DILLON CONSULTING

PORTSTORONTO

Billy Bishop Toronto City Airport

Results of Fall 2015 Traffic and Passenger Surveys

May 2016 — 14-9816

Table of Contents

Tables

Executive Summary

This report documents the results of the mainland traffic and pedestrian surveys undertaken in October 2015 in the vicinity of Billy Bishop Toronto City Airport (BBTCA). These surveys follow up from a similar survey program undertaken in April 2015, and allow for a comparison of operating conditions before and after the opening of the pedestrian tunnel to BBTCA.

The survey program yielded the following data:

- Intersection traffic volumes during the AM and PM peak hours;
- Two-way traffic flows along Eireann Quay;
- The level of compliance with signed turn prohibitions in the vicinity of the airport;
- Variation in the length of northbound queues along Eireann Quay at the Queens Quay intersection;
- Variation in the length of the queue of traffic waiting to board the ferry;
- Ridership on the shuttle traveling between Union Station and the airport;
- Variation in the number of taxis queued in the taxi corral;
- The number of deadheading taxis, including "double deadheading" taxis;
- Vehicle occupancy levels in taxis and private vehicles picking up and dropping off passengers; and
- Calculated modal splits indicating the proportion of passengers using different transportation modes to travel to and from the airport.

The primary difference between the pre- and post-tunnel traffic conditions has been a smoothing of traffic demand and reduced queue lengths along Eireann Quay. Below is a summary of the main findings of the October 2015 survey.

Modal split

(see Section 2.0)

The modal split for trips to and from the airport — the proportion of trips made using the various travel modes — was determined based on observed shuttle usage, auto and taxi pick-ups and drop-offs, pedestrian activity, and parking statistics.

Overall, approximately 35% of trips to the airport and 40% of trips from the airport were made by non-auto modes (the airport shuttle; TTC streetcar service; and pedestrian access):

- The Union Station shuttle bus carries one out of every four to five airport trips (20% of trips to the airport; 27% of trips from the airport);
- Approximately 13% to 15% of trips are other non-vehicular trips (likely most traveling by TTC streetcar and walking between Queens Quay and the airport, but some potentially making the trip entirely by foot or by bicycle).

Overall, approximately 65% of trips to the airport and 60% of trips from the airport were made by auto modes (taxis; private vehicles):

- The greatest percentage of trips are made via taxi (36% of trips to the airport; 49% of trips from the airport);
- Pick-up and drop-off trips make up 22% of trips to the airport and 5% of trips from the airport; and
- Approximately 6% of trips drive to the airport and park in one of the three lots.

When comparing the survey results against the spring 2015 pre-tunnel surveys, the following was noted:

- A decrease in taxi drop-offs, and a corresponding increase in private vehicle drop-offs, potentially related to an increase in the use of Uber and similar services (which would have been indistinguishable from private drop-offs);
- A decrease in shuttle usage, and a corresponding increase in TTC usage, for travel to the airport.
- Continued decrease in the proportion of passengers being picked up in private vehicles (although this may also indicate that pick-ups are occurring in short-term parking facilities rather than in the pick-up / drop-off loop).
- Notwithstanding the variation at the individual mode level, the proportion of automobile-based travel (including taxis) and the proportion of non-auto travel (including shuttle and TTC riders) were only slightly changed for travel to the airport, and were virtually unchanged for travel from the airport.

Peaking of traffic and queues

(see Sections 6.4; 7.1; 3.0)

Before the opening of the tunnel, traffic flows were characterized by periods of lower volume related primarily to drop-offs, with regular surges in traffic flow every 15 to 20 minutes following the arrival of a ferry. The surges in activity would be especially pronounced following ferry trips that accommodated passengers from two or more arriving flights. The Queens Quay and Eireann Quay intersection experienced periods of queuing and congestion following the arrival of a ferry, followed by a "recovery" period to allow queues to dissipate before the arrival of the next ferry. Queues on northbound Eireann Quay regularly reached 10 vehicles in length during the morning peak, and 15 to 18 vehicles during the afternoon peak.

With the opening of the tunnel, the flow of passengers arriving on the mainland is better dispersed rather than concentrated into surges. The flow of taxis and other vehicles associated with passenger pick-up has similarly been better dispersed. Although the traffic flows and queues along Eireann Quay still experience some variation associated with the flight schedule, the variation is much more moderate and the northbound queues were observed to be

substantially reduced compared to conditions observed in spring 2015. Queues on northbound Eireann Quay were rarely observed to exceed five vehicles. When comparing the queues observed in the fall (post-tunnel) against the queues observed in the spring (pre-tunnel), the queues were reduced by approximately 50% in the morning, and by approximately 65% to 75% in the afternoon.

Similar observations were made when reviewing ridership on shuttle trips leaving the airport. Both the proportion of overcrowded trips and the proportion of empty trips were observed to be reduced now that passengers are arriving at the shuttle pick-up location in a more dispersed pattern.

Traffic volumes on Eireann Quay

(see Section 6.4)

Two-way traffic volumes on Eireann Quay were recorded immediately south of Queens Quay.

- During the morning peak period, Eireann Quay carries approximately 600 vehicles per hour; this peak occurs after the end of the main commuting peak.
- During the afternoon peak period, Eireann Quay carries approximately 800 vehicles per hour in the mid-afternoon (prior to the start of the main commuting peak). During the main commuting peak period, airport traffic drops to approximately 500 to 600 vehicles per hour.
- The fall 2015 data were compared against the volumes observed during the Thursday and Friday surveys in spring 2015. The fall 2015 data were found to be generally comparable to the spring 2015 Thursday data.
- In both the morning and the afternoon, the airport peak and the roadway peak do not coincide.

Airport traffic as a proportion of total traffic

(see Section 6.2)

In general, airport traffic makes up approximately 10–16% of all traffic in the surrounding area; however, the proportion of traffic varies by roadway.

- On Lake Shore Boulevard, which serves a commuter function, airport traffic makes up 2–4% of all traffic.
- On Bathurst Street north of Queens Quay, which is a key airport approach route, 50–60% of traffic in the block between Queens Quay and Lake Shore Boulevard is airport related.
- Within the neighbourhood to the west (Queens Quay to the west; Stadium Road), airport traffic comprises 5% of all traffic in the morning peak and 7–8% of all traffic in the afternoon peak.

- On other routes in the area (Queens Quay to the east; Dan Leckie Way; Bathurst Street to the north) airport traffic comprises approximately 15% of total traffic in the morning peak, and approximately 25–35% of total traffic in the afternoon peak.
- The proportion of airport traffic has risen in some instances compared to previous surveys because the volume of through traffic along Queens Quay has seen a reduction following the reconfiguration of the street east of Spadina Avenue, resulting in airport traffic comprising a greater proportion of the reduced volumes.

Turning prohibitions

(see Section 6.3)

Three turn prohibitions were enacted near the airport in 2012. Northbound left turns from Eireann Quay to Queens Quay are prohibited at all times, and time-of-day prohibitions are in effect at Lake Shore Boulevard and Stadium Road during peak periods (no eastbound right turns from 7-9 AM; no northbound left turns from 4-6 PM).

- A high rate of compliance was observed at Queens Quay and Eireann Quay, with an average of three to four northbound left turns (primarily private vehicles) observed during the peak periods.
- On average, 10 vehicles per hour (all private vehicles) were observed making prohibited right turns at Lake Shore Boulevard and Stadium Road during the AM peak period.
- On average, 101 vehicles per hour (of which 16% were taxis) were observed making prohibited left turns at Lake Shore Boulevard and Stadium Road during the PM peak period. Given the minimal number of northbound left turns from Eireann Quay to Queens Quay over the same two-hour period (six vehicles in total), it is believed that most of this traffic is unrelated to the airport.
- Notwithstanding the number of vehicles violating the turn prohibitions at Lake Shore Boulevard and Stadium Road, the volume of traffic on those movements was observed to decrease compared to the volume during the "shoulder" intervals before and following the two-hour peak period.

Taxi queues and corral usage

(see Section 4.1)

The taxi corral on the Canada Malting lands can accommodate approximately 32 to 38 taxis (depending on the spacing between taxis), in addition to approximately 16 to 18 taxis standing at the loading platform. Ideally, the supply of waiting taxis is balanced such that the corral is never full (there is room to allow additional arriving taxis to enter the corral without being turned away) and is never empty (there are always taxis waiting to serve arriving passengers).

- During most of the morning, the corral was typically half full or less; on the Thursday survey, a half-hour period with few queued taxis (9:00–9:30 AM) was followed by a

substantial increase over a ten-minute period (possibly as a result of airport staff making a request for taxis), to the extent where the corral was at its practical capacity for most of the last survey hour.

- During the afternoon surveys, the corral was observed to be near or at practical capacity for much of the period before 5:45 PM, especially on Thursday. Much less variation in the queue length was observed compared to pre-tunnel conditions, with more regular turnover of taxis due to the more evenly spaced arrival of passengers on the mainland.

Taxi deadheading

(see Section 4.2)

Taxi movements were observed to determine the number of deadhead trips to and from the airport (i.e., a taxi being driven to or from the airport without any passengers).

- The majority of taxis accessing the airport generated one deadhead trip (either arriving empty before picking up a fare, or dropping off a fare and then leaving empty).
- At most times, there are also some taxis that enter the corral to pick up a fare immediately after dropping off passengers, generating no deadhead trips.
- At some times, however, this is offset by taxis that arrive empty when the taxi corral is full and are turned away, generating two deadhead trips and serving no passengers. This typically occurs later in the morning and throughout much of the afternoon.

The rate of deadheading varies by time of day.

- For most of the morning, the rate of deadhead trips tends to range from 0.5 to 0.75 deadhead trips per fare (lower than the range of 0.7 to 0.9 deadhead trips per fare observed in the spring surveys).
- In the latter part of the morning, the corral was full with a lower level of turnover, and a sizeable increase was observed in the number of taxis arriving empty and being turned away. During the last 15-minute interval observed in the morning, more than two-thirds of the taxis on Eireann Quay were empty.
- In the afternoon, the deadheading rate was found to be in the order of 0.7 deadhead trips per fare for most of the afternoon. This is reduced from the pre-tunnel rate (approximately 1.0 deadhead trips per fare), likely related to the reduced variability in queue length in the corral and more regular turnover associated with the tunnel opening.

Vehicle occupancy

(see Section 5.0)

Taxi and auto occupancy is generally in the order of 1.2 to 1.25 passengers per vehicle (not including the driver, and not including "deadhead" trips. This is approximately comparable to the results observed in the spring of 2015.

Effect of the opening of the airport pedestrian tunnel

When comparing pre- and post-tunnel conditions, a number of changes in traffic patterns were observed following the opening of the tunnel. Before the tunnel opening, passengers would arrive on the mainland in large groups every 15 to 20 minutes, causing large surges in travel demand at the mainland terminal and along Eireann Quay. Now that most passengers are traveling to the mainland via the tunnel, the arrival of passengers onto the mainland is more dispersed, with the following effects:

- Smoothing out of the peaks in traffic flow, queuing and congestion on Eireann Quay that were previously experienced following the arrival of a ferry;
- More frequent and more gradual turnover of taxis queued in the corral (rather than an extended build-up period followed by a brief surge of outbound taxis);
- A reduction in the number of deadheading taxis during the afternoon; and
- More even distribution of ridership on shuttle trips leaving the airport.

1.0 Introduction

This memo documents the results of the mainland traffic and pedestrian surveys undertaken in October 2015 in the vicinity of Billy Bishop Toronto City Airport (BBTCA). These surveys follow up from a similar survey program undertaken in April 2015. The scope of the updated surveys was the same as in April 2015, allowing for a comparison of operating conditions before and after the opening of the pedestrian tunnel to BBTCA.

The survey included three separate components:

- Passenger counts leading to modal split and auto occupancy calculations;
- Queue length measurements; and
- Traffic counts at key intersections near BBTCA.

Intersection surveys (six locations) were undertaken on Thursday, October 15, 2015. Surveys on Eireann Quay, south of Queens Quay, and at the mainland airport terminal were undertaken on Thursday and Friday, October 15–16, 2015. In both cases, the surveys were undertaken for four hours in the morning (6:30 to 10:30 AM) and for four hours in the afternoon (3:00 to 7:00 PM).

The survey data was augmented by parking and shuttle data obtained from Stolport (local parking operators) and from Pacific Western (shuttle bus operators), respectively.

2.0 Modal Split

Figure 1 shows the number of passengers traveling to and from the airport by each mode. ***Figure 2*** shows the same data, but by the percentage of passengers using each mode (modal split). ***Figure 2*** also shows the average mode split for the four-hour morning period, the four-hour afternoon period, and the total survey period.

The average modal split for travel to and from the airport is presented in ***Table 1***. This table also shows the modal splits that were obtained in 2012 from the passenger surveys, as well as the modal splits obtained from the spring 2015 traffic and pedestrian surveys. The spring and fall 2015 survey methodology was different from the 2012 surveys; in 2012, rather than observing passenger movements, a random sample of passengers was interviewed within the terminal. As well, the 2012 modal split represents average values across the day, whereas the 2015 modal splits were specific to the four-hour morning and afternoon periods.

When comparing the spring and fall 2015 data, the modal splits were little changed for trips from the airport (arriving passengers), while some variation was observed for trips to the airport (departing passengers).

The primary change that has occurred since the spring 2015 surveys is a noticeable decrease in the proportion of departing passengers being dropped off by taxi, and a corresponding increase in the proportion of departing passengers being dropped off by a private vehicle. Notably, a similar trend was not observed for arriving passengers, for whom the proportion leaving the airport via taxi remained stable or increased slightly, and the proportion via private auto remained stable or decreased slightly. It is possible that the changes observed for departing passengers are related to an increase in the use of services such as Uber, which would not have been distinguishable from a private vehicle drop-off.

A second change observed from the spring 2015 surveys is a decrease in the proportion of trips using the airport shuttle to travel to the airport, and an increase in pedestrian access. This may reflect increased usage of TTC to travel to the airport, now that full service has been restored to the reconfigured 509 Harbourfront streetcar and the new low-floor streetcars have begun to be placed into service.

In the morning, the proportion of passengers being picked up at the terminal has decreased to negligible levels, less than the proportion parking at the airport. Given that the “self-drive / park” proportion increased during the AM peak period, it is possible that some motorists are parking in the airport lots (or elsewhere) while they wait for their passengers, rather than picking up at the terminal.

FIGURE 1: PASSENGER MOVEMENTS BY TRAVEL MODE

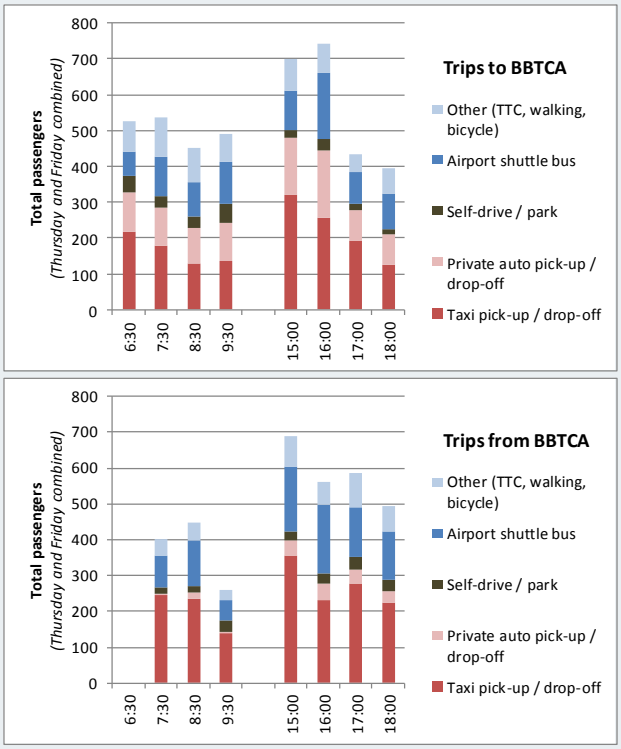


FIGURE 2: HOURLY VARIATION IN MODAL SPLIT

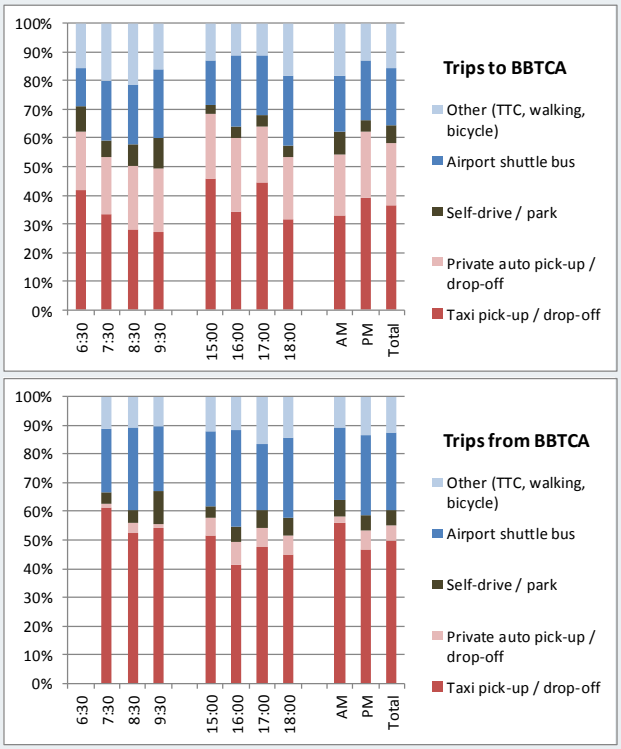


TABLE 1:MODAL SPLIT FOR TRAVEL TO/FROM BBTCA

Travel mode to/from BBTCA	Fall 2015			Spring 2015			2012
	AM	PM	Avg.	AM	PM	Avg.	24h
Trips to BBTCA (drop-offs):							
Taxi drop-off	33%	39%	36%	41%	47%	44%	49%
Private auto drop-off	21%	23%	22%	14%	8%	11%	19%
Self-drive / park	8%	4%	6%	10%	5%	8%	5%
Airport shuttle bus	19%	21%	20%	26%	25%	25%	17%
Other (TTC, walking, bicycle)	18%	13%	15%	9%	15%	12%	10%
Total taxi / auto	62%	66%	64%	65%	60%	63%	73%
Total shuttle / transit / active	37%	34%	35%	35%	40%	37%	27%
Trips from BBTCA (pick-ups):							
Taxi pick-up	55%	47%	49%	54%	44%	47%	46%
Private auto pick-up	2%	7%	5%	7%	8%	8%	14%
Self-drive / park	6%	5%	6%	3%	7%	6%	5%
Airport shuttle bus	25%	28%	27%	30%	26%	27%	25%
Other (TTC, walking, bicycle)	11%	14%	13%	6%	15%	12%	10%
Total taxi / auto	63%	59%	60%	64%	59%	61%	65%
Total shuttle / transit / active	36%	42%	40%	36%	41%	39%	35%

Note: Percentages may not add to 100% due to rounding.

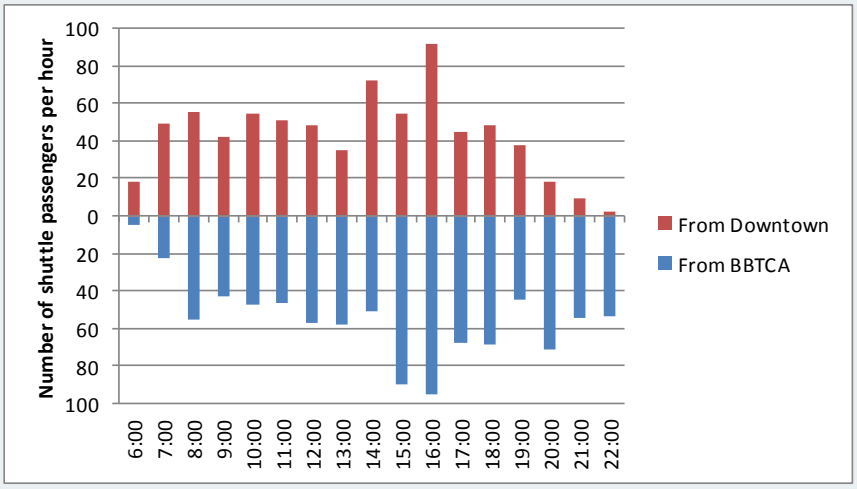
If the individual modes are aggregated into “auto” and “non-auto” modes for the 8 survey hours, the following observations are made when comparing the pre- and post-tunnel surveys:

- For departing passengers (drop-offs), the proportion using non-auto modes remained stable when measured over the full survey period, with a slight increase in the morning and a slight decrease in the afternoon.
- For arriving passengers (pick-ups), the proportion using non-auto modes remained stable during all survey periods.

3.0 Shuttle Usage

Shuttle passenger data was provided by the operator, Pacific Western, who was under contract to Nieuport Aviation, the terminal operator. ***Figure 3*** illustrates the number of passengers per hour (and shows the average of the Thursday and Friday data).

FIGURE 3: HOURLY AIRPORT SHUTTLE RIDERSHIP



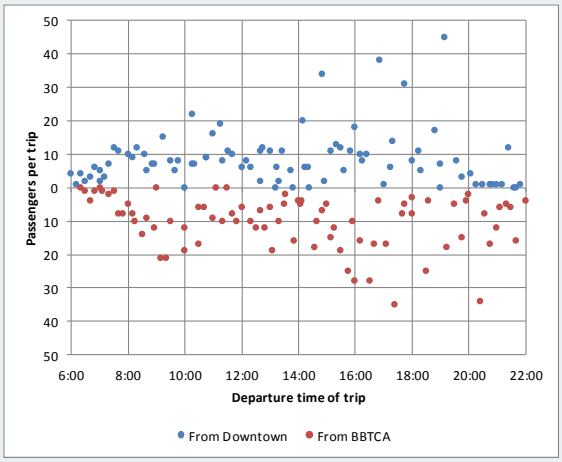
The passenger levels shown in ***Figure 3*** represent the average of the Thursday and Friday data. However, there was considerable variation in the number of riders per trip, particularly for shuttle trips leaving BBTCA, as shown in ***Figure 4***.

The introduction of the tunnel has resulted in more evenly distributed ridership across shuttle trips. Prior to the tunnel opening, shuttle trips connecting with incoming flights would be heavily used, whereas other trips not connecting with flights would have to leave empty to return to Union Station. With the opening of the tunnel, passengers no longer emerge on the mainland simultaneously in a group (as they did when disembarking from the ferry). This has eliminated most of the empty shuttle trips, and has reduced the loading on the busier trips from roughly 25–30 passengers per trip to roughly 20–25 passengers per trip. The maximum observed load was 48 passengers on Friday approximately 5:15 PM (similar to the spring 2015 surveys).

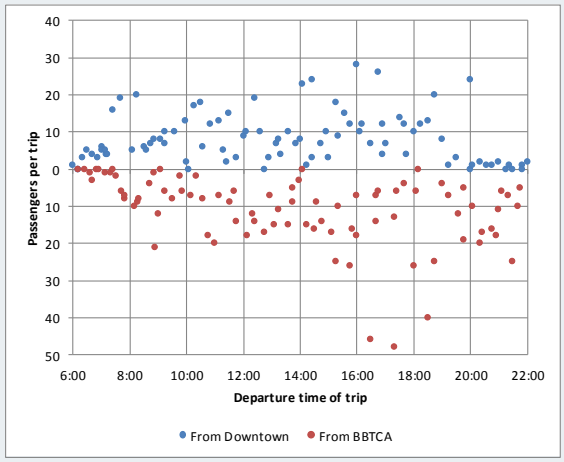
For shuttle trips destined to BBTCA, there remains less variation associated with the flight schedule because passengers have different thresholds of comfort in terms of how early they wish to check in for their flight. Generally each trip carried 5 to 20 passengers, similar to the spring 2015 surveys. The maximum observed load destined to the airport was 45 passengers at approximately 7:00 PM on Thursday.

FIGURE 4: SHUTTLE PASSENGERS PER TRIP

Thursday, October 15, 2015



Friday, October 16, 2015



4.0 Taxi Usage

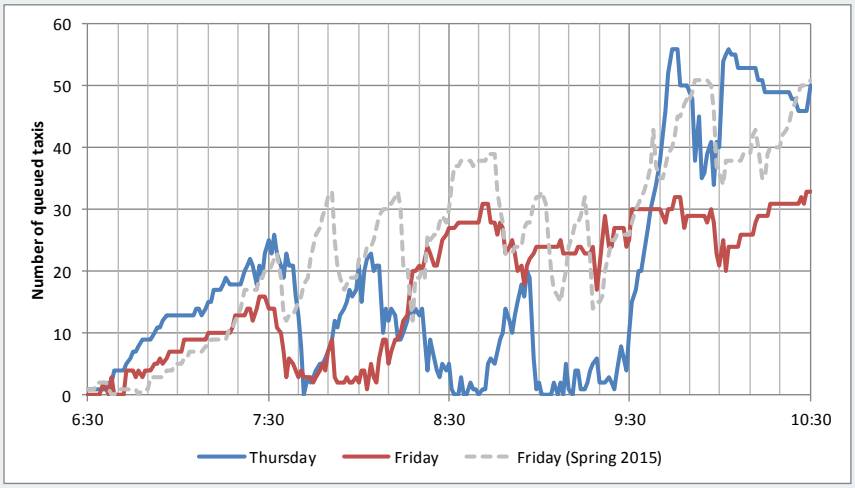
4.1 Taxi Corral Queues

Surveyors recorded the number of taxis queued in the corral at one-minute intervals. The survey includes taxis queued in the corral and at the loading area.

The capacity of the corral itself is in the order of 32 to 38 taxis, depending on how tightly spaced the queued taxis are in each lane. In addition, approximately 16 to 18 taxis may be stored in the loading area beyond the corral stop bar.

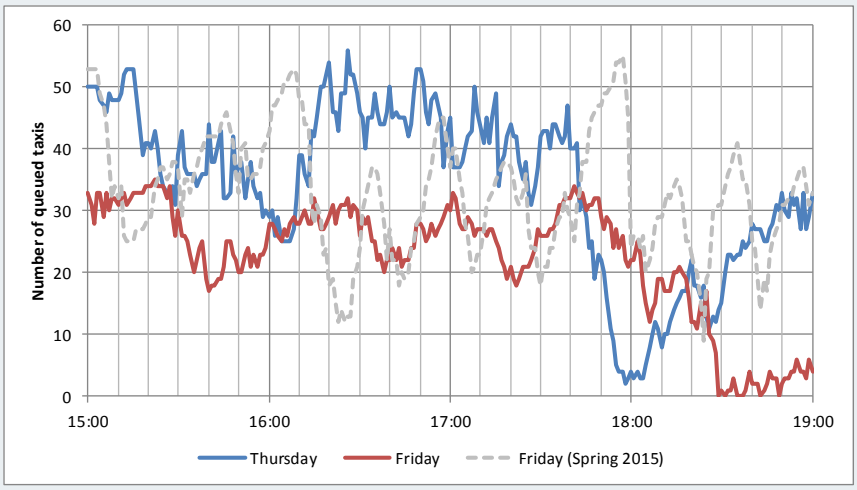
Figure 5 and ***Figure 6*** show the length of the taxi queue through the morning period and afternoon period, respectively. The figures show the surveyed Thursday and Friday data, as well as the Friday pre-tunnel data for comparison purposes.

FIGURE 5: NUMBER OF TAXIS QUEUED IN CORRAL (MORNING)



For most of the morning, the queue reached a maximum level of 20 to 30 taxis. Thursday experienced greater variability; in particular, a half-hour period with few queued taxis (9:00–9:30 AM) was followed by a substantial increase over a ten-minute period (possibly as a result of airport staff making a request for taxis), to the extent where the corral was at its practical capacity for most of the last survey hour.

FIGURE 6: NUMBER OF TAXIS QUEUED IN CORRAL (AFTERNOON)



During the afternoon surveys, the corral was observed to be near or at practical capacity for much of the period before 5:45 PM, especially on Thursday. Much less variation in the queue length was observed compared to pre-tunnel conditions, with more regular turnover of taxis due to the more evenly spaced arrival of passengers on the mainland.

4.2 Taxi Deadheading

One way to mitigate traffic levels is to decrease the number of "deadhead" taxi trips (i.e., taxis leaving empty after dropping off a passenger, or taxis arriving empty to enter the corral).

Surveyors tracked every taxi movement and categorized each taxi according to whether they picked up or dropped off passengers and if they:

- Arrived with passenger and entered corral (no deadhead trips);
- Arrived empty and entered corral (one deadhead trip);
- Arrived with passenger and left empty (one deadhead trip); and
- Arrived empty and left without entering corral (e.g., because the corral was full — two deadhead trips).

Figure 7 and ***Figure 8*** show the number of taxi trips made during the morning and afternoon survey periods, respectively, according to the above four categories.

For the taxis that dropped off passengers and left empty, it was not recorded whether the driver preferred to seek the next fare off-site or if the driver had intended to rejoin the corral but was turned away. This should be considered when reviewing the results for times when the corral was frequently at capacity (late morning; much of the afternoon).

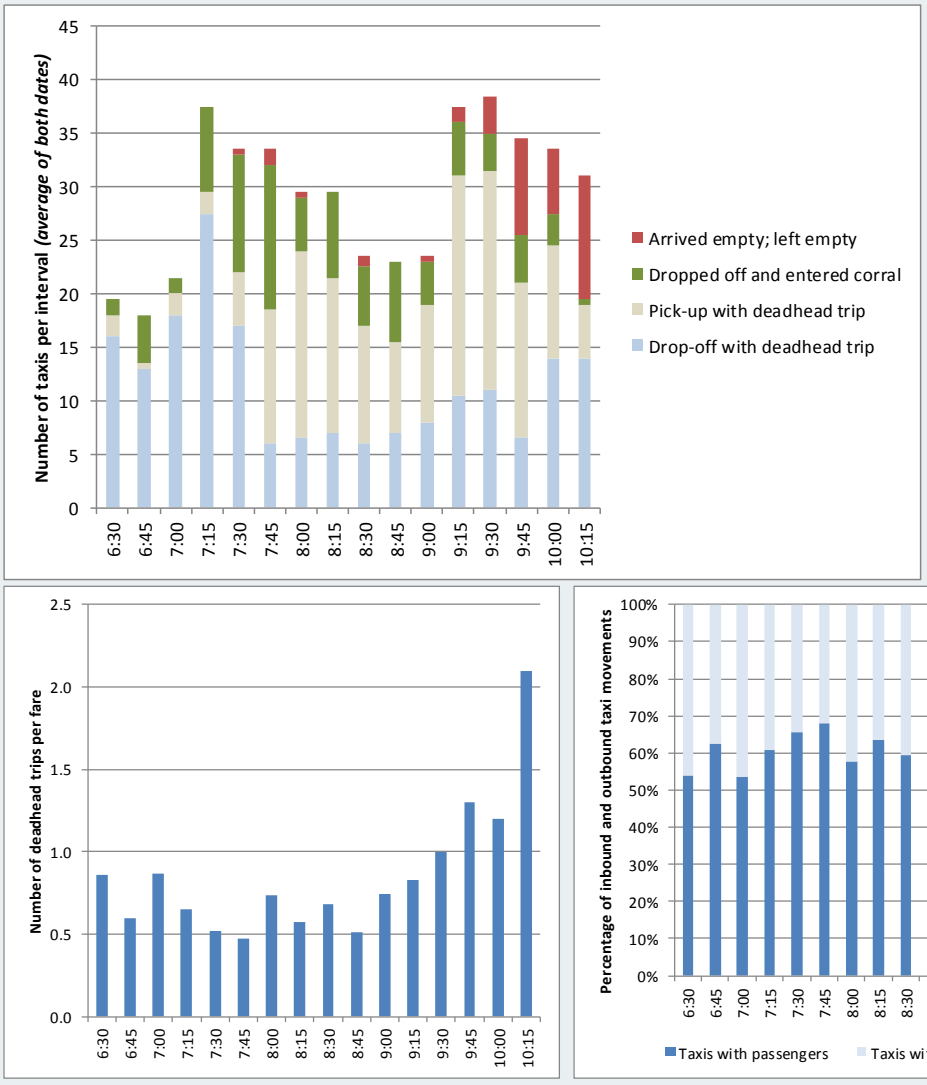
Figure 7 and ***Figure 8*** also show the average number of deadhead trips per fare during the morning and afternoon survey periods, respectively. Previous traffic analyses for BBTCA have been based on a value of one deadhead trip per fare (i.e., every taxi arrives empty before picking up a passenger; every taxi dropping off a passenger leaves empty). A lower value is positive (i.e., preferred) and indicates that taxi drivers are entering the corral after dropping off a fare. A higher value is negative and indicates that taxi drivers are being turned away from entering the corral, whether they arrived with a fare or not.

The proportion of deadhead trips fluctuates throughout the day depending on two factors:

- The balance between arriving and departing flights (generally more departing flights earlier in the morning and afternoon, and more arriving flights later in the morning and afternoon); and
- The occupancy level of the corral (both because taxis cannot enter the corral when it is full, but also potentially because there is a shorter wait time to get a second outbound fare if the corral queues are short).

Finally, ***Figure 7*** and ***Figure 8*** also show the percentage of taxis traveling along Eireann Quay (both directions combined) that are carrying one or more passengers, compared to those that are carrying the driver only.

FIGURE 7: TAXI DEADHEADING STATISTICS (MORNING)

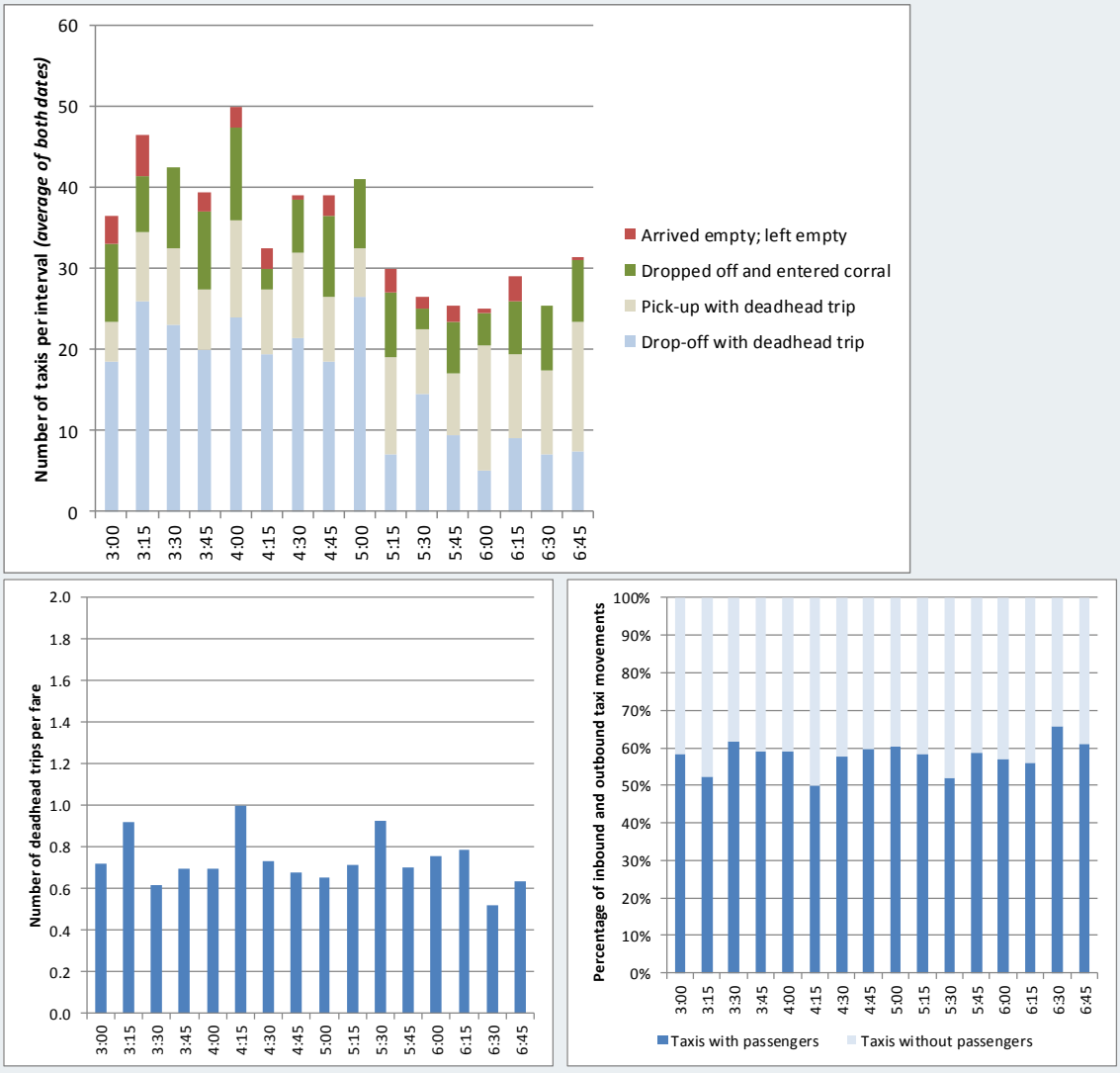


In the morning, some taxis were observed dropping off a passenger and entering the corral. This reflects a heavier proportion of drop-off demand earlier in the morning and plenty of space available in the corral, and also shows that taxi drivers tend to anticipate the late-morning peak for visitors arriving from out of town. For most of the morning, the rate of deadhead trips tends to range from 0.5 to 0.75 deadhead trips per fare (lower than the range of 0.7 to 0.9 deadhead trips per fare observed in the spring surveys).

By the end of the morning period, a sizeable increase was observed in the number of taxis arriving empty and being turned away. The rate of deadhead trips during the last 45 minutes increased substantially, to the point where more than two-thirds of the taxis on Eireann Quay were empty after 10:15 AM. This corresponds to the portion of the morning period where the corral was full with a lower level of turnover.

Although a similar pattern was observed on both Thursday and Friday, the greatest level of double deadheading was observed on Thursday, corresponding to the time period with the longest observed queues in the taxi corral.

FIGURE 8: TAXI DEADHEADING STATISTICS (AFTERNOON)



There was a moderate to low level of double-deadheading observed throughout the afternoon (generally in the order of 5 per 15-minute interval or fewer). This was more than offset by the number of non-deadheading taxis entering the corral after dropping off passengers. The level of double-deadheading was substantially reduced compared to the spring 2015 surveys. Whereas the spring 2015 surveys found a deadheading rate in the order of one deadhead trip per fare, or slightly above, the fall 2015 surveys found this rate to be reduced to approximately 0.7 deadhead trips per fare for most of the afternoon. The lower level of double deadheading

is likely related to the reduced variability in queue length in the corral and more regular turnover associated with the tunnel opening.

5.0 Taxi and Auto Occupancy Levels

One way to mitigate traffic levels is to increase the number of passengers sharing a ride to or from the airport, either in a taxi or in a private vehicle.

Surveyors recorded the number of passengers picked up or dropped off by each taxi and each private vehicle at the pick-up / drop-off loop and at the taxi corral loading area. The taxi and private vehicle occupancy level was observed to be generally in the order of 1.20 to 1.25 passengers per auto / taxi (not including the driver, and not including the "deadhead" trip). Occupancy levels were more variable for private vehicle pick-ups; however, the sample size for that subset is lower and it is possible that not all of these trips were captured (i.e., some pick-ups may have occurred at off-site locations, such as the short-term parking area, rather than at the loop in front of the ferry terminal).

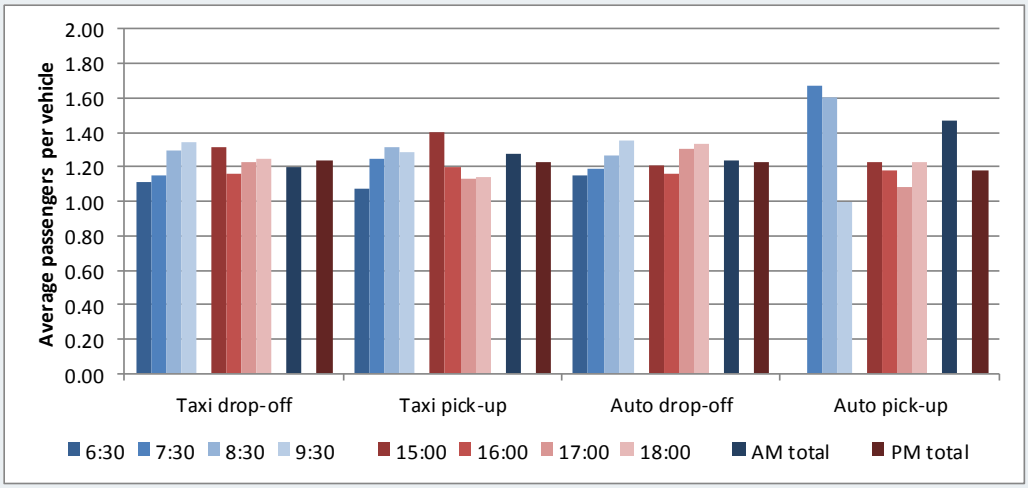
Occupancy levels were approximately comparable to the spring 2015 data in most cases, or slightly reduced.

Table 2 shows the average number of passengers per vehicle during the peak periods. ***Figure 9*** shows the hourly fluctuation of occupancy by mode (private auto vs. taxi) and passenger type (arriving vs. departing).

TABLE 2:AVERAGE NUMBER OF PASSENGERS PER TAXI AND PER AUTO

	Fall 2015 data		Previous data (Spring 2015)	
	Morning *(6:30–10:30)*	Afternoon *(3:00–7:00)*	Morning *(6:30–10:30)*	Afternoon *(3:00–7:00)*
Taxi drop-offs	1.20	1.24	1.25	1.23
Taxi pick-ups	1.27	1.23	1.25	1.26
Private auto drop-offs	1.23	1.23	1.24	1.17
Private auto pick-ups	1.47	1.18	1.36	1.39

FIGURE 9: HOURLY VARIATION IN AUTO / TAXI OCCUPANCY LEVELS



6.0 Intersection Traffic Volumes

6.1 Scope of Intersection Surveys

Intersection traffic counts were undertaken at six locations:

- Lake Shore Boulevard at Stadium Road
- Lake Shore Boulevard / Fleet Street at Bathurst Street
- Lake Shore Boulevard at Dan Leckie Way
- Queens Quay at Stadium Road
- Queens Quay at Bathurst Street / Eireann Quay
- Queens Quay at Dan Leckie Way

Previous surveys had been affected by construction on Queens Quay east of Dan Leckie Way, wherein the eastbound lanes were closed and the westbound lanes were slightly constrained. By the time of the October 2015 surveys, Queens Quay had been reopened to traffic for approximately four months, allowing sufficient time for traffic patterns to become re-established. As a result, the traffic volumes along and related to Queens Quay can generally be considered to be representative.

Conversely, there was a new feature that affected traffic volumes in the study area. During the summer of 2015, a westbound right turn prohibition was enacted at Lake Shore Boulevard and Bathurst Street, effective during the weekday AM and PM peak periods (7:30–9:30 AM; 3:30–6:30 PM). This had the effect of reducing (but not eliminating) westbound right turn demand at the subject intersection, and increasing westbound right turn demand at Lake Shore Boulevard and Dan Leckie Way due to motorists seeking an alternate route to Bathurst Street. Through discussions with City staff, we understand that the right turn prohibition was implemented as a temporary measure for the summer 2015 Pan Am Games; it has since been rescinded. Notwithstanding, the traffic volumes have been presented without adjustment as a reflection of the conditions that existed at the time of the survey, recognizing that traffic may have returned to historical patterns now that the prohibition has been rescinded.

6.2 Intersection Traffic Volumes

Figure 10 and ***Figure 11*** illustrate the AM and PM peak hour intersection traffic volumes (all vehicles; taxis only).

From the existing volumes, the amount of airport traffic at each intersection was estimated (all vehicles; taxis only). These estimated volumes are illustrated in ***Figure 12*** and ***Figure 13***.

The volume of non-airport related traffic was estimated by subtracting airport-related traffic from the total traffic volumes. The estimated non-airport traffic (or background traffic) volumes are illustrated in ***Figure 14***.

During the previous spring 2015 surveys, eastbound Queens Quay was closed east of Dan Leckie Way, and therefore traffic volumes were estimated based on historical data. Conversely, the volumes shown in ***Figure 10*** through ***Figure 14*** were surveyed following the full re-opening of Queens Quay to traffic, including sufficient time for traffic patterns to become re-established. The fall 2015 surveys found eastbound traffic levels to be substantially less than had been assumed based on historical data.

FIGURE 10: TYPICAL FALL 2015 PEAK HOUR TRAFFIC VOLUMES

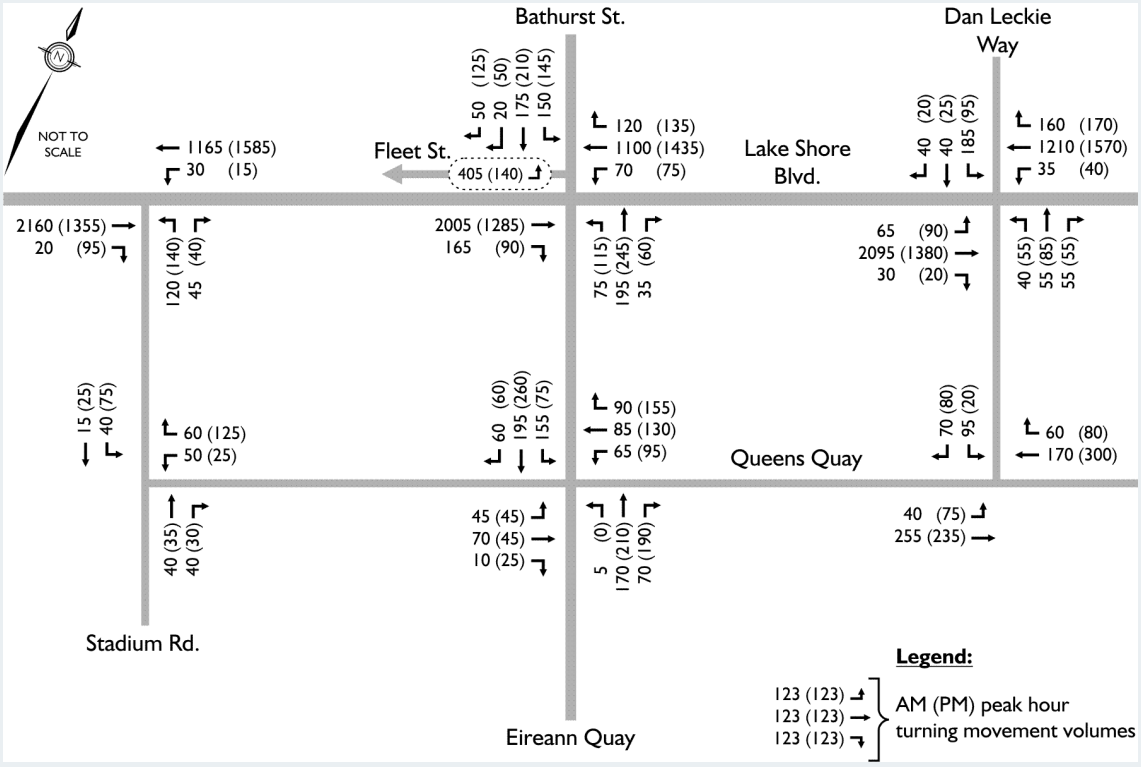


FIGURE 11: TYPICAL FALL 2015 PEAK HOUR TRAFFIC VOLUMES (TAXIS ONLY)

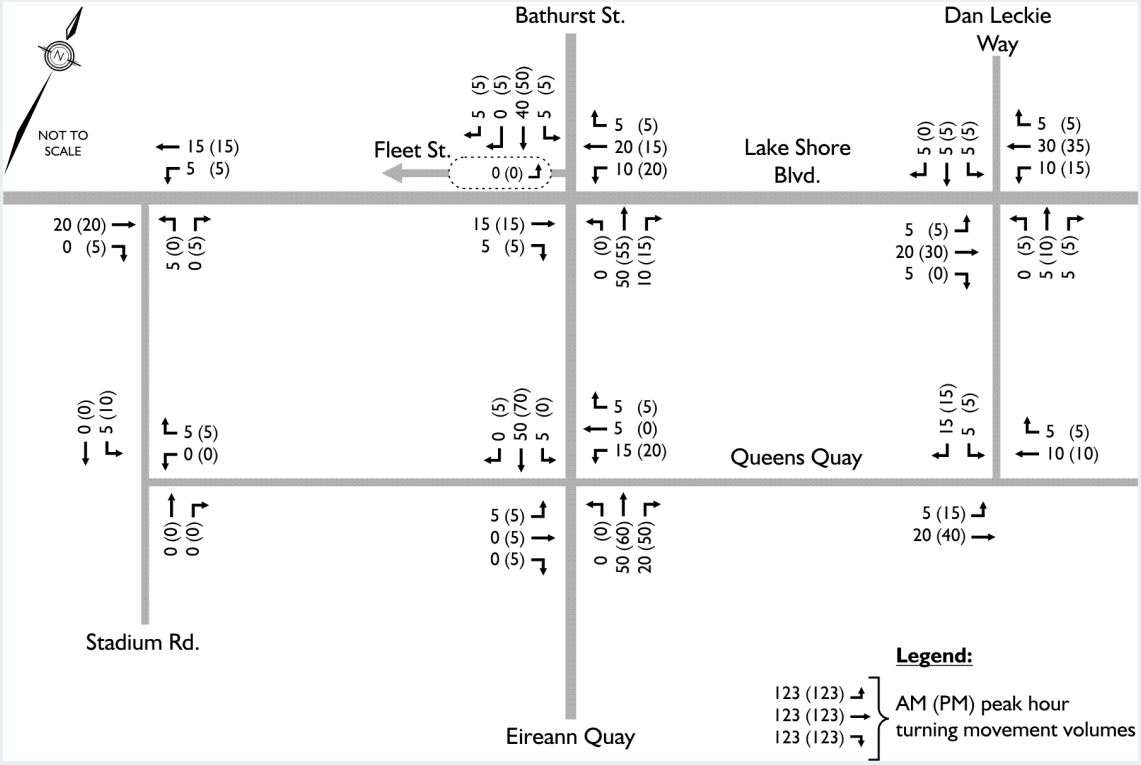


FIGURE 12: ESTIMATED FALL 2015 PEAK HOUR AIRPORT TRAFFIC VOLUMES

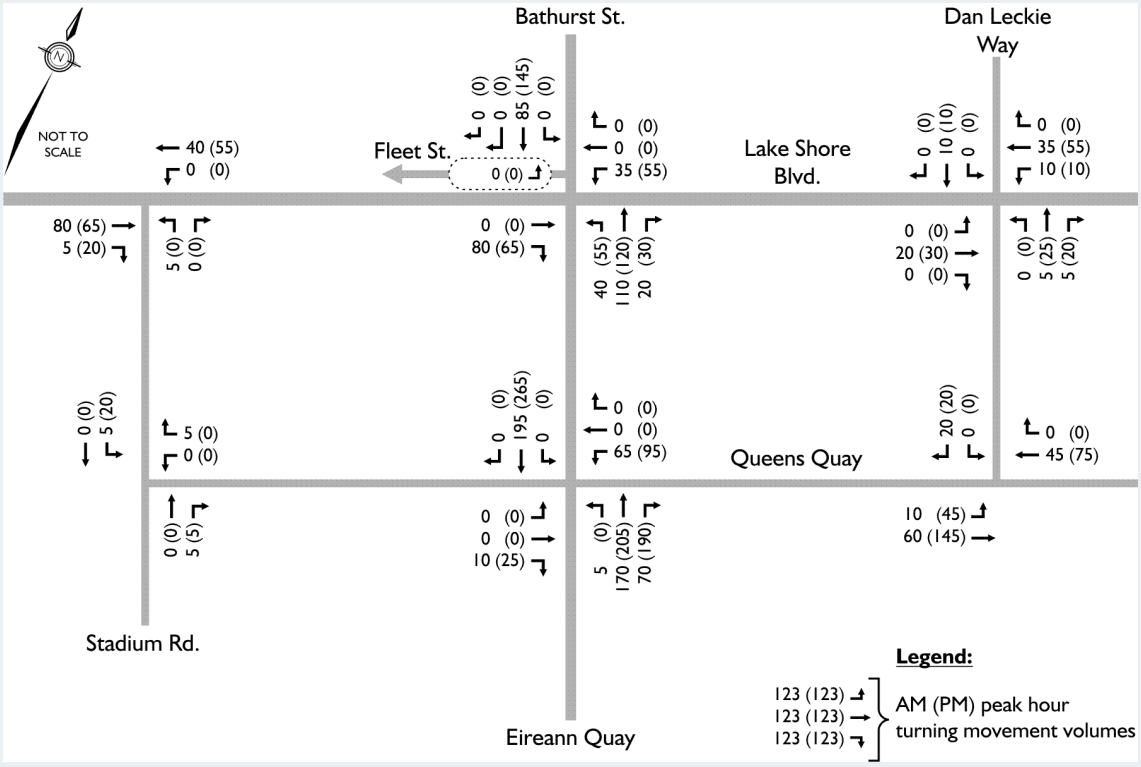


FIGURE 13: ESTIMATED FALL 2015 PEAK HOUR AIRPORT TRAFFIC VOLUMES (TAXIS ONLY)

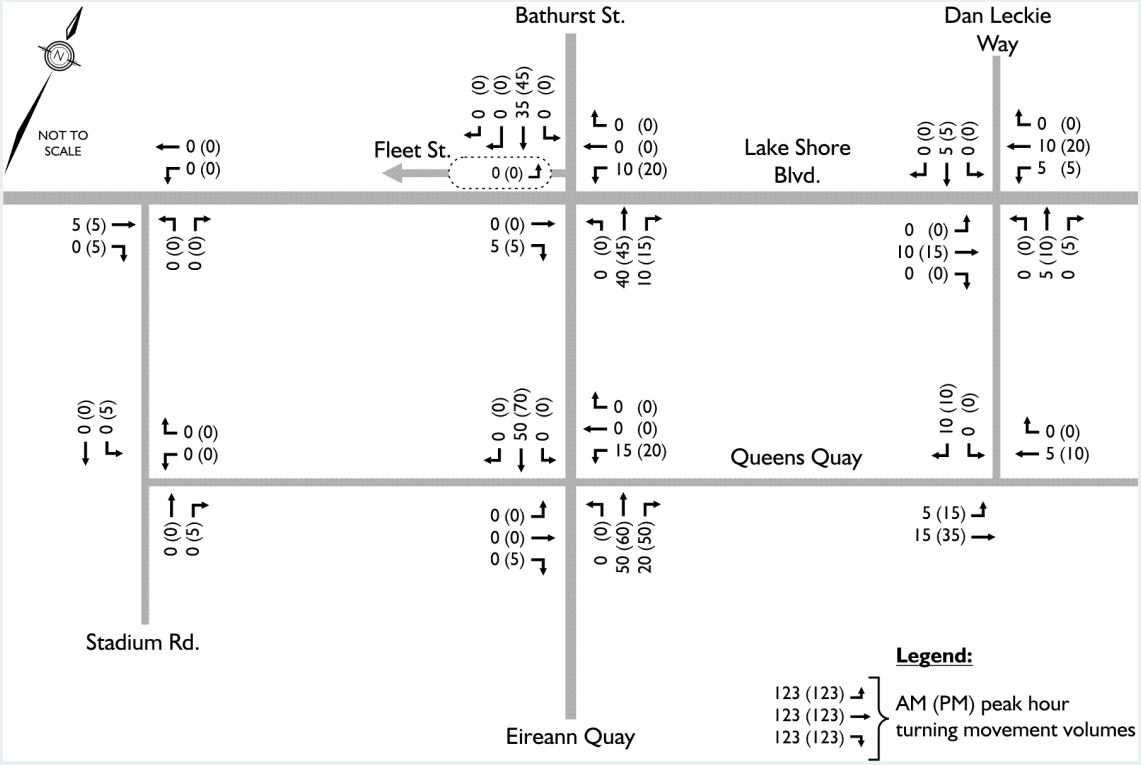
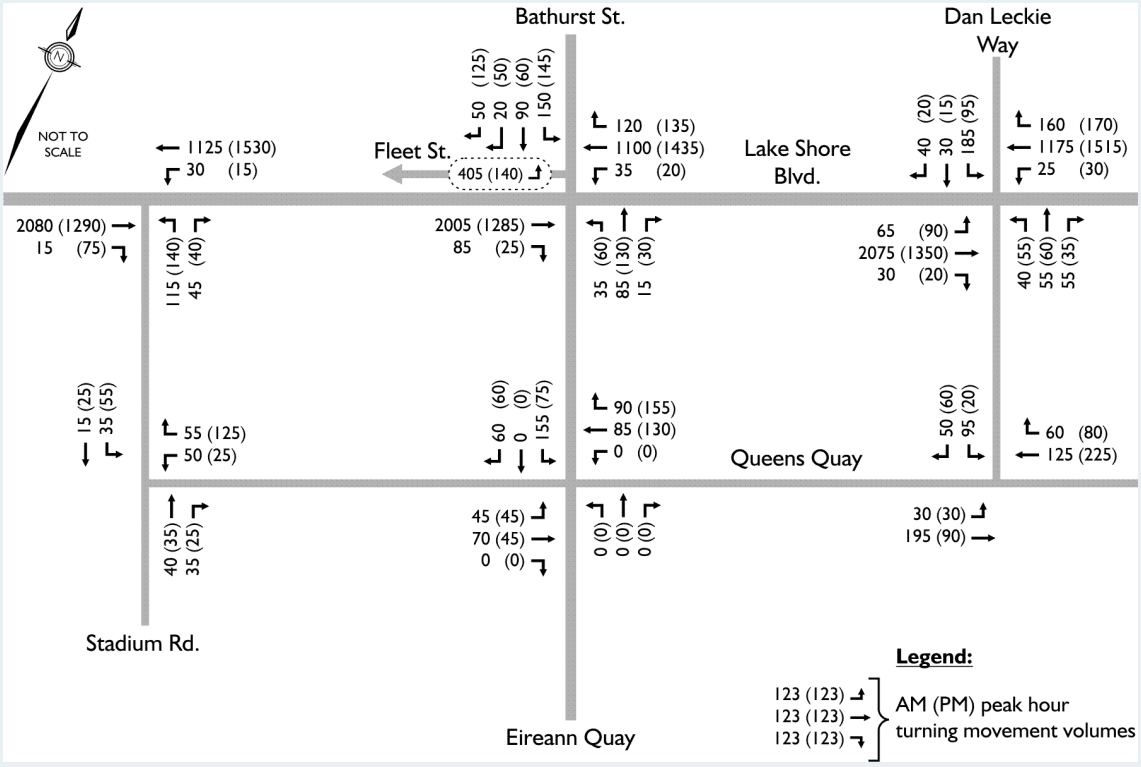


FIGURE 14: ESTIMATED PEAK HOUR FALL 2015 NON-AIRPORT TRAFFIC VOLUMES



6.3 Observance of Signed Turn Prohibitions

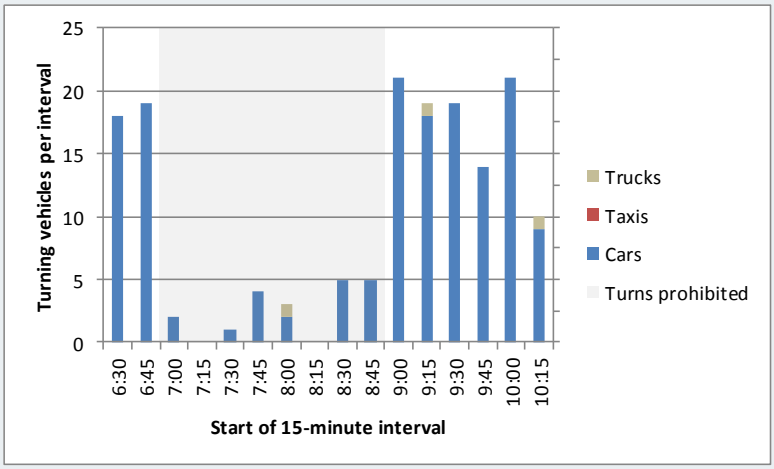
Turn prohibitions were implemented near the airport in 2012; specifically:

- No left turn northbound from Eireann Quay to Queens Quay at any time;
- No right turn eastbound from Lake Shore Boulevard to Stadium Road during the morning peak period; and
- No left turn northbound from Stadium Road to Lake Shore Boulevard during the afternoon peak period.

A small number of vehicles were observed making illegal left turns from Eireann Quay to Queens Quay — an average of approximately three to four per hour during the AM and PM peak periods. The majority of these were private vehicles. This is marginally higher than the spring 2015 observations.

A larger number of vehicles were observed violating the turn prohibitions at Stadium Road and Lake Shore Boulevard, as shown in ***Figure 15*** and ***Figure 16***.

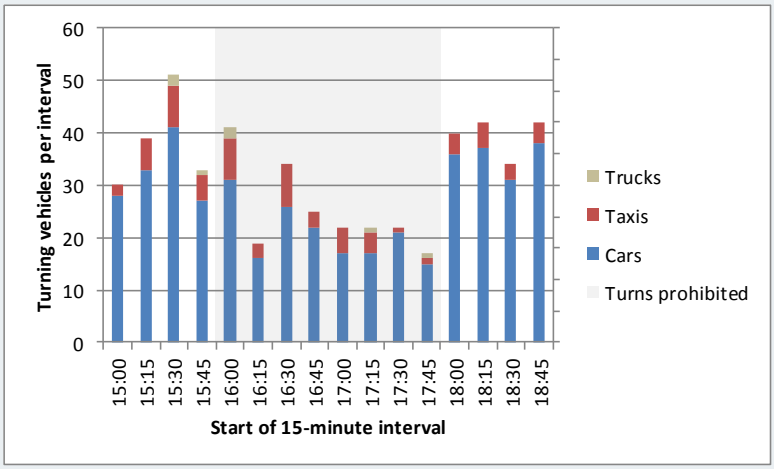
FIGURE 15: EASTBOUND RIGHT TURNS AT LAKE SHORE BOULEVARD AND STADIUM ROAD



During the morning, a minor number of vehicles were observed violating the eastbound right turn prohibition — an average of ten per hour between 7:00 and 9:00, or approximately one vehicle every two to three cycles. No taxis were observed making this movement. This is roughly comparable to the spring 2015 observations.

Given that 11 right turns were observed from Queens Quay to Eireann Quay over the same two-hour period, it is likely that some of this traffic is airport-related.

FIGURE 16: NORTHBOUND LEFT TURNS AT LAKE SHORE BOULEVARD AND STADIUM ROAD



During the afternoon, a greater number of vehicles were observed violating the northbound left turn prohibition — an average of 101 vehicles per hour between 4:00 and 6:00, or approximately four vehicles per green signal. Of the total during this period, 16% were taxis.

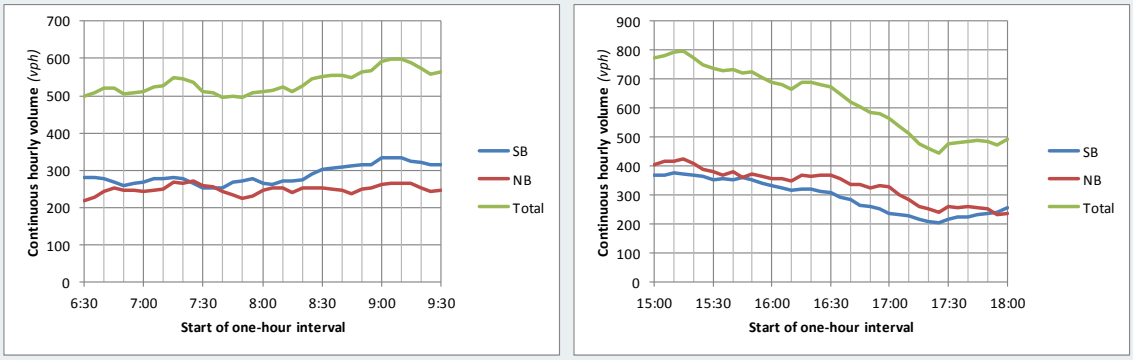
Given the minimal number of northbound left turns from Eireann Quay to Queens Quay over the same two-hour period (six vehicles in total), it is believed that most of this traffic is unrelated to the airport.

6.4 Eireann Quay Traffic Volumes

The traffic volumes along Eireann Quay were determined from the turning movement counts at the intersection of Queens Quay and Bathurst Street / Eireann Quay.

Figure 17 illustrates the hourly traffic volumes observed along Eireann Quay. The volumes reflect continuous ("rolling") hourly traffic volumes (e.g., the data point at 8:25 AM reflects the number of vehicles observed during the one hour between 8:25 and 9:25).

FIGURE 17: HOURLY TRAFFIC VOLUMES ON EIREANN QUAY



During the morning, the heaviest demand was observed near the end of the survey period (after 9:00 AM), peaking at approximately 600 vph.

During the afternoon, the heaviest demand was observed between approximately 3:00 and 4:00 PM, prior to the start of the commuting peak hour, with two-way flows peaking at just under 800 vph. By the 5:00-6:00 PM interval, during the main part of the commuting peak period, traffic on Eireann Quay had decreased to approximately 500 vph. It is notable that the airport peak hour and the background (commuting) peak hour do not coincide.

The fall 2015 data were compared against the volumes observed during the Thursday and Friday surveys in spring 2015. As shown in ***Figure 18***, the fall 2015 data were found to be generally comparable to the spring 2015 Thursday data.

FIGURE 18: HOURLY TRAFFIC VOLUMES ON EIREANN QUAY (SPRING VS. FALL 2015)

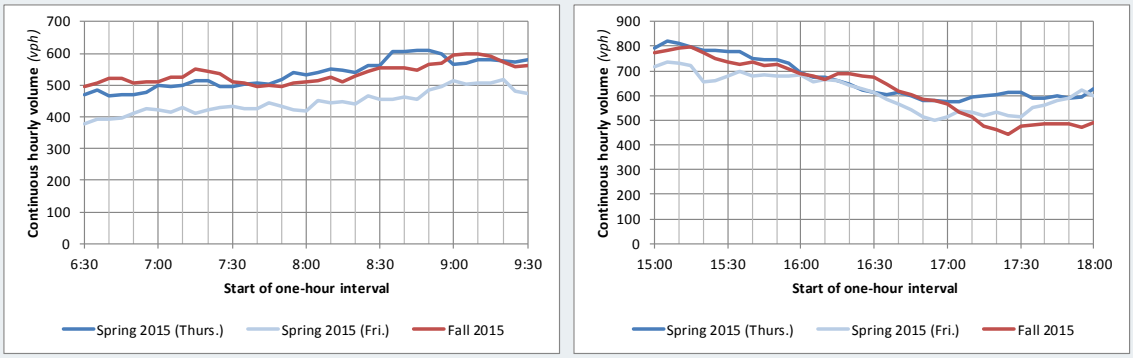
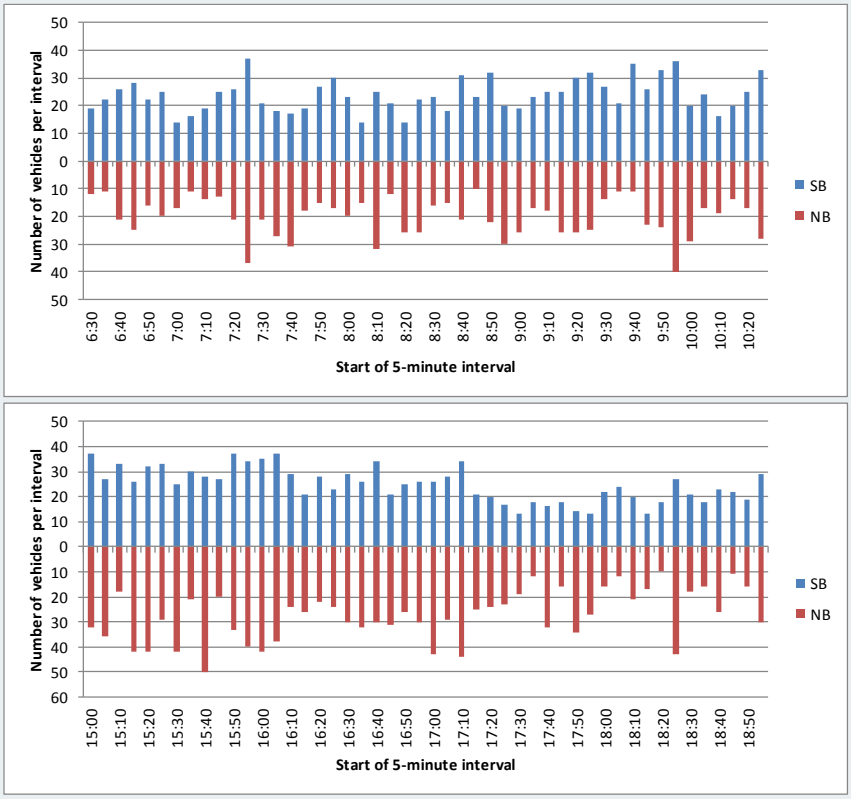


Figure 19 illustrates the variation in traffic demand from one five-minute interval to the next. The five-minute volumes illustrate the difference between traffic flow patterns toward and away from the airport, with greater variability for northbound (away) traffic. The opening of the tunnel has assisted in smoothing out the surges in pedestrian activity and reducing the variability in northbound demand, although there remains variability associated with the flight schedule.

FIGURE 19: 5-MINUTE INTERVAL TRAFFIC VOLUMES ON EIREANN QUAY



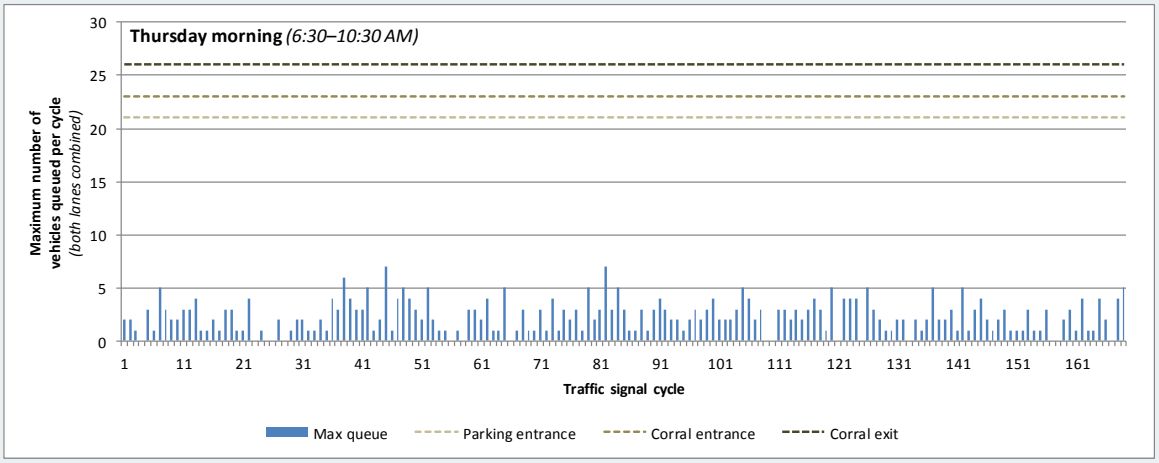
7.0 Queue Surveys

7.1 Northbound Queues on Eireann Quay

Surveyors recorded the number of vehicles queued on northbound Eireann Quay at the Queens Quay traffic signals. The number of queued vehicles was recorded at the start of every northbound green signal. Including the northbound right turn lane at Queens Quay, there is room to accommodate a queue of approximately 26 vehicles before blocking the exit to the taxi corral (depending on the number of trucks and buses in the queue, and the spacing between queued vehicles).

Figure 20 illustrates the maximum length of the northbound queue per cycle during the morning surveys; ***Figure 21*** illustrates the results from the afternoon surveys.

FIGURE 20: QUEUE LENGTH ON NORTHBOUND EIREANN QUAY (MORNING SURVEYS)



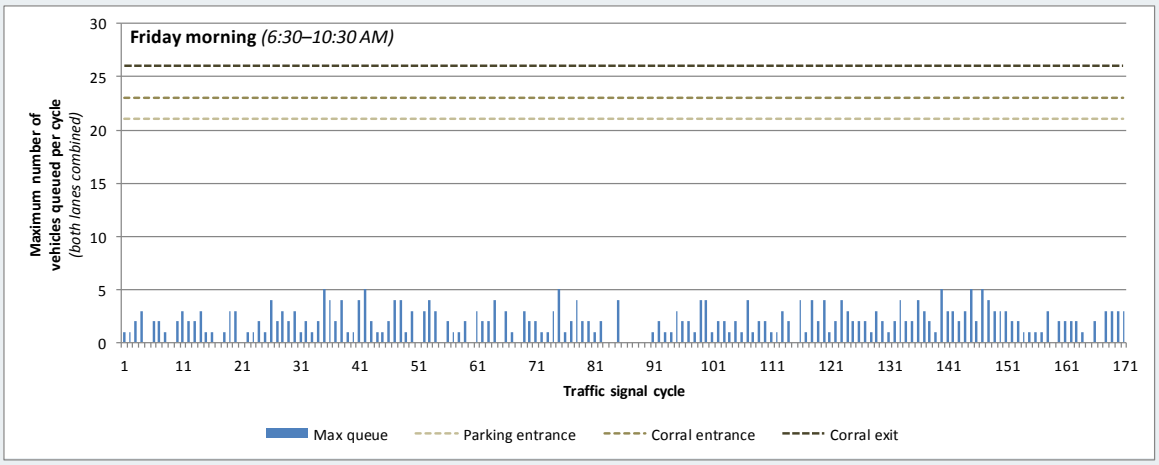
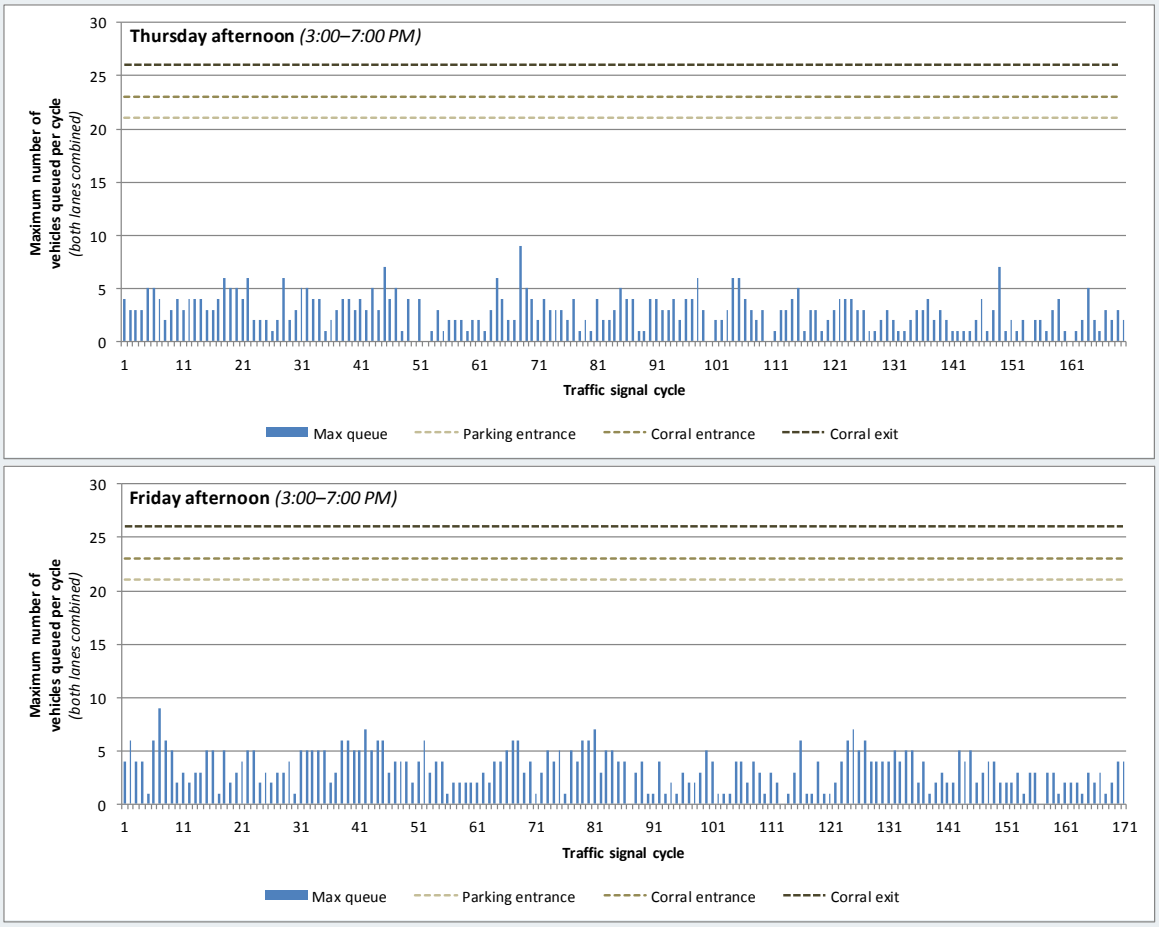


FIGURE 21: QUEUE LENGTH ON NORTHBOUND EIREANN QUAY (AFTERNOON SURVEYS)



During both the morning and afternoon surveys, the queues were typically in the order of five vehicles or less. The maximum observed queue was nine vehicles, at approximately 4:45 PM on Thursday afternoon. Northbound queues were not found to reach the entrances to the taxi corral or Canada Malting site parking facilities. These queues can be reasonably managed and can typically be served on one green signal.

Figure 22 and ***Figure 23*** illustrate the morning and afternoon queue lengths surveyed in the spring of 2015, prior to the tunnel opening. There are substantial differences between the queuing conditions observed during the pre-tunnel (spring 2015) surveys and those observed during the post-tunnel (fall 2015) surveys:

- Queue lengths are shorter. During the spring 2015 surveys, 10-vehicle queues were regularly observed in the morning, and 15- to 18-vehicle queues were regularly observed in the afternoon. During the fall 2015 surveys, queue lengths were rarely observed to exceed five vehicles.
- Queue lengths are less variable. During the spring 2015 surveys, the northbound queue was observed to vary substantially from one cycle to another, with some cycles

with little queuing followed by periods where the northbound queue began to approach the parking entrance. During the fall 2015 surveys, much less variation was observed from one cycle to the next.

The reduction in the magnitude and variability of the northbound queue is an indication of the effect of the tunnel in dispersing the flow of passengers traveling from the island to the mainland, rather than concentrating passenger movements into surges associated with ferry arrivals.

FIGURE 22: QUEUE LENGTH ON NORTHBOUND EIREANN QUAY (MORNING SURVEYS, SPRING 2015)

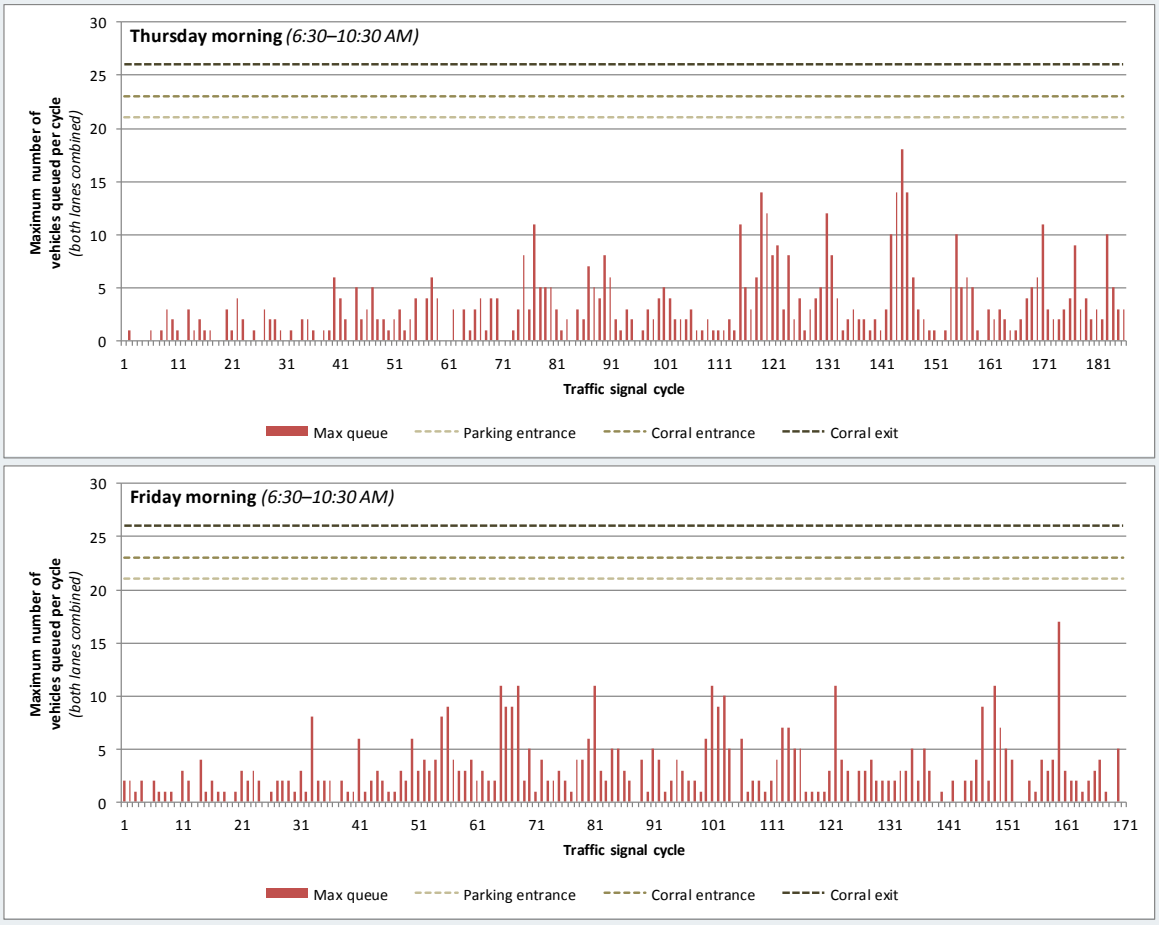
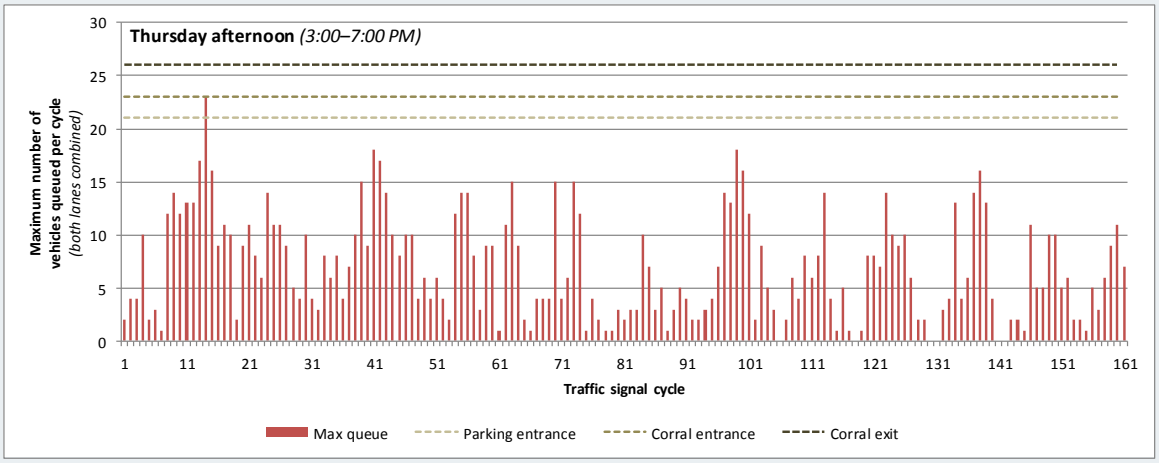
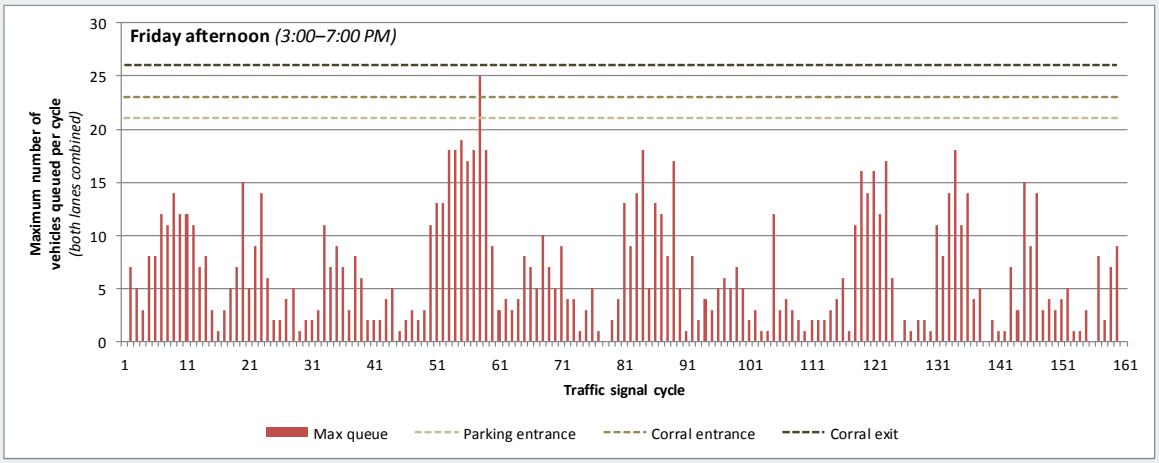


FIGURE 23: QUEUE LENGTH ON NORTHBOUND EIREANN QUAY (AFTERNOON SURVEYS, SPRING 2015)

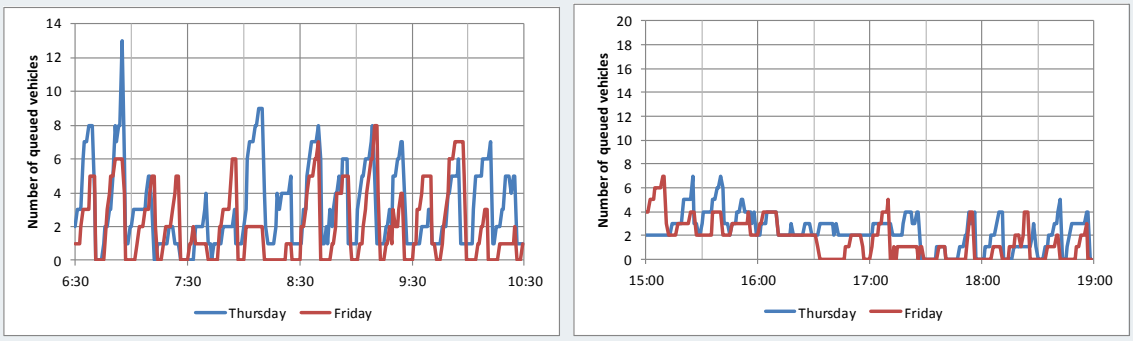




7.2 Ferry Queue

Surveyors recorded the number of vehicles in the Finger Lot waiting to board the ferry; measurements were taken at one-minute intervals. The results are shown in ***Figure 24***.

FIGURE 24: SURVEYED FERRY QUEUES (FINGER LOT)



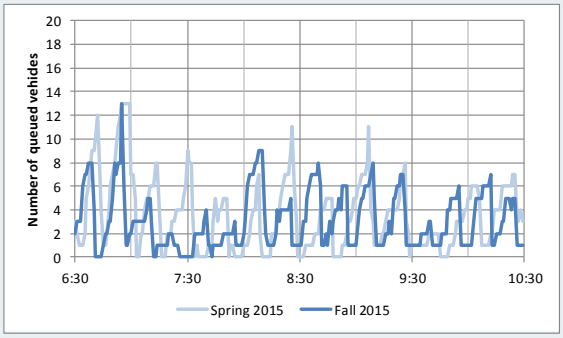
Ferry queues were longest between 6:30 and 7:30 AM, when up to 13 vehicles were observed waiting for the ferry for a brief period on Thursday. For the rest of the morning, ferry queues were generally in the order of eight vehicles or less.

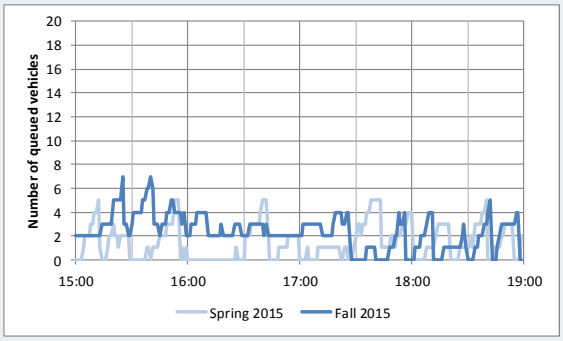
During the afternoon, the ferry queues largely remained at five vehicles or less.

Figure 25 shows a comparison of the ferry queues under pre-tunnel and post-tunnel conditions. Prior to the opening of the tunnel, the ferry was frequently unable to maintain its 15-minute frequency due to the time needed to serve boarding and disembarking passenger flows. With the diversion of most passengers to the tunnel, the ferry is now able to better maintain a 15-minute schedule. However, other than early on Friday morning (when very long queues were observed in the spring of 2015), the tunnel has not substantially affected ferry queue length. This is because the longer vehicle queues are typically observed early in the morning when passenger volumes were not historically a constraint to ferry options. On Thursday, a reduction in queue length was observed between 7:00 and 8:00. This may be due in part to the ability to better maintain the ferry schedule, but it could also reflect the removal of construction traffic now that the tunnel is complete.

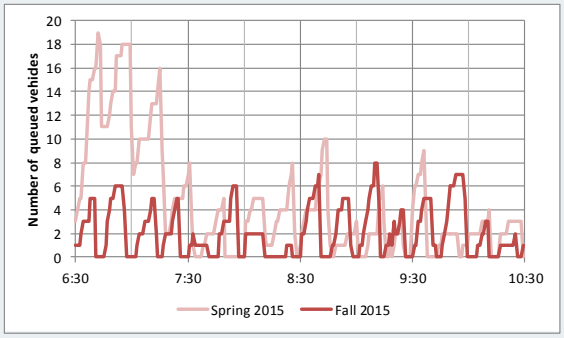
FIGURE 25: FERRY QUEUES, SPRING VS. FALL 2015

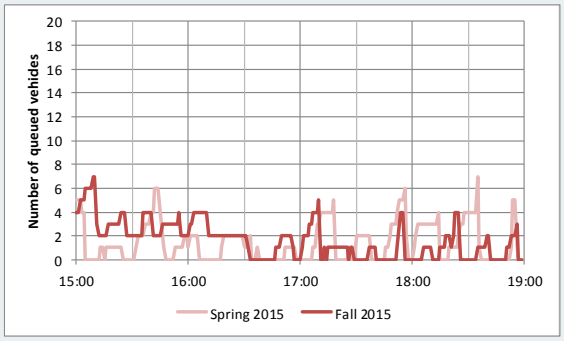
Thursday (blue):





Friday (red):





8.0 Effect of Airport Pedestrian Tunnel

This report documents the results of the mainland traffic and pedestrian surveys undertaken in October 2015 in the vicinity of Billy Bishop Toronto City Airport (BBTCA). These surveys follow up from a similar survey program undertaken in April 2015, and allow for a comparison of operating conditions before and after the opening of the pedestrian tunnel to BBTCA.

The primary difference between the pre- and post-tunnel traffic conditions has been a smoothing of traffic demand and reduced queue lengths along Eireann Quay.

Before the opening of the tunnel, traffic flows were characterized by periods of lower volume related primarily to drop-offs, with regular surges in traffic flow every 15 to 20 minutes following the arrival of a ferry. The surges in activity would be especially pronounced following ferry trips that accommodated passengers from two arriving flights. The Queens Quay and Eireann Quay intersection experienced periods of queuing and congestion following the arrival of a ferry, followed by a "recovery" period to allow queues to dissipate before the arrival of the next ferry.

With the opening of the tunnel, the flow of passengers arriving on the mainland is better dispersed rather than concentrated into surges. The flow of taxis and other vehicles associated with passenger pick-up has similarly been better dispersed. Although the traffic flows and queues along Eireann Quay still experience some variation associated with the flight schedule, the variation is much more moderate. The following effects were observed when comparing pre- and post-tunnel conditions:

- Smoothing out of the peaks in traffic flow, queuing and congestion on Eireann Quay that were previously experienced following the arrival of a ferry;
- More frequent and more gradual turnover of taxis queued in the corral (rather than an extended build-up period followed by a brief surge of outbound taxis);
- A reduction in the number of deadheading taxis during the afternoon; and
- More even distribution of ridership on shuttle trips leaving the airport.