 percent of the non-commercial trips. The percentage of trips that were NHB and HBW were 30 percent and 26 percent, respectively.

Commercial vehicle drivers reported varied trip purposes at the origin and destination ends of their trip. Approximately 30 percent of the trip origin purposes were reported to be picking up cargo. Delivering cargo accounted for an additional 28 percent of trip origins. Delivering cargo was the stated purpose for 48 percent of the destination trips, while picking up cargo accounted for 26 percent of the destinations. Leaving/returning to base operations accounted for 15 percent of the commercial vehicle trip origins and 8 percent of the trip destinations.

The percent distribution of non-commercial and commercial vehicles by time-of-day was similar between inbound and outbound directions for all the sites combined. The largest “spike” for non-commercial vehicles occurred during the afternoon peak for both the inbound direction and outbound directions. Commercial vehicle travel peaked in the middle of the day (around noon) for both the inbound and the outbound directions.

The median vehicle year for non-commercial vehicles was 2001 and for commercial vehicles it was 1999. The average vehicle age for commercial vehicles was 6.4 years and for non-commercial vehicles it was 5.4 years. The average odometer reading for commercial vehicles was approximately five times higher than that for non-commercial vehicles. Average vehicle occupancy for non-commercial vehicles was 1.33, or nearly 25 percent greater than the 1.06 reported for commercial vehicles.

Commercial vehicles represent approximately 18 percent of the vehicles traveling into and out of the San Antonio study area on a daily basis. Nearly 42 percent of the commercial vehicles are carrying no cargo. Of the commercial vehicles carrying cargo, 96 percent are carrying cargo that is not from or destined to Mexico.



## **APPENDIX**



**AUSTIN / SAN ANTONIO EXTERNAL STATION**

**NON-COMMERCIAL VEHICLE SURVEY FORM - A**

(Outbound Direction)

Station # \_\_\_\_\_ Survey Date \_\_\_\_\_

Station Name/Location \_\_\_\_\_ Interviewer \_\_\_\_\_

For each vehicle you collect	Vehicle 1	Vehicle 2	Vehicle 3
Time	_____ a.m. _____ p.m.	_____ a.m. _____ p.m.	_____ a.m. _____ p.m.
Number of people in vehicle			
Vehicle Type			

**Vehicle Type options:** 1) Passenger (car/truck/van) 2) Bus 3) Taxi/Paid Limo 4) School Bus  
 5) Commercial Vehicle (over 1 ton) 6) Motorcycle 7) Recreational Vehicle 8) Other (specify in block) 99) Refused/Unknown

QUESTIONS:	Vehicle 1	Vehicle 2	Vehicle 3
1. What year, make, and model is this vehicle?  Gas (leaded, unleaded), diesel, propane or other fuel?	_____ Year _____ Make _____ Model Leaded <input type="checkbox"/> Unleaded <input type="checkbox"/> Diesel <input type="checkbox"/> Propane <input type="checkbox"/> Other <input type="checkbox"/> _____	_____ Year _____ Make _____ Model Leaded <input type="checkbox"/> Unleaded <input type="checkbox"/> Diesel <input type="checkbox"/> Propane <input type="checkbox"/> Other <input type="checkbox"/> _____	_____ Year _____ Make _____ Model Leaded <input type="checkbox"/> Unleaded <input type="checkbox"/> Diesel <input type="checkbox"/> Propane <input type="checkbox"/> Other <input type="checkbox"/> _____
2. What is the mileage on your odometer?			
3. What county do you live in?  (If other, go to 4)	<input type="checkbox"/> Bastrop <input type="checkbox"/> Bexar <input type="checkbox"/> Caldwell <input type="checkbox"/> Comal <input type="checkbox"/> Hays <input type="checkbox"/> Guadalupe <input type="checkbox"/> Kendall <input type="checkbox"/> Travis <input type="checkbox"/> Williamson <input type="checkbox"/> Wilson <input type="checkbox"/> OTHER <input type="checkbox"/> Refused	<input type="checkbox"/> Bastrop <input type="checkbox"/> Bexar <input type="checkbox"/> Caldwell <input type="checkbox"/> Comal <input type="checkbox"/> Hays <input type="checkbox"/> Guadalupe <input type="checkbox"/> Kendall <input type="checkbox"/> Travis <input type="checkbox"/> Williamson <input type="checkbox"/> Wilson <input type="checkbox"/> OTHER <input type="checkbox"/> Refused	<input type="checkbox"/> Bastrop <input type="checkbox"/> Bexar <input type="checkbox"/> Caldwell <input type="checkbox"/> Comal <input type="checkbox"/> Hays <input type="checkbox"/> Guadalupe <input type="checkbox"/> Kendall <input type="checkbox"/> Travis <input type="checkbox"/> Williamson <input type="checkbox"/> Wilson <input type="checkbox"/> OTHER <input type="checkbox"/> Refused
3a. What city do you live in?	(go to 5)	(go to 5)	(go to 5)
4. What city and state to you live in?	_____ _____ (city / state in US or Mexico) <input type="checkbox"/> Refused	_____ _____ (city / state in US or Mexico) <input type="checkbox"/> Refused	_____ _____ (city / state in US or Mexico) <input type="checkbox"/> Refused
4a. Did you stay overnight as part of your travel?	<input type="checkbox"/> Yes <input type="checkbox"/> Refused <input type="checkbox"/> No (go to 4d)	<input type="checkbox"/> Yes <input type="checkbox"/> Refused <input type="checkbox"/> No (go to 4d)	<input type="checkbox"/> Yes <input type="checkbox"/> Refused <input type="checkbox"/> No (go to 4d)
4b. Where did you stay?	_____ _____ (city / state in US or Mexico) <input type="checkbox"/> Refused	_____ _____ (city / state in US or Mexico) <input type="checkbox"/> Refused	_____ _____ (city / state in US or Mexico) <input type="checkbox"/> Refused
4c. How many nights have you stayed?			
4d. Did you enter Texas today?	<input type="checkbox"/> Yes <input type="checkbox"/> Refused <input type="checkbox"/> No (go to 5)	<input type="checkbox"/> Yes <input type="checkbox"/> Refused <input type="checkbox"/> No (go to 5)	<input type="checkbox"/> Yes <input type="checkbox"/> Refused <input type="checkbox"/> No (go to 5)

4e. Where outside of Texas did you travel from?	_____	_____	_____
	(city / state in US or Mexico)	(city / state in US or Mexico)	(city / state in US or Mexico)
	<input type="checkbox"/> Refused	<input type="checkbox"/> Refused	<input type="checkbox"/> Refused
4f. What road or highway did you use to enter Texas?			
5. Where was the <i>last</i> place you got into your vehicle (place/address or nearest intersection/city)			
5a. What time did you leave that place?	_____ a.m. _____ p.m.	_____ a.m. _____ p.m.	_____ a.m. _____ p.m.
5b. What type of place was that? (choose from type of place options)			
5c. What was your purpose for being at your last location? (Choose from trip purpose options)			
5d. Was that location in the study area? (see Question 3 for study area counties)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Refused (Yes go to 6)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Refused (Yes go to 6)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Refused (Yes go to 6)
5e. What road did you use to enter the study area? (see Question 3 for study area counties)			

- Type of Place Options:** 1) Office building 2) Retail Shopping/Gas 3) Industrial/Manufacturing/Warehouse  
4) Medical 5) Educational (12<sup>th</sup> grade or lower) 6) Educational (college, trade, etc.)  
7) Government 8) Residential 9) Airport 10) Eating Establishment  
11) Hotel / Motel 12) Other (specify) 99) Refused/Unknown

- Trip Purpose Options:** 1) Home/Return Home 2) Go/Return to work 3) Work-related 4) School  
5) Vacation 6) Visit Family/Friends 7) Eat out 8) Shop  
9) Buy gas 10) Personal business 11) Pick-up/Drop off Passenger  
12) Change Travel Mode 13) Delivery 14) Recreation 15) Overnight stay/sleep  
16) Other (specify) 99) Unknown/Refused

6. Where is your next destination? (place/address or nearest intersection/city)			
6a. What is your purpose for traveling to this destination? (Choose from trip purpose options)			
7. Are you going to a location out of Texas?	<input type="checkbox"/> Yes <input type="checkbox"/> Refused <input type="checkbox"/> No (go to 7d)	<input type="checkbox"/> Yes <input type="checkbox"/> Refused <input type="checkbox"/> No (go to 7d)	<input type="checkbox"/> Yes <input type="checkbox"/> Refused <input type="checkbox"/> No (go to 7d)
<i>If Yes:</i> 7a. What city and state are you going to?			
7b. What road / bridge will you use to leave Texas?			
7c. How many more days will you be in Texas?			
<i>If No</i> 7d. What city / county in Texas are you going to?			

To measure the amount of travel you made today, we need to know the number of places you have gone today. Would you please tell us:

8. Where did your first trip today begin? (city/county/landmark))			
9. Where did you go from there? (city/county/landmark)			
10. Where did you go next? (city/county/landmark)			
11. Where did you go next? (city/county/landmark)			
12. Where did you go next? (city/county/landmark)			
13. How many more places did you stop today?			

**AUSTIN / SAN ANTONIO EXTERNAL STATION  
COMMERCIAL VEHICLE SURVEY FORM B**  
(Outbound Direction)

Station # \_\_\_\_\_

Survey Date \_\_\_\_\_

Station Name/Location \_\_\_\_\_

Interviewer \_\_\_\_\_

**For each vehicle you collect:**

	Vehicle 1	Vehicle 2	Vehicle 3
1. Time	_____ a.m. _____ p.m.	_____ a.m. _____ p.m.	_____ a.m. _____ p.m.
2. Number of people in vehicle			
3. Vehicle Classification			
4. What is the cargo ? (choose from vehicle cargo codes)	<input type="checkbox"/> Empty (no cargo)	<input type="checkbox"/> Empty (no cargo)	<input type="checkbox"/> Empty (no cargo)
4a. If empty, what was the last cargo you delivered?			
4b. (To be completed by surveyor) Is vehicle type cargo/freight transport or for service/delivery?	<input type="checkbox"/> Cargo Transport <input type="checkbox"/> Service	<input type="checkbox"/> Cargo Transport <input type="checkbox"/> Service	<input type="checkbox"/> Cargo Transport <input type="checkbox"/> Service
4c. What is the weight of your cargo? <i>* determine 4a and 4b by observation *</i>	(lbs)	(lbs)	(lbs)
4d. Is cargo being hauled using an multi-modal container/trailer or TEU?	<input type="checkbox"/> Yes <input type="checkbox"/> No (go to 5) <input type="checkbox"/> Neither	<input type="checkbox"/> Yes <input type="checkbox"/> No (go to 5) <input type="checkbox"/> Neither	<input type="checkbox"/> Yes <input type="checkbox"/> No (go to 5) <input type="checkbox"/> Neither
<i>If Yes</i> 4e. Is the container a Reefer or Dry Box?	<input type="checkbox"/> Reefer <input type="checkbox"/> Dry Box	<input type="checkbox"/> Reefer <input type="checkbox"/> Dry Box	<input type="checkbox"/> Reefer <input type="checkbox"/> Dry Box
4f. Record the hazardous material placard (if applicable)			
5. Did your cargo come from or is it going to Mexico?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Refused / Unknown	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Refused / Unknown	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Refused / Unknown
6. Where did you pick up your load? (place/address or nearest intersection and city)			
7. Was that location an inter-modal transfer or custom brokerage site?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Refused / Unknown	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Refused / Unknown	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Refused / Unknown
8. How was your load transferred at that site (choose from transfer codes)?			
9. Where will you drop your cargo off? (place/address or nearest intersection and city)			
10. Is that location an inter-modal transfer or custom brokerage site?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Refused / Unknown	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Refused / Unknown	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Refused / Unknown
11. How will the cargo be transferred at that site (choose from transfer codes)?			

**Vehicle Classification Options:** 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 (specify)      99) Refused / Unknown

**Cargo Transfer Options:** 1) Truck-to/from-Truck      2) Rail-to/from-Truck      3) Ship-to/from-Truck      4) Airplane-to/from-Truck  
5) Warehouse-to/from-Truck      6) Pipeline-to/from-Truck      7) Unknown  
99) Refused

**NOTE:** All cargo transfer options are both ways (i.e., Truck-to-Warehouse should be coded same as Warehouse-to-Truck).

**QUESTIONS:**

<p>12. What is the year and gross weight rating of this vehicle ?</p> <p>Gas (leaded, unleaded), diesel, propane or other fuel?</p>	<p>_____</p> <p>Year</p> <p>_____</p> <p>Gross Weight</p> <p>Leaded <input type="checkbox"/> Unleaded <input type="checkbox"/></p> <p>Diesel <input type="checkbox"/> Propane <input type="checkbox"/></p> <p>Other <input type="checkbox"/> _____</p>	<p>_____</p> <p>Year</p> <p>_____</p> <p>Gross Weight</p> <p>Leaded <input type="checkbox"/> Unleaded <input type="checkbox"/></p> <p>Diesel <input type="checkbox"/> Propane <input type="checkbox"/></p> <p>Other <input type="checkbox"/> _____</p>	<p>_____</p> <p>Year</p> <p>_____</p> <p>Gross Weight</p> <p>Leaded <input type="checkbox"/> Unleaded <input type="checkbox"/></p> <p>Diesel <input type="checkbox"/> Propane <input type="checkbox"/></p> <p>Other <input type="checkbox"/> _____</p>
<p>13. What is the mileage on your odometer?</p>			
<p>14. Where are you coming from? (city / state in US or Mexico)</p> <p>14a. Is that location in Texas?</p> <p>14b. (<i>If not in Texas</i>) Did you enter Texas today?</p> <p>14c. What road or highway did you use to enter Texas?</p> <p>14d. Did you stay overnight as part of your travel?</p> <p>14e. If yes, where did you stay? (city/county/state)</p> <p>14f. How many nights have you stayed?</p>	<p></p> <p><input type="checkbox"/> Yes (go to 14d) <input type="checkbox"/> No</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No (go to 14d)</p> <p></p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No (go to 15)</p> <p></p> <p></p>	<p></p> <p><input type="checkbox"/> Yes (go to 14d) <input type="checkbox"/> No</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No (go to 14d)</p> <p></p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No (go to 15)</p> <p></p> <p></p>	<p></p> <p><input type="checkbox"/> Yes ( go to 14d) <input type="checkbox"/> No</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No (go to 14d)</p> <p></p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No (go to 15)</p> <p></p> <p></p>
<p>15. Where was the last place you got into your vehicle? (place/address or nearest intersection/city)</p> <p>15a. What time did you leave that place?</p> <p>15b. What type of place was this? (choose from type of place options).</p> <p>15c. What was your purpose for being at your last location?</p> <p>15d. Was that location in the study area?</p> <p>15e. What road did you use to enter the study area?</p>	<p></p> <p>_____ a.m. _____ p.m.</p> <p></p> <p></p> <p><input type="checkbox"/> Yes (Go to 16) <input type="checkbox"/> No <input type="checkbox"/> Refused</p> <p></p>	<p></p> <p>_____ a.m. _____ p.m.</p> <p></p> <p></p> <p><input type="checkbox"/> Yes (Go to 16) <input type="checkbox"/> No <input type="checkbox"/> Refused</p> <p></p>	<p></p> <p>_____ a.m. _____ p.m.</p> <p></p> <p></p> <p><input type="checkbox"/> Yes (Go to 16) <input type="checkbox"/> No <input type="checkbox"/> Refused</p> <p></p>
<p>16. Where is your next destination? (place/address or nearest intersection/city)</p> <p>16a. What is your purpose for traveling to this destination? (Choose from trip purpose options.)</p>			

17. Are you going to a location outside of Texas?	<input type="checkbox"/> Yes (Go to 17a) <input type="checkbox"/> No (go to 17d) <input type="checkbox"/> Refused	<input type="checkbox"/> Yes (Go to 17a) <input type="checkbox"/> No (go to 17d) <input type="checkbox"/> Refused	<input type="checkbox"/> Yes (Go to 17a) <input type="checkbox"/> No (go to 17d) <input type="checkbox"/> Refused
<i>If Yes</i>			
17a. What city and state are you going to?			
17b. What road or highway will you use to leave Texas?			
17c. How many more days will you be in Texas?			
<i>If No</i>			
17d. What city / county in Texas are you going to?			

- Type of Place Options:**
- |                    |  |                                       |
|--------------------|--|---------------------------------------|
| 1) Office building | 2) Retail Shopping/Gas                           | 3) Industrial/Manufacturing/Warehouse |
| 4) Medical         | 5) Educational (12 <sup>th</sup> grade or lower) | 6) Educational (college, trade, etc.) |
| 7) Government      | 8) Residential                                   | 9) Airport                            |
| 11) Hotel/Motel    | 12) Other (specify)                              | 10) Eating Establishment              |
|                    |  | 99) Refused/Unknown                   |

- Trip Purpose Options:**
- |  |                               |             |
|--|-------------------------------|-------------|
| 1) Base location/return to base location | 2) Delivery                   | 3) Pick-up  |
| 4) Maintenance                           | 5) Driver needs (lunch, etc.) | 6) To Home  |
| 8) Other (specify)                       | 99) Refused/Unknown           | 7) Buy fuel |

**To measure the amount of travel you made today, we need to know the places you have gone today. Would you please tell us:**

18. Where did your first trip today begin? (city/county/landmark)			
19. Where did you go from there? (city/county/landmark)			
20. Where did you go next? (city/county/landmark)			
21. Where did you go next? (city/county/landmark)			
22. Where did you go next? (city/county/landmark)			
23. Where did you go next? (city/county/landmark)			
24. Where did you go next? (city/county/landmark)			
25. How many more places did you stop today?			

#### Vehicle Cargo Codes

1 – Farm Products	Livestock, fertilizer, dirt, landscaping, etc.
2 – Forest Products	Trees, sod, etc.
3 – Marine Products	Fresh fish, seafood, etc.
4 – Metals and Minerals	Crude petroleum, natural gas, propane, metals, gypsum, etc.
5 – Food, Health, Beauty Products	Assorted food products, cosmetics, etc.
6 – Tobacco Products	Cigarettes, cigars, and chewing tobacco
7 – Textiles	Clothing, lines, etc
8 – Wood Products	Lumber, paper, cardboard, wood pulp, etc
9 – Printed Matter	Newspapers, magazines, books, etc.
10 – Chemical Products	Soaps, paints, household or industrial chemicals, etc
11 – Refined Petroleum or Coal Products	Gasoline, etc.
12 – Rubber, Plastic, Styrofoam Products	Finished products of rubber, plastic, or Styrofoam
13 – Clay, Concrete, Glass, or Stone	Finished products of clay, concrete, glass, or stone
14 – Manufactured Goods/Equipment	Miscellaneous products such as machinery, appliances, etc
15 – Wastes	Waste products, including scrap and recyclable materials
16 – Miscellaneous Shipments	U.S. Mail, U.P.S., Federal Express, and other mixed cargo
17 – Hazardous Materials	Hazardous chemicals and substances
18 – Transportation	Automobiles, Heavy Equipment, etc.
19 – Unclassified Cargo (specify)	Cargo not falling within one of the above categories
20 – Driver Refused to Answer	Driver refused to answer
21 – Unknown to Driver	Unknown to driver
22 - Empty	Empty