JULY 2024

TECHNICAL SUMMARY

2022–2023

SOUTH EAST TEXAS REGIONAL PLANNING COMMISSION COMMERCIAL VEHICLE TRAVEL SURVEY

TEXAS DEPARTMENT OF TRANSPORTATION
TRAVEL SURVEY PROGRAM

Texas Department of Transportation

Texas A&M Transportation Institute

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SOUTH EAST TEXAS REGIONAL PLANNING COMMISSION (SETRPC) COMMERCIAL VEHICLE TRAVEL SURVEY

TEXAS DEPARTMENT OF TRANSPORTATION TRAVEL SURVEY PROGRAM

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and the
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The purpose of the travel surveys was to collect data and information needed as input to the SETRPC travel demand model.

COMMERCIAL VEHICLE TRAVEL SURVEY

INTRODUCTION

THE PURPOSE

In 2022, the Texas Department of Transportation (TxDOT) funded a commercial vehicle survey in the South East Texas Regional Planning Commission (SETRPC), the designated Metropolitan Planning Organization (MPO), for the Jasper, Jefferson, Orange, and Hardin Regional Transportation Study (JJOHRTS) area. The purpose of this survey was to provide data that will enable TxDOT to forecast total commercial vehicle travel demand within the SETRPC urban area. ETC Institute was contracted by TxDOT to conduct this commercial vehicle survey for the SETRPC study area, with technical assistance from the Texas A&M Transportation Institute (TTI). The survey was conducted from November 2022 to March 2023 and covered Jasper, Jefferson, Orange, and Hardin Counties, as shown in Figure 1.

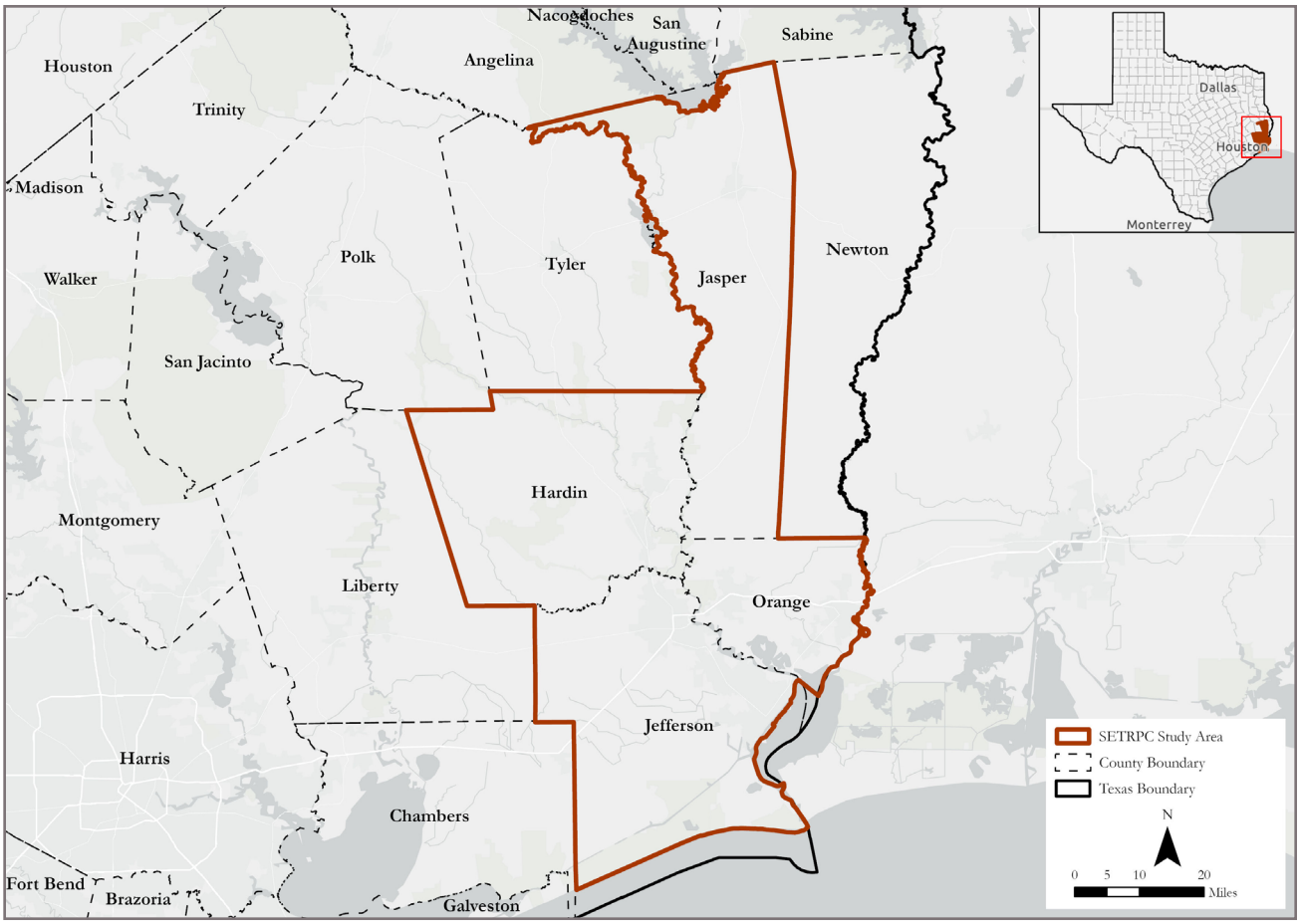


Figure 1. SETRPC Study Area.

METHODOLOGY

SURVEY METHODOLOGY

The survey sample was randomly selected from a list comprising all business individuals, companies, and public agencies that own, operate, or lease commercial vehicles within the study area. This list was acquired from Data Axle and then provided to TTI for categorization and randomization. Selected businesses were contacted and invited to participate in the survey. Those who agreed were given the option to have their commercial vehicle driver(s) record their travel for a 24-hour period using either a paper travel diary form or a travel survey smartphone application (app). For those opting to use the app, they could either download it to their phone or request a cell phone with the app pre-installed from the survey vendor. Alternatively, businesses choosing the paper diary method received a survey packet with detailed instructions. The majority of commercial vehicle drivers (over 60 percent of the participants) used the vendor-provided cell phone with the app pre-installed for recording their travel.

A total of 157 companies participated in the SETRPC commercial vehicle survey, from which a total of 301 commercial vehicle surveys were obtained. Data editing and review processes were performed by TTI staff to ensure that the survey data collected were complete and followed the guidelines outlined in TxDOT's bid specification for the project. A data check program was also used to examine the accuracy of geocoding locations and logic of survey responses.

RESULTS

SURVEY RESULTS

SURVEYED COMMERCIAL VEHICLE CHARACTERISTICS

A total of 301 vehicles were surveyed.

37 were cargo vehicles and 264 were service vehicles.

Commercial vehicles that participated in the SETRPC commercial vehicle survey were distinguished based on the nine classification types listed in Table 1. These were further categorized by commercial type as either major cargo/freight transport or local service vehicles, simply referred to in this report as cargo vehicles and service vehicles, respectively.

Cargo vehicles were defined as vehicles mainly used to transport cargo or freight, which were typically bulk goods, materials, and cargo in large quantities for wholesale distribution. Service vehicles were defined as vehicles mainly used to perform services such as those used by building contractors, plumbers, electricians, cable and telephone services/repairs, and delivery vans/vehicles used by local retailers. These also included company fleet vehicles or fleets and maintenance vehicles of public agencies such as TxDOT, the city, county, or school districts.

Table 1 shows the distribution of surveyed vehicles by vehicle classification type and commercial type. Of the total 301 vehicles surveyed, 37 were cargo vehicles and 264 were service vehicles. Among cargo vehicles, approximately 40 percent were vans, 35 percent were pick-up trucks, and 18 percent were single unit 2-axle (6-wheel) trucks. Among service vehicles, approximately 45 percent were pick-up trucks, 21 percent were passenger cars, and 17 percent were Sport Utility Vehicle (SUV).

Table 1. Vehicle Classification Type of Surveyed Commercial Vehicles.

Vehicle Classification	Cargo Vehicles		Service Vehicles		Total Vehicles	
	Number of Vehicles	Percent of Cargo	Number of Vehicles	Percent of Service	Number of Vehicles	Percent of Total
Passenger Car	1	2.7%	57	21.6%	58	19.3%
Pick-up	13	35.1%	120	45.5%	133	44.2%
Van (Cargo or Minivan)	15	40.5%	27	10.2%	42	14.0%
Sport Utility Vehicle (SUV)	0	0.0%	44	16.7%	44	14.6%
Dump Truck (all axle/ wheel combinations)	0	0.0%	2	0.8%	2	0.7%
Tow Truck (all axle/wheel combinations)	1	2.7%	2	0.8%	3	1.0%
Single Unit 2-axle (6 wheels)	7	18.9%	2	0.8%	9	3.0%
Single Unit 4-axle (14 wheels)	0	0.0%	4	1.5%	4	1.3%
Semi (all Tractor-Trailer combinations)	0	0.0%	5	1.9%	5	1.7%
Other	0	0.0%	1	0.4%	1	0.3%
All Vehicles	37	100.0%	264	100.0%	301	100.0%

Approximately 97 percent used gasoline, and 3 percent of the surveyed vehicles used diesel.

Figure 2 shows the distribution of surveyed vehicles by fuel type. Approximately 97 percent used gasoline, and 3 percent of the surveyed vehicles used diesel. Among cargo vehicles, approximately 86 percent used gasoline, and 14 percent used diesel. Among service vehicles, 98 percent used gasoline, and 2 percent used diesel. Across the surveyed vehicles, cargo vehicles use a combination of gasoline and diesel with a higher reliance on gasoline, while service vehicles predominantly use gasoline and very little diesel.

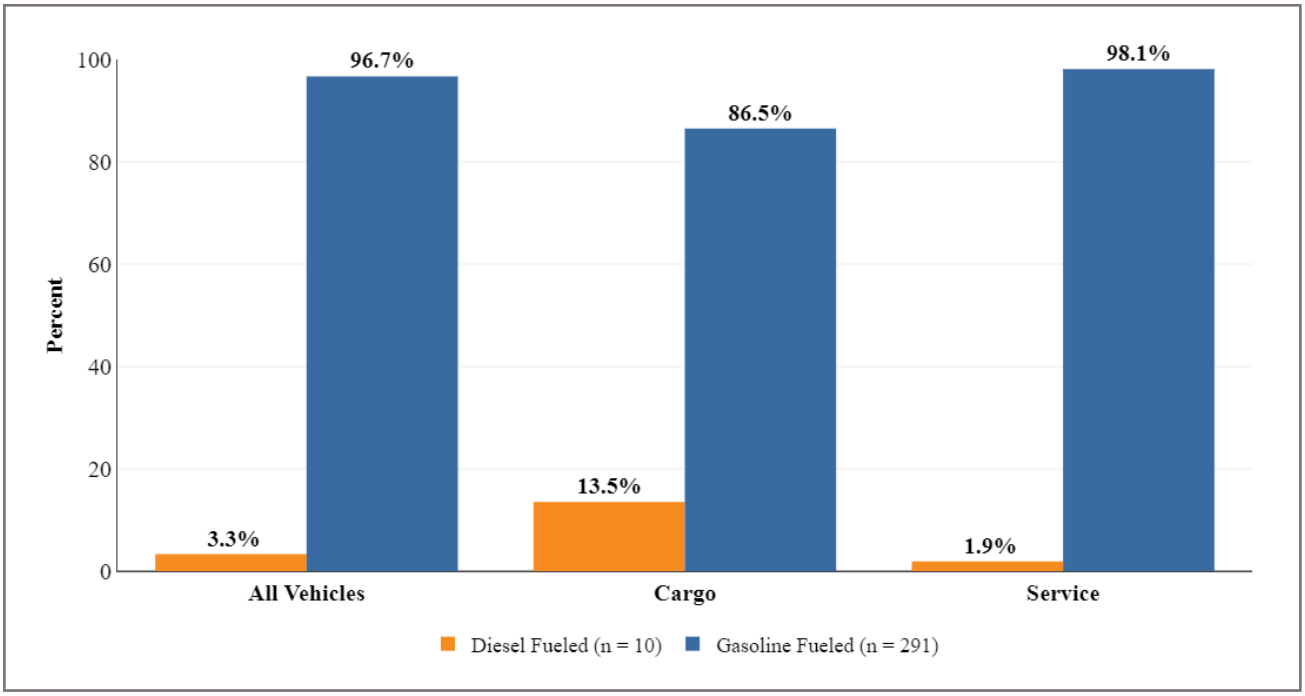


Figure 2. Type of Fuel Used by Surveyed Commercial Vehicles.

Table 2 shows the distribution of surveyed vehicles by gross vehicle weight. With approximately 84 percent of the service vehicles and 48 percent of the cargo vehicles having a gross vehicle weight of less than 10,000 lb., the service vehicles included in the survey had a lower average gross vehicle weight than cargo vehicles.

Table 2. Gross Vehicle Weight.

Gross Vehicle Weight (lb.)1	Cargo		Service		Total	
	Number of Vehicles	Percent of Cargo Vehicles	Number of Vehicles	Percent of Service Vehicles	Number of Vehicles	Percent of Total Vehicles
< 10,000	18	48.6%	224	84.8%	242	80.4%
10,000–14,000	6	16.2%	14	5.3%	20	6.6%
14,000–16,000	3	8.1%	0	0.0%	3	1.0%
16,000–19,500	0	0.0%	1	0.4%	1	0.3%
19,500–26,000	0	0.0%	6	2.3%	6	2.0%
26,000–33,000	0	0.0%	2	0.8%	2	0.7%
33,000–60,000	0	0.0%	5	1.9%	5	1.7%
60,000 +	1	2.7%	0	0.0%	1	0.3%
Unknown	9	24.3%	12	4.5%	21	7.0%
Total	37	100.0%	264	100.0%	301	100.0%

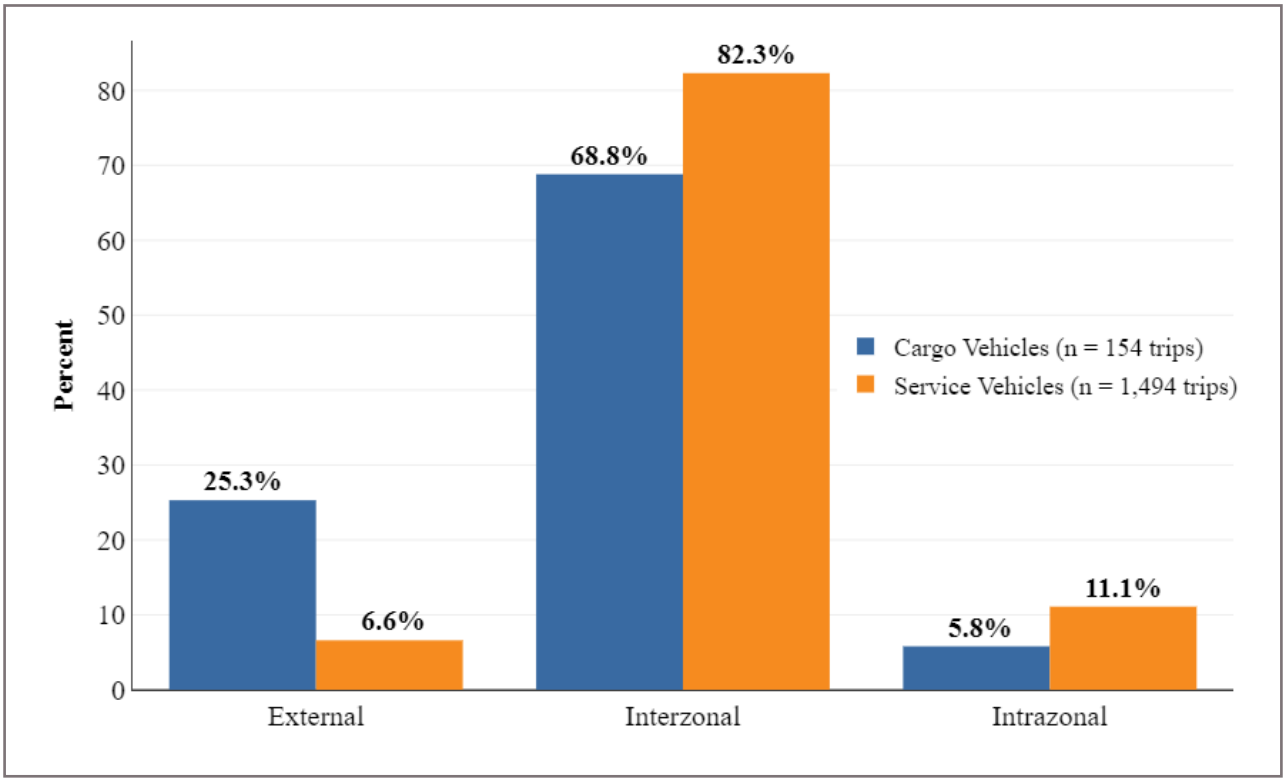
[1] The upper bound is not included in the gross vehicle weight categories. For example, '10,000 – 14,000' refers to weights greater than or equal to 10,000 pounds but less than 14,000 pounds.

TRIP FREQUENCY

The surveyed vehicles generated a total of 1,648 trips, of which 1,510 were internal trips and 138 were external trips. Internal trips were defined as those trips made within the SETRPC area. These trips were further distinguished by travel within or between traffic analysis zones (TAZs). Inter-zonal trips were those trips made from one zone to another, while intra-zonal trips were made within the same zone. External trips were those trips with at least one end made outside of the study area.

Figure 3 shows the distribution of inter-zonal, intra-zonal, and external trips, while Table 3 provides the breakdown of these trips. Cargo vehicles generated 154 trips, of which approximately 69 percent were inter-zonal trips, 25 percent were external trips, and 6 percent were intra-zonal trips. Service vehicles generated 1,494 trips, of which 82 percent were inter-zonal trips, 7 percent were external trips, and 11 percent were intra-zonal trips. The figure also reveals that the cargo vehicles report significantly higher external travel in comparison to the service vehicles.

The surveyed vehicles generated a total of 1,648 trips, of which 1,510 were internal trips and 138 were external trips.



*Percentages may not sum to one due to rounding.

Figure 3. Inter-Zonal, Intra-Zonal, and External Trips.

Table 3. Total Internal and External Trips.

Trip Type	Cargo (37 Vehicles)			Service (264 Vehicles)			Total (301 Vehicles)		
	Number of Trips	Percent of Total	Trips per Veh.	Number of Trips	Percent of Total	Trips per Veh.	Number of Trips	Percent of Total	Trips per Veh.
Inter-Zonal	106	68.8%	2.90	1,229	82.3%	4.7	1,335	81.0%	4.4
Intra-Zonal	9	5.8%	0.20	166	11.1%	0.6	175	10.6%	0.6
Total Internal	115	74.7%	3.10	1,395	93.4%	5.3	1,510	91.6%	5.0
External	39	25.3%	1.10	99	6.6%	0.4	138	8.4%	0.5
Total	154	100.0%	4.20	1,494	100.0%	5.7	1,648	100.0%	5.5

*Percentages and trips per vehicle sum may vary due to rounding.

Figure 4 shows the distribution of total trips (internal and external trips), which varied from one to 44 trips per vehicle on the survey day. The average number of total trips per day was 4.2 trips for cargo vehicles and 5.7 trips for service vehicles. Over 90 percent of the service vehicles made less than 12 trips per day. The service vehicles that made 12 or more trips per day belonged to the retail, warehouse, wholesale, public administration, entertainment, and utilities sectors. The two percent of service vehicles that reported 20 or more trips (shown on the far-right side of the chart) were associated with 5 service vehicle records from the transportation, public administration, and retail sectors.

The average number of total trips per day was 4.2 trips for cargo vehicles and 5.7 trips for service vehicles.

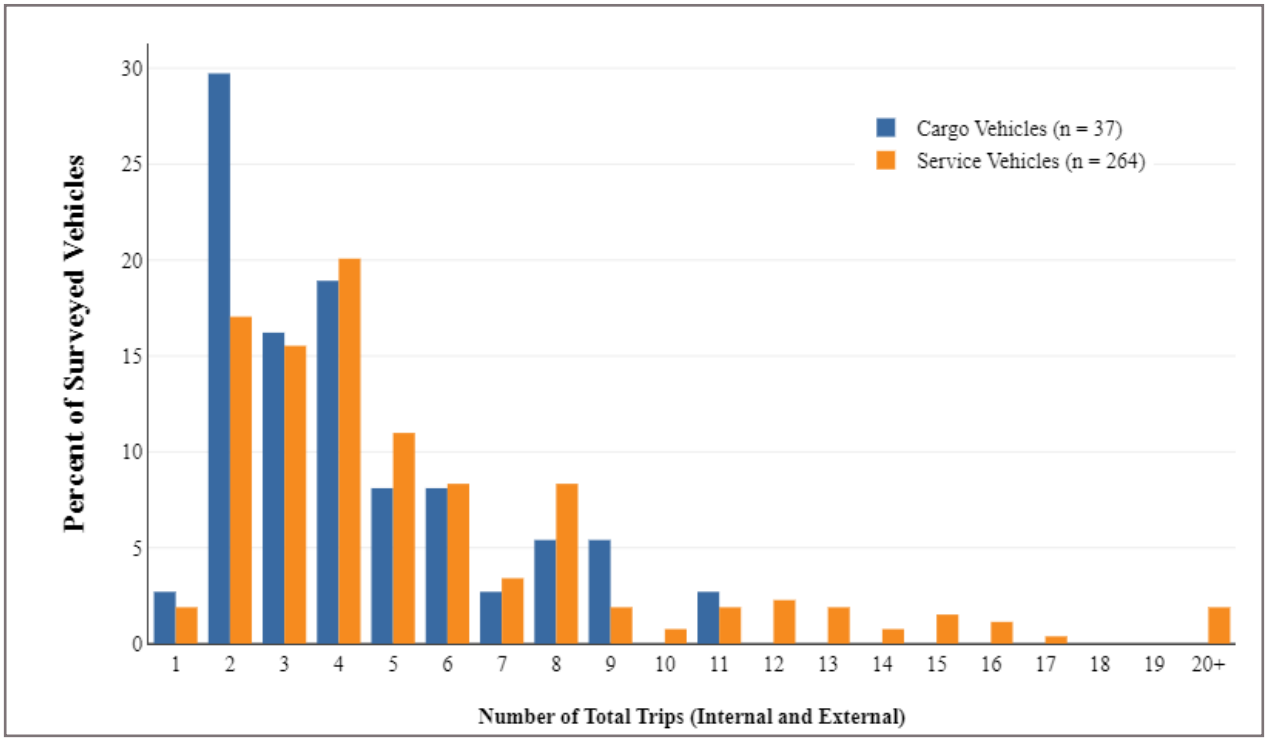
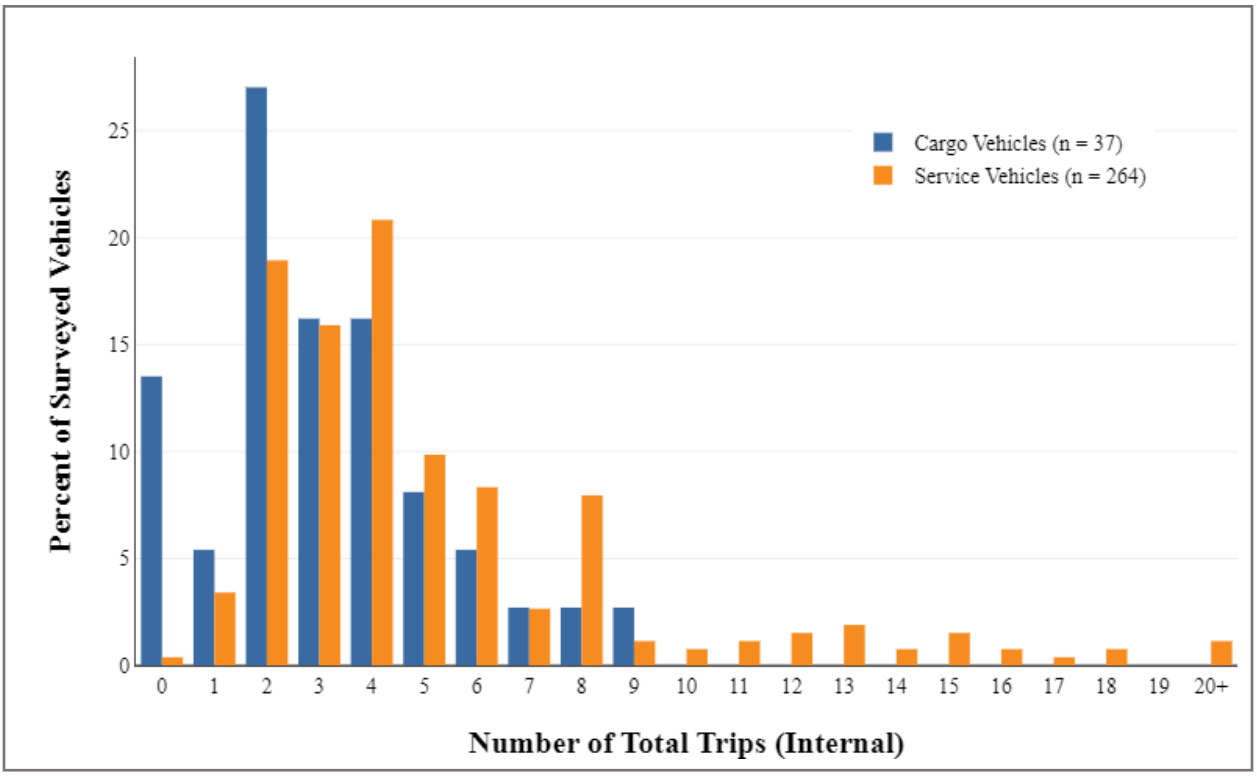


Figure 4. Total Trips per Vehicle.

Figure 5 shows the distribution of internal trips only by vehicle type. On the survey day, approximately 14 percent of cargo vehicles did not make any internal trips, while none of the cargo vehicles made more than 9 internal trips. The average number of internal trips per day was 3.1 trips for cargo vehicles and 5.3 trips for service vehicles. Over 90 percent of the service vehicles made less than 11 trips per day. The service vehicles that made 11 or more trips per day belonged to the retail, warehouse, wholesale, public administration, entertainment, and utilities sectors. The one percent of service vehicles that reported 20 or more trips (shown on the far-right side of the chart) were associated with 3 service vehicle records from the transportation, public administration, and retail sectors.



**The vehicles reporting zero trips in this figure are vehicles that primarily only reported external trips.*

Figure 5. Total Internal Trips per Vehicle.

TRIP CHARACTERISTICS

Information on travel purposes and the type of land use activity where these trips occurred are important in estimating commercial vehicle trip patterns. The analysis of trips presented in this section is based solely on internal trips and does not include external trips.

Table 4 shows the distribution of internal trips by land use type at trip destinations. Approximately 25 percent of the trips made by cargo vehicles traveled to warehouse/wholesale trade, followed by 24 percent to retail and residential locations, and 13 percent to office buildings. For service vehicles, nearly 26 percent of the trips traveled to residential locations, followed by nearly 18 percent to office buildings and 16 percent to warehouse/wholesale trade. The educational facilities report a relatively higher share of service trips compared to cargo.

Table 4. Distribution of Internal Trips by Land Use Type at Trip Destinations.

NAICS (2-digit)	Land Use	Cargo		Service	
		Number	Percent of Cargo	Number	Percent of Service
51, 53-56, 81	Office Building (Non-Government)	15	13.0%	254	18.2%
44-45	Retail/Shopping	28	24.3%	143	10.3%
31-33	Industrial/Manufacturing	4	3.5%	37	2.7%
62	Medical/Hospital	1	0.9%	16	1.1%
61	Education (< 12th Grade)	1	0.9%	31	2.2%
61	Education (College, Trade)	0	0.0%	1	0.1%
92	Government Office/Building	4	3.5%	47	3.4%
N/A	Residential	12	10.4%	370	26.5%
72	Convenience Store/Gas Station	7	6.1%	88	6.3%
72	Grocery Store	1	0.9%	5	0.4%
72	Restaurant/Fast Food/Bar & Grill	5	4.3%	64	4.6%
52	Bank/Financial Institution	1	0.9%	24	1.7%
42, 48, 49	Transportation, Warehousing and Wholesale Trade	29	25.2%	225	16.1%
22, 23	Construction Site	4	3.5%	31	2.2%
N/A	Other	2	1.7%	58	4.2%
N/A	Refused/Unknown	1	0.9%	1	0.1%
	Total	115	100.0%	1,395	100.0%

TRIP LENGTH

Network matrices available for the study area were used to estimate trip lengths. The network matrices provide travel distance and time estimates from one TAZ zone to all other TAZ zones in the SETRPC study area. Since each reported trip in the survey was coded with a TAZ zone number assigned to the study area, it was then possible to estimate the trip length based on the distance provided in the network matrix. Figure 6 shows the TAZ boundary, base locations of surveyed vehicles within the SETRPC study area, and the origin and destination TAZ locations of trips made by the surveyed vehicles.

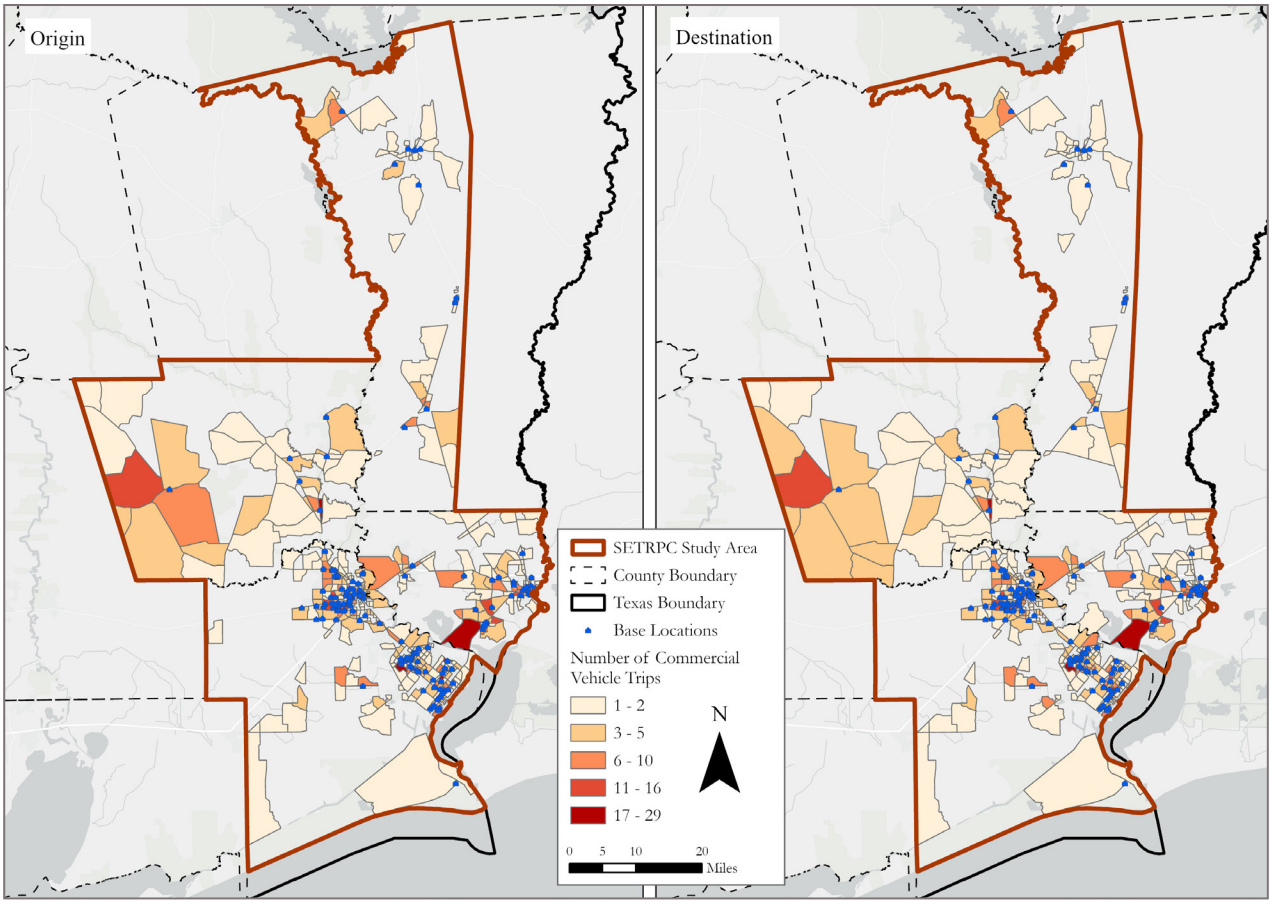


Figure 6. Trip Origins and Destinations of Surveyed Commercial Vehicles.

Since commercial vehicles tend to complete tours throughout the day (vehicle returns to the original base location), the two maps in Figure 6 are very similar, with the main differences being where the complete tour did not occur. Trips that had an origin or a destination outside of the SETRPC study area were considered external trips and not included in the trip length analysis.

The results presented in this section pertain to trip length characteristics for the 1,335 inter-zonal trips only. Table 5 shows the trip length frequency distribution (TLFD), grouped at five-mile intervals, while Figure 7 shows the ungrouped TLFDs. Approximately 48 percent of the cargo vehicles and 61 percent of the service vehicle trips had trip lengths of less than or equal to 5 miles. Additionally, 14 percent of the cargo vehicle trips and 18 percent of the service vehicles had trip lengths between 5 miles and 10 miles. The longest trip lengths reported by cargo and service vehicles were 47 and 46 miles, respectively. The average trip length for cargo vehicles was 9.2 miles while that for service vehicles was 6.5 miles. Over 60 percent of vehicle trips reported were 5 miles or less in length.

Table 5. Trip Length Frequency Distributions (Grouped Interval).

Trip Length (miles)	Cargo Vehicles		Service Vehicles		All Vehicles	
	Number of Trips	Percent of Total	Number of Trips	Percent of Total	Number of Trips	Percent of Total
≤ 5	51	48.1%	756	61.5%	807	60.4%
5–10	15	14.2%	229	18.6%	244	18.3%
10–15	19	17.9%	109	8.9%	128	9.6%
15–20	8	7.5%	55	4.5%	63	4.7%
20–25	5	4.7%	35	2.8%	40	3.0%
25–30	4	3.8%	13	1.1%	17	1.3%
30–35	0	0.0%	15	1.2%	15	1.1%
35–40	2	1.9%	6	0.5%	8	0.6%
40–45	1	0.9%	10	0.8%	11	0.8%
45–50	1	0.9%	1	0.1%	2	0.1%
Total	106	100.0%	1,229	100.0%	1,335	100.0%

[1] *The lower bound is not included in the trip length categories. For example, '5-10' category refers to trip length greater than 5 miles but less than or equal to 10 miles.*

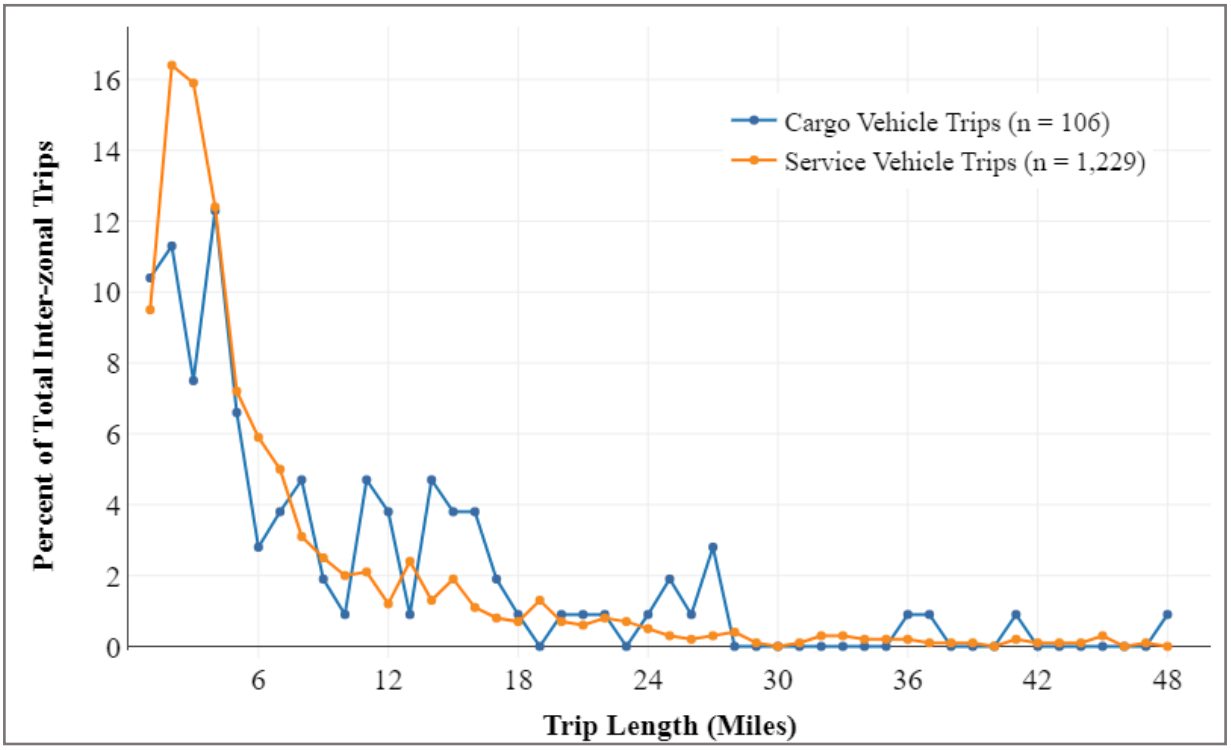


Figure 7. Surveyed Commercial Vehicle Trips TLFD.

The average duration of travel time for cargo and service vehicles was 13 minutes and 10 minutes, respectively.

TRAVEL TIME AND SPEED

A key outcome of the SETRPC commercial vehicle survey was travel logs on the arrival and departure times for each trip made by the surveyed commercial vehicles. These travel logs can be compared with the network travel time matrix table available for the study area. The travel time estimates were generated from the network travel time matrix table available for the SETRPC study area, and travel speed estimates were derived from the estimated trip lengths.

Table 6 shows the travel time-frequency distributions of inter-zonal trips, grouped at five-minute intervals, while Figure 8 shows the ungrouped TLFDs. Approximately 28 percent of the trips made by cargo vehicles were less than or equal to 5 minutes, 23 percent were between 5 and 10 minutes, and 13 percent were between 10 and 15 minutes. For service vehicles, approximately 38 percent of the trips were less than or equal to 5 minutes, 30 percent were between 5 and 10 minutes, and 11 percent were between 10 and 15 minutes. The longest duration of travel time for cargo and service vehicles was 64 minutes and 63 minutes respectively. The average duration of travel time for cargo and service vehicles was 13 minutes and 10 minutes, respectively.

Table 6. Travel Time Frequency Distributions (Grouped Interval).

Travel Time (minute)	Cargo		Service		All Vehicles	
	Number of Trips	Percent of Total	Number of Trips	Percent of Total	Number of Trips	Percent of Total
≤ 5	30	28.3%	476	38.7%	506	37.9%
5–10	25	23.6%	374	30.4%	399	29.9%
10–15	14	13.2%	138	11.2%	152	11.4%
15–20	18	17.0%	101	8.2%	119	8.9%
20–25	6	5.7%	45	3.7%	51	3.8%
25–30	3	2.8%	38	3.1%	41	3.1%
30–35	6	5.7%	20	1.6%	26	1.9%
35–40	0	0.0%	11	0.9%	11	0.8%
40–45	0	0.0%	4	0.3%	4	0.3%
45–50	2	1.9%	8	0.7%	10	0.7%
50–55	1	0.9%	6	0.5%	7	0.5%
55–60	0	0.0%	4	0.3%	4	0.3%
≥60	1	0.9%	4	0.3%	5	0.4%
Total	106	100.0%	1,229	100.0%	1,335	100.0%

[1] *The lower bound is not included in the travel time categories. For example, '5-10' refers to travel time greater than 5 minutes but less than or equal to 10 minutes.*

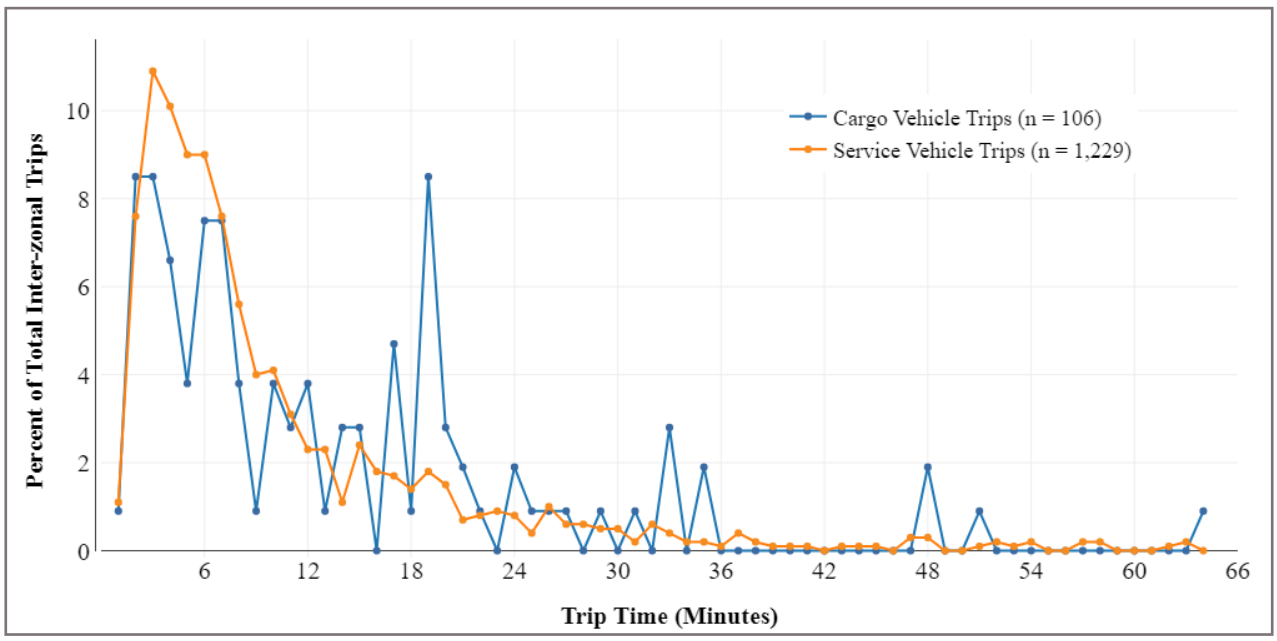


Figure 8. Surveyed Commercial Vehicle Trips Travel Time.

SUMMARY

SURVEY SUMMARY

The SETRPC commercial vehicle survey was conducted between the fall of 2022 and spring of 2023. The survey collected vehicle and trip data of 301 commercial vehicles from 157 businesses that agreed to participate in the survey. The purpose of the survey was to collect data needed to estimate the amount and characteristics of commercial vehicle travel in the SETRPC study area that is needed as an important input to the SETRPC travel demand model. The model is used to assess current and future traffic levels and conditions on area roadways, assisting TxDOT and the SETRPC in planning and prioritizing transportation projects in the area. Based on the results from the survey, significant differences as well as similarities of travel characteristics were observed between cargo vehicles and service vehicles.

Out of 301 surveyed vehicles, 37 were cargo vehicles and 264 were service vehicles. Among cargo vehicles, approximately 40 percent were vans, 35 percent were pick-up trucks, and 18 percent were single unit 2-axle (6-wheel) trucks. Among service vehicles, approximately 45 percent were pick-up trucks, 21 percent were passenger cars, and 17 percent were Sport Utility Vehicle (SUV). The overall fleet was predominately made up of pick-up , comprising 44 percent of the total surveyed vehicles. In terms of fuel use, approximately 86 percent used gasoline, 14 percent used diesel, while 98 percent of service vehicles used gasoline, and 2 percent used diesel. In terms of weight class, approximately 48 percent of cargo vehicles and 84 percent of service vehicles were light-duty vehicles (less than 10,000 lb.). The following insights were drawn from the analysis conducted for the 2022–2023 SETRPC Commercial Vehicle Survey:

- Surveyed cargo vehicles made an average of 4.2 total trips per day, compared to 5.7 trips per day for service vehicles.
- Cargo vehicles produced 3.1 internal trips per day, with an average travel distance of 9.2 miles.
- Service vehicles made 5.3 internal trips per day, with an average trip length of 6.5 miles.
- The average travel time per trip for cargo vehicles was 13 minutes, and for service vehicles, the average travel time per trip was 10 minutes.
- The top destinations for cargo vehicles were warehouse/wholesale trade (25%), retail and residential locations (24%), and office buildings (13%).
- The top destinations for service vehicles were residential locations (26%), office buildings (18%) and warehouse/wholesale trade retail locations (16%).

Using the above insights, upon initiation of the next update or calibration to the SETRPC travel demand model, the processed and analyzed data from this survey will be utilized to develop final model inputs of commercial vehicle travel. These final inputs are developed at the time of model development to ensure the incorporation of the latest TAZ system, model area boundary, and other parameters in developing the final commercial vehicle travel estimates.

2022–2023

SOUTH EAST TEXAS REGIONAL PLANNING COMMISSION COMMERCIAL VEHICLE TRAVEL SURVEY

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TRAVEL SURVEY PROGRAM

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