The Dirty Job Of Truck Movement Data Gathering: An Evaluation of Intercept Surveys

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Abstract

Many states have limited information on truck trips, their origins and destinations, routes traveled and commodities carried. The overall goal of this study was to identify a reliable data collection method capable of generating specific detail useful to Oregon Department of Transportation's modeling and freight planning needs for data on truck movements at the metropolitan level. This report looks specifically at the use of interceptor surveys at different land use locations.

Roadside interviews were conducted on an interstate highway, a port facility and a warehouse/distribution center. Results indicate that data captured at roadside interview locations do provide excellent trip detail for inter-regional movements (state and interstate highway locations) and also very good trip detail for intra- regional freight movements (warehouse / distribution center locations).

It was found that the capture rate (number of vehicles sampled out of the total volume) is dependent upon available parking and survey personnel relative to the total truck traffic volume and undoubtedly will vary by roadside interview site. All three types of roadside interviews produced high response rates related to vehicle and trailer, carrier identification, route, and facility.

Roadside interviews at the warehouse/distribution center and interstate highway weigh station provided high response rates related to commodity type, while the preponderance of container traffic at the port facility limited responses on payload information.

Obtaining specific street addresses and zip codes for trip origin and destination is very difficult for all types of roadside interviews, but the best responses were from warehouse/distribution centers.

Specific findings and analyses will be presented in the paper. Implications for costs and applicability are drawn.

INTRODUCTION

Freight movement is a significant transportation issue throughout Oregon and the U.S. Much of what the Oregon Department of Transportation (ODOT) knows about truck movements within the state and specifically in urban/metropolitan areas comes from observational data via traffic counts. While traffic count information is important, it is inadequate for understanding truck freight movements sufficiently and in significant detail for transportation modeling and freight planning.

ODOT has limited information on truck trips, their origins and destinations, routes traveled and commodities carried. Moreover, there is very little known about truck trip chaining (multiple pick-ups and/or drop-offs of loads) and the use of distribution centers (inter-modal facilities, reload facilities, warehouses). While distribution centers have increased dramatically with the advent of supply-chain logistics (third party management of goods movement), almost nothing is known about the extent or frequency of their use, or their role in urban congestion. Such knowledge would aid planners and providers of transportation infrastructure, as they assist businesses and communities in decreasing the congestion and travel time that have a negative effect on economic activity and opportunity by focusing on choke-points of critical commodities or traffic flows, e.g. ports, seasonal commodities, etc.

BACKGROUND AND NEED FOR THE RESEARCH

A principal reason for the lack of data on truck movements is that reliable methodologies have not been developed to obtain the level of detail needed for modeling efforts and planning. Aggregate data has been used and partial studies have been undertaken, both in ODOT efforts and regional/state studies, but these efforts have not yielded the needed level of detail. Research is needed to develop and test truck trip data collection methods, so as to produce data capable of better characterizing freight flows at the metropolitan level for transportation models and freight planning processes. Development of such a data generation methodology would put ODOT in a leadership position among state departments of transportation (DOTs), federal entities and academic researchers, because such a data generation methodology has yet to be found in the literature or known studies.

The need for accurate and detailed freight movement data for modeling and freight planning is not a new phenomenon. Reliance on traffic counts has been endemic throughout most DOTs as they seek information for such modeling and planning efforts. Recent changes in supply chain distribution methodology, such as Just-In-Time or Off-The-Shelf, and the advent of significant trip chaining in intra-city movements, create an intensified need for data that reflect actual modal movements, rather than portraying the trips as simple origin-destination pairs. Such new levels of data specificity will allow real time and real location analysis to be undertaken.

Aggregate data on commodity flows are available (see the Oregon Freight Truck Commodity Flow Study (*Oregon Department of Transportation 1998*) and federal commodity flow studies for 1993, 1997 and 2002 (*US Department of Transportation 2003*)), but the need is for reliable truck movement data at the metropolitan and sub-state level with more specific detail on individual movements. This search for a productive truck trip generation data methodology, with its examination of movements at generators, entry points/gateways and activity centers, will provide a means of achieving the overall goal of improved models and freight planning.

STUDY OBJECTIVES

The overall goal of this study was to identify a reliable data collection method capable of generating the information at a level of detail useful to ODOT's modeling and freight planning needs for data on truck movements at the metropolitan level. Such a method would then be available to other planning agencies in other states and the nation.

Specific objectives of this research effort were to:

1. Identify and evaluate alternative methods of collecting truck travel data (origin and destinations, routes traveled, record of stops, commodity type and quantity, and vehicle classification), defining the advantages and disadvantages of each, assessing the utility of the methods for transportation modeling work in Oregon.

2. Recommend a data collection method that will provide the necessary data to ODOT, in detail, on truck movements for transportation modeling and freight planning needs. The selected method will address the role of trip chaining and the use of distribution centers in truck movements.

3. Select one or more data collection methods for field testing. Field test the effectiveness of the chosen method(s) in pilot areas determined in conjunction with ODOT. The field test(s) will also address issues related to the sampling frame necessary to achieve statistical reliability of data inputs to modeling or planning.

4. Analyze field test results, identifying constraints, data detail and statistical reliability achieved using the recommended methodology(ies). Suggest any needed modifications and applications for the methodology(ies).

PAST DATA COLLECTION AND ATTRIBUTES

The past literature contains studies at local, regional and state levels. The total population of data attributes reviewed in the literature for this study included many different combinations of data and in different dimensions. These data attributes included the following:

Time dimension attributes

- 24-hour coverage, or in some cases coverage only during peak hours
- travel time
- truck flow by time of day
- traffic composition, as trucks as a percentage of total traffic flow over time
- trip frequency, the method of identification varied depending on what methodology of data collection was used
- vehicle usage, by hours per day, per week or per month
- total number of one-way trips on the survey day
- speed profiles, by route and segment, time of day

Trip attributes

- route, sometimes not collected in real time but inferred by transportation model options
- distance, data varied by total trip, specific origin or destination, or distance for each individual segment
- purpose of the trip
- origin and destination, usually by street location or common known name, on the survey day or traditional
- start and stop times for trips, by total and segments, with some studies collecting time spent idling as well
- odometer readings, used as a surrogate for actual trip or segment distance
- name and address of each stop on a trip chain or pick up and delivery tours
- land use or facility at each stop
- location and magnitude of trip generators
- route information and facility type for every segment
- types of truck patterns for a study region; external to external, external to internal or vice versa, and internal to internal
- business type by corporate, private, etc.

Vehicle attributes

- commercial vehicle types (light, medium and heavy), other studies identified the specific configuration of each vehicle, usually by number of axles and body style
- land use type, often this was collected by facility type or in a specific land use category
- configuration, especially identifying container type and size
- weight, by gross and tare weight, with load weight either inferred or captured by bill of lading
- trailer width and length
- fuel type of vehicle
- driver characteristics, such as age, sex, years of experience, training, union affiliation and method of enumeration (payment type to driver)
- driver and vehicle activity at each stop

ALTERNATIVE DATA COLLECTION METHODOLOGIES

This section builds upon the earlier literature review and data requirements/structure by comparing and contrasting the alternative truck and freight data collection methodologies previously mentioned. While some of the comparisons have already been discussed, particular attention will be focused on 1) the implementation challenges, 2) investment and maintenance requirements, 3) statistical reliability, 4) data attributes and 5) geographic coverage concerns for each methodology.

The data collection methods previously summarized from the literature include:

- Mail Survey
- Telephone Survey
- Roadside Interview Survey
- Combined Telephone and Mail Survey
- Video Surveillance
- GPS Receiver Attached to Sample of Trucks

Mail Survey

The most common data collection method has been mail surveys of some type to either shippers or licensed truck owners. Implementation is very easy and there is no disruption of the traffic flow on highways or urban streets where available parking may be limited or non-existent. The investment and maintenance costs are also very low for mail surveys. This type of data collection also requires minimal personnel to implement and generally provides good data and information for those respondents providing completed responses.

Unfortunately, this approach typically experiences very low response rates, especially for follow-up surveys, which may bias the information that is collected. The survey coverage may also be quite low, due to the fact that freight movements by vehicles licensed outside the geographical area are not included in the mail survey. Also, this approach limits the ability to clarify specific questions, which may additionally compromise the data integrity. However, given the economical cost of implementation, this approach may be useful for capturing freight movements not accessible via other means.

Telephone Survey

Telephone surveys provide slightly higher response rates when compared to mail surveys, but they present a difficult challenge of identifying the appropriate contact person and phone number, leading to potential information bias. Often the owner of the vehicle isn't the best person to obtain information about the daily use of the truck and, in many cases, the truck is utilized for a variety of different shipment types, routes, commodities and origin-destination combinations. Identifying specific trip detail about all shipment types is quite difficult in a telephone conversation.

Coverage is limited to availability of accurate contact information and phone numbers. The problems associated with follow-up calls, incorrect numbers and only calling during regular business hours are often time consuming and costly. Data may be biased to those vehicles licensed within a given urban or metropolitan area. Telephone surveys to large shippers or truck trip generators may provide very good aggregate information, but they appear to provide limited data at the level of detail required by ODOT for freight planning and modeling.

However, this data collection approach is very easy to implement, requires low investment, may be replicated frequently and therefore may be used in combination with other collection approaches for freight shipments that are difficult to capture through other means.

Combined Mail/Telephone Survey

Response rates are improved significantly when mail surveys are combined with telephone contact. However, the cost of implementation increases significantly with this approach. Both mail and phone surveys rely upon a list of registered vehicles or firms from the urban area under study and fail to capture truck movements by vehicles registered outside the metropolitan area.

The telephone contact prior to the mail survey, and as a follow-up, provides the opportunity to complete questionnaires and enhance qualitative information about freight movements. Information about other relevant trip generators may also be available. However, the main data gathering technique is the mailed questionnaire, with both the positive and negative attributes detailed earlier.

Roadside Interview

There are many advantages to collection of truck and freight shipments via roadside interviews, especially related to sampling control, complete data attributes and broad geographic coverage. Prior studies have demonstrated significantly higher response rates when compared to mail or telephone surveys. This method also has relatively easy implementation requirements. The statistical reliability for this approach is also quite high, given that the total traffic population from which the sampling frame is collected is generally known for the time periods collected. This allows one to extrapolate all collected information on truck type, commodity, routes, etc. to the entire vehicle population. This approach also avoids the problem of identifying the appropriate person to contact (as in the mail or phone methods), since the driver is most knowledgeable of the current shipment characteristics. This approach also allows interaction between the survey personnel and respondents to clarify specific questions and misunderstandings. These advantages lead to higher data quality when compared to mail, or in some cases, phone surveys.

Implementing roadside interviews within concentrated urban areas can be difficult, given limited parking availability and traffic congestion. However, if interview sites are strategically selected as to the primary entry and exit corridors around urban centers, roadside interviews can provide excellent data and trip information for shipments into and out of the urban center. Roadside interviews also require sizable labor

services, may potentially disrupt traffic in high volume corridors and are limited to designated survey locations. Survey personnel may also be exposed to safety risks and adverse weather while implementing and completing surveys.

Video Surveillance

The strength of this methodology is that it provides good information on traffic flows without disrupting traffic. Unfortunately, it does not yet provide information on key data attributes necessary for the scope of freight modeling and planning needs. Data detail such as origin-destination, trip purpose, commodity, route, trip-chaining, etc. are not available from this data collection methodology. In the future this technique may prove to be both efficient and effective, especially when the data can be associated with other information sources and data sets. Technical concerns, such as visual impairment in adverse weather, plus the high cost of initial implementation, limit the current usage of video data collection. Use of video output collected for other purposes may lower the cost and provide some supplemental analytical ability.

Global Positioning System (GPS) Receiver

Utilization of global positioning systems do provide additional information regarding individual truck travel activity and truck type frequencies on given corridors and may offer future data collection possibilities. However, high equipment costs and frequent equipment malfunctions currently prevent widespread implementation. Also, utilizing GPS receivers for recording truck travel activity only provide a very limited amount of information. Critical information such as weight, trip purpose and commodity hauled is not captured.

The above concerns can be minimized by increasing the density of vehicle numbers with GPS receivers or by narrowing the focus of each individual study, e.g. to a specific corridor or trip generator of interest. However, widespread utilization of GPS receivers for data collection on freight movements is currently cost prohibitive relative to the value of information obtained, especially for large urban areas with a large variety of freight movements.

PILOT STUDY

Two data collection approaches were chosen as the most promising means of providing needed information regarding ***inter***-regional and ***intra***-regional freight movements. However, this paper focuses on those results from the three separate roadside interviews.

Roadside Interviews

Three separate roadside interviews were conducted at different locations and facility types in the Portland metropolitan area – an interstate highway weigh station, a port location and a warehouse/distribution facility. Each roadside interview was conducted by trained service club members (Lions) from the Vancouver, Washington area. These service club members had previous experience conducting similar roadside interviews in Washington with the Strategic Freight Transportation Analysis (SFTA) project and were therefore quite knowledgeable and experienced. Regardless, all interview personnel received thorough training and explanation of all questions on the survey, site set-up, safety and use of survey equipment prior to conducting roadside interviews[i].

Interstate Highway Weigh Station

The interstate highway weigh station selected for the pilot study was the Cascade Locks weigh-station at milepost 44.93 on eastbound I-84. Consultation with officials at the ODOT Motor Carrier Transportation Division indicated that this particular site represented one of the heaviest traffic volumes for the Portland/Metro area and could thus offer more challenges in conducting a roadside survey when compared to lower volume sites. The traffic is especially heavy for eastbound traffic on Tuesdays, as freight operators have made deliveries and freight drops within the Portland area on Monday and are headed back east with new freight loads on Tuesday. This roadside survey was conducted on June 17, 2003 during the regularly scheduled hours of operation (7 a.m. – 2 a.m., a total of 19 hours).

A copy of the interview form is provided in Appendix B. The survey posed questions on the following topics, and each interview was designed to be completed in about 2 minutes.

- Carrier name
- Carrier address
- Vehicle and trailer configuration
- Number of axles
- Origin address of shipment
- Destination address of shipment
- Commodity
- Detailed trip route
- Address of LTL pickups and deliveries
- Time of day
- Hazardous material placard code

As indicated above, the survey methodology was patterned after that used in the Strategic Freight Transportation Analysis (SFTA) conducted by Washington State University for the Washington State Department of Transportation in 2002. The interviews were conducted by a local service club (Lions Club), which provided teams of four to seven individuals to conduct surveys throughout the 19-hour survey period. A quality/support manager from Washington State University trained and supervised the interview teams. The survey operation had the full support of the Oregon Department of Transportation Motor Carrier Enforcement Office.

Port Facility

The roadside interview method was also tested at the Port of Portland's Rivergate Industrial Park, Terminal 6. This site was chosen over other port facilities primarily due to the large volume of container and automobile traffic passing through this facility relative to other port locations, and the multi-modal characteristics of this site. This site also presented significant administrative and security issues for implementing on-site freight surveys, thus providing a better test of the data collection process.

Surveys at this location were conducted on July 9, 2003 during the regular hours of operation at the Terminal 6 port facilities (8 a.m. – 5 p.m.). This day was selected over other days-of-the-week due to the heavy volume of inbound and outbound container traffic occurring on this date. Between five and eight local service club (Lions) members conducted the surveys at the port facility.

The interview form for the port facility was modified slightly from the weigh station questionnaire to accommodate data collection on two separate freight movements (the ending of one trip and the beginning of another) for those freight operators who delivered a shipment to the port facility and immediately picked-up another shipment to be delivered somewhere else. This situation did not occur for weigh station interviews, since the information was captured during the trip segment and not at the intersection of potentially two trip segments.

Warehouse/Distribution center

The roadside interview method was also tested at a trucking company, which had voluntarily agreed to participate in the pilot study. Interviews were conducted at a primary warehouse/distribution center, northwest of downtown Portland, with the support and cooperation of the transportation company. This facility handles several different inbound and outbound shipment types and represented the heaviest volume facility owned by the transportation firm.

These roadside interviews were conducted on July 16, 2003, over a twenty-four hour period beginning at 7 a.m. Between four and six service club members interviewed truck drivers as they delivered or picked up loads at the warehouse. As with the port facility, the interview form for the warehouse/distribution center was modified slightly from the weigh station questionnaire to accommodate data collection on two separate freight movements (the ending of one trip and the beginning of another) for those freight operators who delivered a shipment to the facility and immediately picked up another shipment to be delivered somewhere else.

By the nature of the different traffic characteristics at each roadside interview site, slight differences may have existed in the samples collected as they relate to truck size. The roadside interviews conducted at the weigh station included all commercial vehicles weighing at least 16,000 lbs. However, those interstate freight companies which participate in the Commercial Vehicle Information Systems and Networks (CVISN) program (known as "Green Light" in Oregon) may by-pass certain weigh stations throughout the state, thus not being captured as part of this sample. Those vehicles not captured as parts of this sample are more likely to be from firms specializing in long-distance, common carriers, compared to those that enter the weigh station. Vehicles sampled at the port and warehouse/distribution facility may include vehicles smaller than 16,000 lbs and those participating in Green Light. Thus, while some differences may have existed between theses different samples, the differences were expected to be relatively small.

PILOT STUDY RESULTS

PILOT STUDY I – ROADSIDE INTERVIEW RESULTS

Interstate Highway Weigh Station Survey

Roadside interviews were conducted at a weigh station on eastbound Interstate 84 at Cascade Locks on June 17, 2003 during the regularly scheduled hours of operation, from 7 a.m. to 2 a.m. A total of 249 questionnaires were completed out of a total truck traffic population of 2,524, as presented in Table 1. The capture rate of 9.8% at this roadside survey site is somewhat misleading and is not indicative of the response rate for this survey technique. The response rate for those truck operators invited to participate in the roadside interview and questionnaire was above 95%, as truck drivers were very cooperative and willingly provided information.

The capture rate for a given site is constrained by the amount of available parking, the number of survey personnel available, and their capabilities to complete interviews with the volume of truck traffic passing through the weigh station[ii]. A limited number of vehicles can be interviewed at a given time without creating traffic disruptions and safety risks to survey personnel. The proportion of truck traffic captured will therefore undoubtedly vary by roadside interview site.

Table 1: Roadside survey test cell sample size and capture rate

Roadside Interview Site	Truck Population	Sample Size	Number of Responses	Response Rate	Capture Rate
Highway I-84	2,524	262	249	95%	9.8%
Port of Portland, Terminal 6	641	99 (est.)[iii]	92	93%	14.4%
Warehouse/Distribution Center	134	56	56	100%	42.0%

The amount of information and level of detail captured from these roadside interview questionnaires was relatively complete overall, as truck drivers provided answers to most of the survey questions. However, not all questions were answered with identical frequency, which is evident in the frequency of responses by specific question in Figure 1. The low frequency of responses to some questions points to the types of information that truck drivers were either unable or unwilling to provide in the survey.

Vehicle type information (truck configuration, number of axles and hazardous material placard) from the I-84 weigh station interviews was very complete. This is not surprising, however, given that this information was captured through visual inspection of the vehicle by survey personnel prior to addressing the truck driver. A low response on vehicle information questions would have indicated survey personnel errors and omissions. There were slightly fewer responses for trailer style at 96%, mostly due to the occasional occurrence of odd trailer styles that did not fit previously identified categories on the survey questionnaire or could not be easily described in the "other" category.

There were very high responses to questions relating to carrier information, with at least 99% response to carrier name, city and state. Somewhat fewer responses were provided for the specific carrier street address (80%) and carrier zip code (67%). In many cases, some of this information was available from the truck decal advertising the name and address of the truck carrier. However, truck drivers were less likely to know the specific street address and zip code of the carrier.

Questions concerning payload information also received very high responses. All 249 respondents indicated whether the vehicle was loaded or empty; 96% provided the empty weight of the vehicle; 97% indicated the payload weight; 96% supplied the maximum licensed weight; and 88% provided a response for commodity description. The slightly lower response for commodity description was primarily due to container traffic where often the driver didn't know the contents of the container.

The two topic areas on the I-84 weigh station interview questionnaire that presented the greatest difficulty to truck operators, as compared to the port facility and the warehouse/distribution center, were trip origin and destination detail. For both the origin and destination, a high proportion of responses were provided for city (99% and 96% respectively), state (99% and 96% respectively) and facility type (95% and 90% respectively). However, considerably fewer responses were provided for the origin name (25%), origin street address (39%), origin zip code (12%), destination name (17%), destination street address (28%) and destination zip code (6%).

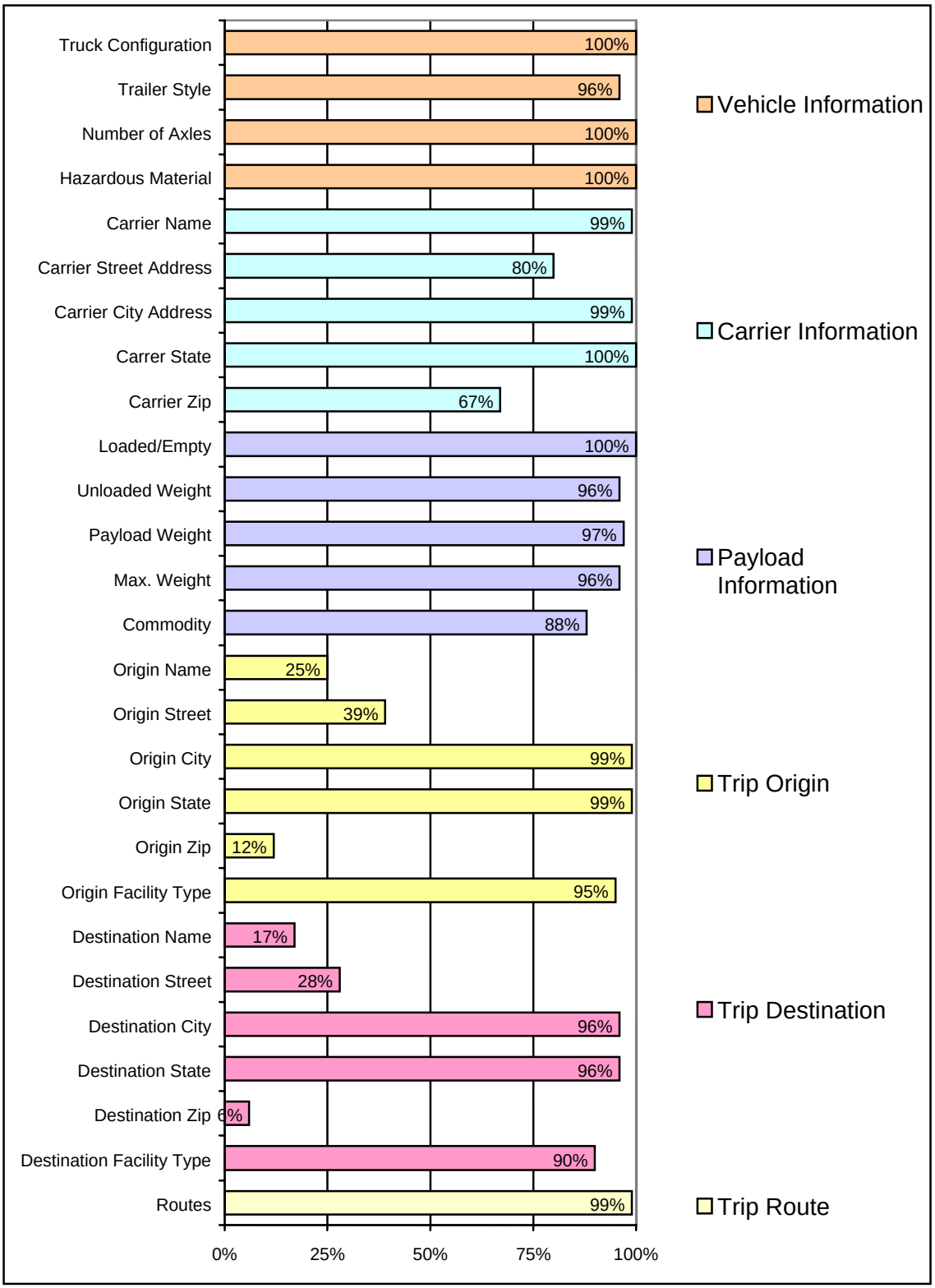

Figure 1: Roadside interview item response – interstate highway weigh station (N=249)

Those vehicles which did have the exact street address and zip code of the trip origin and destination were generally long-haul vehicles that had printed delivery and driving instructions with this information available. Local and regional delivery drivers on routine schedules or those carrying bulk agricultural and natural resource products rarely knew the specific street address or zip code of the trip origin and destination. In addition, drivers at the interstate location were less likely to dig through their paperwork to find specific origin and destination detail, whereas drivers were less hurried at the port and warehouse facilities. Trip route information did, however, generate a large proportion of responses at 99%.

Further analysis of the I-84 roadside intercept surveys revealed that respondents that originated from Oregon provided better origin data detail as compared to those respondents with out-of-state origin points. Fourteen percent of respondents originating within Oregon provided origin zip code information as compared to six percent of respondents originating from out-of-state.

Port Facilities Survey

The second roadside interview tested under Pilot Study-I was at the Port of Portland's T-6 marine terminal. Both inbound and outbound freight traffic occurs at this large container facility. Interviews were conducted by local service club members on July 9, 2003 between 8 a.m. and 5 p.m. Ninety-two questionnaires were completed out of a total of 641 freight vehicles entering and exiting through the port facilities, as shown in Table 1. This represents a capture rate of 14.4%, slightly more than the weigh station interviews on I-84.

The response rate (percentage of all truck operators when asked to participate who agreed) for this site was slightly lower, primarily due to the differences in where and how the survey was initiated between the two sites. Drivers who were asked to park at the highway weigh station were generally relieved to find out that it did not involve an enforcement action and cooperated wholeheartedly. Drivers passing through the port facilities, while still very cooperative, had slightly different expectations when asked by service club members to participate in a survey and occasionally did not have the time.

Evaluation of the frequency of responses by individual survey question (Figure 2) reveals several similarities in certain informational areas and also a few differences when compared to those responses from the highway interviews. A few minor changes were made to the questionnaire used at the port facilities to allow capture of two separate truck trips (inbound and outbound). Other than this difference, both questionnaires sought to capture the same types of freight information. As with the highway interviews, the survey conducted at the port facilities collected data on vehicle information from most of the sample. Over 89% of survey respondents provided data for truck configuration, trailer style, number of axles and hazardous material. As a percent of the total sample size, this response rate for vehicle information was only slightly lower than in the highway interviews.

The response rate for questions about carrier information was slightly higher for interviews conducted at the port facilities, especially for carrier street name and zip code, whereas questions dealing with the payload information generated much fewer responses overall. Those specific questions which generated the greatest difficulty at the port facilities were outbound unloaded weight (57%), inbound commodity description (40%) and outbound commodity description (35%). This lower response rate is likely due to the preponderance of container traffic at the port facility relative to the highway weigh station site and the difficulty of the driver to know the container's contents or weight.

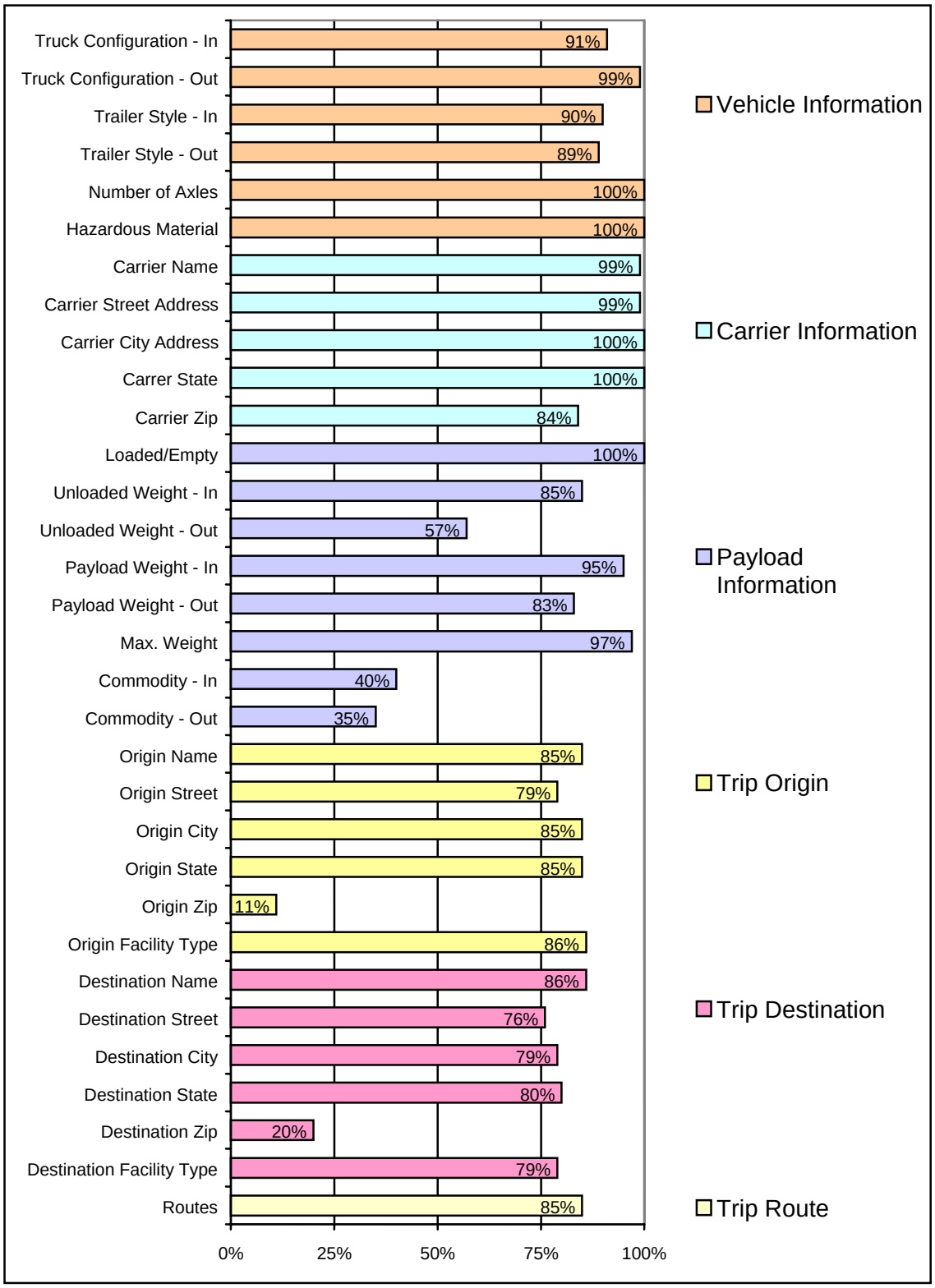

Figure 2: Roadside interview item response – port facility (N=92)

Responses to questions dealing with trip origins and destinations were relatively high at the port facility for all questions except origin and destination zip code (11% and 20% respectively).[iv] The name, street address, city, and state for both trip origin and destination were proportionately stronger at the port facility than at the weigh station survey. This difference could be explained by the relatively smaller types and number of origins and destinations for port facility traffic, as compared to the traffic on an interstate highway. Drivers of vehicles that are on designated routes between warehouses in the Portland area and the port facility may be more likely to know the specific address detail of origins and destinations.

Warehouse/Distribution Center Survey

The final roadside interview tested under Pilot Study I was administered at the warehouse/distribution center of a private freight trucking company within the Portland metropolitan area. The selection of the individual warehouse to participate in this roadside survey was identified through a process of contacting transportation and logistics firms from a list of customers provided by the Port of Portland. Several calls and contacts were made to different firms before reaching a company that was receptive to allowing this survey to be conducted at one of their warehouse facilities. In most all cases, those who declined to participate were concerned with safety, liability and interference with daily freight operations without any immediate gain from allowing the survey team to conduct the roadside survey. This reluctance to participate may pose a significant challenge when broadening the scope of data collection to the full metropolitan area and identifying enough firms to participate.

From a purely logistical and safety point of view, this roadside interview site was the easiest to manage and implement due to the lower volume of traffic at this site (134 trucks) and how drivers were interviewed relative to the other two roadside interview sites. Since considerably less truck traffic passed through this site as compared to the other two sites, truck drivers were less hurried and more apt to participate in the survey given their availability of time between drops and pickups. As shown in Table 1, this roadside interview generated the largest response rate (100%) and the greatest capture rate (42%), when compared to the other two survey sites. A total of 56 questionnaires was completed from a total vehicle volume of 134.

Questionnaires administered at the warehouse/distribution center generated a large proportion of responses for individual questions, similar to that of the port facility and highway sites. As shown in Figure 3, questions related to vehicle information generated a high percentage of responses, especially for outbound truck configuration (95%), number of axles (100%) and hazardous material (100%). But the response rate to questions relating to vehicle information were slightly lower at the warehouse/distribution center when compared to the other two sites.

Responses to carrier information questions were also high for the warehouse/distribution center survey. The interviews captured 100% of responses for carrier name, carrier city address and carrier state.

Questions dealing with payload information were completed over 95% of the time at the warehouse/distribution center, the highest among all roadside interviews. This phenomenon is likely the result of fewer types and subsets of commodities that were handled at the warehouse/distribution center, as compared to the freight traffic at the port facility and interstate highway, and the lack of container traffic at this site.

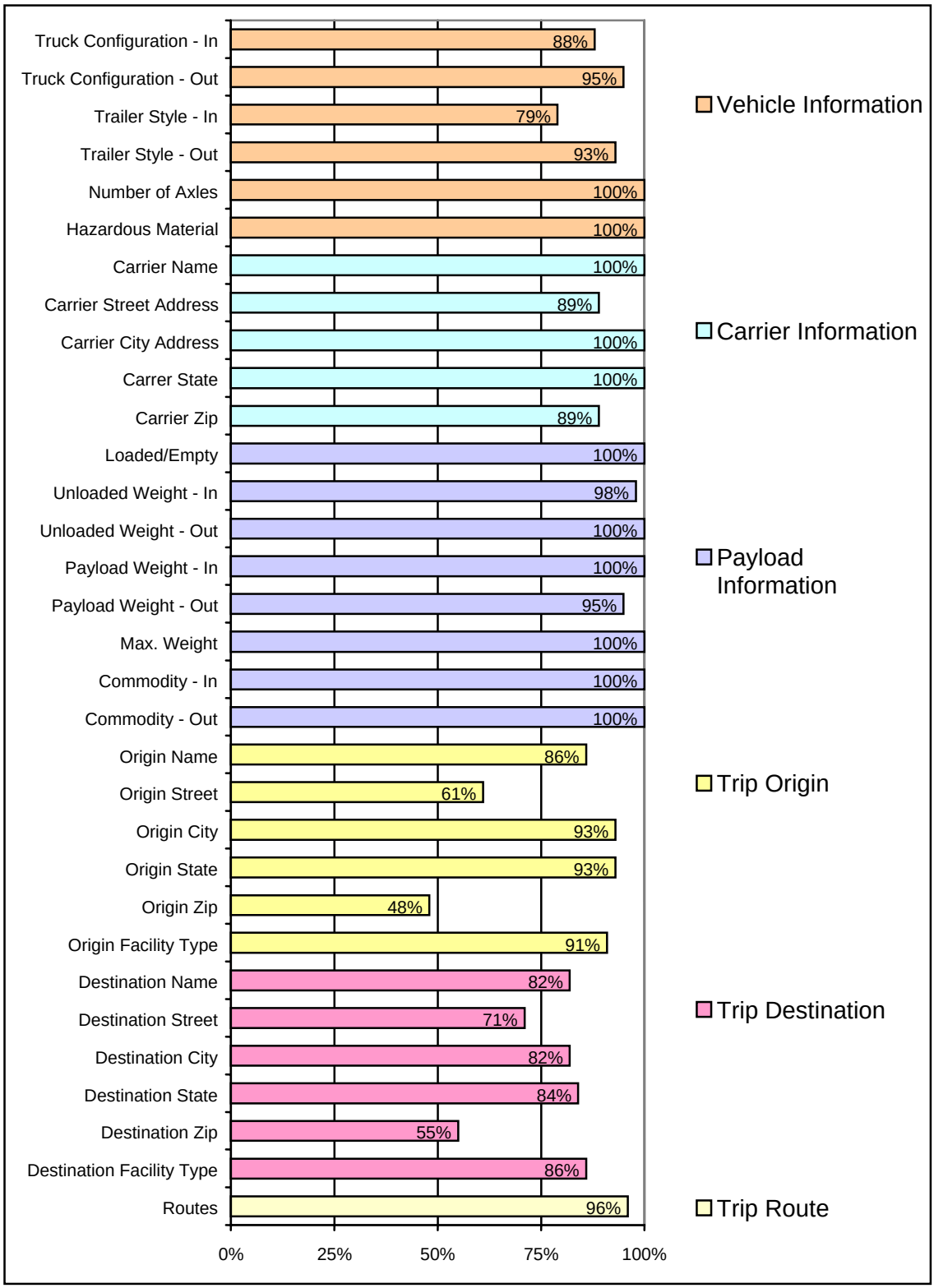

Figure 3: Roadside interview item response – warehouse/distribution center (N=56)

Data and information describing trip origin and destination were less complete for the warehouse/distribution center as compared to other types of questions on the survey. Less than 62 percent of respondents provided answers to trip origin street address and only 48% provided a response to origin zip code.[v] However, this represents the largest proportion of responses to origin zip code when compared to the port facility (11%) and interstate highway (12%). Responses to destination zip code were slightly higher at 55%, also the largest proportion of responses to destination zip code as compared to port facility (20%) and interstate highway (6%). Trip route information was very complete for roadside interviews administered at the warehouse/distribution center, with over 96% of respondents providing a detailed trip route.

Information related to multiple stops of less-than-truck-loads (LTL), shown in Table 2, was also captured with all three roadside interviews. Generally, these questions generated the least response across all three locations for all survey questions. For those respondents which were LTL vehicles, none had specific zip code and very few had street information of the multiple stops; but the highway interview yielded a relatively better response rate on city and state information for multiple stops. Less than 4% of all questionnaires from all three roadside interview locations provided information related to facility name of shipment origin. Respondents provided better detail for the city and state of shipment origins (13% highway I-84, 4% port facility, 2% warehouse) but very little information related to the address of shipment destination. This level of detail provided by respondents follows the pattern of responses among non-LTL trucks.

Table 2: Roadside survey item response percentage to LTL origin and destination questions

Roadside Interview Site	Origin				Destination			
	Facility Name	Street Address	City	State	Facility Name	Street Address	City	State
Highway I-84	2%	2%	13%	13%	1%	2%	10%	10%
Port of Portland, Terminal 6	4%	-	4%	4%	-	-	-	-
Warehouse/Distribution Center	1%	-	2%	2%	-	-	-	-

Summary Findings from Roadside Interviews

Overall, the roadside surveys were completely successful in all facets of implementation and collecting freight data. The support and cooperation of the ODOT Motor Carrier Transportation Division, the Port of Portland and the private warehouse/distribution center's management and operations personnel all contributed to a safe and successful data collection effort.

The recruitment and training of service club volunteers to conduct the roadside surveys was simplified, given that a previous relationship already existed between with the club from prior research activities through the Strategic Freight Transportation Analysis (SFTA) project in Washington. Most club members had already participated in four previous roadside interviews and were well experienced. This lessened the need for close supervision and monitoring by quality control officers during the survey. It is expected that significant resources and energy would be required for recruitment, training, supervision and performance monitoring of service club volunteers without prior freight survey experience. A full description of training, recruitment and performance monitoring requirements are provided in SFTA Research Report Number 2 (*Clark, et al. 2002*).

The general capture rate for other highway sites, port sites and warehouse/distribution locations within the Portland metropolitan area can be expected to be significantly higher overall than those specific sites tested in this pilot study. Each of the pilot study sites were selected because they represented the most difficult locations, primarily due to vehicle volume at each site.

Primary findings from the roadside interviews of Pilot Study I are as follows:

- The capture rate (number of vehicles sampled out of the total volume) is dependent upon available parking and survey personnel relative to the total truck traffic volume and undoubtedly will vary by roadside interview site.

- All three types of roadside interviews produced high response rates related to:

    - Vehicle and Trailer Information
    - Carrier Information
    - Trip Route Information
    - Facility Type

- Roadside interviews at the warehouse/distribution center and interstate highway weigh station provided high response rates related to commodity type, while the preponderance of container traffic at the port facility limited responses on payload information.

- Obtaining specific street addresses and zip codes for trip origin and destination is very difficult for all types of roadside interviews, but the best responses were from warehouse/distribution centers.

- Finding a large number of private transportation firms to participate in warehouse/ distribution center roadside surveys may prove challenging.

The results of these pilot studies offer valuable information and direction for future freight data collection efforts designed to serve the modeling and planning needs of the Oregon Department of Transportation and other states interested in collection truck freight movements within urban areas.

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[i] For a complete description of survey personnel training, survey site planning, layout, traffic flow and interview processes, see “Freight Truck Origin-Destination Study: Methods, Procedures and Data Dictionary,” SFTA Research Report #2 at www.sfta.wsu.edu. (*Clark, et al. 2002*)

[ii] The truck traffic sampled at the I-84 weigh station included commercial vehicles above 16,000 lbs. but did not include those vehicles by-passing the site as part of the Commercial Vehicle Information System and Networks (CVISN) or “Green Light” program.

[iii] The logistics for maintaining a record of all vehicles invited to participate in the survey was more challenging at the port facilities, since various personnel contacted each driver initially as opposed to one person making the initial request to participate, as was the case at the weigh station site.

[iv] The origin zip code was asked of incoming trucks, and the destination zip code was asked of outgoing trucks. The zip code of the other end of each trip was of course known, as it was the zip code of the survey location.

[v] The origin zip code was asked of incoming trucks, and the destination zip code was asked of outgoing trucks. The zip code of the other end of each trip was of course known, as it was the zip code of the survey location.