# AN EVALUATION OF BICYCLE SAFETY IMPACTS OF SEATTLE'S COMMERCIAL VEHICLE LOAD ZONES

## FINAL PROJECT REPORT

by

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**16. Abstract**

The Seattle Department of Transportation (SDOT) partnered with the University of Washington to explore how commercial vehicle parking in Seattle's downtown area affects the safety of bicyclists. The hypothesis was that increased truck access to SDOT's commercial vehicle loading zones (CVLZs) can positively contribute to bicycle safety. Because CVLZs provide truck drivers with more access to legal parking, their presence could reduce incidences of trucks parking illegally in the street or blocking bicycle lanes, thus reducing the necessity for bicyclists to maneuver around them. This research explored this hypothesis by using four methods, an analysis of bike-trucks accident data, interviews with bicyclists and truck drivers who frequently travel in downtown Seattle, analysis of video recordings of cyclists riding downtown, and observations of truck loading/unloading operations downtown.

The research determined that from bicyclists' perspectives, illegally parked trucks were a more serious problem than the locations of CVLZs. Therefore, increasing the availability of legal truck parking should have a positive effect on bicyclist safety and level of stress. When trucks park in the bike lane, cyclists are required to maneuver into the stream of traffic, increasing level of exposure and accident risk. Similarly, both the cyclist interviews and video data indicated that construction sites are problematic locations for illegally parked trucks blocking cyclist travel lanes. Better enforcement of parking regulations near construction sites and better site planning would help alleviate a significant amount of conflict between cyclists and parked trucks.

Loading zones on higher speed or busy streets or in areas where cyclists travel downhill increase the danger of those areas. In some areas, it may be possible to relocate loading zones around the corner, onto less busy side streets, to eliminate the need for cyclists to choose between merging into a busy lane to pass a truck or passing close enough to the truck that the delivery operations may put obstacles in the bicyclist's path. If loading zones are moved, the zones should be situated at the beginning of the block and should allow drivers to still reach the businesses they are serving quickly and without having to maneuver or cross a street. This will encourage the use of the loading zone as opposed to illegal parking.

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## List of Abbreviations

PacTrans: Pacific Northwest Transportation Consortium

SDOT: Seattle Department of Transportation

CVLZ: Commercial Vehicle Loading Zones

# Acknowledgments

Special thanks to the Cascade Bicycle Club, Charlie's Produce, the truckers and bicyclists who participated in interviews and surveys, and all others who were able to assist with this research.

# Executive Summary

The Seattle Department of Transportation (SDOT) partnered with the University of Washington to explore how commercial vehicle parking in Seattle's downtown area affects the safety of bicyclists. The hypothesis was that increased truck access to SDOT's commercial vehicle loading zones (CVLZs) can positively contribute to bicycle safety. Because CVLZs provide truck drivers with more access to legal parking, their presence could reduce incidences of trucks parking illegally in the street or blocking bicycle lanes, thus reducing the necessity for bicyclists to maneuver around them. However, CVLZs may also negatively affect bicycle safety by increasing the frequency with which trucks cross bicycle lanes to enter or exit loading zones.

This research explored this hypothesis by using four methods:

- an analysis of bike-trucks accident data
- interviews with bicyclists and truck drivers who frequently travel in downtown Seattle
- analysis of video recordings of cyclists riding downtown
- observations of truck loading/unloading operations downtown.

The research determined that from bicyclists' perspectives, illegally parked trucks were a more serious problem than the locations of CVLZs. Cyclists participating in the study easily avoided legally parked trucks. While trucks entering and exiting loading zones may pose more of a hazard to cyclists, this type of conflict was not observed during this study, suggesting that it is infrequent. The process of parking a truck, whether legally or illegally, likely poses similar hazards to cyclists, and interviews with truckers, as well as observation of loading and unloading, showed that truck drivers will park near the businesses they serve regardless of the availability of legal parking.

Therefore, increasing the availability of legal truck parking should have a positive effect on bicyclist safety and level of stress. When trucks park in the bike lane, cyclists are required to maneuver into the stream of traffic, increasing level of exposure and accident risk. These are the conditions that bicyclists in this research reported to be most difficult, particularly at higher travel speeds. In addition, even though most fatal incidents occur at intersections, bicyclists indicated that it is the roadway between intersections, rather than intersections, that are more problematic.

Similarly, both the cyclist interviews and video data indicated that construction sites are problematic locations for illegally parked trucks blocking cyclist travel lanes. Better enforcement of parking regulations near construction sites and better site planning would help alleviate a significant amount of conflict between cyclists and parked trucks.

Loading zones on higher speed or busy streets or in areas where cyclists travel downhill increase the danger of those areas. In some areas, it may be possible to relocate loading zones around the corner, onto less busy side streets, to eliminate the need for cyclists to choose between merging into a busy lane to pass a truck or passing close enough to the truck that the delivery operations may put obstacles in the bicyclist's path. If loading zones are moved, the zones should be situated at the beginning of the block and should allow drivers to still reach the businesses they are serving quickly and without having to maneuver or cross a street. This will encourage the use of the loading zone as opposed to illegal parking.

Ensuring that loading zones fit the needs of delivery drivers is an essential part of reducing illegal parking and increasing safety for cyclists. Implementing value pricing to better manage parking availability, together with increased enforcement to prevent non-commercial vehicles from parking in CVLZs, could help provide more effective legal parking options for drivers.

The next step for research in this field will be use of simulators and instrumented bikes to gather enough data to fully understand bicyclists' behavior and to provide realistic models of unsafe traffic situations and conflicts between cyclists and trucks. This information can then be used for educational purposes and to contribute to overall road safety.

# Chapter 1 Introduction

The City of Seattle actively promotes increasing bicycling mode share. According to Seattle Department of Transportation (SDOT) Traffic Reports, between 2013 and 2014 mode share for biking in Seattle increased by 1 percent (see fig. 1.1) (SDOT 2015a). Concurrently, the city is trying to improve bicycle safety (SDOT 2015d). Several well-reported bicyclist fatalities due to collisions with trucks in downtown Seattle have underscored the need to evaluate bike-truck safety.

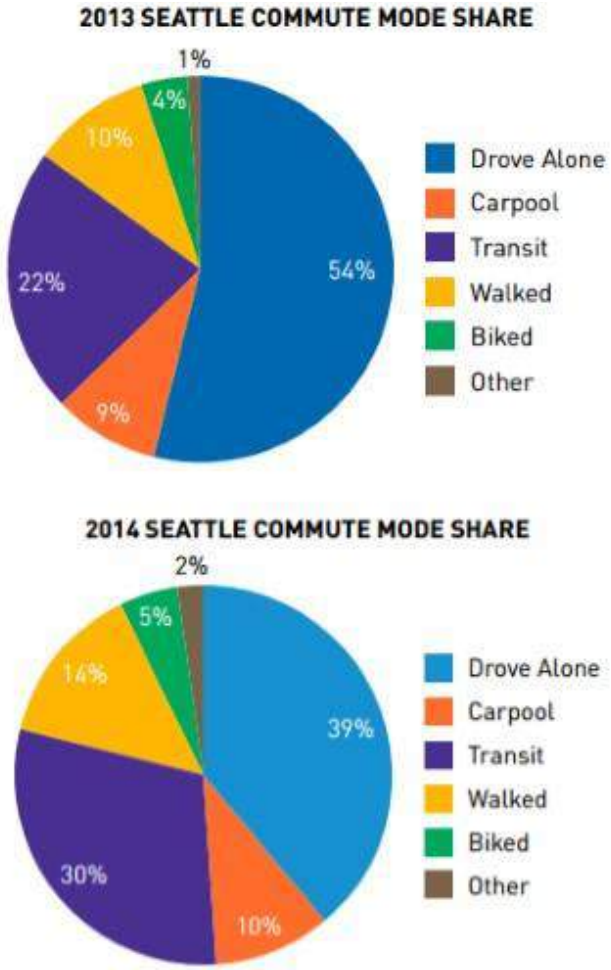


**Figure 1.1** 2013 and 2014 mode share in Seattle (SDOT 2015a)

Biking is an important part of Seattle's transportation system, but it is challenging to estimate bicyclists' population. The main sources of information are automated, permanent bicycle counters at ten locations, multiday short counts, and regular spot counts at 50 intersections (SDOT 2015a). For example, the Fremont bridge permanent bicycle counter provides data from one of the busiest bicycle routes in Seattle, connecting the Fremont district and northern neighborhoods with downtown Seattle (see fig. 1.2). The route accommodates over 100,000 bicyclists per month in the summer.

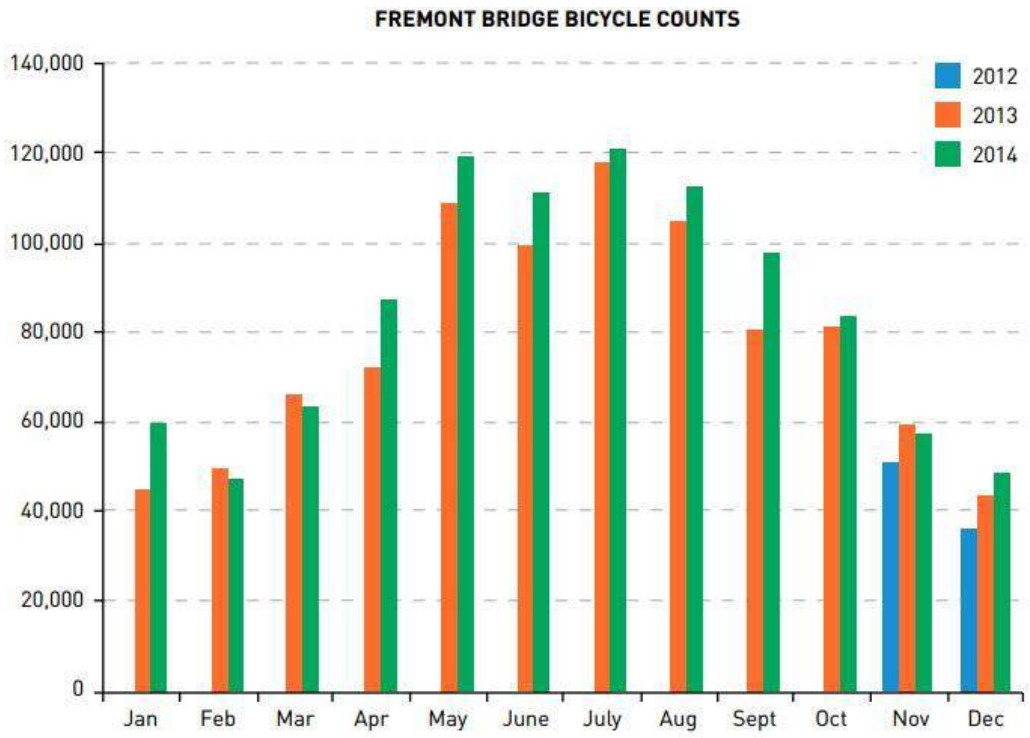


**Figure 1.2** Fremont Bridge bicycle counts (SDOT 2015a)

According to the U.S. Census Bureau, Seattle's population grew by 9.8 percent from 2010 to 2014 (U.S. Census 2015). All urban areas require freight service, and the growth of the city is causing increased demand for freight in the downtown area. SDOT has noted that 12

percent of all of Seattle's streets are major truck arterials (SDOT 2015c), but this percentage is higher in downtown Seattle, which means that bicyclists and trucks operate closely together.

SDOT partnered with the University of Washington to study how commercial vehicle (truck) parking in the downtown area affects the safety of non-motorized users, with an emphasis on bicyclists. The hypothesis was that increased access to commercial vehicle loading zones (CVLZs) in Seattle, because of more efficient use of these zones, may either

1. positively contribute to bicycle safety by providing drivers with more access to legal parking, thereby reducing the number of incidences of trucks parked illegally in the street or blocking bicycle lanes and requiring bicyclists to maneuver around them, or
2. negatively affect bicycle safety by increasing the frequency with which trucks cross bicycle lanes to enter or exit loading zones.

A CVLZ is curb space that is restricted to provide "a special parking space for service delivery vehicles to stop" (SDOT 2015b). Approximately 500 CVLZs are designated throughout the city, with an estimated 150 CVLZs in downtown Seattle (City of Seattle 2016). These zones require use of permits or meters and have signage limiting access (see fig. 1.3).


**Figure 1.3** SDOT's commercial vehicle loading zones signage (Source SDOT 2015b)

This research project explored the impacts of CVLZs on bicyclists by using four methods:

- analysis of bike trucks accident data
- interviews with bicyclists and truck drivers that frequent downtown Seattle
- analysis of video recordings of cyclists riding downtown and
- observations of truck loading/unloading operations in downtown Seattle.

This information was collected to allow researchers to identify conditions that may be linked to unsafe conditions for bicyclists.

# Chapter 2 Background and Literature Review

Under current City of Seattle rules, commercial drivers can obtain a permit to park in designated commercial vehicle loading zones. However, a recent study by SDOT showed that 40 percent of vehicles using CVLZs were not legally eligible to park there (SDOT 2014). A map of CVLZs in the Seattle downtown area is shown in figure 2.1.

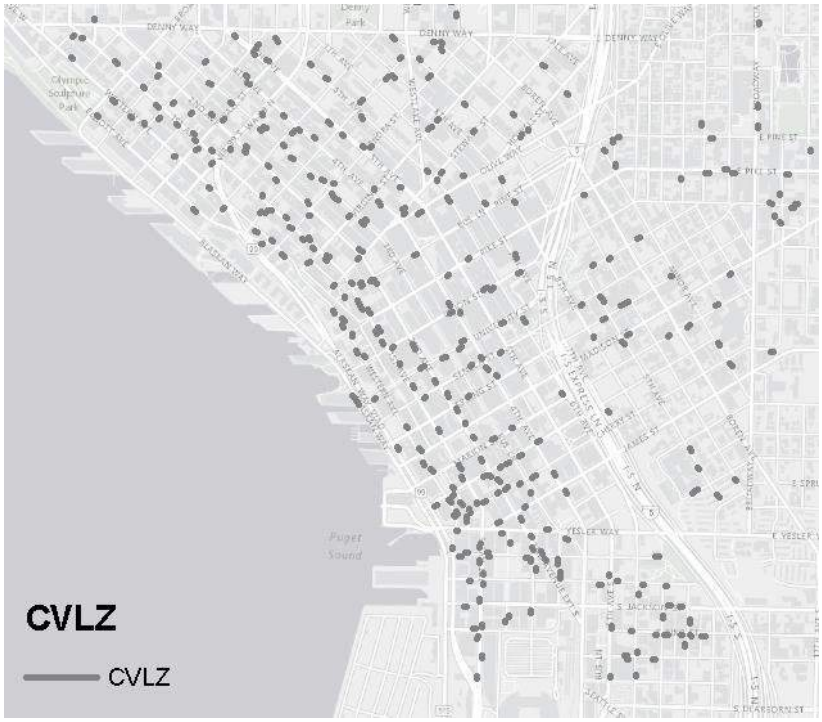


**Figure 2.1** CVLZ parking areas in downtown Seattle

Trucks can cause safety issues simply because most trucks are wider than cars and may protrude into bicycle or other travel lanes even when they are parked legally. Additionally, limited parking options, as well as incidences of non-commercial vehicles in CVLZs and other truck loading/unloading facilities, can cause truck drivers to choose to park illegally, which can block bicycle or other travel lanes used by cyclists.

A comparison to a map of Seattle bicycle routes shows that many of the city's CVLZs are on marked bicycle routes in the downtown area (see fig. 2.2).


**Figure 2.2** CVLZs that intersect with bicycle lanes

Previous research on Seattle truckers by Pivo et al (2002) in "Learning from Truckers" explored the issues that Seattle truck drivers face when working in Seattle, including concerns regarding parking and loading/unloading. The study used focus groups to identify the issues that truckers felt were important. Truckers identified problems that included loading zones that were

too short to accommodate truck lengths, loading zones not located at the beginning of blocks, loading zones being used by vehicles other than trucks, and loading zone time limits insufficient to allow drivers to complete loading and unloading.

A more recent study by Conway et al (2013) investigated conflicts between commercial vehicle parking and bicycles in New York City. Several blocks were observed, and conflict rates between bicyclists and trucks were calculated for different neighborhoods, retail densities, and bicycle lane configurations. The lane configurations observed included a standard bicycle lane to the left of parking curb space, bicycle lanes to the left of curb space with a striped buffer zone between the bicycle lane and the vehicle travel lane, and bicycle lanes between curb-parked vehicles and the sidewalk. All these lane configurations are used in Seattle. In the NYC study, lanes between parking and the sidewalk had the lowest incidence of conflict between cyclists and trucks, while buffered lanes between parking and travel lanes had the highest. The authors speculated that the buffered bicycle lanes may be more attractive to truckers, who double park there because the buffer zone enables them to protrude less far into other travel lanes.

# Chapter 3 Bicycle-Truck Accidents

This study initially investigated available bicycle accident data from the City of Seattle to evaluate the scale of bike-truck accidents. These data come from Seattle Police Department accident reports and are maintained by the Seattle Department of Transportation. The data used for this study were from December 1, 2004, to April 8, 2014 (the latest available).

During this period, 75 bicycle-truck accidents, including three fatalities and ten serious injuries, occurred. The fatality rate for bicycle-truck accidents was 4 percent, and the serious injury rate was 13 percent. (Note that the widely reported incident in which a bicyclist was killed by a truck on 2nd Avenue on August 29, 2014, was not included in these statistics.) In comparison, the rate of fatalities for all Seattle roadway bicycle accidents during the study period was 0.4 percent, and the serious injury rate was 7.6 percent, indicating that bike-truck accidents are more severe. Bicycle-truck accidents made up 2 percent of all bicycle accidents. In addition, alcohol was indicated as a factor in one of the 75 accidents. Speeding was not indicated as a factor in any of the 75 accidents.

Because of the relatively small number of accidents and the geographical dispersion of the accidents, it was not possible to identify whether CVLZs were correlated to bicycle-truck accidents.

Because there are many bike lanes in downtown, many of accidents occurred in bicycle lanes (including on-street bicycle lanes, bike boulevards, multi-use trails, and sharrow-marked bicycle lanes on the uphill side of the street). Figure 3.1 shows the locations of bike facilities and bicycle-truck accidents between 2004 and 2014.

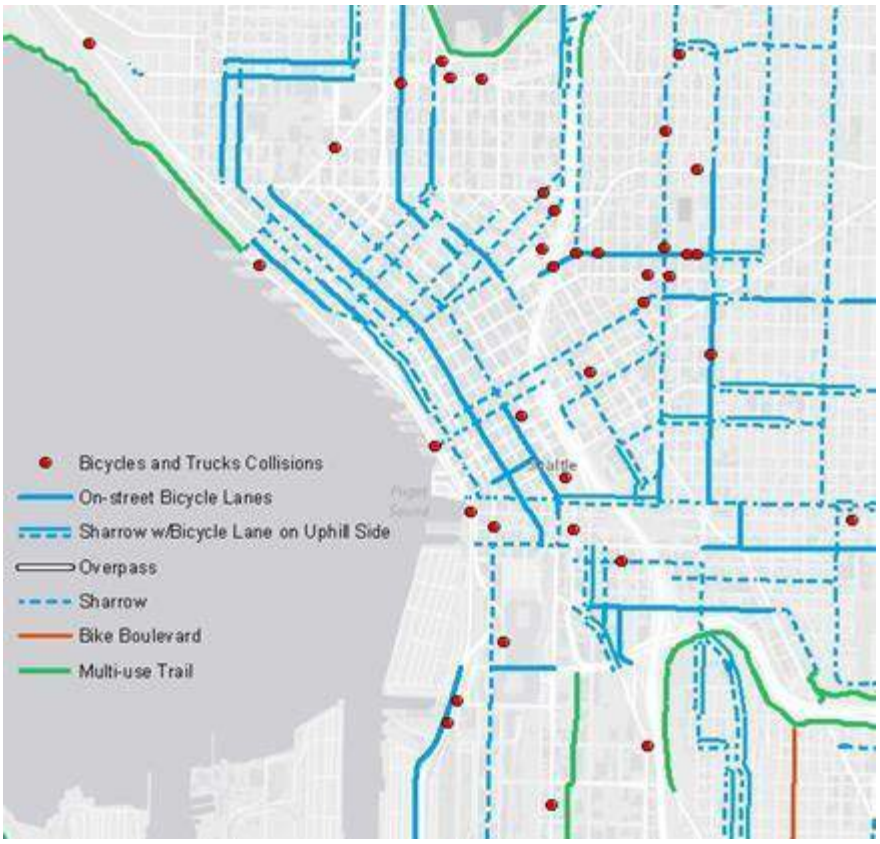


**Figure 3.1** Bicycle lanes and bicycle-truck accidents (2004 to 2014)

Two of the three fatalities, as well as many injury accidents, also occurred in on-street bicycle lanes (see fig. 3.2).

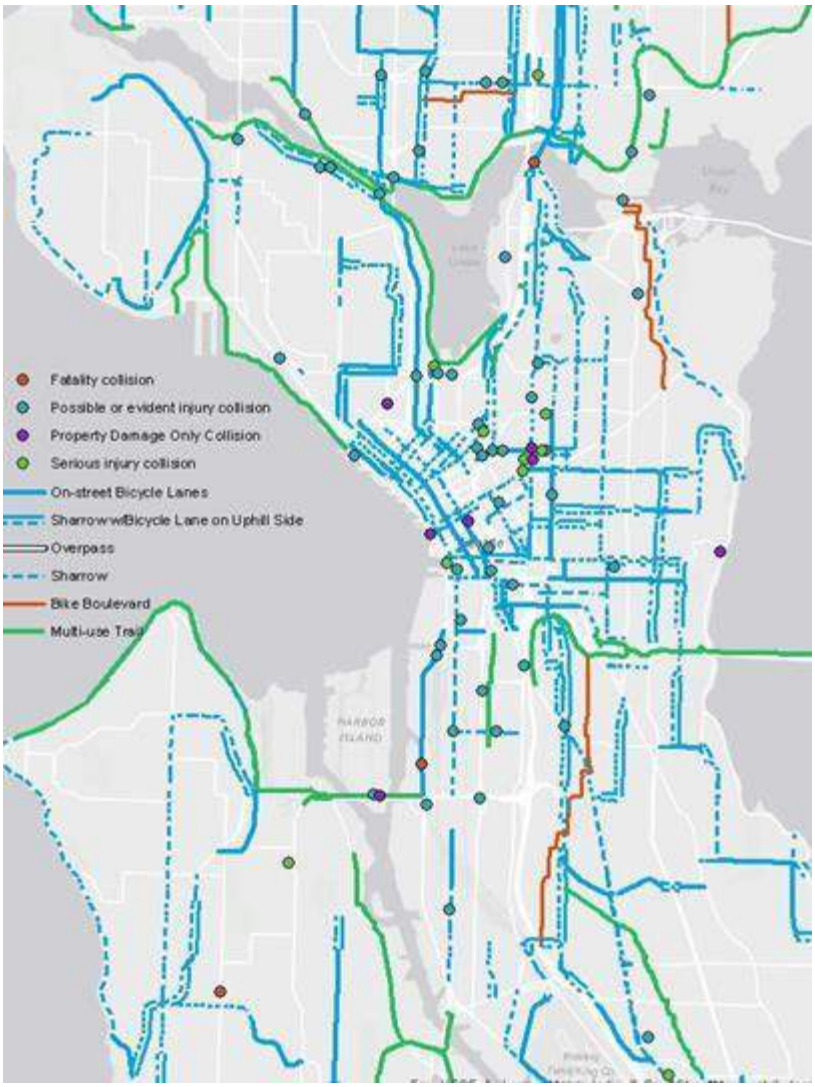


**Figure 3.2** Locations and severities of bicycle- truck accidents in Seattle

As seen in Figure 3.3, three of the 75 collisions occurred on streets defined as major truck routes by SDOT (2015c).


**Figure 3.3** Bicycle-truck accidents and major truck routes

Twelve of the 75 bike and truck collisions occurred in the downtown area where many CVLZs are located, but no fatal injuries occurred in that area during the study period (see fig. 3.4).


**Figure 3.4** Bicycle and truck collision map of downtown of Seattle

The majority of the accidents occurred at intersections or were intersection related (83 percent). Of the rest, 9 percent were related to driveways, and 8 percent were in mid-block segments (see fig. 3.5). All three fatal accidents during the study period occurred in intersections. Of the intersection accidents, 55 percent occurred at signalized intersections (see fig. 3.6).

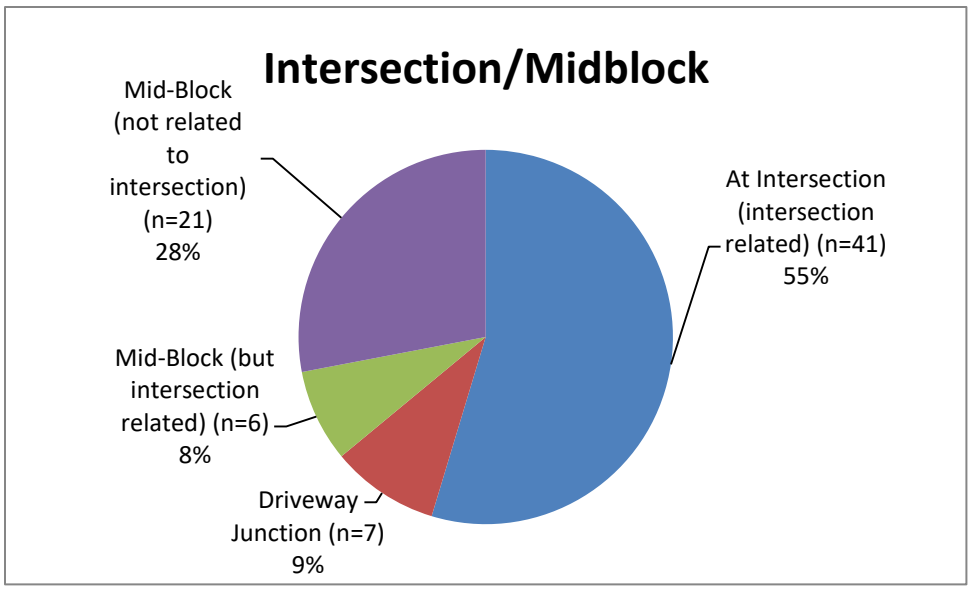


**Figure 3.5** Collision location

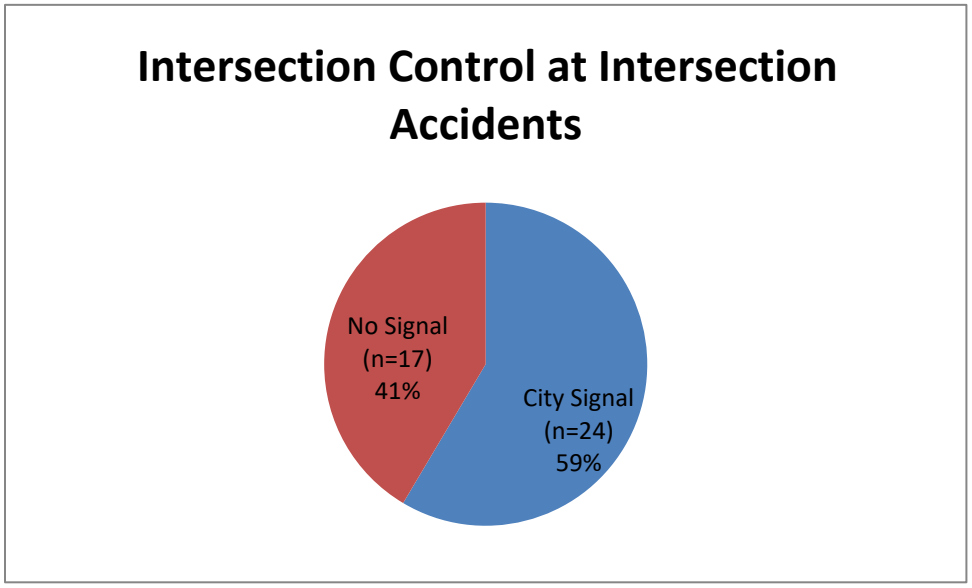


**Figure 3.6** Number of collisions at signalized intersection versus unsignalized intersections

Most accidents (78 percent) occurred on dry pavement. As for lighting, 87 percent of accidents occurred during daylight; 8 percent occurred under dark conditions with street lights; and 5 percent occurred at dusk, dawn, or under unknown lighting conditions.

Because of the small number of accidents overall and the lack of detail provided in the accident reports, it was difficult to draw definitive conclusions from the accident data. In particular, information about how accidents between bicycles and trucks occurred was very limited or unavailable. Another limiting issue was that a bicyclist attempting to maneuver around a parked truck (either legally or illegally parked) could be struck by a car, and the incident would not be recorded as a bicycle-truck accident despite the role the truck played. In addition, the crash locations as reported by the police at the scene may not have been inaccurate.

# Chapter 4 Bicyclist Interviews

Six bicyclists were interviewed for this project. Each bicycled in downtown Seattle at least once per week for commute purposes. All of them self-identified as frequent riders and felt confident on the road with other modes of transport. The bicyclists were asked background questions that covered typical commuting times and routes, as well as questions focused on perceived safety around trucks, frequency of interaction with parked or moving trucks, and problem areas for cyclists interacting with parked trucks. The questionnaire used to interview bicyclists is in Appendix A.

The bicyclists indicated that their major concerns were as follows:

- passing parked trucks when traveling downtown
- passing trucks illegally parked in bike lanes
- trucks parked illegal near construction sites.

Participants indicated that they rode past many parked trucks when they rode in downtown Seattle. One noted, “Every time I ride there is a truck of some sort, delivery truck, bus, lots of trucks.” For the most part, bicyclists did not see trucks as a specific safety concern. Participants identified Eastlake and Dexter, the two major bicycle routes going into downtown from the north side of Seattle, as the areas where they experienced the most conflict with parked trucks. More specifically, they identified widely parked or double-parked trucks on Eastlake near Aloha as an issue, and trucks parked in the Dexter bicycle lane, particularly south of Highland Drive. They listed 1$^{st}$ Avenue and 4$^{th}$ Avenue as streets within downtown where cyclists were most likely to encounter parked trucks that could be problematic. Participants also indicated that trucks were frequently encountered near construction sites, and that these trucks were often parked illegally and blocked cyclists’ travel way.

Participants further indicated that passing parked trucks near or in the bicycle travel way seemed more hazardous when they were traveling downhill because higher travel speeds gave them less time to react and evade trucks. In particular, they noted the greater consequences of hitting an opening door or other part of the truck when travelling at a higher speed. Participants also indicated that higher vehicle speeds or greater traffic volumes on the street increased the difficulty of passing a truck that was close to or blocking the bicycle travel way. Figure 4.1 shows the routes in downtown Seattle that bicyclists noted as a concern.


**Figure 4.1** Areas of concern to bicyclists

Table 4.1 presents comments made by the bicyclists participating in the study.

**Table 4.1** Bicyclist issues and comments

| Issue | Bicyclists Comments |
|---|---|
| Riding through construction sites | "By construction zones, big trailer went to turn and was so big that would've killed me if I hadn't gotten out of the way."<br><br>"Next to construction sites, definitely. Today on 2nd between Stewart and Pine." (talking about the most trouble with parked (or parking) trucks)<br><br>"How often do you experience a problem with a parked (or parking) truck? - Twice a week. Almost every day because of construction zone on 2nd Ave." |
| Trucks blocking bike lanes | "…the truck is too wide for the parking lane…"<br><br>"Occasionally (trucks) parked in a bike lane on Dexter, have to leave bike lane to get into traffic" |

The overall results of bicyclists' interviews and video analysis suggest that the need to pass trucks puts riders in potentially unsafe conditions. This need to maneuver away from trucks results in higher levels of concern.

# Chapter 5 Truck Driver Interviews

At the start of this project a truck driver and trucking company safety manager were interviewed at length to obtain the trucking industry's perspective on bike-truck interactions. In addition, ten truck drivers filled in questionnaires asking about safety and mobility concerns in downtown Seattle. The questionnaire asked about how often the drivers delivered in downtown, safety concerns with loading/unloading, safety problems experienced when working around cyclists and pedestrians, the difficulty of finding parking, and areas where it is most difficult to find parking. The questionnaire is in Appendix B.

Despite asking for help at the SDOT Freight Advisory Board meeting, working with the Washington Trucking Associations, and contacting truckers who had participated in other UW research projects, the project team was not successful at recruiting more truck driver participants.

Truck drivers from Charlie's Produce took part in both the interview and survey. Charlie's Produce is a wholesale distributor of produce and grocery items and has an active presence in downtown Seattle. It operates deliveries from 4:00 am to 3:00 pm, and to keep up with demand, it recently began operating at 4:00 am instead of 5:00 am, with half of all deliveries completed by 11:00 am.

## Parking and Loading Zones

Participants indicated that finding parking was a major challenge every time a delivery had to be made in downtown Seattle. They reported that the difficulty of finding parking was more dependent on congestion and business activity than on a particular area. However, 1st Avenue was identified as an area where parking was difficult (figure 5.1). Drivers indicated that CVLZs were sometimes difficult to use because of their design. CVLZs at the ends of blocks were identified as the best because they allow drivers to pull into the loading zone without

backing up or parallel parking. CVLZs located at other points in the block were described as much more difficult to use. Drivers also indicated that passenger cars parked in loading zones were a frequent problem. Finally, drivers noted that if CVLZs or other loading/unloading facilities were too far from the location being serviced, they were likely to park illegally just to be closer to the location.


**Figure 5.1** Areas of truck drivers' concerns

Eight participants indicated safety concerns when parking. Table 5.1 summarizes their responses.

**Table 5.1** Common safety issues indicated by truck drivers

| Safety concern | Participants comments |
|---|---|
| Limited size of loading zones. | "Load zones aren't big enough. No room for big deliveries."<br><br>"Truck zone park area too small"<br><br>"Not enough loading zones, or large enough loading zones for trucks only" |
| Usage of loading zones by private cars | "People parking in loading zones without a permit."<br><br>"People parking cars in loading zones for trucks." |
| Cars parking too close behind the trucks | "When driver unloading some people drive car parking behind truck"<br>"Cars parking too close to allow loading and unloading." |
| Low hanging objects | "Low hanging objects…"<br><br>"Low hanging wires and tree branches along roadways" |

Bicyclists and Pedestrians

The truck driver and trucking company safety manager initially contacted indicated that bicyclists and pedestrians are not a major safety concern for drivers. They indicated that the biggest problem with bicyclists are those who behave unpredictably.

Five of the ten survey interview participants indicated that they have concerns driving in urban areas. Three participants said that there were not enough loading zones in delivery areas and that roads are not designed for trucks. One driver commented, "Streets are too restricted in width and number of lanes due to bike lanes and SDOT restrictions." Nine of the ten participants indicated that they have safety concerns with cyclists. Most of the comments were about careless cyclists and those who do not follow road rules. Comments included the following:

- "Careless cyclists not looking out for cars and pulling out in front them"

- “They (bicyclists) don’t care about life and want to be hit by cars”
- “Not paying attention to laws of the roadway” (about bicyclists)
- “Bicyclists have little or no regard for traffic lanes. They weave in and out of traffic. Therefore, cyclists feel and behave as though they can do whatever they want.”
- “I see bicycles cut off trucks without warning. Ride in front of trucks in Capitol Hill.”
- “Most do not follow rules of the road, especially downtown. They try to pass on the left of trucks trying to make left turns and constantly run red lights”
- “I drive downtown every day and see many cyclists. I have never seen one who obeys the rules of the road! Running red lights, driving between rows of cars, using sidewalks.”

# Chapter 6 Bicyclist Video Observations

The researchers recruited bicyclists commuting through downtown to record videos to help further investigate interactions between bicyclists and trucks loading/unloading. A GoPro camera was used to capture the entire commute, and each video captured two trips through downtown, one in each direction during a round trip. Recorded interactions with trucks were then analyzed for conflict potential and severity.

The severity of the conflicts observed in the videos was ranked with the scale described below. Example pictures of observed conflict severities are shown in figures 6.1 and 6.2.

| | |
|---|---|
| **None** | No truck activity necessitated deviation from the normal path |
| **Low** | Small adjustments in the travel path may be necessary, and more than 3 seconds are available to anticipate needed changes |
| **Medium** | Evasion is necessary within less than 3 seconds, or the cyclist is in danger of being hit as a result of normal loading/unloading activities (opening doors, hand trucks in the street, etc.) |
| **High** | The current path of the cyclist is completely blocked, and less than 1 second of warning requires a complete stop and/or change of direction |
| **Severe** | Immediate evasion is required to avoid collision. |

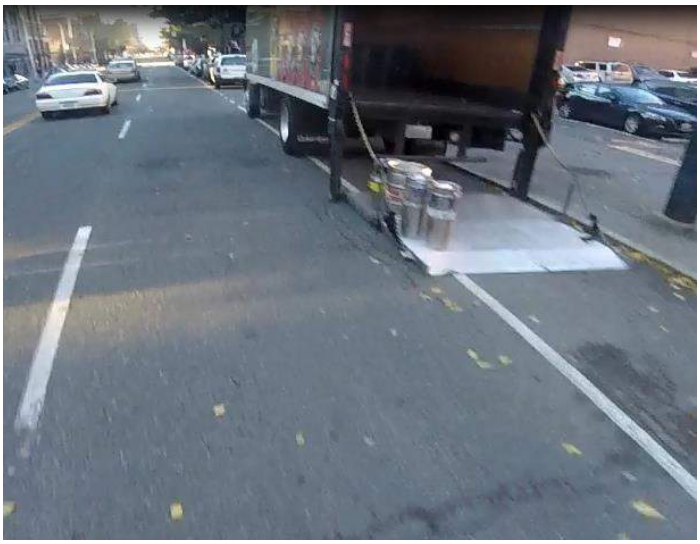

**Figure 6.1** Cyclist passing by loading/unloading operations

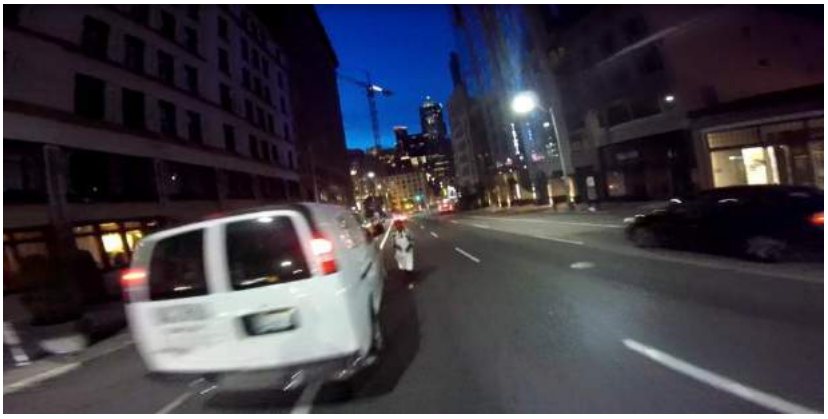

**Figure 6.2** A pickup changing lanes in front of the bicyclist

Of the 11 recorded trips, six were analyzed for conflicts. Within those six trips, 24 conflicts were recorded, and every trip included at least two conflicts. No severe conflicts were recorded (see table 6.1).

**Table 6.1.** Summary of the video analysis

| Conflict Severity | Total Count | Average/Trip |
|---|---|---|
| low | 13 | 2.2 |
| medium | 9 | 1.5 |
| high | 2 | 0.3 |
| severe | 0 | 0.0 |

Both of the high severity conflicts and seven of the nine medium severity conflicts involved illegally parked trucks. Neither of the two high severity conflicts occurred at a construction site, but six of the nine medium severity conflicts occurred at construction sites.

The analysis of these trips suggested that cyclists routinely make significant maneuvers along their routes to avoid conflicts with trucks, putting themselves at increased risk of an accident.

# Chapter 7 Bike-Truck Conflict Observations

In October 2015, seven teams of University of Washington Department of Civil and Environmental Engineering students observed five areas in downtown and one area on Capitol Hill to look for urban freight parking issues and conflicts with bicyclists. The survey areas are shown in Figure 7.1.

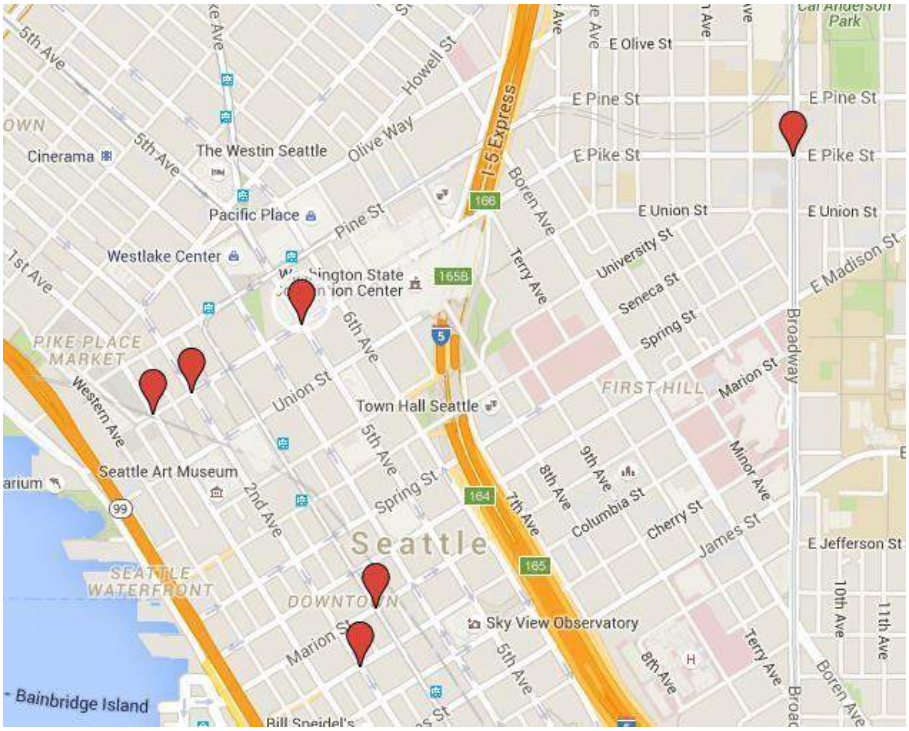


**Figure 7.1** Locations of student team observations

The teams each observed trucks loading and unloading for several hours. Two groups also spoke to drivers who were making deliveries. Table 7.1 provides a summary of the survey findings.

**Table 7.1** Summary of the survey

| Issue | Location and time | Comments |
|---|---|---|
| Truck stopped by a "No parking" sign. | Yesler Way & 1st AVE S<br><br>Morning hours | |
| Truck driver illegally crossing the street | 1st Avenue and Marion Street | Group interviewed two truck drivers |
| to deliver package. | | Noted major challenges faced by them: size of alleyways, pedestrians, bikes and securing the load. |
| Truck was trying to park in an alleyway but the rear wheel got jammed on the road, blocking the traffic | | |
| Trucks drove down the two way protected bike lanes | Pike Street in Capitol Hill | |
| Illegal parking(observed three groups out of seven) | 1st Ave between Pine and Pike<br><br>3rd St, between Marion St. and Colombia St<br><br>Union St (between 5th Ave and 1st Ave), and 1st Ave (between Pike St and University St) | Trucks parked on a bicycle lane and even in the only right turn lane at a crossroads. |
| Numerous trucks and vans parked substantially longer than allowed (Observed by three groups out of seven) | 1st Ave between Pine and Pike<br><br>Union St (between 5th Ave and 1st Ave), and 1st Ave (between Pike St and University St) | Driver noted concerns about parking spaces for loading and unloading, that many available parking spaces have time restrictions, available from 9:00 am to 3:00 pm and from 7:00 pm to 8:00 pm; hence during the 3:00 pm to 7:00 pm time window they had to find free alleys or unrestricted parking zones, which was even more challenging. |

| | | |
|---|---|---|
| Usage of the CVLZ by private cars | 1st Ave between Pine and Pike<br><br>3rd St, between Marion St. and Colombia St | |
| Numerous trucks parked in a passenger zone and obstructing a bike lane. | 2nd Ave and Cherry St | |

Multiple groups observed trucks being unable to park in CVLZs because they were already occupied by other trucks or other vehicles in the zones illegally.

One team noted delivery trucks from a local business driving in a protected bicycle lane at Broadway.

Students frequently observed commercial vehicles occupying loading zones for more time than was permitted by zone regulations. One team spoke with a driver who stated that the maximum allowable time was frequently insufficient to complete deliveries, and that the usual approach to dealing with the insufficient time was to violate the regulations and risk getting a ticket.

Three of the seven teams reported observing trucks parked in bicycle lanes. In addition to blocking bicycle lanes, some groups commented that illegally parked trucks obscured visibility for pedestrians attempting to cross the street. All groups observed trucks parked illegally when legal parking was not available.

# Chapter 8 Study Results

The study initially investigated available bicycle-truck accident data from December 1, 2004, to April 8, 2014, as provided by police reports and SDOT. During that period, 75 bicycle-truck accidents occurred, including three fatalities and ten serious injuries. This is a 4 percent fatality rate for this type of accident and a 13 percent rate for serious injury. The majority of accidents occurred at intersections or were intersection related (83 percent). In addition, 9 percent were related to driveways, and 8 percent were in mid-block segments. Twelve of the 75 bike and truck collisions happened in the downtown Seattle area. No fatal injuries happened in that area during the study period.

Most CVLZs are located mid-block, so collisions are typically not related to CVLZ locations. In addition, because of the relatively small number of accidents and geographical dispersion of the accidents, it was not possible to determine from the available collision data whether CVLZs are correlated to bicycle-truck accidents. It is also possible that a cyclist attempting to maneuver around a parked truck could be struck by a car, but the incident would not be recorded as a bicycle-truck accident despite the role the truck played.

Because of limited data on bicycle and truck accidents, the project collected video taken by cyclists commuting through downtown Seattle to explore bike-truck interactions and to look at possible risks while trucks conducted loading/unloading operations. Six of the recorded trips were analyzed in detail for different levels of conflicts (no conflicts to severe). From those six trips, 24 conflicts were recorded, and every trip included at least two conflicts. Video analysis showed that the bicyclists had to make significant maneuvers along routes to avoid conflicts with trucks, putting themselves at increased risk of injury. No severe conflicts were recorded. Both of the higher severity conflicts and seven of the nine medium severity conflicts involved illegally

parked trucks. Neither of the two high severity conflicts occurred at a construction site, but six of the nine medium severity conflicts occurred at construction sites.

Bicyclist interviews indicated that bicyclists' major concerns were passing parked trucks when traveling downtown, passing trucks illegally parked in bike lanes, and trucks parked illegally near construction sites.

Truck driver interviews indicated that finding parking was a major challenge every time a delivery had to be made downtown. Five of ten survey participants noted that they have concerns driving in urban areas. Three participants said that there are not enough loading zones in delivery areas and that roads are not designed for trucks. Nine of ten participants indicated that they have safety concerns with cyclists, with the most common issues being careless cyclists and cyclists who don't follow road rules.

The most common safety issues of truck drivers included the following:

1. Limited size of loading zones
2. Usage of loading zones by private cars
3. Cars parked too closely behind trucks
4. Low hanging objects.

Several groups of students observed five areas in downtown and one area on Capitol Hill to look for urban freight parking issues and conflicts with bicyclists. Common safety issues observed included the following:

1. A truck stopped by a "No parking" sign
2. A truck driver illegally crossing the street to deliver packages
3. Illegal parking
4. Trucks parked longer than allowed

5. Usage of CVLZs by private cars.

# Chapter 9 Conclusions and Recommendations

From bicyclists' perspectives, illegally parked trucks were a more serious problem than the locations of CVLZs. Cyclists participating in the study easily avoided legally parked trucks. While trucks entering and exiting loading zones may pose more of a hazard to cyclists, this type of conflict was not observed during this study, suggesting that it is infrequent. The process of parking a truck, whether legally or illegally, likely poses similar hazards to cyclists, and interviews with truckers, as well as observation of loading and unloading, showed that truck drivers will park near the businesses they serve regardless of the availability of legal parking.

Increasing the availability of legal truck parking should have a positive effect on bicyclist safety and level of stress because fewer trucks will be illegally parked in the roadway or bicycle lane. When trucks park in the bike lane, cyclists are required to maneuver into the stream of traffic, increasing level of exposure and accident risk. These are the conditions that bicyclists in this research reported to be most difficult, particularly at higher travel speeds. In addition, even though most fatal incidents occur at intersections, bicyclists indicated that it is the roadway between intersections, rather than intersections, that are more problematic.

Similarly, both the cyclist interviews and video data indicated that construction sites are problematic locations for illegally parked trucks blocking cyclist travel lanes. Better enforcement of parking regulations near construction sites and better site planning would help alleviate a significant amount of conflict between cyclists and parked trucks.

Loading zones on busy streets or in areas where cyclists will be going downhill at higher speeds increase the danger of these areas. In some areas, it may be possible to relocate loading zones around a corner onto less busy side streets, eliminating the need for cyclists to choose between merging into a busy lane to pass a truck or passing close enough to a truck that

unloading operations may create an obstacle. If loading zones are moved around the corner, the zones should be at the beginning of the block to allow drivers to reach the businesses quickly, without having to maneuver or cross the street to park. This will encourage the use of the loading zones rather than illegal parking.

If SDOT wishes to address bike-truck safety, then ensuring that loading zones fit the needs of drivers is an essential part of reducing illegal parking and increasing safety for cyclists. Approaches include the following:

- locating CVLZs at the beginning of blocks to reduce the need for trucks to maneuver to park
- avoiding placement of CVLZs on hills used by bicyclist
- increasing enforcement to prevent non-commercial vehicles from parking in CVLZs
- providing more CVLSs as an alternative to illegal parking, and
- better enforcing parking regulations near construction sites.

Given that bike-truck accident data are (thankfully) uncommon, suggested next steps for research in this field include the use of simulators and instrumented bikes to gather the data to fully understand bicyclists' behavior. This approach may provide realistic models of unsafe traffic situations with bicyclists and trucks that can be used for educational purposes, roadway design, and to contribute to overall road safety.

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# Appendix A: Bicyclist Interview

*Bicyclists interview #1.*

Background:

-Where do you normally ride? What for?

S: From home (Ravenna) to work in SLU via Eastlake.

F: From U District to King Street Station. Different route back than to work.

-How often do you ride downtown?

F: 3 to 4 days a week.

S: Once a week, although lately less Project

Specific:

-How often do you interact with trucks during your normal riding?

S: Not very often

F: 3 times per trip

-Where do you have the most trouble with parked (or parking) trucks?

F: Next to construction sites, definitely. Today on 2nd between Stewart and Pine.

S: On Eastlake, at the top of the hill going downtown. Right after Aloha.

-How often do you experience a problem with a parked (or parking) truck?

S: Once every few weeks

F: Twice a week. Almost every day because of construction zone on 2nd.

-Are there areas you avoid because of truck use? F:

The freeway.

S: Try to avoid construction zones. Buses are a bigger issue. No, I don't really need to go anywhere with lots of trucks.

-How safe do you feel riding in areas with truck loading/unloading?

S: Anywhere where it is just one lane with just a shoulder to ride in.

F: Not very safe. (just from construction trucks or other trucks too?) Mostly just construction.

-Are there areas where you feel CVLZs are unsafe for cyclists? Where are they? What makes them unsafe?

S: Spot by Eastlake/Mercer is a little dicey, the truck is too wide for the parking lane. It's not that bad, I've seen worse in the past but don't remember where.

F: Always next to construction zones. Not really a loading zone.

S: By construction zones, big trailer went to turn and was so big that would've killed me if I hadn't gotten out of the way. *Bicyclists interview #2.*

Background:

-Where do you normally ride? What for?

Riding all over the city for errands, work, meetings, sometimes for recreation - How often do you ride downtown?

4 times a week, going through downtown to get somewhere else, or to CBC satellite office

Project Specific:

-How often do you interact with trucks during your normal riding?

Every time I ride there is a truck of some sort, delivery truck, bus, out towards West Seattle or marginal, lots of trucks

-Where do you have the most trouble with parked (or parking) trucks?

Occasionally parked in a bike lane on Dexter, have to leave bike lane to get into traffic

Lots of construction traffic on Dexter, block often. Other trucks often in median or turn lane

-How often do you experience a problem with a parked (or parking) truck?

Long term construction, happens often. Crane type equipment.

Construction projects should take lanes from traffic rather than bike/peds.

-Are there areas you avoid because of truck use?

East marginal way on a weekday – take different route or use a sidewalk. Not worried for myself but worry for other people. "I know what htye can't see but worry about people next to trucks that are turning. Get too close to back of truck, truck can't see them." See a lot of that behavior

Find truck drivers to be pretty courteous, pro drivers, license depends on it.

-Are there areas where you feel CVLZs are unsafe for cyclists? Where are they? What makes them unsafe?

I don't really know of any. Haven't had trouble

-Are there specific areas where you feel improperly parked trucks are a problem or safety concern for you as a cyclist? Where are they? What makes them unsafe?

Dexter, parked in bike lane

# Appendix B: Trucker's Surveys

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Truck Driver Questionnaire

The University of Washington working with the City of Seattle Department of Transportation to research truck parking and safety in downtown Seattle. The goal is to identify safety and mobility concerns that are operational or infrastructure related.

1. Do you have any concerns driving in urban areas?

☐ Yes ☒ No

2. If yes, can you explain?

3. Do you have specific safety concerns with cyclists?

☒ Yes ☐ No

4. If yes, can you explain?

Careless cyclers not looking out for CARS and pulling out infront of them because them dont look

5. What are your safety concerns when parking?

Load Zones arent big enough. no room for big deliveries

*Thank you for your time!*

*Questions? Contact Polina Butrina*
*Research Assistant*
*pbutrina@uw.edu*

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WASHINGTON

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1. Do you have any concerns driving in urban areas?

☐ Yes ☒ No

2. If yes, can you explain?

3. Do you have specific safety concerns with cyclists?

☒ Yes ☐ No

4. If yes, can you explain?

They dont care about life and want to be Hit by cars.

5. What are your safety concerns when parking?

People [redacted] Jay-Walking When Trying to park.
People Parking In loading zones without a permit.

*Thank you for your time!*

*Questions? Contact Polina Butrina*
*Research Assistant*
*pbutrina@uw.edu*

UNIVERSITY OF
WASHINGTON

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1. Do you have any concerns driving in urban areas?

☐ Yes ☑ No

2. If yes, can you explain?

3. Do you have specific safety concerns with cyclists?

☒ Yes ☐ No

4. If yes, can you explain?

Not paying attention to laws of the road way

5. What are your safety concerns when parking?

Not to backing if its not necessary

*Thank you for your time!*

*Questions? Contact Polina Butrina*
*Research Assistant*
*pbutrina@uw.edu*

**UNIVERSITY OF WASHINGTON**

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The University of Washington working with the City of Seattle Department of Transportation to research truck parking and safety in downtown Seattle. The goal is to identify safety and mobility concerns that are operational or infrastructure-related.

1. Do you have any concerns driving in urban areas?

☐ Yes ☒ No

2. If yes, can you explain?

3. Do you have specific safety concerns with cyclists?

☒ Yes ☐ No

4. If yes, can you explain?

Cyclists have Little or No Regard for traffic Laws. They Weave in and out of traffic, there are No Laws that are visibly enforced. Therefore, cyclists feel and behave as though they can do what ever they Want.

5. What are your safety concerns when parking?

None

*Thank you for your time!*

*Questions? Contact Polina Butrina*
*Research Assistant*
*pbutrina@uw.edu*

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1. Do you have any concerns driving in urban areas?

☑ Yes ☐ No

2. If yes, can you explain?

Too many car
Not enough ~~No~~ Truck zone parking

3. Do you have specific safety concerns with cyclists?

☑ Yes ☐ No

4. If yes, can you explain?

I see some bycycle cut off Truck without Warning Ride infron of Truck ~~at~~ in captil Hill

5. What are your safety concerns when parking?

Truck zone park area ~~doesn't~~ Too small space when driver unLoading some Car parking Behine Truck People drived

Thank you for your time!

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1. Do you have any concerns driving in urban areas?

☒ Yes ☐ No

2. If yes, can you explain?

Inattentive pedestrians either looking at their phones or gawking at the scenery.

3. Do you have specific safety concerns with cyclists?

☒ Yes ☐ No

4. If yes, can you explain? Most do not follow rules of the road, especially downtown. They try to pass on the left of trucks trying to make left turns and constantly run red lights

5. What are your safety concerns when parking?

low hanging objects, cars pulling in behind in our blindspot. people walking behind trucks trying to back up

*Thank you for your time!*

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The University of Washington working with the City of Seattle Department of Transportation to research truck parking and safety in downtown Seattle. The goal is to identify safety and mobility concerns that are operational or infrastructure related.

1. Do you have any concerns driving in urban areas?

☒ Yes ☐ No

2. If yes, can you explain?

Not enough loading zones in delivery areas. Streets are too restricted in width and number of lanes due to bike lanes and SDOT restructuring.

3. Do you have specific safety concerns with cyclists?

☒ Yes ☐ No

4. If yes, can you explain?

I drive downtown every day and see many cyclists. I have never seen one who obeys the rules of the road! etal. running red lights, driving between rows of cars, using sidewalks, ....

5. What are your safety concerns when parking?

People parking cars in loading zones for trucks. Cars parking too close to allow loading & unloading. Cars cutting off trucks or following too closely.

*Thank you for your time!*

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1. Do you have any concerns driving in urban areas?

[X] Yes [ ] No

2. If yes, can you explain?

Roads that are not designed for trucks.

3. Do you have specific safety concerns with cyclists?

[X] Yes [ ] No

4. If yes, can you explain?

They shouldn't be riding in the streets.

5. What are your safety concerns when parking?

The public parking in loading zones when they shouldn't be

*Thank you for your time!*

*Questions? Contact Polina Butrina*
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1. Do you have any concerns driving in urban areas?

☐ Yes ☒ No

2. If yes, can you explain?

3. Do you have specific safety concerns with cyclists?

☐ Yes ☒ No

4. If yes, can you explain?

5. What are your safety concerns when parking?

N/A

*Thank you for your time!*

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1. Do you have any concerns driving in urban areas?

☑ Yes ☐ No

2. If yes, can you explain?

Low Hanging WIRES — AND TREE Branches Along ROADWAYS

3. Do you have specific safety concerns with cyclists?

☑ Yes ☐ No

4. If yes, can you explain?

MOST DONT Follow the Bike Lanes THAT THERE ARE OR Follow the Rules OF The Road AS They ARE Suppose, THEY CUT IN AND OUT OF TRAFFIC, Run STOP Lights STOP SIGNS ETC. AND There's NO ENFORCEMENT ON cyclists.

5. What are your safety concerns when parking?

NOT Enough Loading ZONES, OR LARGE Enough Loading ZONES, FOR TRUCKS ONLY NOT public parking FOR their STARBUCK RUNS

*Thank you for your time!*

*Questions? Contact Polina Butrina*
*Research Assistant*
*pbutrina@uw.edu*