Truck Data Collection Study Report

Port of Vancouver USA

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SCJ ALLIANCE
CONSULTING SERVICES

Truck Data Collection Study Report

Project Information

Project: **Port of Vancouver Truck Study**

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1. INTRODUCTION

The Port of Vancouver USA is one of the largest ports on Columbia River and generates significant economic activity in greater Portland/Vancouver Metropolitan Area. While much of the cargo handled through the Port's marine terminals travels by rail, truck circulation and access to the regional transportation system is an important element in the movement of freight generated by the Port and its industrial tenants.

The Port has expressed an interest in better understanding the magnitude of truck traffic which travels to and from the port and its related properties (both marine and industrial) on a daily basis. The Port is also interested in determining the directional orientation of Port-related traffic, with a particular focus on trips traveling to and from the I-5 corridor, primarily along Mill Plain Boulevard/15th Street and Fourth Plain Boulevard.

1.1 DATA COLLECTION APPROACH

In order to meet the Port's objectives, a focused data collection effort was undertaken during August of 2018. This data collection effort included:

- Vehicle classification counts – these counts were taken at six locations for 24-hours per day over a typical 5-day week (Monday through Friday). Count data has been stratified in accordance with the Federal Highway Administration's 13 vehicle classification system. Bi-directional data was obtained at the following locations:
    - Centennial Industrial Park - 32nd Avenue north of Lower River Road (SR 501)
    - Port office road south of SR 501
    - Driveway east of Port office road and south of SR 501
    - Main Gate - 26th Avenue south of SR 501
    - St. Francis Lane south of SR 501
    - Thompson Avenue south of SR 501
- 8-Hour Turning Movement Count at the intersection of SR 501 with 32nd Avenue - Data was collected for a total of 8-hours to test the need for traffic signal installation. Counts were obtained during the busiest hours of the day including: 6 AM to 9 AM, 11 AM to 1 PM, and 3 PM to 6 PM.
- Trip origin and destination data were obtained by collecting and matching the license plates of trucks traveling through six locations in both the inbound and outbound directions. These locations included:
    - Lower River Road (SR 501) west of Gateway Avenue – including both inbound and outbound directions
    - Fruit Valley Road north of Fourth Plain Boulevard – inbound and outbound
    - Fourth Plain Boulevard east of Mill Plain Boulevard – inbound and outbound
    - Mill Plain Boulevard east of Thompson Avenue – inbound and outbound

- I-5 southbound off-ramp at Fourth Plain Boulevard – inbound only
- I-5 southbound on-ramp at Fourth Plain Boulevard – outbound only
- I-5 northbound on-ramp at Fourth Plain Boulevard – outbound only
- I-5 northbound off-ramp at Fourth Plain Boulevard – inbound only
- I-5 southbound off-ramp at Mill Plain Boulevard – inbound only
- I-5 southbound on-ramp at Mill Plain Boulevard – outbound only
- I-5 northbound on-ramp at Mill Plain Boulevard – outbound only
- I-5 northbound off-ramp at Mill Plain Boulevard – inbound only

Day and time period selected for the license plate survey were determined based on the data collected during the vehicle classification counts. This data was used to identify the peak day and hour of truck activity along the major streets traveling to and from the Port and its properties.

1.2 CONTENT AND ORGANIZATION OF THIS REPORT

This purpose of this report is to summarize the data collection effort, document data collection results, and describe key findings that help us to understanding both the magnitude of truck traffic entering and leaving Port properties, and the directional orientation of that traffic to the I-5 corridor.

This report includes four chapters, the first of which is this Introduction.

Chapter 2 describes the data collection effort to obtain vehicle classification counts and analyzes the relative magnitude of truck traffic using the access roads to/from the Port. Data is summarized both in table format and illustrated in graphics that show truck arrival and departure patterns over the course of a typical day.

Chapter 3 presents a short summary of an 8-hour turning movement count taken at the intersection of SR 501 with 32nd Avenue. This count was obtained to assess existing traffic operations at this location and to determine whether Manual of Uniform Traffic Control Devices (MUTCD) warrants would be met for traffic signal installation.

Chapter 4 illustrates the results of the origin/destination survey for Port-related trucks to determine the magnitude of existing travel between Port properties and the I-5 interchanges at Mill Plain Boulevard and Fourth Plain Boulevard.

2. VEHICLE CLASSIFICATION COUNTS

To enhance the Port's understanding of the magnitude and type of truck activity being attracted to Port-owned/operated properties, a series of vehicle classification traffic counts were taken during August of 2018. These counts were taken at the six locations illustrated in **Figure 2-1**. This chapter highlights the approach to data collection and summarizes key findings and conclusions with respect to overall truck activity to/from the Port and activity at each of the specific surveyed locations.

2.1 METHODOLOGY

The methodology for collecting the count data involved recording traffic on video cameras, then processing this information to classify the vehicles according to the Federal Highway Administration (FHWA) 13-Category Classification System. An illustration of this system is presented in **Appendix A** and includes the following:

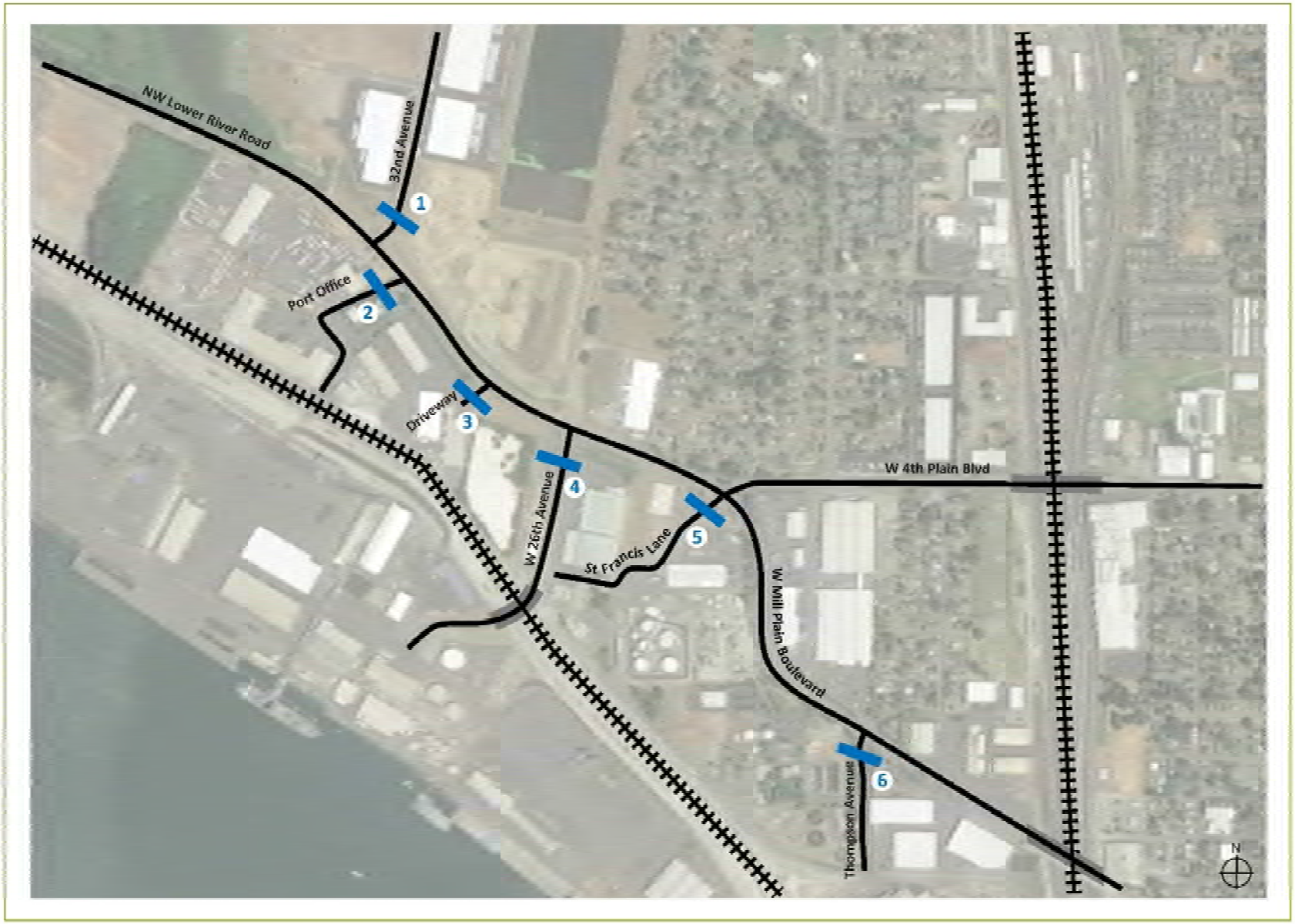
- Classes 1 through 4 include motorcycles, cars, pick-ups and buses and are not considered to be trucks
- Classes 5 and 6 vehicles are considered light duty trucks (i.e., 2 or 3 axles)
- Classes 7 and 8 are considered medium duty trucks (i.e., 4 or more axles with a single unit or 3 or 4 axles with a trailer)
- Classes 9 through 13 are considered heavy duty trucks (i.e., 5 axles or more with trailer)

The vehicle counts were obtained for each hour out of a 24-hour day for five consecutive weekdays and averaged to represent a "typical" weekday. Counts for five out of the six locations were taken on weekdays during the period from August 13 through August 24, 2018 when the Port anticipated numerous ships to be loading and unloading. The presence of these ships was expected to generate the highest level of truck activity for an average weekday, and, as such, represents an optimal condition for collecting vehicle classification counts. The sixth count was taken on 32nd Avenue north of SR 501 and included only weekdays during the period from August 23 through August 29, 2018. It was necessary to recount this location due to equipment failure during the original traffic data collection period. As this road serves only the Port's Centennial Industrial Park, the influence of ship activity was judged not to be significant on the level of truck traffic at this location.

2.2 FINDINGS AND CONCLUSIONS

Vehicle classification count data was assembled into tables with supportive graphics for each count location to show average inbound, outbound and total volumes for trucks and all vehicular activity for each hour and for the day as a whole. Truck percentages out of the total vehicle mix were also included. Data was also summarized to show a distribution of truck activity by classification of truck. For purposes of brevity trucks were generally grouped by light duty, medium duty and heavy duty rather than the full range of classifications in the FHWA system, although the full raw data will be made available to the Port in electronic format.

Figure 2-1. Vehicle Classification Count Locations

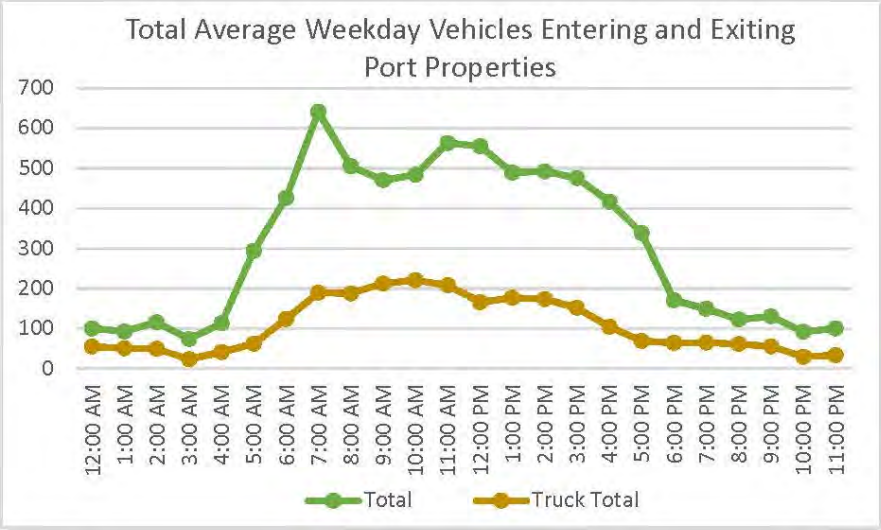


2.2.1 Total Port-Related Truck Traffic

Table 2-1 presents a summary of vehicle classification count data for all six count locations. In essence this table provides insight into the magnitude of truck activity to/from the Port' industrial properties including the marine terminals west of 32nd Avenue. According to the data in this table there were nearly 2,600 trucks entering and leaving the Port on an average weekday during the time when ships were loading or unloading. Of this total, slightly over 1,300 trucks entered the Port, while just under 1,300 trucks left the port during an average weekday. The total daily truck volume represented about 33 percent of all traffic into and out of the Port.

The data in Table 2-1 is also illustrated in **Figure 2-2**. This figure provides a visual summary of total daily truck activity by hour, and clearly indicates which time periods were the busiest for both trucks and for total traffic (including employees, visitors and others with business on Port property).

Figure 2-2. Total Average Weekday Truck Traffic Entering and Exiting Port Properties



As indicated in the figure, there is a very noticeable peak in total vehicular traffic between 7 and 8 AM when people are arriving at work. An average of approximately 670 vehicles were counted during this hour of which 470 were inbound (or 71 percent) and 190 were outbound (or 29 percent). Another peak occurred during the midday time period from 11 AM to noon (with 590 vehicles) and noon to 1 PM (with 580 vehicles). There were more outbound vehicles than inbound during the first of these two hours, but the second was evenly balanced. A smaller peak occurred for several hours in the early afternoon with vehicle activity rapidly tailing off after 6 PM.

Truck activity on a typical weekday was much more evenly balanced during prime working hours. There is a rapid increase in trucks starting around 5 AM which generally levels off at 7 AM and remains consistent until 11 AM. Truck volumes drop slightly in the afternoon gradually tailing off through the remainder of the day.

Table 2-1. Total Average Weekday Trucks Entering and Exiting Port Properties

	Entering Trucks (westbound)			Exiting Trucks (eastbound)			Total Entering and Exiting Trucks		
Start Time	Total Vehicles	Total Trucks	Truck Percentage	Total Vehicles	Total Trucks	Truck Percentage	Total Vehicles	Total Trucks	Truck Percentage
12 am	43	27	62.8%	62	28	45.2%	105	55	52.4%
1 am	42	25	59.5%	55	25	45.5%	97	50	51.5%
2 am	44	21	47.7%	74	29	39.2%	118	50	42.4%
3 am	48	11	22.9%	32	12	37.5%	80	23	28.8%
4 am	77	19	24.7%	46	22	47.8%	123	41	33.3%
5 am	239	43	18.0%	65	17	26.2%	304	60	19.7%
6 am	347	87	25.1%	94	36	38.3%	441	123	27.9%
7 am	466	117	25.1%	191	72	37.7%	657	189	28.8%
8 am	289	98	33.9%	236	89	37.7%	525	187	35.6%
9 am	226	97	42.9%	270	115	42.6%	496	212	42.7%
10 am	222	108	48.6%	288	113	39.2%	510	221	43.3%
11 am	229	97	42.4%	361	112	31.0%	590	209	35.4%
12 pm	295	85	28.8%	287	81	28.2%	582	166	28.5%
1 pm	257	92	35.8%	249	84	33.7%	506	176	34.8%
2 pm	207	80	38.6%	311	93	29.9%	518	173	33.4%
3 pm	150	68	45.3%	346	85	24.6%	496	153	30.8%
4 pm	99	44	44.4%	336	59	17.6%	435	103	23.7%
5 pm	105	35	33.3%	244	32	13.1%	349	67	19.2%
6 pm	63	29	46.0%	117	35	29.9%	180	64	35.6%
7 pm	67	33	49.3%	88	32	36.4%	155	65	41.9%
8 pm	57	30	52.6%	69	30	43.5%	126	60	47.6%
9 pm	55	26	47.3%	80	30	37.5%	135	56	41.5%
10 pm	50	17	34.0%	44	12	27.3%	94	29	30.9%
11 pm	40	19	47.5%	63	15	23.8%	103	34	33.0%
Day Total	**3,717**	**1,308**	**35.2%**	**4,008**	**1,258**	**31.4%**	**7,725**	**2,566**	**33.2%**

Source: SCJ Alliance traffic counts obtained on weekdays between August 13 – 24, 2018 for most locations and, due to equipment malfunction, on August 23 – 29, 2018 on 32nd Avenue.

Figure 2-3 illustrates total entering and exiting vehicle traffic for an average weekday. As can be seen from the data there is a strong inbound peak at 7 AM and another, smaller inbound peak around noon. This corresponds with morning arrival at work and lunchtime activities. Arrivals taper off after noon into the evening hours. Truck arrivals do not show the same morning and midday peaks but are relatively consistent during the work day between 7 AM and about 3 PM.

The figure for exiting vehicles shows two clear peaks, one at 11 AM and one at 3 and 4 PM. The first peak corresponds with the entering vehicle peak that occurs roughly an hour later and most probably represents people leaving for lunch. The latter peak represents people leaving work at the end of the day. The volume of exiting vehicles tapers off dramatically after about 4 PM. As with truck arrivals, truck departures are relatively consistent throughout the working day with a small peak between 9 AM and 11 AM and another around 2 PM.

Figure 2-3. Average Weekday Truck Traffic Entering and Exiting Port Properties

The remainder of this chapter describes the results of detailed vehicle classification counts at each of the six study area locations. Full count data is presented in **Appendix B**. The following sections highlight the total of entering and exiting traffic by location.

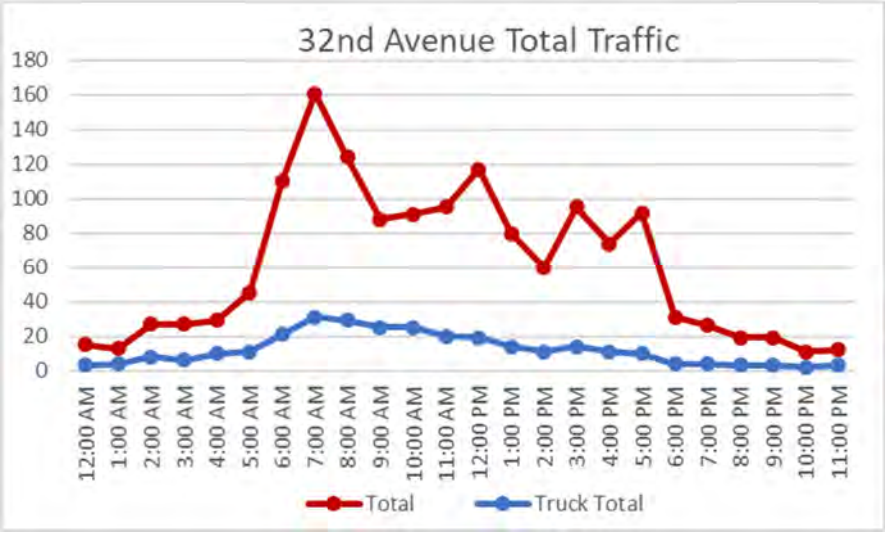
2.2.2 Vehicle Activity at Station #1 – 32nd Avenue north of SR 501 (Centennial Industrial Park)

As shown in Table B-1 of Appendix B, a daily total of 1,461 vehicles were counted on an average weekday during the period from August 23 to 29, 2018. An average of 291 trucks were counted which equates to just under 20 percent of total daily volume. Total daily vehicular traffic was nearly evenly split between inbound and outbound vehicles, while total daily truck activity included about 55 percent inbound vehicles and 45 outbound vehicles.

Figure 2-4 presents a summary of average weekday truck traffic entering or leaving the Port's Centennial Industrial Park via 32nd Avenue. As indicated in the figure, there is a steep increase in traffic activity during the hour beginning at 7 AM. At this time, approximately 76 percent of all trips were inbound, that is, people arriving at work. Other, smaller peaks were observed at noon, 3 PM and 5 PM. At noon, traffic was largely equal between inbound and outbound vehicles which is consistent with the lunchtime period. At 3 and 5 PM, approximately 80 percent of all traffic was outbound which is consistent with the end of the work day.

As with the overall hourly truck activity observed in Figure 2-2 for the Port as a whole, truck trips saw a small peak in the hour between 7 and 8 AM. Truck traffic remained relatively consistent throughout the day with volume decreasing slightly until after 5 PM when only nominal truck activity was observed.

Figure 2-4. Average Weekday Truck Traffic Entering and Exiting Port Properties via 32nd Avenue (Centennial Industrial Park)



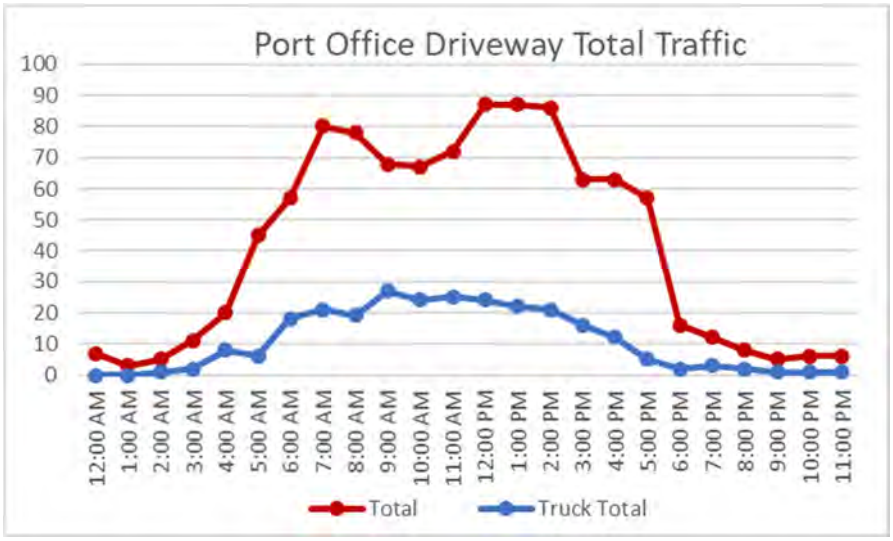
2.2.3 Vehicle Activity at Station #2 – Port Office Driveway south of SR 501

As shown in Table B-2 of Appendix B, a daily total of 1,009 vehicles were counted on an average weekday during the period from August 13 to 17, 2018. An average of 261 trucks were counted which equates to just under 26 percent of total daily volume. Total daily vehicular traffic was nearly evenly split between inbound and outbound vehicles, while total daily truck activity included about 48 percent inbound vehicles and 52 outbound vehicles.

Figure 2-5 presents a summary of average weekday truck traffic entering or leaving Port property via the driveway leading to the Port's Administrative offices and associated industrial areas. As indicated in the figure, there is a steep increase in traffic activity during the hour beginning at 7 AM and continuing through the hour beginning at 8 AM. During the first hour, 74 percent of all trips were inbound, while during the second hour about 68 percent of all trips were inbound. These two different inbound peak hours are consistent with an arrival time at work for the industrial area at 7 AM and the Port office at 8 AM. There was a significant, three hour peak starting at noon when inbound and outbound vehicles were nearly evenly matched. There was a smaller, two hour peak starting at 4 PM which equates to the end of the work day for industrial workers (4 PM) and office workers (5 PM).

Truck traffic peaked during the hour beginning at 9 AM when inbound and outbound trips were nearly evenly matched. Truck traffic levels were relatively consistent until after about 3 PM when they dropped off to nominal levels.

Figure 2-5. Average Weekday Truck Traffic Entering and Exiting Port Properties via Port Office Driveway



2.2.4 Vehicle Activity at Station #3 –Driveway East of Port Office and south of SR 501

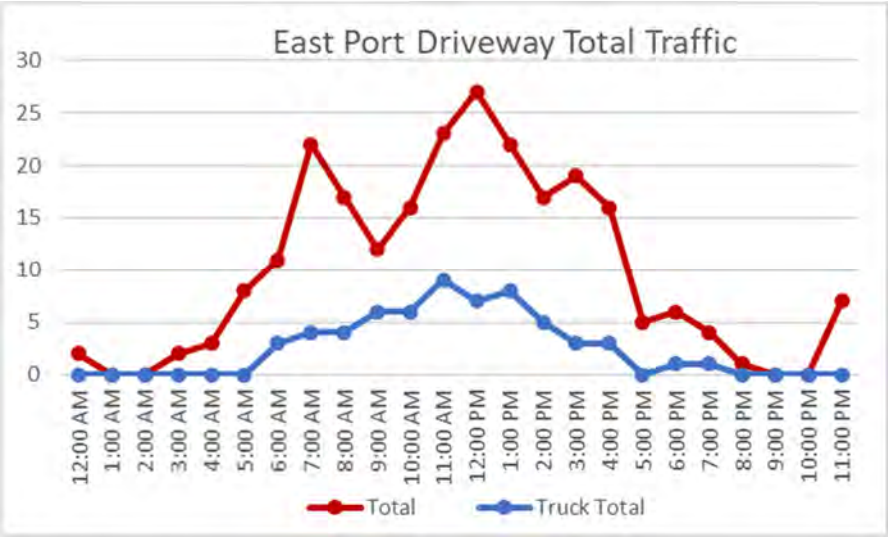
As shown in Table B-3 of Appendix B, a daily total of 240 vehicles were counted on an average weekday during the period from August 13 to 24, 2018. An average of 60 trucks were counted which equates to just 25 percent of total daily volume. Total daily vehicular traffic was nearly evenly split between inbound and outbound vehicles, while total daily truck activity included about 53 percent inbound vehicles and 47 outbound vehicles.

Figure 2-6 presents a summary of average weekday truck traffic entering or leaving Port property via the driveway east of the Port's Administrative offices. This driveway serves a small number of industrial uses. As indicated in the figure, there is a steep increase in traffic activity during the hour beginning at 7 AM followed by another sharp peak at noon.

During the 7 AM hour, 73 percent of all trips were inbound while only 27 percent were outbound. This is consistent with an arrival time at work for the industrial area. There was a higher peak from noon to 1 PM with approximately 56 percent of traffic exiting and 44 percent entering. Traffic activity dropped off significantly after 1 PM with a slight increase at 3 PM. 68 percent of vehicles during that time period were leaving the area, while only 32 percent were arriving. An unusual but small increase in non-truck traffic occurred between 11 PM and midnight. Approximately 86 percent of trips during this time period were inbound with 14 percent being outbound.

Unlike the other locations discussed previously, truck traffic into and out of this location peaked during the middle of the day, with a gradual increase starting around 6 AM and a gradual decrease into the nighttime hours.

Figure 2-6. Average Weekday Truck Traffic Entering and Exiting Port Properties via Driveway East of Port Office



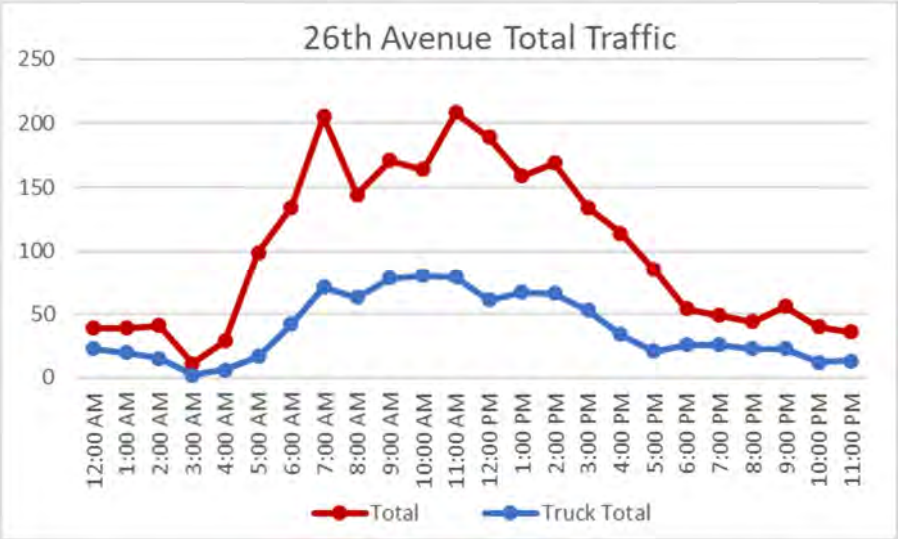
2.2.5 Vehicle Activity at Station #4 – 26th Avenue south of SR 501 (Main Gate)

As shown in Table B-4 of Appendix B, a daily total of 2,413 vehicles were counted on an average weekday during the period from August 13 to 17, 2018. An average of 921 trucks were counted which equates to just over 38 percent of total daily volume. Total daily vehicular traffic was split with 48 percent inbound and 52 percent outbound vehicles, while total daily truck activity was the reverse with about 52 percent inbound vehicles and 48 outbound vehicles.

Figure 2-7 presents a summary of average weekday truck traffic entering or leaving Port property via 26th Avenue. As indicated in the figure, there is a steep increase in traffic activity during the hour beginning at 7 AM. During this time period 69 percent of all trips were inbound, while about 31 percent of all trips were outbound. There was another significant peak starting at noon when inbound vehicles represented about 60 percent of total traffic and outbound represented about 40 percent. Traffic activity dropped off significantly after 1 PM with a slight increase at 3 PM. 69 percent of vehicles during that time period were leaving the area, while only 31 percent were arriving.

Truck traffic increased significantly beginning around 7 AM and remained relatively consistent throughout the day until around 2 PM when it began to drop off. Volumes were also relatively consistent, but at a lower level between 5 PM and around 10 PM.

Figure 2-7. Average Weekday Truck Traffic Entering and Exiting Port Properties via 26th Avenue (Main Gate)



2.2.6 Vehicle Activity at Station #5 – St. Francis Lane south of SR 501

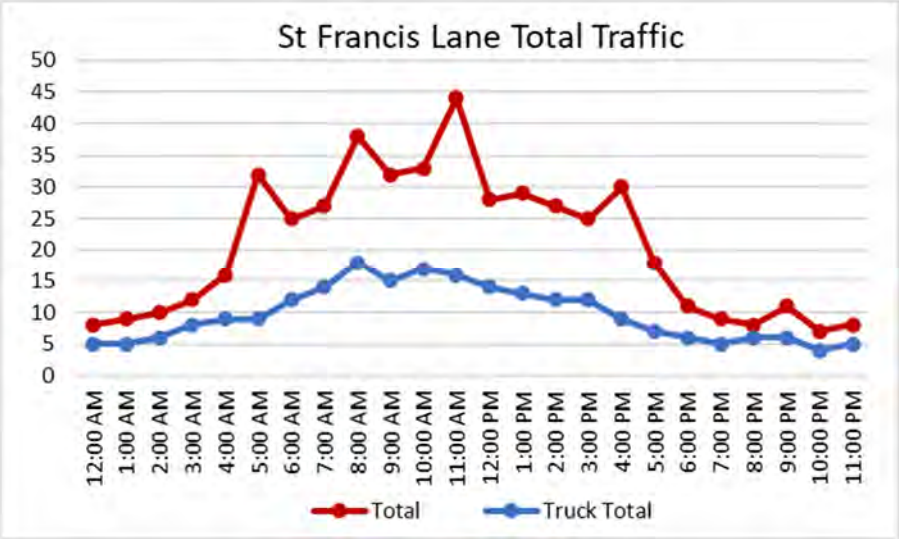
As shown in Table B-5 of Appendix B, a daily total of 497 vehicles were counted on an average weekday during the period from August 13 to 17, 2018. An average of 233 trucks were counted which equates to just nearly 47 percent of total daily volume. Total daily vehicular traffic was split with 41 percent

inbound and 59 percent outbound vehicles, while total daily truck activity was about 47 percent inbound vehicles and 53 outbound vehicles.

Figure 2-8 presents a summary of average weekday truck traffic entering or leaving Port property via St. Francis Lane. As indicated in the figure, there were multiple peaks in vehicular activity throughout the day including the hours from 5 to 6 AM, 8 to 9 AM, 11 AM to noon and 4 to 5 PM. Between 5 and 6 AM, approximately 66 percent of traffic on St. Francis Lane was traveling inbound, while 44 percent was headed outbound. During the 8 to 9 AM and 11 AM to noon peaks, traffic was largely split with slightly heavier outbound volumes than inbound. During the hour between 4 and 5 PM, traffic was predominately outbound, comprising 70 percent of total traffic counted during this hour.

Truck traffic increased gradually beginning around 5 AM with a peak between 8 and 9 AM. Traffic levels largely decreased after 10 AM dropping to a nominal level after 7 PM.

Figure 2-8. Average Weekday Truck Traffic Entering and Exiting Port Properties via St. Francis Lane



2.2.7 Vehicle Activity at Station #6 – Thompson Avenue south of SR 501

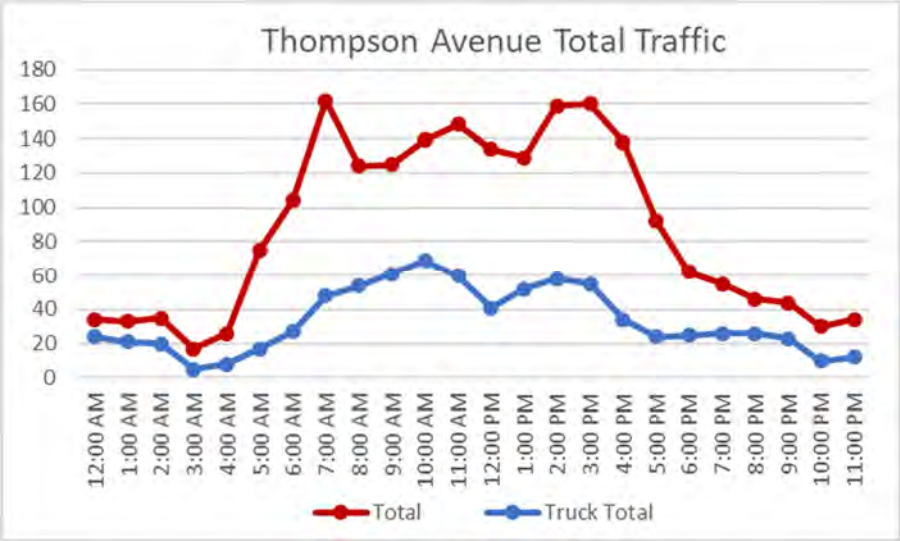
As shown in Table B-6 of Appendix B, a daily total of 2,105 vehicles were counted on an average weekday during the period from August 13 to 17, 2018. An average of 800 trucks were counted which equates to 38 percent of total daily volume. Total daily vehicular traffic was nearly evenly split with 48 percent inbound and 52 percent outbound vehicles. Truck volumes were nearly 50/50 between inbound and outbound vehicles over the course of a typical weekday.

Figure 2-9 presents a summary of average weekday truck traffic entering or leaving Port property via Thompson Avenue. As indicated in the figure, there were three peaks in vehicular activity over the course of the day including the hours from 7 to 8 AM, 11 AM to noon and 2 to 4 PM. Between 7 and 8 AM, approximately 69 percent of traffic on Thompson Avenue was traveling inbound, while 31 percent

was headed outbound. During the peaks occurring between 11 AM and noon and 2 to 3 PM, total traffic was split with approximately 45 percent inbound and 55 percent outbound. In the hour from 3 to 4 PM, outbound traffic increased significantly to 67 percent of total traffic.

Truck traffic saw two peaks, one between 10 and 11 AM and the other between 2 and 3 PM. Truck traffic was nearly evenly split between inbound and outbound with a slightly higher level heading outbound during these time periods.

Figure 2-9. Average Weekday Truck Traffic Entering and Exiting Port Properties via Thompson Avenue



2.2.8 Comparison of Vehicle Traffic Activity by Location

Table 2-2 presents a summary of the average weekday traffic volumes counted at each of the six locations discussed in the sections above. Data in the table includes the daily total of all vehicles and all trucks entering and exiting from Port properties. The data also identifies the percentage of trucks at each location in each travel direction. **Figure 2-10** presents a graphic illustration of this data.

As shown in the data, the busiest location was on 26th Avenue just south of SR 501 where a total of 2,413 vehicles were counted on an average weekday. Out of this total, 1,151 vehicles were inbound to the Port (of which 477 or 41 percent were trucks). A total of 1,262 vehicles were outbound from the Port (of which 444 or 35 percent were trucks). The sum of inbound and outbound trucks on 26th Avenue comprised just over 38 percent of all vehicles. The second busiest location was on Thompson Avenue south of SR 501, followed by 32nd Avenue.

2.2.9 Summary of Types of Trucks by Location

Table 2-3 provides a summary of average total weekday trucks by type and location including light duty trucks (FHWA Classes 5 and 6), medium duty trucks (FHWA Classes 7 and 8), and heavy duty trucks (FHWA Classes 9 through 13). See Appendix A for a definition and illustration of each truck class.

As indicated in the table, just under 16 percent of all vehicles or nearly 48 percent of all trucks were considered light duty and included 2 and 3-axle vehicles. Four percent of all vehicles or just over 13 percent of trucks included medium duty or single unit vehicles (including those with 3 or more axles). Thirteen percent of all vehicles were heavy trucks including single and multiple trailers. This represented 39 percent of all trucks. 26th Avenue had a high preponderance of light duty trucks (nearly 60 percent), while Thompson Avenue had the largest percentage of heavy duty trucks (54 percent). **Figure 2-11** presents a graphic illustration of this data.

Table 2-2. Total Average Weekday Traffic Entering and Exiting Port Properties by Location

	Entering Trucks (westbound)			Exiting Trucks (eastbound)			Total Entering and Exiting Trucks		
Location	**Total Vehicles**	**Total Trucks**	**Truck Percentage**	**Total Vehicles**	**Total Trucks**	**Truck Percentage**	**Total Vehicles**	**Total Trucks**	**Truck Percentage**
32nd Avenue	725	160	22.1%	736	131	17.8%	1,461	291	19.9%
Port Office Driveway	501	125	25.0%	508	136	26.8%	1,009	261	25.9%
East Port Driveway	122	32	26.2%	118	28	23.7%	240	60	25.0%
26th Avenue	1,151	477	41.4%	1,262	444	35.2%	2,413	921	38.2%
St Francis Lane	202	110	54.5%	295	123	41.7%	497	233	46.9%
Thompson Avenue	1,016	404	39.8%	1,089	396	36.4%	2,105	800	38.0%
Total	**3,717**	**1,308**	**35.2%**	**4,008**	**1,258**	**31.4%**	**7,725**	**2,566**	**33.2%**

Figure 2-10. Comparison of Average Weekday Traffic Entering and Exiting Port Properties by Location

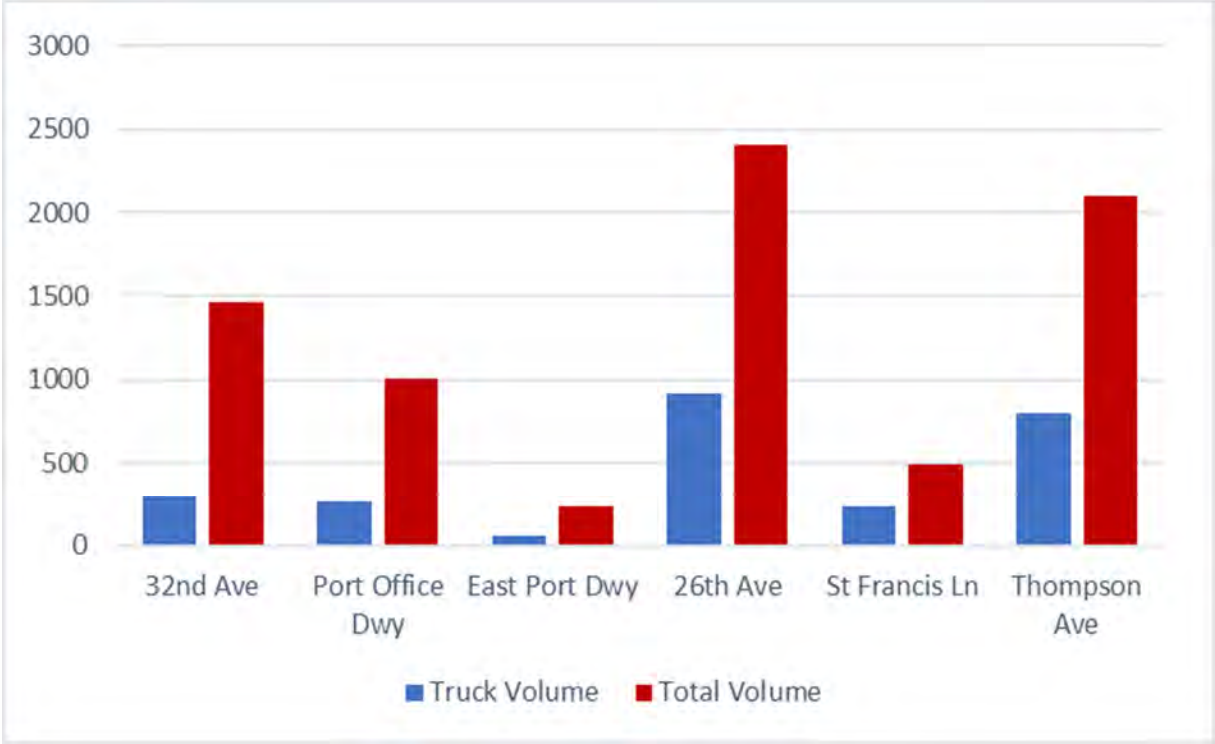
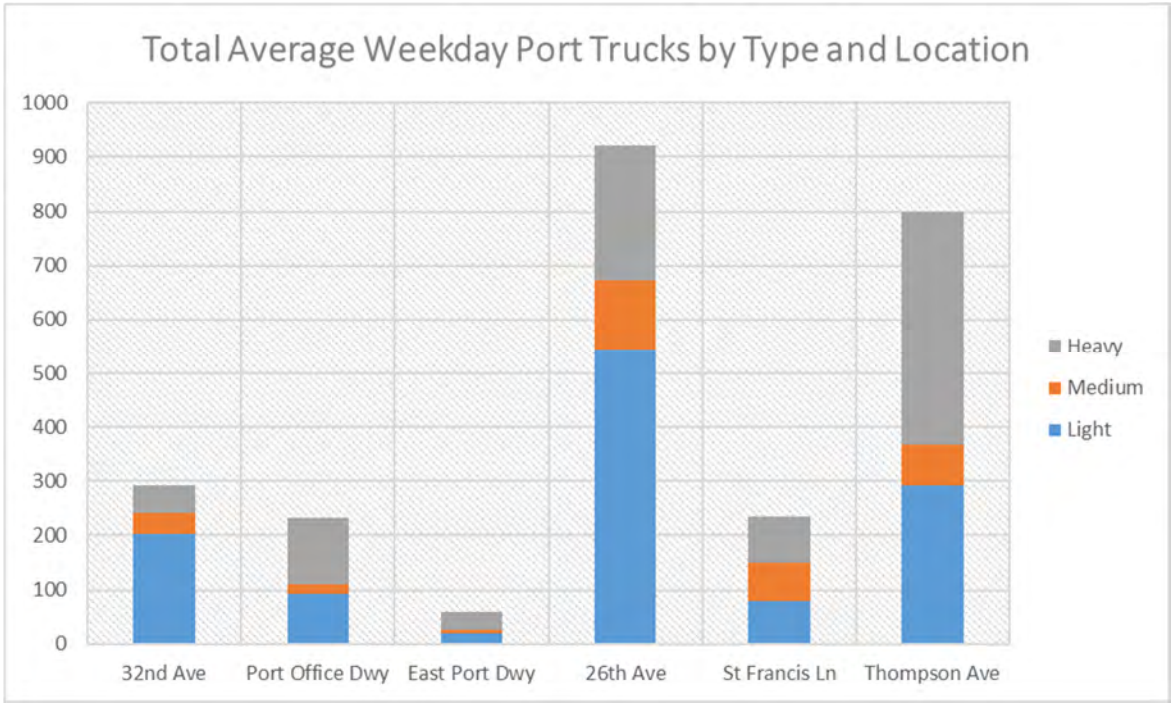


Table 2-3. Total Average Weekday Trucks Entering and Exiting Port Properties by Truck Type and Location

	Light Trucks		Medium Trucks		Heavy Trucks		Total Trucks		
Location	**Total Trucks**	**Truck Percentage**	**Total Trucks**	**Truck Percentage**	**Total Trucks**	**Truck Percentage**	**Total Trucks**	**Truck Percentage**	**Total Volume**
32nd Avenue	202	13.8%	39	2.7%	50	3.4%	291	19.9%	1,461
Port Office Driveway	92	9.1%	17	1.7%	152	15.1%	261	25.9%	1,009
East Port Driveway	20	8.3%	6	2.5%	34	14.3%	60	25.0%	240
26th Avenue	545	22.6%	127	5.3%	249	10.3%	921	38.2%	2,413
St Francis Lane	78	15.7%	72	14.5%	83	16.7%	233	46.9%	497
Thompson Avenue	291	13.8%	76	3.6%	433	20.6%	800	38.0%	2,105
Totals	**1,228**	**15.9%**	**337**	**4.4%**	**1,001**	**13.0%**	**2,566**	**33.2%**	**7,725**
Percent of Total Trucks	**--**	**47.9%**	**--**	**13.1%**	**--**	**39.0%**	**--**	**100%**	

Figure 2-11. Comparison of Average Weekday Truck Traffic Entering and Exiting Port Properties by Truck Type



3. ANALYSIS OF SR 501 AT 32ND AVENUE

The intersection of SR 501 with 32nd Avenue currently serves the Port's Centennial Industrial Park, but there are plans under consideration at extend this roadway further north, ultimately connecting with Fruit Valley Road south of 78th Street. The Port wished to explore whether it would be appropriate to install a traffic signal at this intersection at this time, in advance of any roadway extension to the north. To make this determination, eight hours of traffic turning movement count data was obtained and signal warrant analysis was conducted consistent with WSDOT guidance. This chapter describes the data collection effort, the results of existing operations analysis during the AM, midday and PM peak hour, and the results of signal warrant analysis.

3.1 TRAFFIC VOLUME DATA

On August 14, 2018, peak hour traffic turning movement counts were collected for the AM, midday and PM peak periods. Truck percentages, bicycle and pedestrian activity, and other operational characteristics are available from these counts. Raw traffic count data is presented in **Appendix C**. Based on the count data collected the highest single hourly volume during the AM, PM and midday periods were used to perform traffic operations analysis at the subject intersection. This analysis was conducted to identify any existing operational deficiencies including extensive delays or traffic queues.

3.2 APPROACH TO TRAFFIC OPERATIONS ANALYSIS

SR 501 is under the jurisdiction of the Washington State Department of Transportation (WSDOT) and is a designated Highway of Statewide Significance. As such, this highway has a mobility target of Level of Service (LOS) D. LOS is a qualitative term describing the operating conditions a driver will experience while traveling during a specific time interval and is measured in terms of the average delay experienced by each vehicle along a highway segment or at an intersection. LOS ranges from A (very little delay) to F (long delays and congestion) as described in **Table 3-1**. For purposes of the analysis included in this report, the LOS D standard for SR 501 has been applied to the intersection of SR 501 with 32nd Avenue.

Table 3-1. Level of Service Criteria for Intersections

Level of Service	Stop-Controlled Intersection Average Control Delay (seconds/vehicle)
A	≤ 10
B	> 10-15
C	> 15-25
D	> 25-35
E	> 35-50
F	> 50

3.3 TRAFFIC OPERATIONS AND QUEUING ANALYSIS RESULTS

Traffic operations analysis was conducted using Synchro 10 traffic operations analysis software. Synchro follows the intersection analysis methodology outlined in the 2010 Highway Capacity Manual (HCM) for

signal or stop-controlled intersections. The results of the 2018 PM peak hour intersection operations analysis are presented in **Table 3-2**. As indicated in this table, all intersections currently meet the LOS D mobility target. Analysis worksheets are included in **Appendix C**.

An assessment of existing 95th percentile traffic queues was also conducted for key movements at the intersection using the Synchro and SimTraffic analysis package. The results of this assessment are presented in **Table 3-2** and queuing output worksheets are included in **Appendix C**. As indicated in the table, all existing traffic queues are expected to be accommodated within available vehicle storage.

Table 3-2. 2018 Peak Hour Intersection Level of Service

Peak Period	Control Type	Movement	Level of Service (seconds)	Available Storage	95th Percentile Queue (feet)
AM Peak Hour	Two-Way Stop-Control	EBL	A (8.2)	No Lane	0 feet
		SBL	B (11.7)	500 feet	5 feet
		SBR	A (9.9)	1,000 feet	0 feet
Midday Peak Hour	Two-Way Stop-Control	EBL	A (7.8)	No Lane	0 feet
		SBL	B (12.1)	500 feet	10 feet
		SBR	A (9.4)	1,000 feet	0 feet
PM Peak Hour	Two-Way Stop-Control	EBL	A (7.6)	No Lane	0 feet
		SBL	B (14.1)	500 feet	20 feet
		SBR	A (9.1)	1,000 feet	0 feet

3.4 TRAFFIC SIGNAL WARRANTS

To identify whether it would be appropriate to install a traffic signal at the subject intersection today or in the near future, an analysis was conducted of traffic signal warrants. The methodology provided in the current *Manual on Uniform Traffic Control Devices* (MUTCD) was used to perform the analysis. The results of this analysis are summarized in **Table 3-3** and discussed in the paragraphs below. Traffic signal warrant analysis worksheets are included in **Appendix C**.

Table 3-3. Summary of Signal Warrant Analysis

	Warrant 1 – Eight Hour			
Location	Minimum Volume	Interruption of Flow	Warrant 2 – Four Hour	Warrant 3 – Peak Hour
SR 501 @ 32nd Avenue	Doesn't Meet	Doesn't Meet	Doesn't Meet	Doesn't Meet

Because the posted travel speed along SR 501 is in excess of 40 mph at the intersection, MUTCD guidance provides a 70 percent reduction factor for the volume thresholds for all three signal warrants. With this reduction, the results indicate that none of the signal warrants would be met.

With the operational analysis indicating the intersection operates well today for all three analysis periods and the fact that no signal warrants thresholds are currently being met, a traffic signal at this location is not recommended at the present time.

4. TRUCK TRIP ORIGINS AND DESTINATIONS

WSDOT designates all State highways as truck routes including SR 501 which connects the Port of Vancouver with the statewide transportation system at Interstate 5. SR-501 is identified as Lower River Road adjacent to the Port, transitioning to Mill Plain Boulevard east of the intersection with Fourth Plain Boulevard. Through the Vancouver city center Mill Plain Boulevard is split into a one-way couplet. Mill Plain Boulevard provides eastbound service, while 15th Street provides westbound service.

Prior traffic analysis conducted for the Port through a variety of studies identified Mill Plain Boulevard/15th Street as the primary connection between Port properties and I-5, with secondary access provided via Fourth Plain Boulevard. To a lesser extent, some Port-related traffic uses Fruit Valley Road north of Fourth Plain Boulevard, but the level of truck activity in this area is minimal.

This chapter summarizes key findings and conclusions from a survey of trucks traveling between Port properties and I-5 with the specific objective of determining:

1. The magnitude of truck activity making the full connection between the Port and the freeway
2. The directional orientation of Port-related truck traffic on I-5. In other words, the study addressed what share of Port-related trucks were destined to and from I-5 northbound and southbound via both the Mill Plain and Fourth Plain Boulevard corridors.

4.1 METHODOLOGY

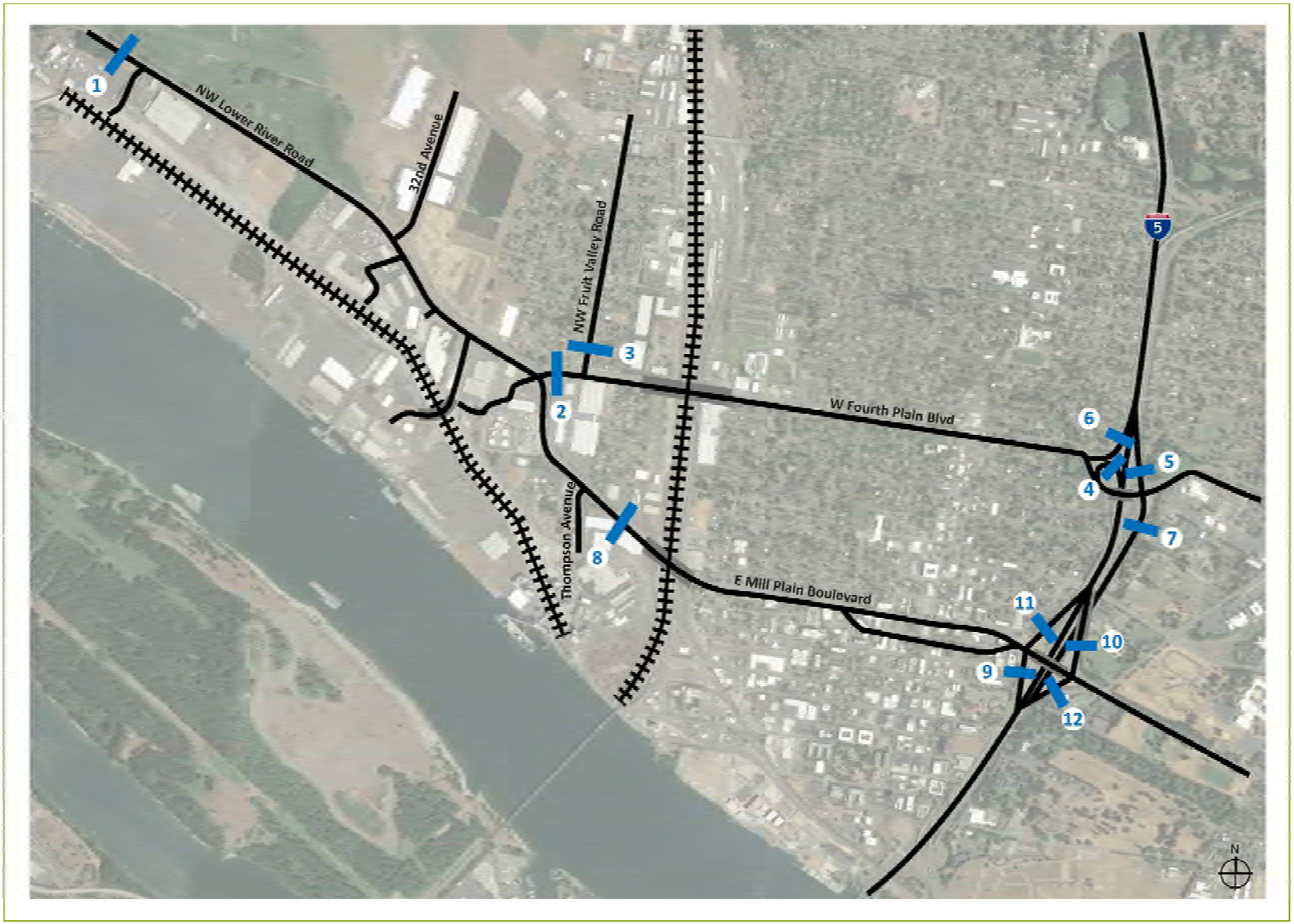
The survey was conducted by videotaping and matching the numbers on the license plates of trucks that traveled through at least two survey stations along Lower River Road, Fourth Plain Boulevard, Mill Plain Boulevard and the I-5 ramps at Fourth Plain and Mill Plain Boulevards. By matching license plate numbers, patterns of travel between Port properties and the north and southbound I-5 ramps could be determined. In addition to determining the orientation of Port-related truck traffic to I-5, orientation to Fruit Valley Road was also determined.

The survey was conducted between the hours of 10 AM and 1 PM on Wednesday, August 29, 2018, in two travel directions – inbound to Port properties and outbound from Port properties. These hours were chosen as they represented the busiest three-hour time period for traffic into and out of the Port. The busiest three hours of truck activity ran from 9 AM to noon, but it was not possible to obtain permission from WSDOT to set up the survey on the I-5 ramps prior to 9 AM. Because of that limitation, the earliest that counting could actually start was at 10 AM (it took nearly an hour to set up all the video cameras and initiate taping). Traffic volume data collection is commonly obtained during Tuesday, Wednesday and Thursday time periods which are not holidays and which are not experiencing adverse weather or traffic conditions that might cause data to be skewed (e.g., an accident, road construction, etc.). Data collected during these time periods is commonly considered to be representative of typical conditions and, thus, a substantive basis for analysis.

The survey stations at which license plate data was collected are illustrated in **Figure 4-1** and included:

- Station 1: SR 501/Lower River Road west of Gateway Avenue

Figure 4-1. Truck Origin/Destination Survey Locations



- Station 2: Fourth Plain Boulevard west of Fruit Valley Road
- Station 3: Fruit Valley Road north of Fourth Plain Boulevard
- Station 4: I-5 southbound on-ramp from Fourth Plain Boulevard
- Station 5: I-5 northbound on-ramp from Fourth Plain Boulevard
- Station 6: I-5 southbound off-ramp to Fourth Plain Boulevard
- Station 7: I-5 northbound off-ramp to Fourth Plain Boulevard
- Station 8: Mill Plain Boulevard east of Thompson Avenue
- Station 9: I-5 southbound on-ramp from Mill Plain Boulevard
- Station 10: I-5 northbound on-ramp from Mill Plain Boulevard
- Station 11: I-5 southbound off-ramp to Mill Plain Boulevard
- Station 12: I-5 northbound off-ramp to Mill Plain Boulevard

After all data was collected the video for each survey station was viewed to identify individual license plate numbers which were tabulated and then matched to the license plate numbers collected at all other survey stations. Data collected at survey station #1 (Lower River Road west of Gateway Avenue) was used to eliminate trucks traveling to or from locations west of existing Port development from the data matches, allowing the survey results to focus solely on Port-related truck traffic.

The resulting data matches have been assembled in table format, as well as graphically to identify the magnitude of truck traffic moving between the freeway and various destination at the Port. Data has been expressed in terms of both truck volumes and percentages.

4.2 KEY FINDINGS AND CONCLUSIONS

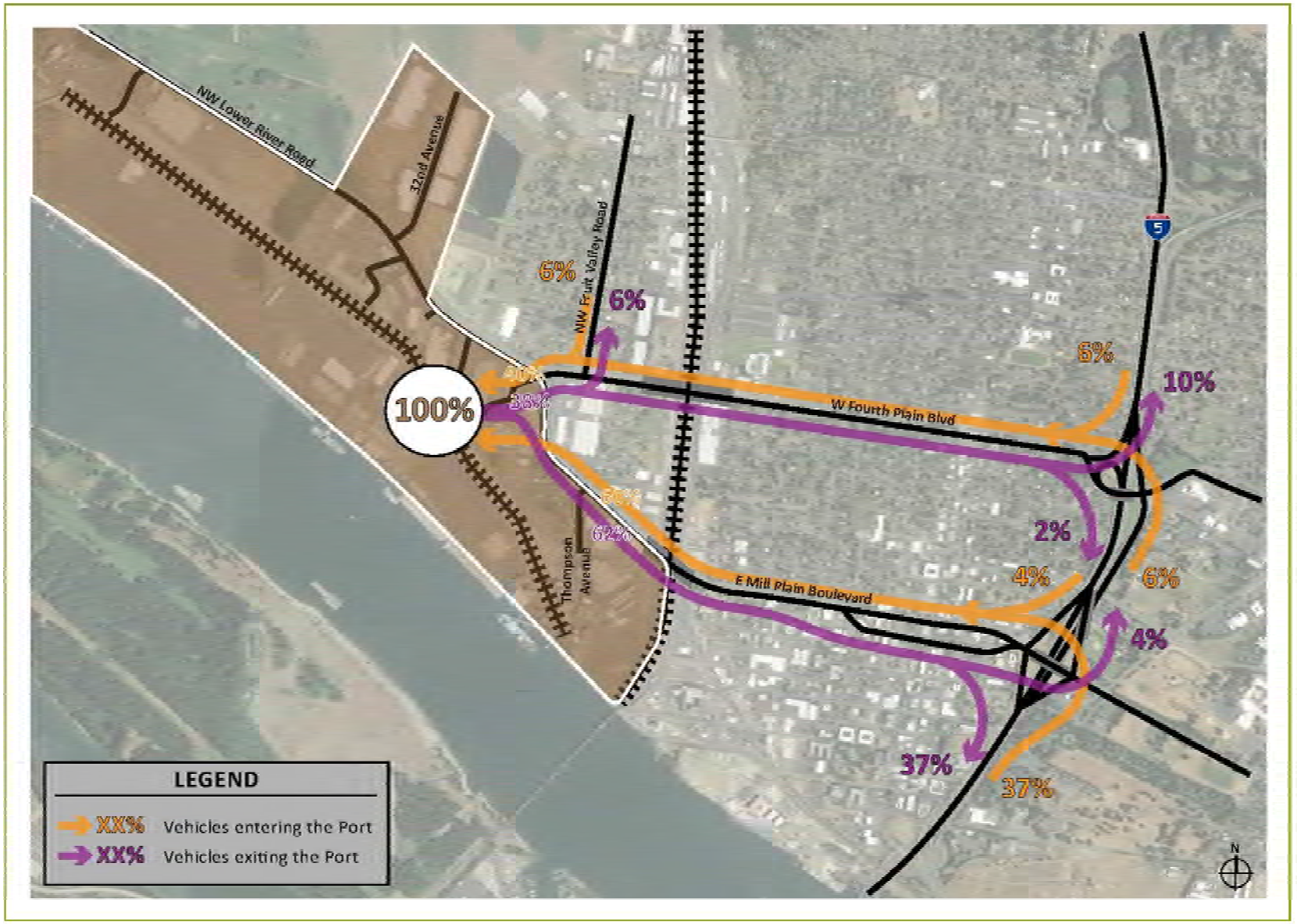
The results of the truck license plate origin/destination survey are presented in **Table 4-1** and illustrated in **Figure 4-2**.

Table 4-1. Summary of Truck Trip Patterns Destined to Port Properties (Inbound)

Trips Destined to Port Properties	Volumes	Percentages
Total Volume	**439**	**100%**
Travel Inbound via Fourth Plain Boulevard	**175**	**39.86%**
- From southbound Fruit Valley Road	28	6.38%
- From I-5 southbound off-ramp at Fourth Plain Boulevard	27	6.15%
- From I-5 northbound off-ramp at Fourth Plain Boulevard	27	6.15%
- From all other points of origin (not surveyed)	93	21.18%
Travel Inbound via Mill Plain Boulevard	**264**	**60.14%**
- From I-5 southbound off-ramp at Mill Plain Boulevard	17	3.87%
- From I-5 northbound off-ramp at Mill Plain Boulevard	162	36.90%
- From all other points of origin (not surveyed)	85	19.36%

As indicated in this table and shown in Figure 4-2, truck traffic heading into Port properties was split roughly 40 percent along the Fourth Plain Boulevard corridor (including traffic that ultimately used Fruit Valley Road) and 60 percent along the Mill Plain Boulevard corridor. The I-5 northbound off-ramp at Mill

Figure 4-2. Truck Trip Origin/Destination Patterns



Plain Boulevard was used by nearly 37 percent of all truck traffic heading to the Port. Port truck volumes on the other three I-5 ramps was considerably lower ranging between about 4 and 6 percent. Approximately 6 percent of inbound Port traffic used Fruit Valley Road. The non-specific (or "other") points of trip origin was expected to include locations between the Port and I-5, as well locations further east along the Fourth Plain and Mill Plain corridors. This traffic did not use the I-5 ramps.

Table 4-2 presents a summary of truck trip patterns originating on Port properties and traveling outbound towards I-5 and other destinations. A similar split was observed between use of the Fourth Plain Boulevard corridor (40 percent) and the Mill Plain Boulevard corridor (60 percent). The I-5 southbound on-ramp at Mill Plain Boulevard was used by about 37 percent of all Port-related trucks. Port truck volumes on the other three I-5 ramps was considerably lower ranging between a low of 2 percent for the southbound on ramp at Fourth Plain Boulevard to a high of just less than 10 percent using the I-5 northbound on-ramp at Fourth Plain Boulevard. Approximately 6 percent of outbound Port traffic used Fruit Valley Road. The non-specific (or "other") destinations expected to include locations between the Port and I-5, as well locations further east along the Fourth Plain and Mill Plain corridors. This traffic did not use the I-5 ramps.

Table 4-2. Summary of Truck Trip Patterns Originating from Port Properties (Outbound)

Trips Originating from Port Properties	Volumes	Percentages
Total Volume	**452**	**100%**
Travel Outbound via Fourth Plain Boulevard	**172**	**39.86%**
- To northbound Fruit Valley Road	27	5.97%
- To I-5 southbound on-ramp at Fourth Plain Boulevard	9	1.99%
- To I-5 northbound on-ramp at Fourth Plain Boulevard	45	9.96%
- To all other points of origin (not surveyed)	91	20.12%
Travel Outbound via Mill Plain Boulevard	**280**	**61.95%**
- To I-5 southbound on-ramp at Mill Plain Boulevard	168	37.17%
- To I-5 northbound on-ramp at Mill Plain Boulevard	20	4.42%
- To all other points of origin (not surveyed)	92	20.35%

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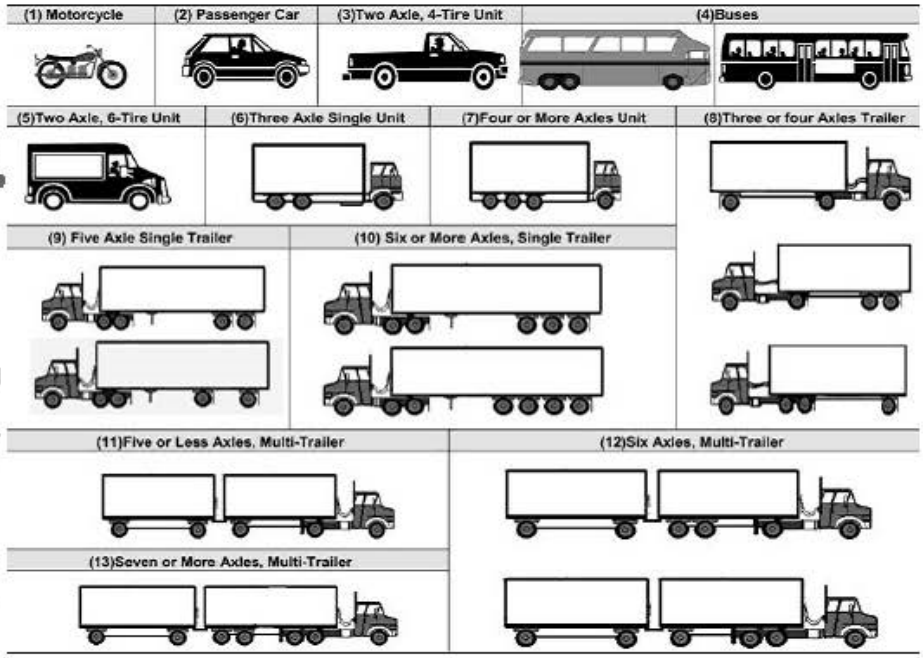
APPENDIX A

FHWA VEHICLE CLASSIFICATION SYSTEM

APPENDIX A – FHWA Vehicle Classification System

FHWA 13 Vehicle Classification (Scheme F)

NOTE: The term "Scheme F" is a nickname for the FHWA 13 Classification definitions. It is no longer referred to in this manner.



Class 1 -

Motorcycles: All two- or three-wheeled motorized vehicles. Typical vehicles in this category have saddle type seats and are steered by handle bars rather than wheels. This category includes motorcycles, motor scooters, mopeds, motor-powered bicycles, and three-wheeled motorcycles.

Class 2 -

Passenger Cars: All sedans, coupes, and station wagons manufactured primarily for the purpose of carrying passengers and including those passenger cars pulling recreational or other light trailers.

Class 3 -

Other Two-Axle, Four-Tire, Single Unit Vehicles: All two-axle, four-tire, vehicles other than passenger cars. Included in this classification are pickups, panels, vans, and other vehicles such as campers, motor homes, ambulances, hearses, carryalls, and minibuses. Other two-axle, four-tire single unit vehicles pulling recreational or other light trailers are included in this classification.

Class 4 -

Buses: All vehicles manufactured as traditional passenger-carrying buses with two axles and six tires or three or more axles. This category includes only traditional buses (including school buses) functioning as passenger-carrying vehicles. Modified buses should be considered to be trucks and be appropriately classified.

Note: In reporting information on trucks the following criteria should be used:

a. Truck tractor units traveling without a trailer will be considered single unit trucks.

b. A truck tractor unit pulling other such units in a "saddle mount" configuration will be considered as one single unit truck and will be defined only by axles on the pulling unit.

c. Vehicles shall be defined by the number of axles in contact with the roadway. Therefore, "floating" axles are counted only when in the down position.

d. The term "trailer" includes both semi- and full trailers.

Class 5 -

Two-Axle, Six-Tire, Single Unit Trucks: All vehicles on a single frame including trucks, camping and recreational vehicles, motor homes, etc., having two axles and dual rear wheels.

Class 6 -

Three-axle Single unit Trucks: All vehicles on a single frame including trucks, camping and recreational vehicles, motor homes, etc., having three axles.

Class 7 -

Four or More Axle Single Unit Trucks: All trucks on a single frame with four or more axles.

Class 8 -

Four or Less Axle Single Trailer Trucks: All vehicles with four or less axles consisting of two units, one of which is a tractor or straight truck power unit.

Class 9 -

Five-Axle Single Trailer Trucks: All five-axle vehicles consisting of two units, one of which is a tractor or straight truck power unit.

Class 10 -

Six or More Axle Single Trailer Trucks: All vehicles with six or more axles consisting of two units, one of which is a tractor or straight truck power unit. .

Class 11 -

Five or Less Axle Multi-Trailer Trucks: All vehicles with five or less axles consisting of three or more units, one of which is a tractor or straight truck power unit .

Class 12 -

Six-Axle Multi-Trailer Trucks: All six-axle vehicles consisting of three or more units, one of which is a tractor or straight truck power unit.

Class 13 -

Seven or More Axle Multi-Trailer Trucks: All vehicles with seven or more axles consisting of three or more units, one of which is a tractor or straight truck power unit.

APPENDIX B

VEHICLE CLASSIFICATION COUNT DATA SUMMARIES

APPENDIX B – TRUCK VOLUME DATA BY LOCATION, TIME AND VEHICLE DIRECTIONALITY

Table B-1. Total Average Weekday Trucks Entering and Exiting Port Properties via 32nd Avenue

Start Time	Entering Trucks (westbound)			Exiting Trucks (eastbound)			Total Entering and Exiting Trucks		
	Total Vehicles	Total Trucks	Truck Percentage	Total Vehicles	Total Trucks	Truck Percentage	Total Vehicles	Total Trucks	Truck Percentage
12 am	8	2	25.0%	7	1	14.3%	15	3	20.0%
1 am	9	3	33.3%	4	1	25.0%	13	4	30.8%
2 am	17	5	29.4%	10	3	30.0%	27	8	29.6%
3 am	20	4	20.0%	7	2	28.6%	27	6	22.2%
4 am	20	5	25.0%	9	5	55.6%	29	10	34.5%
5 am	37	8	21.6%	8	3	37.5%	45	11	24.4%
6 am	100	19	19.0%	10	2	20.0%	110	21	19.1%
7 am	123	24	19.5%	38	7	18.4%	161	31	19.3%
8 am	65	13	20.0%	59	16	27.1%	124	29	23.4%
9 am	34	9	26.5%	54	16	29.6%	88	25	28.4%
10 am	33	11	33.3%	58	14	24.1%	91	25	27.5%
11 am	38	9	23.7%	57	11	19.3%	95	20	21.1%
12 pm	57	10	17.5%	60	9	15.0%	117	19	16.2%
1 pm	41	7	17.1%	39	7	17.9%	80	14	17.5%
2 pm	22	5	22.7%	38	6	15.8%	60	11	18.3%
3 pm	20	7	35.0%	75	7	9.3%	95	14	14.7%
4 pm	15	5	33.3%	59	6	10.2%	74	11	14.9%
5 pm	16	3	18.8%	76	7	9.2%	92	10	10.9%
6 pm	9	1	11.1%	22	3	13.6%	31	4	12.9%
7 pm	13	2	15.4%	13	2	15.4%	26	4	15.4%
8 pm	11	2	18.2%	8	1	12.5%	19	3	15.8%
9 pm	7	3	42.9%	12	0	0.0%	19	3	15.8%
10 pm	4	1	25.0%	7	1	14.3%	11	2	18.2%
11 pm	6	2	33.3%	6	1	16.7%	12	3	25.0%
Day Total	**725**	**160**	**22.1%**	**736**	**131**	**17.8%**	**1,461**	**291**	**19.9%**

Source: SCJ Alliance traffic counts obtained on weekdays between August 23 – 29, 2018.

Table B-2. Total Average Weekday Trucks Entering and Exiting Port Properties via Port Office Road

Start Time	Entering Trucks (westbound)			Exiting Trucks (eastbound)			Total Entering and Exiting Trucks		
	Total Vehicles	Total Trucks	Truck Percentage	Total Vehicles	Total Trucks	Truck Percentage	Total Vehicles	Total Trucks	Truck Percentage
12 am	1	0	0.0%	6	0	0.0%	7	0	0.0%
1 am	1	0	0.0%	2	0	0.0%	3	0	0.0%
2 am	3	1	33.3%	2	0	0.0%	5	1	20.0%
3 am	6	0	0.0%	5	2	40.0%	11	2	18.2%
4 am	12	1	8.3%	8	7	87.5%	20	8	40.0%
5 am	38	2	5.3%	7	4	57.1%	45	6	13.3%
6 am	41	8	19.5%	16	10	62.5%	57	18	31.6%
7 am	59	9	15.3%	21	12	57.1%	80	21	26.3%
8 am	53	8	15.1%	25	11	44.0%	78	19	24.4%
9 am	41	13	31.7%	27	14	51.9%	68	27	39.7%
10 am	27	10	37.0%	40	14	35.0%	67	24	35.8%
11 am	29	13	44.8%	43	12	27.9%	72	25	34.7%
12 pm	46	13	28.3%	41	11	26.8%	87	24	27.6%
1 pm	47	11	23.4%	40	11	27.5%	87	22	25.3%
2 pm	36	12	33.3%	50	9	18.0%	86	21	24.4%
3 pm	22	8	36.4%	41	8	19.5%	63	16	25.4%
4 pm	15	7	46.7%	48	5	10.4%	63	12	19.0%
5 pm	4	2	50.0%	53	3	5.7%	57	5	8.8%
6 pm	5	1	20.0%	11	1	9.1%	16	2	12.5%
7 pm	5	2	40.0%	7	1	14.3%	12	3	25.0%
8 pm	3	1	33.3%	5	1	20.0%	8	2	25.0%
9 pm	2	1	50.0%	3	0	0.0%	5	1	20.0%
10 pm	3	1	33.3%	3	0	0.0%	6	1	16.7%
11 pm	2	1	50.0%	4	0	0.0%	6	1	16.7%
Day Total	**501**	**125**	**25.0%**	**508**	**136**	**26.8%**	**1,009**	**261**	**26.0%**

Source: SCJ Alliance traffic counts obtained on weekdays between August 13 – 17, 2018.

Table B-3. Total Average Weekday Trucks Entering and Exiting Port Properties via Driveway east of Port Offices

Start Time	Entering Trucks (westbound)			Exiting Trucks (eastbound)			Total Entering and Exiting Trucks		
	Total Vehicles	Total Trucks	Truck Percentage	Total Vehicles	Total Trucks	Truck Percentage	Total Vehicles	Total Trucks	Truck Percentage
12 am	0	0	0.0%	2	0	0.0%	2	0	0.0%
1 am	0	0	0.0%	0	0	0.0%	0	0	0.0%
2 am	0	0	0.0%	0	0	0.0%	0	0	0.0%
3 am	2	0	0.0%	0	0	0.0%	2	0	0.0%
4 am	1	0	0.0%	2	0	0.0%	3	0	0.0%
5 am	7	0	0.0%	1	0	0.0%	8	0	0.0%
6 am	9	2	22.2%	2	1	50.0%	11	3	27.3%
7 am	16	2	12.5%	6	2	33.3%	22	4	18.2%
8 am	9	2	22.2%	8	2	25.0%	17	4	23.5%
9 am	8	4	50.0%	4	2	50.0%	12	6	50.0%
10 am	8	3	37.5%	8	3	37.5%	16	6	37.5%
11 am	12	5	41.7%	11	4	36.4%	23	9	39.1%
12 pm	12	3	25.0%	15	4	26.7%	27	7	25.9%
1 pm	10	4	40.0%	12	4	33.3%	22	8	36.4%
2 pm	7	2	28.6%	10	3	30.0%	17	5	29.4%
3 pm	6	1	16.7%	13	2	15.4%	19	3	15.8%
4 pm	3	2	66.7%	13	1	7.7%	16	3	18.8%
5 pm	0	0	0.0%	5	0	0.0%	5	0	0.0%
6 pm	3	1	33.3%	3	0	0.0%	6	1	16.7%
7 pm	2	1	50.0%	2	0	0.0%	4	1	25.0%
8 pm	1	0	0.0%	0	0	0.0%	1	0	0.0%
9 pm	0	0	0.0%	0	0	0.0%	0	0	0.0%
10 pm	0	0	0.0%	0	0	0.0%	0	0	0.0%
11 pm	6	0	0.0%	1	0	0.0%	7	0	0.0%
Day Total	**122**	**32**	**26.2%**	**118**	**28**	**23.7%**	**240**	**60**	**25.0%**

Source: SCJ Alliance traffic counts obtained on weekdays between August 13 – 24, 2018.

Table B-4. Total Average Weekday Trucks Entering and Exiting Port Properties via 26th Avenue

Start Time	Entering Trucks (westbound)			Exiting Trucks (eastbound)			Total Entering and Exiting Trucks		
	Total Vehicles	Total Trucks	Truck Percentage	Total Vehicles	Total Trucks	Truck Percentage	Total Vehicles	Total Trucks	Truck Percentage
12 am	15	11	73.3%	24	12	50.0%	39	23	59.0%
1 am	13	10	76.9%	26	10	38.5%	39	20	51.3%
2 am	7	4	57.1%	34	11	32.4%	41	15	36.6%
3 am	5	0	0.0%	6	2	33.3%	11	2	18.2%
4 am	21	5	23.8%	8	1	12.5%	29	6	20.7%
5 am	75	15	20.0%	24	2	8.3%	99	17	17.2%
6 am	108	36	33.3%	26	6	23.1%	134	42	31.3%
7 am	141	42	29.8%	64	29	45.3%	205	71	34.6%
8 am	75	36	48.0%	69	27	39.1%	144	63	43.8%
9 am	72	36	50.0%	99	42	42.4%	171	78	45.6%
10 am	76	43	56.6%	88	37	42.0%	164	80	48.8%
11 am	64	32	50.0%	144	47	32.6%	208	79	38.0%
12 pm	113	36	31.9%	76	25	32.9%	189	61	32.3%
1 pm	79	34	43.0%	80	33	41.3%	159	67	42.1%
2 pm	62	29	46.8%	107	37	34.6%	169	66	39.1%
3 pm	41	23	56.1%	93	30	32.3%	134	53	39.6%
4 pm	23	10	43.5%	91	24	26.4%	114	34	29.8%
5 pm	46	14	30.4%	39	7	17.9%	85	21	24.7%
6 pm	22	14	63.6%	32	12	37.5%	54	26	48.1%
7 pm	18	12	66.7%	31	14	45.2%	49	26	53.1%
8 pm	17	11	64.7%	27	12	44.4%	44	23	52.3%
9 pm	19	9	47.4%	37	14	37.8%	56	23	41.1%
10 pm	27	9	33.3%	13	3	23.1%	40	12	30.0%
11 pm	12	6	50.0%	24	7	29.2%	36	13	36.1%
Day Total	**1,151**	**477**	**41.4%**	**1,262**	**444**	**35.2%**	**2,413**	**921**	**38.2%**

Source: SCJ Alliance traffic counts obtained on weekdays between August 13 – 17, 2018.

Table B-5. Total Average Weekday Trucks Entering and Exiting Port Properties via St. Francis Lane

Start Time	Entering Trucks (westbound)			Exiting Trucks (eastbound)			Total Entering and Exiting Trucks		
	Total Vehicles	Total Trucks	Truck Percentage	Total Vehicles	Total Trucks	Truck Percentage	Total Vehicles	Total Trucks	Truck Percentage
12 am	3	2	66.7%	5	3	60.0%	8	5	62.5%
1 am	4	2	50.0%	5	3	60.0%	9	5	55.6%
2 am	4	3	75.0%	6	3	50.0%	10	6	60.0%
3 am	5	4	80.0%	7	4	57.1%	12	8	66.7%
4 am	8	5	62.5%	8	4	50.0%	16	9	56.3%
5 am	21	6	28.6%	11	3	27.3%	32	9	28.1%
6 am	12	6	50.0%	13	6	46.2%	25	12	48.0%
7 am	15	9	60.0%	12	5	41.7%	27	14	51.9%
8 am	17	10	58.8%	21	8	38.1%	38	18	47.4%
9 am	10	4	40.0%	22	11	50.0%	32	15	46.9%
10 am	13	8	61.5%	20	9	45.0%	33	17	51.5%
11 am	19	7	36.8%	25	9	36.0%	44	16	36.4%
12 pm	9	5	55.6%	19	9	47.4%	28	14	50.0%
1 pm	11	6	54.5%	18	7	38.9%	29	13	44.8%
2 pm	8	5	62.5%	19	7	36.8%	27	12	44.4%
3 pm	8	4	50.0%	17	8	47.1%	25	12	48.0%
4 pm	9	5	55.6%	21	4	19.0%	30	9	30.0%
5 pm	7	4	57.1%	11	3	27.3%	18	7	38.9%
6 pm	3	2	66.7%	8	4	50.0%	11	6	54.5%
7 pm	3	2	66.7%	6	3	50.0%	9	5	55.6%
8 pm	3	3	100.0%	5	3	60.0%	8	6	75.0%
9 pm	4	3	75.0%	7	3	42.9%	11	6	54.5%
10 pm	3	2	66.7%	4	2	50.0%	7	4	57.1%
11 pm	3	3	100.0%	5	2	40.0%	8	5	62.5%
Day Total	**202**	**110**	**54.5%**	**295**	**123**	**41.7%**	**497**	**233**	**46.9%**

Source: SCJ Alliance traffic counts obtained on weekdays between August 13 – 17, 2018.

Table B-6. Total Average Weekday Trucks Entering and Exiting Port Properties via Thompson Avenue

Start Time	Entering Trucks (westbound)			Exiting Trucks (eastbound)			Total Entering and Exiting Trucks		
	Total Vehicles	Total Trucks	Truck Percentage	Total Vehicles	Total Trucks	Truck Percentage	Total Vehicles	Total Trucks	Truck Percentage
12 am	16	12	75.0%	18	12	66.7%	34	24	70.6%
1 am	15	10	66.7%	18	11	61.1%	33	21	63.6%
2 am	13	8	61.5%	22	12	54.5%	35	20	57.1%
3 am	10	3	30.0%	7	2	28.6%	17	5	29.4%
4 am	15	3	20.0%	11	5	45.5%	26	8	30.8%
5 am	61	12	19.7%	14	5	35.7%	75	17	22.7%
6 am	77	16	20.8%	27	11	40.7%	104	27	26.0%
7 am	112	31	27.7%	50	17	34.0%	162	48	29.6%
8 am	70	29	41.4%	54	25	46.3%	124	54	43.5%
9 am	61	31	50.8%	64	30	46.9%	125	61	48.8%
10 am	65	33	50.8%	74	36	48.6%	139	69	49.6%
11 am	67	31	46.3%	81	29	35.8%	148	60	40.5%
12 pm	58	18	31.0%	76	23	30.3%	134	41	30.6%
1 pm	69	30	43.5%	60	22	36.7%	129	52	40.3%
2 pm	72	27	37.5%	87	31	35.6%	159	58	36.5%
3 pm	53	25	47.2%	107	30	28.0%	160	55	34.4%
4 pm	34	15	44.1%	104	19	18.3%	138	34	24.6%
5 pm	32	12	37.5%	60	12	20.0%	92	24	26.1%
6 pm	21	10	47.6%	41	15	36.6%	62	25	40.3%
7 pm	26	14	53.8%	29	12	41.4%	55	26	47.3%
8 pm	22	13	59.1%	24	13	54.2%	46	26	56.5%
9 pm	23	10	43.5%	21	13	61.9%	44	23	52.3%
10 pm	13	4	30.8%	17	6	35.3%	30	10	33.3%
11 pm	11	7	63.6%	23	5	21.7%	34	12	35.3%
Day Total	**1,016**	**404**	**39.8%**	**1,089**	**396**	**36.4%**	**2,105**	**800**	**38.0%**

Source: SCJ Alliance traffic counts obtained on weekdays between August 13 – 17, 2018.

APPENDIX C

SR 501/32ND AVENUE DATA AND ANALYSIS

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

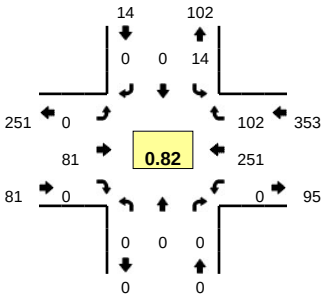
LOCATION: NW 32nd Ave -- NW Lower River Rd

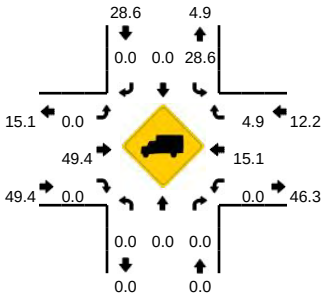
QC JOB #: 14747820

CITY/STATE: Vancouver, WA

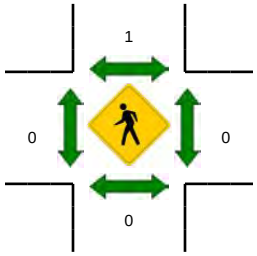
DATE: Tue, Aug 14 2018

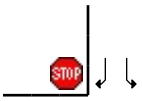
Peak-Hour: 6:10 AM -- 7:10 AM
Peak 15-Min: 6:45 AM -- 7:00 AM

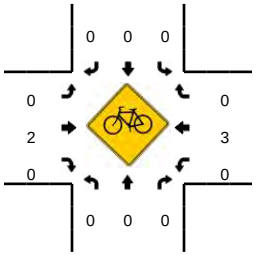


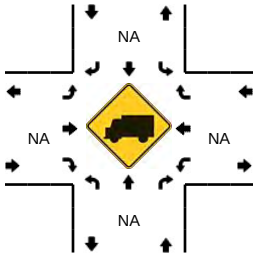


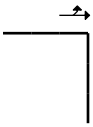
Quality Counts
TRANSPORTATION DATA COLLECTION SERVICES

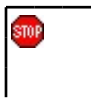


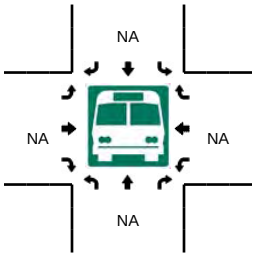












5-Min Count Period Beginning At	NW 32nd Ave (Northbound)				NW 32nd Ave (Southbound)				NW Lower River Rd (Eastbound)				NW Lower River Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	0	0	0	0	1	0	0	0	0	2	0	0	0	15	5	0	23	
6:05 AM	0	0	0	0	0	0	0	0	0	3	0	0	0	20	3	0	26	
6:10 AM	0	0	0	0	0	0	0	0	0	5	0	0	0	22	2	0	29	
6:15 AM	0	0	0	0	0	0	0	0	0	6	0	0	0	23	6	0	35	
6:20 AM	0	0	0	0	4	0	0	0	0	9	0	0	0	22	5	0	40	
6:25 AM	0	0	0	0	2	0	0	0	0	5	0	0	0	18	7	0	32	
6:30 AM	0	0	0	0	0	0	0	0	0	5	0	0	0	26	8	0	39	
6:35 AM	0	0	0	0	2	0	0	0	0	9	0	0	0	18	8	0	37	
6:40 AM	0	0	0	0	0	0	0	0	0	6	0	0	0	24	5	0	35	
6:45 AM	0	0	0	0	2	0	0	0	0	6	0	0	0	31	11	0	50	
6:50 AM	0	0	0	0	0	0	0	0	0	5	0	0	0	30	16	0	51	
6:55 AM	0	0	0	0	2	0	0	0	0	6	0	0	0	14	14	0	36	433
7:00 AM	0	0	0	0	2	0	0	0	0	3	0	0	0	9	10	0	24	434
7:05 AM	0	0	0	0	0	0	0	0	0	16	0	0	0	14	10	0	40	448
7:10 AM	0	0	0	0	1	0	0	0	0	10	0	0	0	11	7	0	29	448
7:15 AM	0	0	0	0	0	0	0	0	0	10	0	0	0	11	14	0	35	448
7:20 AM	0	0	0	0	1	0	0	0	0	5	0	0	0	14	6	0	26	434
7:25 AM	0	0	0	0	3	0	0	0	0	5	0	0	0	13	10	0	31	433
7:30 AM	0	0	0	0	8	0	0	0	0	6	0	0	0	8	9	0	31	425
7:35 AM	0	0	0	0	3	0	0	0	0	9	0	0	0	10	9	0	31	419
7:40 AM	0	0	0	0	3	0	0	0	0	1	0	0	0	11	9	0	24	408
7:45 AM	0	0	0	0	1	0	0	0	0	7	0	0	0	11	12	0	31	389
7:50 AM	0	0	0	0	4	0	0	0	0	3	0	0	0	19	10	0	36	374
7:55 AM	0	0	0	0	4	0	0	0	0	10	0	0	0	13	28	0	55	393

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	16	0	0	0	0	68	0	0	0	300	164	0	548
Heavy Trucks	0	0	0		4	0	0		0	40	0		0	40	0		84
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	1	0		0	1	0		2
Railroad																	
Stopped Buses																	

Comments:

Report generated on 8/31/2018 3:04 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

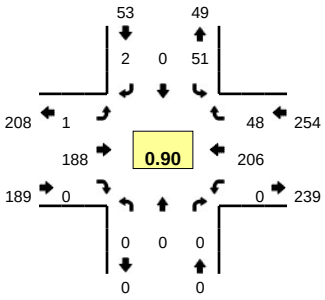
LOCATION: NW 32nd Ave -- NW Lower River Rd

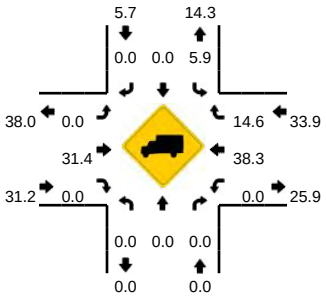
QC JOB #: 14747821

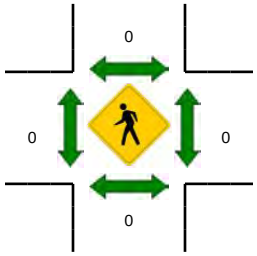
CITY/STATE: Vancouver, WA

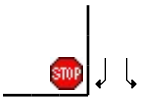
DATE: Tue, Aug 14 2018

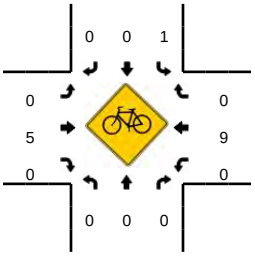
Peak-Hour: 11:55 AM -- 12:55 PM
Peak 15-Min: 12:40 PM -- 12:55 PM

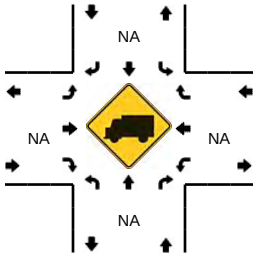


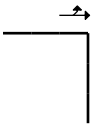


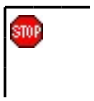


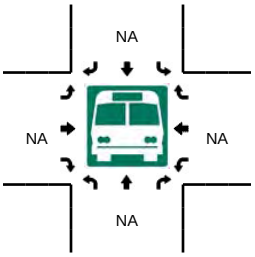












5-Min Count Period Beginning At	NW 32nd Ave (Northbound)				NW 32nd Ave (Southbound)				NW Lower River Rd (Eastbound)				NW Lower River Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
11:00 AM	0	0	0	0	2	0	0	0	0	14	0	0	0	12	1	0	29	
11:05 AM	0	0	0	0	3	0	0	0	0	24	0	0	0	10	0	1	38	
11:10 AM	0	0	0	0	2	0	0	0	0	14	0	0	0	16	2	0	34	
11:15 AM	0	0	0	0	0	0	0	0	0	16	0	0	0	17	0	0	33	
11:20 AM	0	0	0	0	3	0	0	0	0	9	0	0	0	12	0	0	24	
11:25 AM	0	0	0	0	2	0	0	0	0	16	0	0	0	15	1	0	34	
11:30 AM	0	0	0	0	6	0	0	0	0	10	0	0	0	19	2	0	37	
11:35 AM	0	0	0	0	4	0	0	0	0	8	0	0	0	14	2	1	29	
11:40 AM	0	0	0	0	3	0	0	0	0	20	0	0	0	25	2	0	50	
11:45 AM	0	0	0	0	3	0	0	0	0	13	0	0	0	13	2	0	31	
11:50 AM	0	0	0	0	3	0	0	0	0	20	0	0	0	13	3	0	39	
11:55 AM	0	0	0	0	8	0	0	0	0	16	0	0	0	15	1	0	40	418
12:00 PM	0	0	0	0	8	0	0	0	0	23	0	0	0	17	2	0	50	439
12:05 PM	0	0	0	0	7	0	0	0	0	25	0	0	0	13	1	0	46	447
12:10 PM	0	0	0	0	6	0	0	0	0	12	0	0	0	16	6	0	40	453
12:15 PM	0	0	0	0	5	0	0	0	1	10	0	0	0	8	3	0	27	447
12:20 PM	0	0	0	0	3	0	0	0	0	16	0	0	0	23	2	0	44	467
12:25 PM	0	0	0	0	2	0	0	0	0	14	0	0	0	22	4	0	42	475
12:30 PM	0	0	0	0	1	0	0	0	0	13	0	0	0	11	5	0	30	468
12:35 PM	0	0	0	0	4	0	1	0	0	14	0	0	0	15	5	0	39	478
12:40 PM	0	0	0	0	2	0	0	0	0	17	0	0	0	20	3	0	42	470
12:45 PM	0	0	0	0	1	0	1	0	0	19	0	0	0	24	11	0	56	495
12:50 PM	0	0	0	0	4	0	0	0	0	9	0	0	0	22	5	0	40	496
12:55 PM	0	0	0	0	2	0	0	0	0	14	0	0	0	17	5	0	38	494

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	28	0	4	0	0	180	0	0	0	264	76	0	552
Heavy Trucks	0	0	0		4	0	0		0	56	0		0	124	12		196
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	3	0		0	2	0		5
Railroad																	
Stopped Buses																	

Comments:

Report generated on 8/31/2018 3:04 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

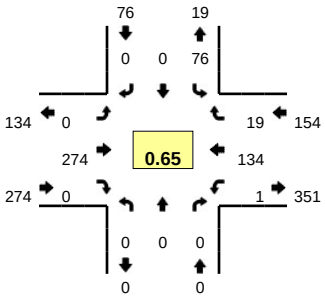
LOCATION: NW 32nd Ave -- NW Lower River Rd

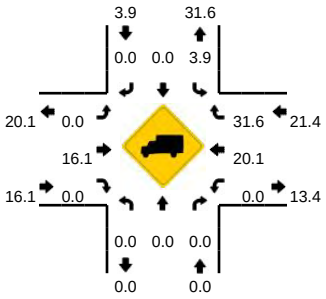
QC JOB #: 14747822

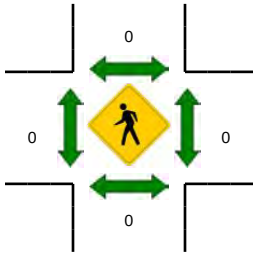
CITY/STATE: Vancouver, WA

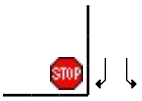
DATE: Tue, Aug 14 2018

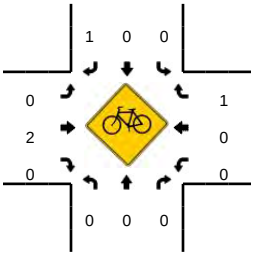
Peak-Hour: 3:25 PM -- 4:25 PM
Peak 15-Min: 4:00 PM -- 4:15 PM

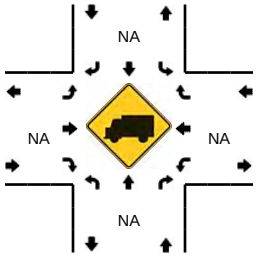


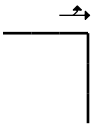


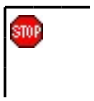


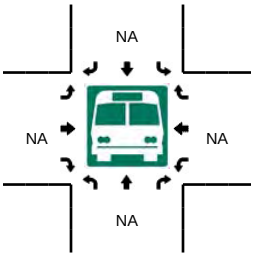












5-Min Count Period Beginning At	NW 32nd Ave (Northbound)				NW 32nd Ave (Southbound)				NW Lower River Rd (Eastbound)				NW Lower River Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	0	0	0	1	0	0	0	0	7	0	0	0	20	4	0	32	
3:05 PM	0	0	0	0	2	0	0	0	0	30	0	0	0	9	2	0	43	
3:10 PM	0	0	0	0	1	0	0	0	0	26	0	0	0	9	0	0	36	
3:15 PM	0	0	0	0	3	0	0	0	0	22	0	0	0	12	0	0	37	
3:20 PM	0	0	0	0	0	0	0	0	0	24	0	0	0	14	0	0	38	
3:25 PM	0	0	0	0	5	0	0	0	0	14	0	0	0	12	3	0	34	
3:30 PM	0	0	0	0	17	0	0	0	0	21	0	0	0	10	1	0	49	
3:35 PM	0	0	0	0	10	0	0	0	0	17	0	0	0	19	1	0	47	
3:40 PM	0	0	0	0	3	0	0	0	0	12	0	0	0	12	2	0	29	
3:45 PM	0	0	0	0	2	0	0	0	0	14	0	0	0	7	0	0	23	
3:50 PM	0	0	0	0	2	0	0	0	0	8	0	0	0	9	2	0	21	
3:55 PM	0	0	0	0	5	0	0	0	0	11	0	0	0	12	1	0	29	418
4:00 PM	0	0	0	0	13	0	0	0	0	22	0	0	0	10	1	0	46	432
4:05 PM	0	0	0	0	7	0	0	0	0	59	0	0	0	15	2	0	83	472
4:10 PM	0	0	0	0	4	0	0	0	0	52	0	0	0	8	0	0	64	500
4:15 PM	0	0	0	0	3	0	0	0	0	21	0	0	0	11	3	0	38	501
4:20 PM	0	0	0	0	5	0	0	0	0	23	0	0	0	9	3	1	41	504
4:25 PM	0	0	0	0	1	0	0	0	0	14	0	0	0	12	2	0	29	499
4:30 PM	0	0	0	0	3	0	0	1	0	13	0	0	0	11	1	0	29	479
4:35 PM	0	0	0	0	3	0	0	1	0	18	0	0	0	7	1	0	30	462
4:40 PM	0	0	0	0	5	0	0	0	0	17	0	0	0	7	0	0	29	462
4:45 PM	0	0	0	0	6	0	0	0	0	12	0	0	0	11	0	0	29	468
4:50 PM	0	0	0	0	3	0	0	0	1	11	0	0	0	8	0	0	23	470
4:55 PM	0	0	0	0	2	0	0	0	0	7	0	0	0	14	1	0	24	465

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	96	0	0	0	0	532	0	0	0	132	12	0	772
Heavy Trucks	0	0	0		0	0	0		0	28	0		0	20	4		52
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	1		0	1	0		0	0	0		2
Railroad																	
Stopped Buses																	

Comments:

Report generated on 8/31/2018 3:04 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Intersection	
Int Delay, s/veh	0.4

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	1	81	251	102	14	1
Future Vol, veh/h	1	81	251	102	14	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	375	500	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	0	49	15	5	29	0
Mvmt Flow	1	99	306	124	17	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	430	0	-	0	407	306
Stage 1	-	-	-	-	306	-
Stage 2	-	-	-	-	101	-
Critical Hdwy	4.1	-	-	-	6.69	6.2
Critical Hdwy Stg 1	-	-	-	-	5.69	-
Critical Hdwy Stg 2	-	-	-	-	5.69	-
Follow-up Hdwy	2.2	-	-	-	3.761	3.3
Pot Cap-1 Maneuver	1140	-	-	-	552	739
Stage 1	-	-	-	-	689	-
Stage 2	-	-	-	-	860	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1140	-	-	-	551	739
Mov Cap-2 Maneuver	-	-	-	-	551	-
Stage 1	-	-	-	-	688	-
Stage 2	-	-	-	-	860	-

Approach	SE	NW	SW
HCM Control Delay, s	0.1	0	11.6
HCM LOS			B

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1140	-	551	739
HCM Lane V/C Ratio	-	-	0.001	-	0.031	0.002
HCM Control Delay (s)	-	-	8.2	0	11.7	9.9
HCM Lane LOS	-	-	A	A	B	A
HCM 95th %tile Q(veh)	-	-	0	-	0.1	0

Intersection	
Int Delay, s/veh	1.3

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	1	188	206	48	51	2
Future Vol, veh/h	1	188	206	48	51	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	375	500	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	31	38	15	6	0
Mvmt Flow	1	209	229	53	57	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	282	0	-	0	440	229
Stage 1	-	-	-	-	229	-
Stage 2	-	-	-	-	211	-
Critical Hdwy	4.1	-	-	-	6.46	6.2
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	2.2	-	-	-	3.554	3.3
Pot Cap-1 Maneuver	1292	-	-	-	567	815
Stage 1	-	-	-	-	800	-
Stage 2	-	-	-	-	815	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1292	-	-	-	566	815
Mov Cap-2 Maneuver	-	-	-	-	566	-
Stage 1	-	-	-	-	799	-
Stage 2	-	-	-	-	815	-

Approach	SE	NW	SW
HCM Control Delay, s	0	0	12
HCM LOS			B

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1292	-	566	815
HCM Lane V/C Ratio	-	-	0.001	-	0.1	0.003
HCM Control Delay (s)	-	-	7.8	0	12.1	9.4
HCM Lane LOS	-	-	A	A	B	A
HCM 95th %tile Q(veh)	-	-	0	-	0.3	0

Intersection	
Int Delay, s/veh	2.1

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	1	274	134	19	76	1
Future Vol, veh/h	1	274	134	19	76	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	375	500	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	75	75	75	75	75	75
Heavy Vehicles, %	0	16	20	32	4	0
Mvmt Flow	1	365	179	25	101	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	204	0	-	0	546	179
Stage 1	-	-	-	-	179	-
Stage 2	-	-	-	-	367	-
Critical Hdwy	4.1	-	-	-	6.44	6.2
Critical Hdwy Stg 1	-	-	-	-	5.44	-
Critical Hdwy Stg 2	-	-	-	-	5.44	-
Follow-up Hdwy	2.2	-	-	-	3.536	3.3
Pot Cap-1 Maneuver	1380	-	-	-	495	869
Stage 1	-	-	-	-	847	-
Stage 2	-	-	-	-	696	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1380	-	-	-	495	869
Mov Cap-2 Maneuver	-	-	-	-	495	-
Stage 1	-	-	-	-	846	-
Stage 2	-	-	-	-	696	-

Approach	SE	NW	SW
HCM Control Delay, s	0	0	14
HCM LOS			B

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1380	-	495	869
HCM Lane V/C Ratio	-	-	0.001	-	0.205	0.002
HCM Control Delay (s)	-	-	7.6	0	14.1	9.1
HCM Lane LOS	-	-	A	A	B	A
HCM 95th %tile Q(veh)	-	-	0	-	0.8	0

Preliminary Signal Warrant Analysis
Lower River Road/32nd Avenue

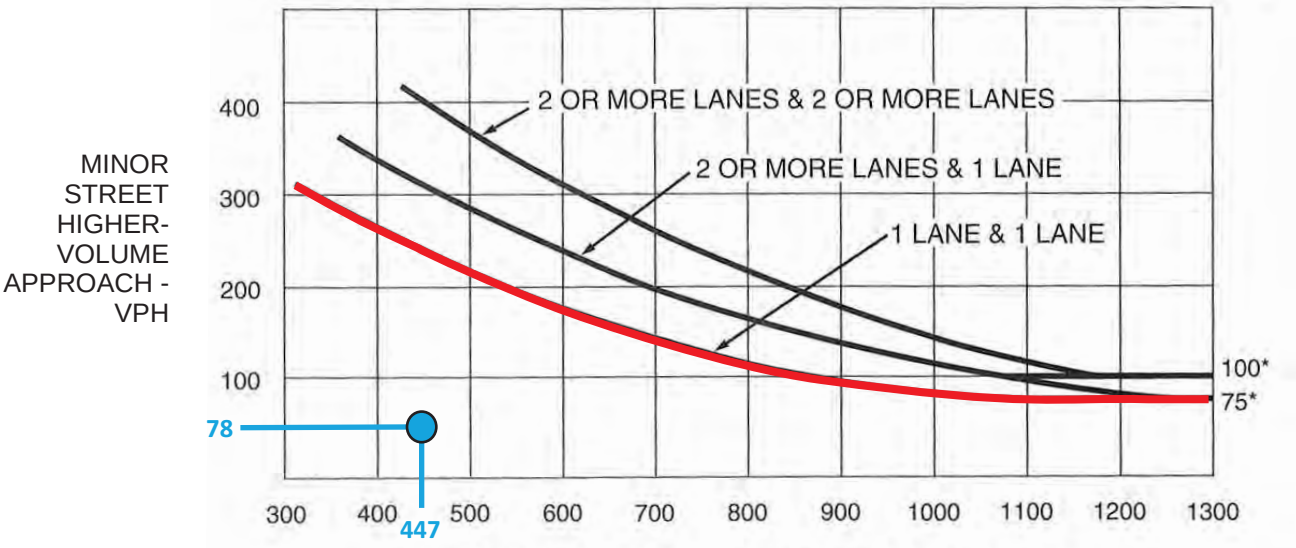
70% Reduction based on major street speed exceeding 40 mph

Lower River Road/32nd Avenue Location							
Preliminary Signal Warrant Analysis							
	Existing 2018			Warrant 1: 8-Hour Vehicular Volume Condition A Minimum Volume Warrants	Warrant 1: 8-Hour Vehicular Volume Condition B Minimum Volume Warrants	Warrant 2: 4-Hour Vehicular Volume	Warrant 3: Peak Hour Vehicular Volume
	Peak Hour (VPH)	4th Hour (VPH)	8th Hour (VPH)				
Lower River Road	**TMC**	**TMC**	**TMC**				
Eastbound	187	180	97				
Westbound	260	199	186			See Table 4C-2	See Table 4C-4
Total Both Approaches	**447**	**379**	**283**	**350**	**525**		
32nd Avenue							
Southbound (North Approach)	**47**	**47**	**13**	**105**	**53**	See Table 4C-2	See Table 4C-4
	Minimum Volume Warrants Satisfied:			**No**	**No**	**No**	**No**

SCJ ALLIANCE
CONSULTING SERVICES

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

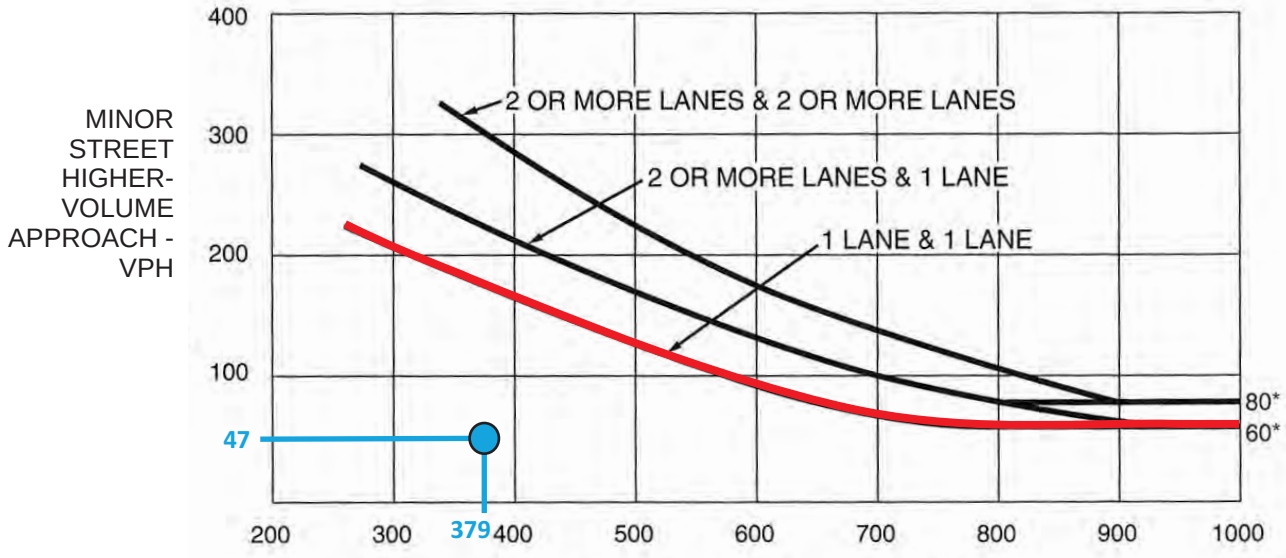
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

LEGEND

Existing 2018

SOURCE: Manual on Uniform Traffic Control Devices (MUTCD), 2009 Edition