



Georgia Department of Transportation  
Office of Planning

# **EXISTING VOLUME DEVELOPMENT AND ORIGIN-DESTINATION DATA**

Downtown Connector Study

September 8, 2016

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## Existing Volume Development & O-D Data Memo

P.I. 0013210

Georgia Department of Transportation

September 8, 2016

## Summary

The purpose of this Existing Volume Development and Origin-Destination Data Memo is to provide the Georgia Department of Transportation (GDOT) and stakeholders with an analysis of existing traffic counts and origin-destination data. The purpose of this memorandum is to explain:

1. The methodology used to determine traffic volumes along the corridor, and
2. The data and calculations used to formulate origin-destination ratios within the study area.

This memo has been prepared as part of the Downtown Connector Study, a study that aims to promote safe and efficient travel while balancing mobility and access needs for all users, recognizing its vital role in the Atlanta region and moving Georgia's economy.

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## **ATTACHMENTS**

Attachment 1: Raw Traffic Counts, Queue Volumes, & Resulting Final Volumes

Attachment 2: Queue Calculations

Attachment 3: Volume Diagrams

Attachment 4: O-D Zone Combinations & Calculations



# 1 DATA SOURCES

## 1.1 Data Glossary

Traffic data were collected from multiple sources, as noted in Table 1.

Table 1: Data Glossary

Data Description	Source
Mainline & Ramp Throughput Data	GDOT GeoCounts
Turning Movement Counts	All Traffic Data
Ramp Queue Length	Google Maps Aerial video footage Field verification
Travel Time between Key Locations	Google Maps Streetlight Data
Origin-Destination Data	Streetlight Data

## 1.2 Glossary of Terms

**ADT:** Average Daily Traffic

**Airport Split:** The southern terminus of the Downtown Connector.

**Brookwood Split:** The northern terminus of the Downtown Connector.

**Connector:** The connected portion of I-75 and I-85 from the northern terminus (referred to as the Brookwood Split), through midtown and downtown Atlanta, to the southern terminus (referred to as the Airport Split).

**Demand Volume:** The sum of throughput volume plus queued volume, which represents the total number of vehicles that attempt to use a facility during a certain period of time.

**ITP:** “Inside the Perimeter,” or the area of the metro Atlanta region inside I-285.

**OTP:** “Outside the Perimeter,” or the area of the metro Atlanta region outside of I-285.

**Perimeter:** The I-285 loop.

**Throughput Volume:** The number of vehicles that use a facility during a certain period of time.



## 2 VOLUME DEVELOPMENT

### Key Facts

- There are two permanent count locations on the Connector, but they are not located in the highest and lowest volume sections. Analysis was conducted to determine the volumes at additional locations. The highest segment-level ADT on the Connector in September 2015 was 418,735 vehicles between Williams Street and 10<sup>th</sup> Street. The lowest segment-level ADT on the Connector in September 2015 was 243,200 vehicles between Fulton Street and the southern I-20 exit and entrance ramps.
- Generally, total traffic volumes on the Connector are higher north of I-20 than south of I-20.
  - Average weekday traffic volume on the Downtown Connector in September 2015 north of I-20 was 305,000 vehicles per day.
  - Average weekday traffic volume on the Downtown Connector in September 2015 south of I-20 was 294,000 vehicles per day.
- The total entrance/exit volumes for all exits north of I-20 is significantly higher than the total of all exits south of I-20.
- Northbound traffic volumes are generally higher than southbound traffic volumes.

### 2.1 Count Locations

The GDOT Office of Transportation Data (OTD) collects traffic counts across Georgia at continuous, permanent count locations or at short duration, portable count locations. The collection of these counts supports the annual Highway Performance Monitoring System report required by the Federal Highway Administration. Additionally, these counts support operations at GDOT. Permanent and temporary traffic count data can be viewed using the GDOT GeoCounts Traffic Counts application.

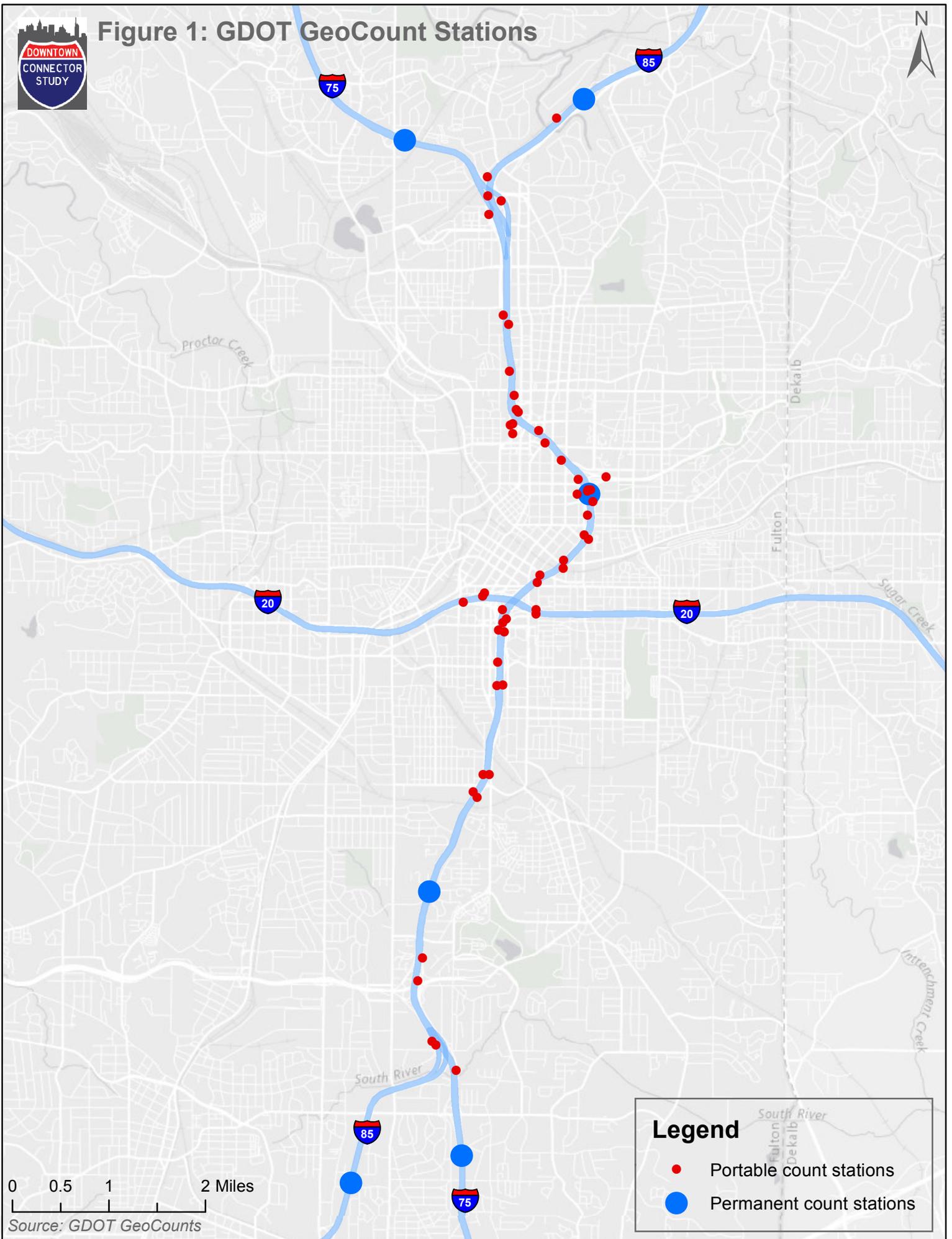
Traffic counts for the Downtown Connector Study area were collected from GDOT GeoCounts stations on I-75, I-85, I-20, and at entrance and exit ramp locations. Average weekday traffic counts from September 2015 were collected from four permanent stations located respectively north and south of the connected portion of I-75 and I-85. These counts established the inbound traffic volumes to the Connector. Counts collected from two permanent count stations along the Connector were used to determine the peak period and peak hour for the study area. Entrance and exit ramp counts were collected from portable GDOT GeoCounts stations.

The most recent, accepted count was collected from each station in order to most closely represent existing year volumes. The GDOT Office of Transportation Data reviews volumes collected at temporary count locations to ensure that the volumes fall within an acceptable range dictated by historic counts at each location. "Accepted" counts are those that have been approved by the GDOT OTD. There are instances in which collected traffic counts are rejected, likely due to equipment failure or anomalous activity on the day or days counts were collected. In the instance of count rejection, volumes are not available on the GDOT GeoCounts Traffic Counts application.

Figure 1 illustrates the locations of the count stations within the study area.



# Figure 1: GDOT GeoCount Stations



0 0.5 1 2 Miles

Source: GDOT GeoCounts

**Legend**

- Portable count stations
- Permanent count stations



## **2.2 Peak Period & Peak Hour Selection**

The AM and PM peak periods surround the morning and evening commute. The peak period is comprised of the peak hour and shoulder hours before and after it. The shoulder hours are the time between the non-peak traffic and the peak hour traffic; they are the warm up to and the cool down from the peak hour.

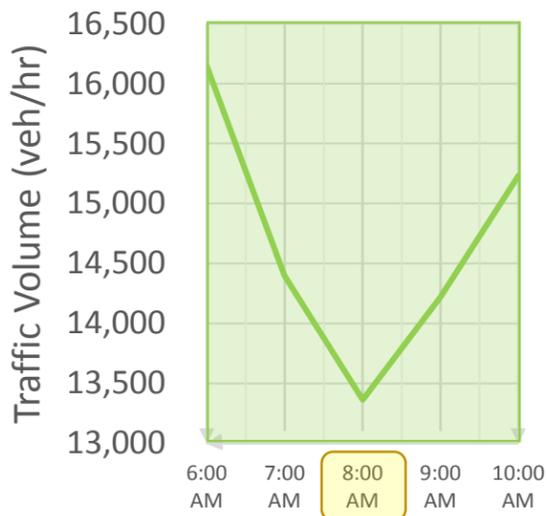
The AM peak period for the study area is 6:00 to 10:00 AM, and the PM peak period is 3:00 to 7:00 PM. These peak periods mirror those of the Atlanta Regional Commission's regional Travel Demand Model. Figure 2 shows the average weekday traffic volumes in September 2015 collected from the permanent count stations along the Downtown Connector. The AM and PM peak periods are highlighted.



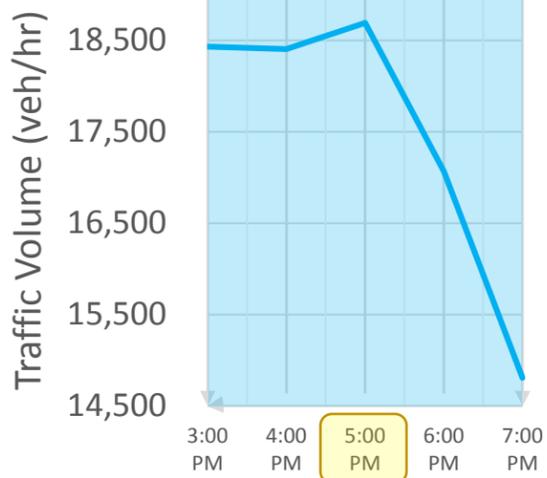
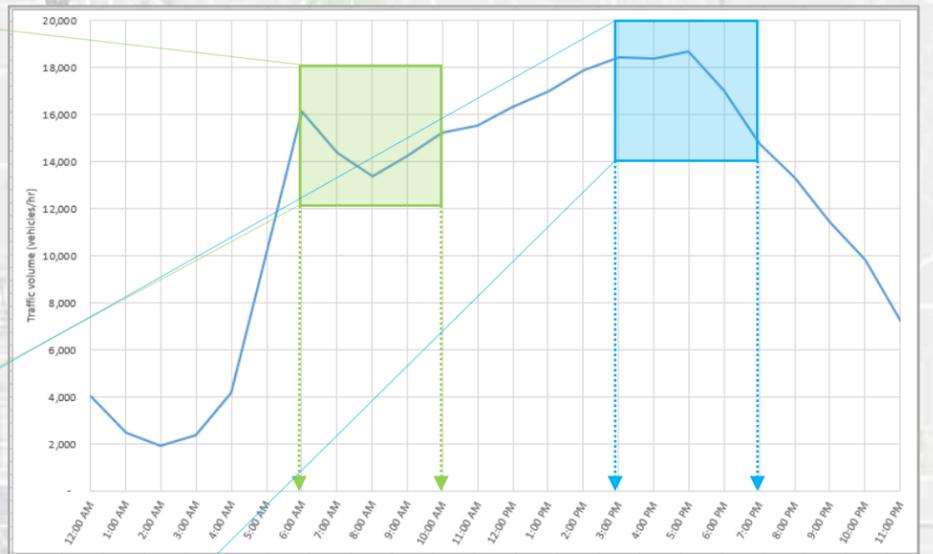
Figure 2: Peak Period & Peak Hour Selection



**Peak Periods**



Northern Count Station Hourly Weekday Traffic (Sept 2015)



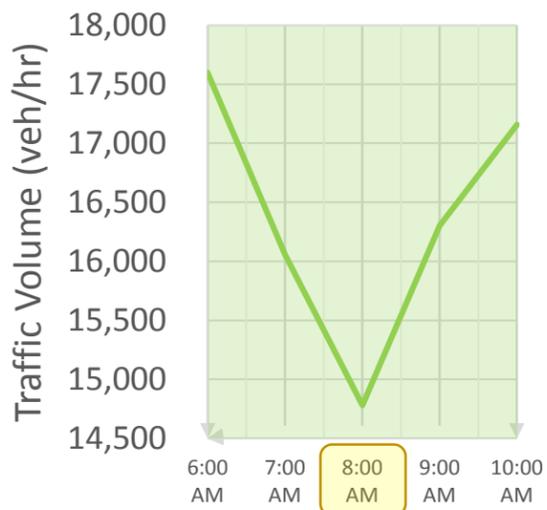
**Peak Analysis**

AM Peak Period: 6 – 10 AM  
20.5% of Daily Volume

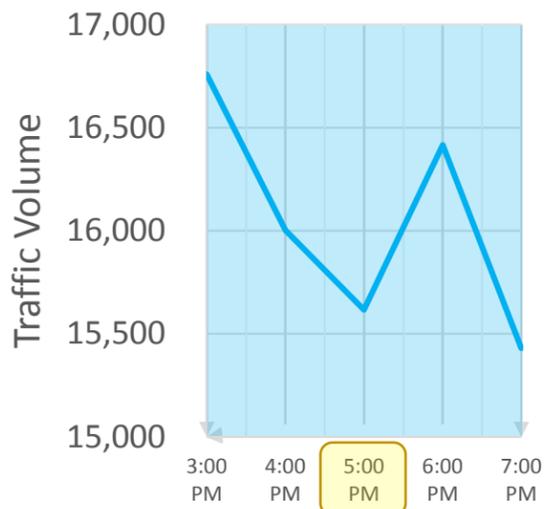
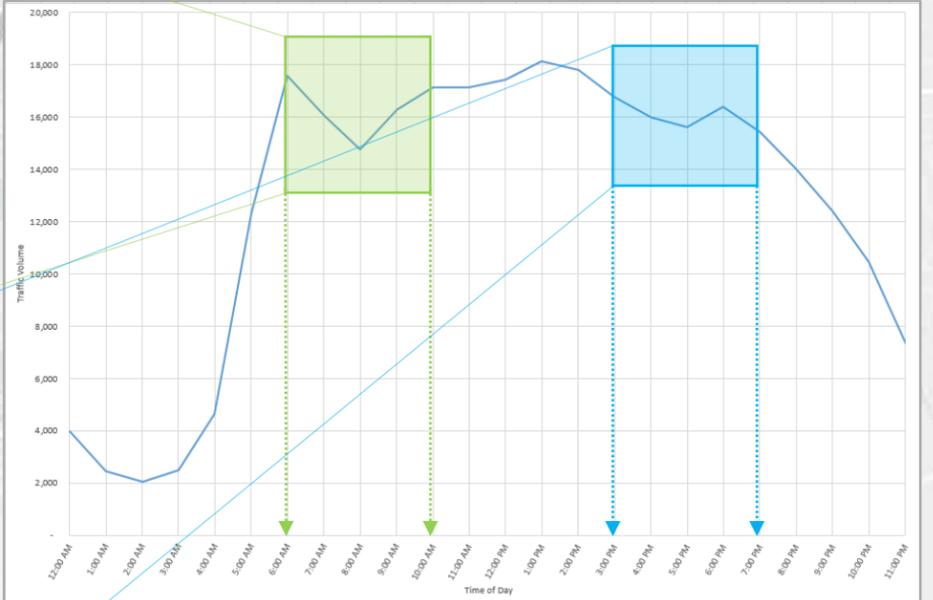
AM Peak Hour: 7 – 8 AM  
5.1% of Daily Volume

PM Peak Period: 3 – 7 PM  
22.9% of Daily Volume

PM Peak Hour: 5 – 6 PM  
5.8% of Daily Volume



Southern Count Station Hourly Weekday Traffic (Sept 2015)



**Legend**

Permanent Count Location

Volumes listed represent existing (2016) **THROUGHPUT VOLUMES** (source: GDOT GeoCounts).

**Peak Period & Peak Hour Selection**





Note that the AM trend for both locations is similar: a throughput peak at 6:00 as the morning commute begins with a decline in volume until 8 AM. The downward trend is due to shoulder hour congestion as demand increases. The AM peak hour for the study area is 7:00 to 8:00 AM.

The PM peak periods differ north and south of I-20. The northern count station shows a peak at 5 PM, while the southern count station shows a peak at 6 PM. Due to the higher traffic counts and demand along the northern half of the Downtown Connector, the northern count station's trend was used to determine PM peak hour. The PM peak hour for the study area is 5:00 to 6:00 PM.

## 2.3 Peak Hour Volume Calculations

Throughput is a measure of the actual number of vehicles traveling through a corridor, whereas demand represents the sum of the number of vehicles passing through a corridor and the vehicles waiting to travel through a corridor. Throughput and demand are sometimes different, as congestion delays demand from traveling through a corridor. For this reason, it is important to count or estimate demand so that traffic operational analyses of proposed changes will better reflect resulting real world conditions.

The raw counts collected from the GDOT GeoCounts locations represent throughput along the Downtown Connector and traffic coming from or to surface streets at each entrance or exit ramp along its length. In order to account for the additional unmet demand, queue lengths were observed and measured using Google Maps historic traffic data. Aerial video footage gathered during the peak periods and spot field verification were also used to confirm queue trends from Google Maps.

While Google Maps traffic data is available to everyone, it is a valuable tool for calculating typical queue length. Google collects traffic data from any Android smart phone that has location services enabled, every iPhone with Google Maps open, Waze accident and incident reports, and local departments of transportation.

Collecting manual back-of-queue locations for every ramp on the Connector would be costly and time consuming. Additionally, the collection would, at best, only show a few days' worth of data. Google Maps traffic data shows an average of back-of-queue locations, aggregated over weeks and months of data collection, that cannot be duplicated by manual collection. In short, Google's database of historical traffic data is a resource unlike any available for the specific purpose of measuring average queue length.

Queue lengths from the Google Maps traffic function for a typical Tuesday were measured every half hour over the peak periods on each mainline approach and entrance ramp. The number of queued vehicles was calculated using the following equation:

$$(\text{Queue length} * \text{number of lanes within the queue}) / \text{headway} = \text{Number of vehicles in queue}$$

Headway (average distance between vehicles from front of vehicle to front of vehicle) of 25 feet was used in all queue calculations. This distance is a typical dimension commonly observed and used for vehicle queues.

The queue accumulated over the peak hour was added to throughput to arrive at the demand volume for each mainline approach. Entrance ramp queues were also measured, and the queue accumulated over the peak hour was added to throughput to arrive at the demand volume for each ramp entrance to the Downtown Connector.



Northbound and southbound tables of raw traffic counts, queue volumes, and the resulting final demand volumes for each count location are included as Attachment 1. Queue calculations are included as Attachment 2.

## 2.4 Daily Volumes

Daily volumes were balanced across the system to create volume diagrams that show inflow, ramp, and segment volumes along the Connector. Traffic volumes vary daily and count equipment has a small degree of inaccuracy; therefore, balancing is an important step to calculate volumes which best fit a typical weekday and accurately account for all traffic entering and exiting the corridor. The balancing of volumes results in a set of volumes where the approach volume – exit volume + entrance volume = departure volume throughout the corridor in both directions.

During the balancing exercise, care was taken to closely match mainline traffic counts from the GDOT GeoCounts permanent count stations for the daily volumes (ADTs). Given that the traffic counts used to develop the volumes were from different days, months, or even years, matching the counts at all locations was challenging.

The goal of the balancing exercise is to reasonably adjust ADT ramp volumes in order to match ADT segment volumes. Figures 3 and 4 illustrate a simplified traffic count balancing exercise.

In Figure 3, an unbalanced volume diagram of the southbound direction of an interstate is shown. The yellow “GeoCount” cells represent raw counts collected from GeoCounts stations. The green “Calculated” cells show the sum of the previous mainline count and the entrance or exit ramp volume. The pink “Difference” cells show the difference between that calculation and the raw GeoCount at that location. The balancing exercise seeks to minimize the difference between calculated and raw segment counts.

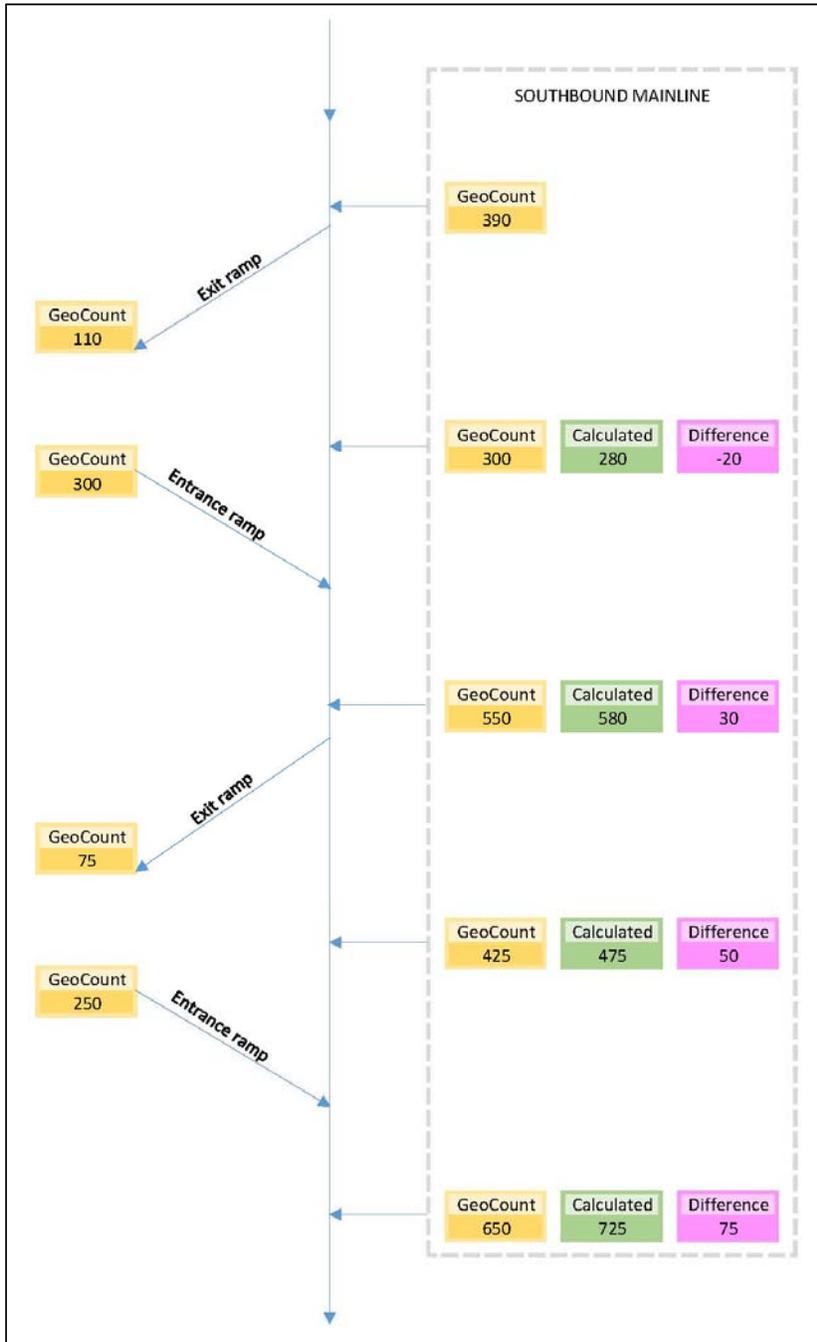


Figure 3: Unbalanced Volume Diagram

Figure 4 shows a balanced volume diagram of the same interstate. “Balanced” cells show the adjusted counts at each location. Care was taken to minimize the difference between adjusted and raw counts, at both the ramp and segment level. While there is not an exact methodology for balancing, factors considered during the exercise include known congestion or queuing at each ramp, downstream effects of adjusting a ramp count, etc.

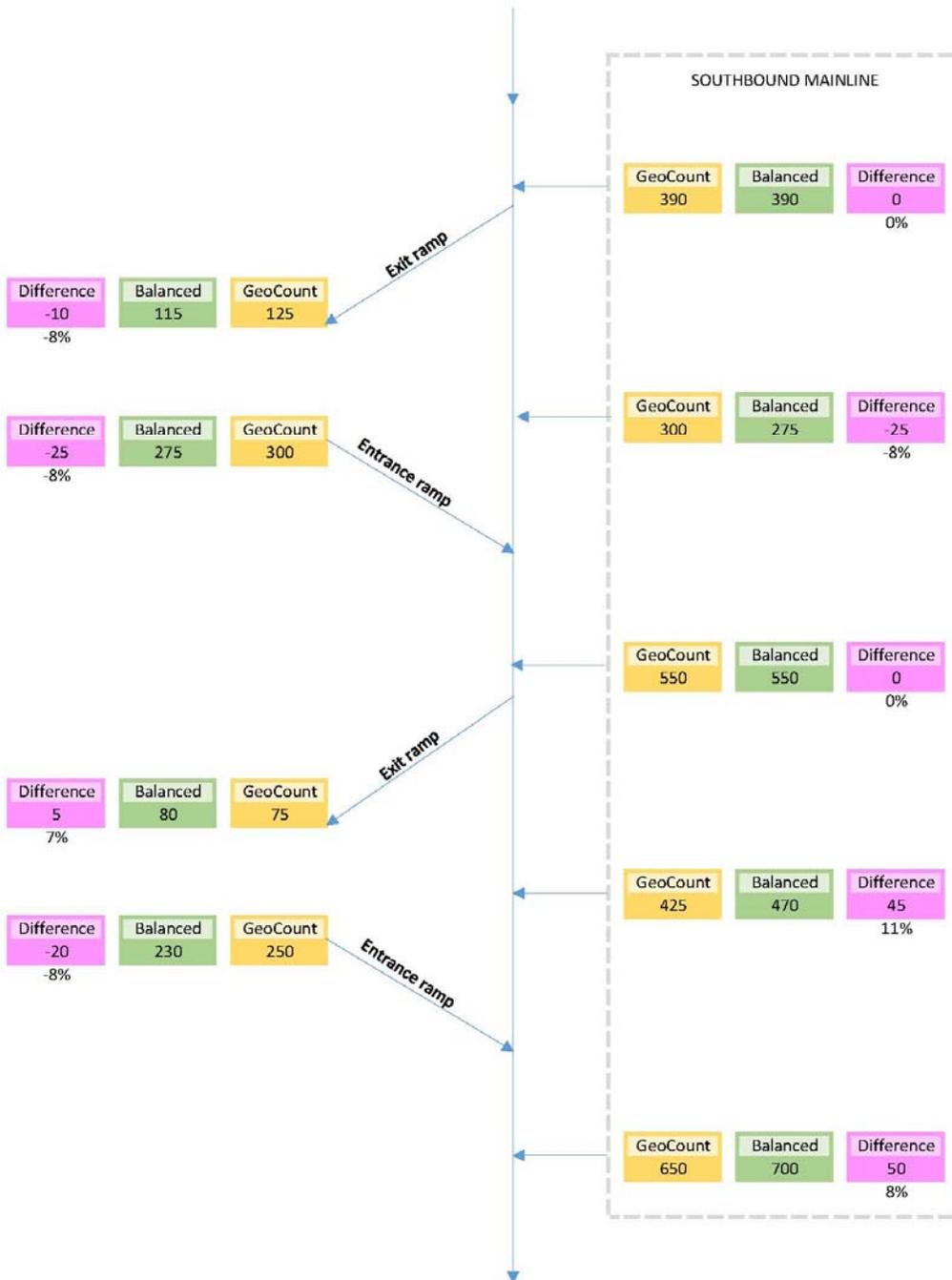


Figure 4: Balanced Volume Diagram

Tables 2 and 3 show the raw and balanced daily volumes on the Connector and the difference between the two numbers. Note that the I-75 southbound count station located south of the Airport Split was not used for matching, as the combination of ramp configuration and portable count stations just north of the permanent count station does not allow for a “clean” count of vehicles traveling southbound out of the study area.



Table 2: Northbound Mainline ADT Variation

Northbound Mainline	Raw (vehicles)	Balanced (vehicles)	Difference (vehicles)	% Difference
North of Langford Pkwy entrances	151,473	161,000	9,527	6%
North of Piedmont HOV exit	158,883	156,605	-2,278	-1%
75 NB north of Brookwood split	110,917	103,076	-7,841	-7%
85 NB north of Brookwood split	124,497	115,884	-8,613	-7%

Table 3: Southbound Mainline ADT Variation

Southbound Mainline	Raw (vehicles)	Balanced (vehicles)	Difference (vehicles)	% Difference
South of John Wesley Dobbs exit	145,942	150,500	4,558	3%
South of University entrance	142,929	145,500	2,571	2%
85 SB south of Airport split	71,566	78,147	6,581	9%

Southbound ramp entrance volumes were proportionally increased and exit volumes were proportionally decreased in order to match the mainline counts within a reasonable range. Conversely, northbound ramp entrance volumes were decreased and exit volumes increased in order to match the mainline counts within a reasonable range.

The expected ADT on the Connector is approximately 300,000 vehicles per day. The highest segment-level ADT on the Connector is 418,735 vehicles between Williams Street and 10<sup>th</sup> Street. The lowest segment-level ADT on the Connector is 243,200 vehicles between Fulton Street and the southern I-20 exit and entrance ramps. Because of the disparity between the expected and actual ADT, balanced ramp volumes and raw ramp counts were compared. Tables 4 and 5 show the proportional increases and decreases in ramp volumes used to balance the daily volumes in the system.



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Table 4: Northbound Ramp ADT Variation

Northbound Ramps	Raw (vehicles)	Balanced (vehicles)	Difference (vehicles)	% Difference
I-75 Northbound	76,065	67,759	-8,306	-11%
Langford Pkwy exit from I-75	17,860	8,131	-9,729	-54%
I-85 Northbound	74,795	66,628	-8,167	-11%
Langford Pkwy exit from I-85	2,015	2,665	650	32%
Langford Pkwy EB entrance	14,845	13,224	-1,621	-11%
Langford Pkwy WB entrance	27,150	24,185	-2,965	-11%
University Ave exit	6,890	6,662	-228	-3%
University Ave entrance	11,370	11,746	376	3%
Ralph David Abernathy Blvd exit	2,345	2,267	-78	-3%
Central Ave/Fulton St exit	12,665	12,246	-419	-3%
I-20 exit	29,505	28,528	-977	-3%
Memorial Dr HOV exit	765	740	-25	-3%
Fulton St entrance	6,590	6,808	218	3%
I-20 entrance	57,595	59,502	1,907	3%
MLK Jr Dr entrance	13,290	13,730	440	3%
Edgewood Ave exit	7,845	7,585	-260	-3%
Andrew Young Intl Blvd/Freedom Pkwy exit	37,445	36,205	-1,240	-3%
Piedmont Ave HOV exit	1,885	1,947	62	3%
Irwin St entrance	8,370	8,370	0	0%
Freedom Pkwy/Ellis St entrance	51,070	51,070	0	0%
Pine St exit	6,805	6,805	0	0%
Spring St exit	9,390	9,390	0	0%
Spring St/Williams St entrance	33,465	33,465	0	0%
Williams St HOV entrance	2,140	2,140	0	0%
Williams St exit	16,495	16,495	0	0%
17th St exit	19,160	19,160	0	0%
16th St entrance (onto I-75)	19,160	19,160	0	0%



**Table 5: Southbound Ramp ADT Variation**

Southbound Ramps	Raw (vehicles)	Balanced (vehicles)	Difference (vehicles)	% Difference
I-75 Southbound	123,820	123,820	0	0%
I-85 Southbound	156,945	156,945	0	0%
I-75 SB to I-85 NB	31,875	34,415	2,540	8%
I-85 SB to I-75 NB	23,135	24,978	1,843	8%
17th St exit from I-85 SB	21,895	23,640	1,745	8%
10th, 14th, 16th St exit from I-75 SB	13,930	15,040	1,110	8%
10th St entrance	21,060	19,382	-1,678	-8%
North Ave exit	17,410	18,797	1,387	8%
Williams St HOV exit	2,140	2,311	171	8%
Williams St exit	15,125	16,330	1,205	8%
Spring-Techwood Connector entrance	18,615	17,132	-1,483	-8%
Courtland St exit	12,240	13,215	975	8%
Freedom Pkwy exit	10,440	11,272	832	8%
John Wesley Dobbs Ave exit	6,280	6,780	500	8%
John Portman Blvd entrance	2,355	1,530	-825	-35%
Ellis St entrance	8,095	5,260	-2,835	-35%
Freedom Pkwy entrance	14,085	9,152	-4,933	-35%
Edgewood Ave entrance	8,520	5,536	-2,984	-35%
MLK Jr Dr exit	7,655	10,336	2,681	35%
I-20 exit	24,070	32,501	8,431	35%
Fulton St exit	6,105	8,243	2,138	35%
I-20 entrance	33,255	21,607	-11,648	-35%
Memorial Dr HOV entrance	1,000	650	-350	-35%
Pulliam St entrance	16,255	10,561	-5,694	-35%
Ralph David Abernathy Blvd entrance	4,140	2,690	-1,450	-35%
University Ave exit	11,550	15,596	4,046	35%
University Ave entrance	7,220	4,691	-2,0529	-35%
Langford Pkwy exit	27,150	27,150	0	0%
Langford Pkwy entrance onto I-85	22,522	22,522	0	0%
Langford Pkwy entrance onto I-75	13,576	13,576	0	0%

The difference between the raw and balanced vehicle volume on the northbound ramps is -11,189, and on the southbound ramps is -30,360. These numbers reflect fewer vehicles entering and more vehicles exiting the Connector than the raw counts reflect, lending further validity to the high segment-level ADTs at the north end of the Connector.

## 2.5 Volume Representations

Volume diagrams showing AM and PM peak hour demand volumes are included as Attachment 3.



### 3 ORIGIN-DESTINATION ANALYSIS

Key facts:

- There is generally more local traffic than through traffic on the Downtown Connector. There is approximately 60% local traffic and 40% through traffic on the Downtown Connector over the course of the day.
  - “Local” traffic begins or ends on a Connector ramp, including entering or exiting from I-20.
  - “Through” traffic is generated on I-75 or I-85 north or south of the Connector that travels the entire length of the Connector without exiting.
- In the AM peak hour, the I-85 southbound volume is higher than all other approaches followed by I-75 southbound. More than 50% of southbound traffic from I-75 and I-85 is traveling to destinations along the Connector, 76% of which exits north of I-20.

#### 3.1 Origin-Destination Data Source

Origin-Destination (O-D) data allows a more detailed analysis of trip patterns than other traditional data sources and methods of analysis. O-D data was obtained from StreetLight Data for the Downtown Connector Study area and was processed, analyzed and summarized. StreetLight obtains their GPS data points through formal partnerships with data aggregation companies such as INRIX.

StreetLight Data processes GPS data from mobile devices (smart phones), hand-held GPS devices, commercial fleet management systems, and connected cars. Their GPS data is generally precise to within 5 meters, making it more precise than cellular data. This precision affords accurate O-D trips to be filtered from the billions of GPS data points generated every day.

#### 3.2 Origin-Destination Data Limitations

O-D data gathered by StreetLight is from a large sample of vehicles, but not from every vehicle on the roadway. Therefore, the user of the data should keep in mind that while this information is very good and useful, there are some inherent limits and considerations to its use:

- Connected cars and fleet management systems are one of StreetLight’s most significant data sources. Connected vehicles are typically newer and more expensive than cars without navigation, creating bias toward higher income households.
- Smart phones using location-based services are more expensive than simpler cell phones, creating potential bias toward higher income households, though StreetLight’s survey of the residential penetration of devices in North America shows that their model relies on a similar quantity of devices per capita in high- and low-income areas.



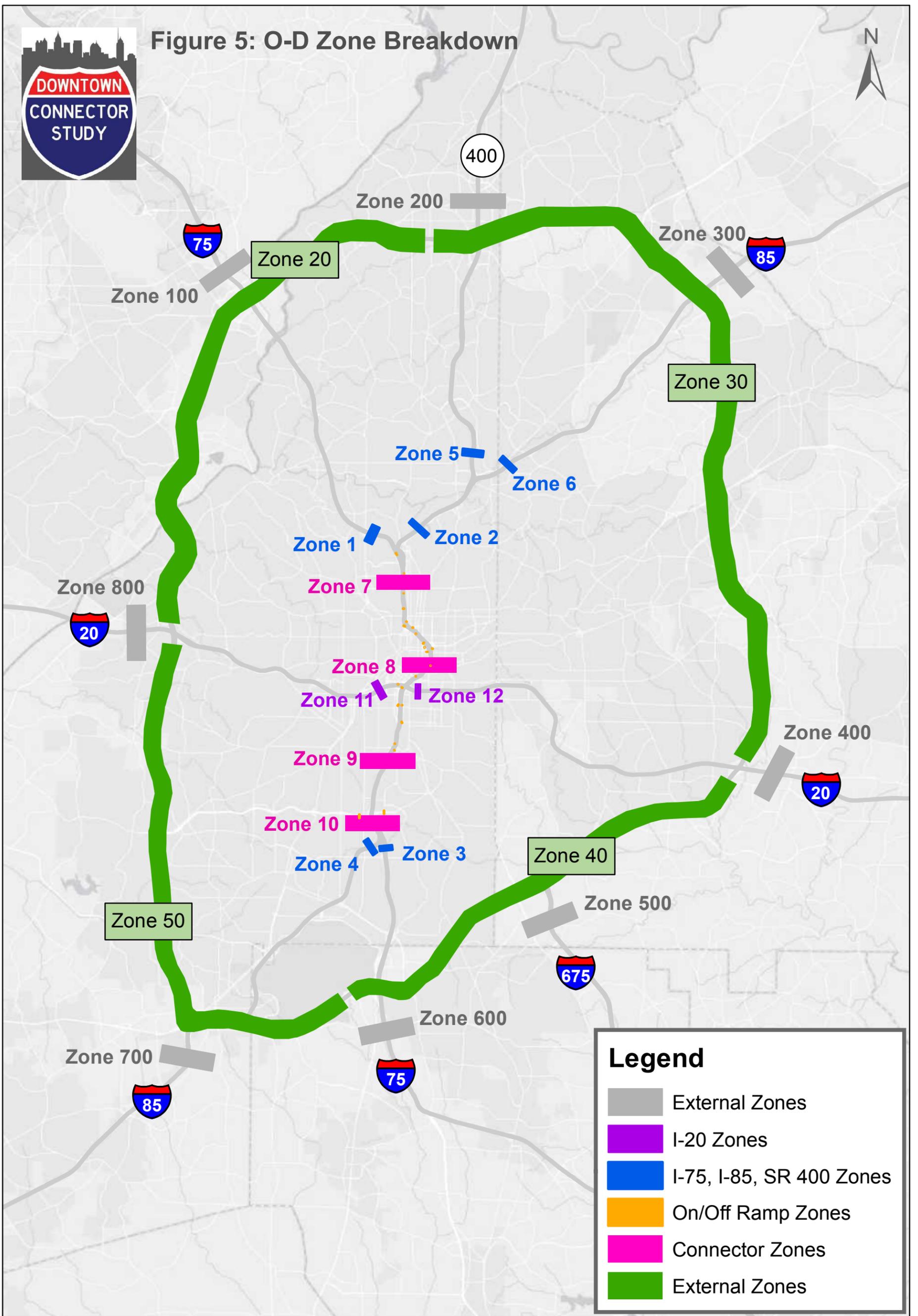
- StreetLight's sample is likely biased toward a younger population, as they are more likely to have smart phones using location-based services.

### 3.3 Origin-Destination Inputs & Outputs

O-D zones were predetermined for the study area in order to capture data for specific desired trip patterns. Four zones were created to surround I-285 on the northwest (zone 20), northeast (zone 30), southwest (zone 40), and southeast (zone 50) quadrants. These zones were placed such that they would capture inbound and outbound outside the perimeter (OTP) trips. Eight zones were created on each interstate and State Route 400 just outside of I-285 to capture trips entering and exiting the Perimeter on each of these eight roadways (zones 100 through 800). Thirty-four secondary zones were created to capture inside the perimeter (ITP) movements. Of the 34 ITP zones, 12 were placed on I-75, I-85, SR-400, I-20, and on the Connector (zones 1 through 12). The other 24 ITP zones were placed on entrance and exit ramps along the Connector. See Figure 5 for the O-D zone breakdown.



Figure 5: O-D Zone Breakdown



**Legend**

- External Zones
- I-20 Zones
- I-75, I-85, SR 400 Zones
- On/Off Ramp Zones
- Connector Zones
- External Zones

# O-D Zone Breakdown





StreetLight provides a web portal for running their O-D model. The model accepts combinations of zones to analyze O-D percentages. Zone combinations include:

- Origin zone – trips originate in or through this zone
- Middle filter (optional) – a zone placed strategically between the origin and destination zones to limit route
- Destination zone – trips end in or continue through this zone after passing through the origin and middle filter

StreetLight provides their output data in a “StreetLight Index” format. The index provides the estimated number of trips within a zone based on device penetration data from a study completed in Sacramento, CA. Arcadis used the overall trips versus the trips between specific pairs of zones to calculate the percentages provided in this memorandum.

### 3.4 Origin-Destination Calculations

Four primary trip types were identified:

- OTP to OTP: Trips that originate outside the Perimeter, travel along the entire length of the Connector, and then end outside the Perimeter.
- ITP to OTP (not including trips originating on the Connector): Trips that originate inside the Perimeter, travel along the entire length of the Connector, and then end outside the Perimeter.
- OTP to ITP: Trips that originate outside the Perimeter, travel along some or all of the Connector, and then end inside the Perimeter.
- ITP to ITP (not including trips originating on the Connector): Trips that originate inside the Perimeter, and then end inside the Perimeter.

Three secondary trip types were identified:

- Connector trips: Trips that begin and end on a Connector ramp.
- I-20 to ITP: Trips that originate on I-20, travel on the Connector, and then end inside the Perimeter and vice versa.
- I-20 to OTP: Trips that originate on I-20, travel on the Connector, and then end outside the Perimeter and vice versa.

Trip type percentages were calculated using specific zone combinations or by using zone combinations in simple mathematic equations. Figure 6 shows an example of these zone combinations.



**Figure 6: Zone Combination Example**

The goal of this zone combination is to isolate the number of trips originating on I-75 inside the perimeter between I-285 and the southern terminus of the Connector and ending outside of the perimeter on I-75 to the north. The following equation is used in order to isolate the trips originating inside the Perimeter:

$$(Zone 3 \text{ through } Zone 1 \text{ to } Zone 20) - (Zone 40 \text{ through } Zone 1 \text{ to } Zone 20)$$

The trips captured by Zone 3 include *all* vehicles approaching the Downtown Connector from I-75 northbound. The trips captured by Zone 40 through Zone 1 include only the vehicles approaching the Downtown Connector from outside the Perimeter. The equation accomplishes the goal of subtracting the OTP trips from ITP trips.



OTP to OTP trip types were calculated using a single zone combination of quadrant zone through internal zone to quadrant zone. Sample zone combinations for this trip type are:

- 20 through 1 to 40
- 50 through 4 to 30

ITP to OTP trips were calculated using combinations of equations using the format (inside zone through middle filter to outside zone) – (quadrant zone through middle filter to quadrant zone). Sample equations for this trip type are:

- (3 through 1 to 20) – (40 through 1 to 20)
- (2 through 4 to 50) – (30 through 4 to 50)

OTP to ITP trips were calculated using combinations of equations following the format of (quadrant zone through Connector middle filter to inside zone) – (quadrant zone through middle filter to outside zone).

Sample calculations for this trip type are:

- (20 through 8 to 3) – (20 through 3 to 40)
- (40 through 8 to 2) – (40 through 2 to 30)

ITP to ITP trips were calculated using combinations of equations following the format of (inside zone through Connector middle filter to inside zone) – (quadrant zone through middle filter to quadrant zone).

Sample equations for this trip type are:

- (1 through 8 to 3) – (20 through 8 to 40)
- (4 through 8 to 2) – (50 through 8 to 30)

I-20 to ITP trips were calculated as (I-20 zone through Connector middle filter to inside zone) – (I-20 zone through Connector middle filter to outside zone). Sample calculations for this trip type are:

- (12 through 8 to 1) – (12 through 8 to 20)
- (11 through 9 to 3) – (11 through 9 to 40)

I-20 to OTP trips were calculated using a single zone combination of I-20 zone through middle filter to quadrant zone. Sample zone combinations for this trip type are:

- 12 through 1 to 20
- 11 through 4 to 50

Connector through trips were calculated using single zone combinations. Sample zone combinations for this trip type are:

- Zone 1 through Zone 10 to Zone 4
- Zone 3 through Zone 7 to Zone 2



The data used to derive O-D percentages for this study were gathered from all Tuesdays, Wednesdays, and Thursdays in September and October of 2015. These days were chosen to represent normal, weekday traffic along the Downtown Connector. A complete list of zone combinations and calculations can be found in Attachment 4.

### **3.5 Origin-Destination Results**

#### *Through Traffic vs. Local Traffic*

Trips generated on I-75 or I-85 north or south of the Connector that travel the entire length of the Connector without exiting were considered through trips for this analysis. Trips that begin or end on a Connector ramp, including those coming from or going to I-20, were considered local trips for this analysis.

Through versus local trip percentages varies by location and time of day. There is generally more local traffic than through traffic on the Downtown Connector. There is approximately 60% local traffic and 40% through traffic on the Downtown Connector over the course of the day.

There is a higher percentage of local traffic during the peak periods than during the remainder of the day due to the high volume of commute-to-work trips during those peak periods. There is a higher percentage of local traffic coming from the north than from the south, likely due to the fact that there are more commute-to-work trips coming from the larger population located north of downtown Atlanta than south of downtown Atlanta. While the northbound and southbound percentages vary, the volume of through traffic is roughly equivalent between northbound and southbound. Figure 7 shows the breakdown of through versus local trips at four locations along the Connector.



Figure 7: Through vs. Local Trips

Through traffic travels the full length of the Downtown Connector.

Southbound between 10 <sup>th</sup> St and North Ave			
Time of Day	Through	Local	Total
AM	4,966 (31%)	11,279 (69%)	16,245
PM	3,458 (32%)	7,202 (68%)	10,660
Daily	67,139 (33%)	134,931 (67%)	202,070

Southbound between Wesley Dobbs and John Portman Blvd			
Time of Day	Through	Local	Total
AM	4,966 (56%)	3,909 (44%)	8,875
PM	3,458 (38%)	5,572 (62%)	9,030
Daily	67,139 (45%)	83,356 (55%)	150,495

Southbound between I-20 and Memorial Dr HOV			
Time of Day	Through	Local	Total
AM	4,966 (62%)	3,089 (38%)	8,055
PM	3,458 (30%)	7,927 (70%)	11,385
Daily	67,139 (47%)	75,356 (53%)	142,495

Southbound between University Ave and Langford Pkwy			
Time of Day	Through	Local	Total
AM	4,966 (62%)	3,104 (38%)	8,070
PM	3,458 (27%)	9,257 (73%)	12,715
Daily	67,139 (46%)	78,351 (54%)	145,490

Northbound Between Williams St and 10 <sup>th</sup> St			
Time of Day	Through	Local	Total
AM	3,906 (23%)	12,739 (77%)	16,645
PM	4,015 (29%)	9,775 (71%)	13,790
Daily	79,234 (34%)	156,231 (66%)	235,465

Northbound Between Freedom Pkwy Off-Ramp and Irwin St On-Ramp			
Time of Day	Through	Local	Total
AM	3,906 (30%)	9,209 (70%)	13,115
PM	4,015 (50%)	4,015 (50%)	8,030
Daily	79,234 (50%)	79,326 (50%)	158,560

Northbound Between Fulton St and I-20 Off-Ramps			
Time of Day	Through	Local	Total
AM	3,906 (43%)	5,084 (57%)	8,990
PM	4,015 (48%)	4,420 (52%)	8,435
Daily	79,234 (52%)	72,346 (48%)	151,580

Northbound Between Langford Pkwy and University Ave			
Time of Day	Through	Local	Total
AM	3,906 (37%)	6,589 (63%)	10,495
PM	4,015 (46%)	4,690 (54%)	8,705
Daily	79,234 (49%)	81,771 (51%)	161,005

AM and PM peak volumes listed represent 2016 DEMAND VOLUME. Demand volume is the sum of throughput (source: GDOT GeoCounts) and calculated queue volume (source: Google Maps traffic function and aerial video) that accumulates over the peak hour on the mainlines, entrance ramps, and exit ramps. Inbound queue volume is distributed proportionally across the system.

Source of existing daily volumes is GDOT Geocounts.

Percentages listed are percentages of segment traffic.

# Through vs. Local Trip Breakdown







Figure 8 is a side-by-side comparison of through trips at each of the four locations depicted in Figure 7. The colored bars represent through trip percentages by direction and time of day.

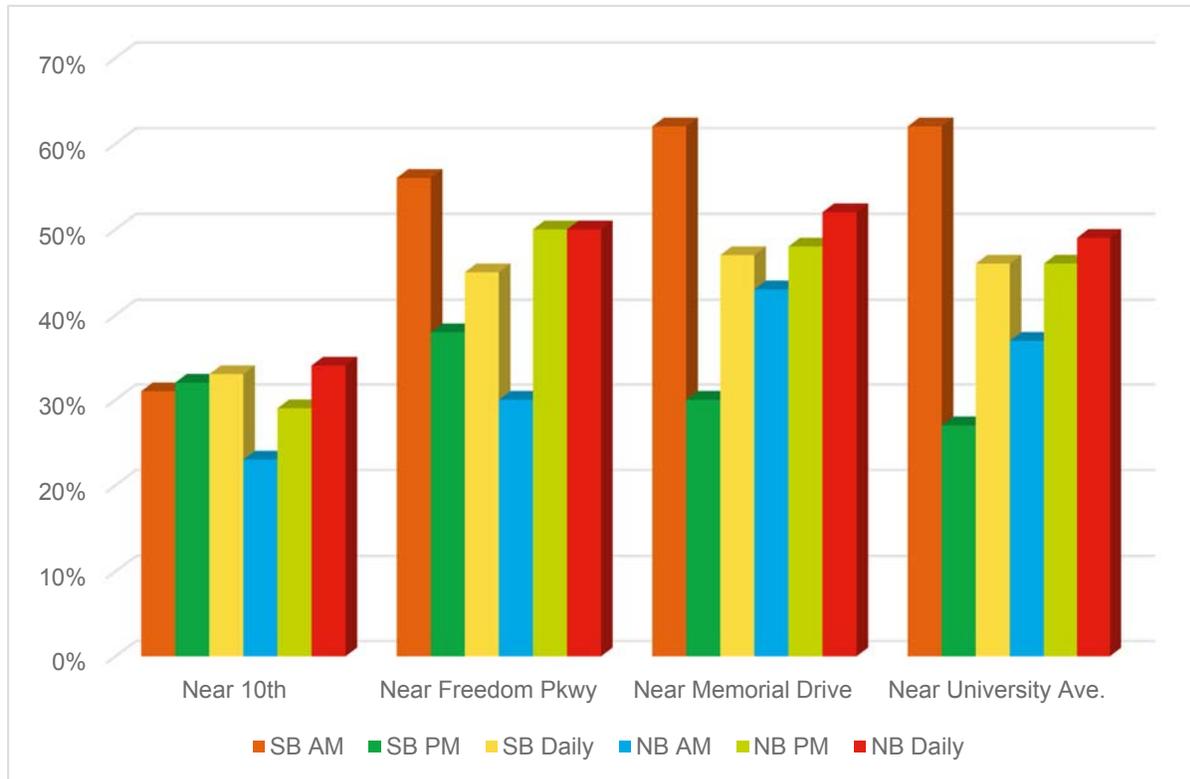


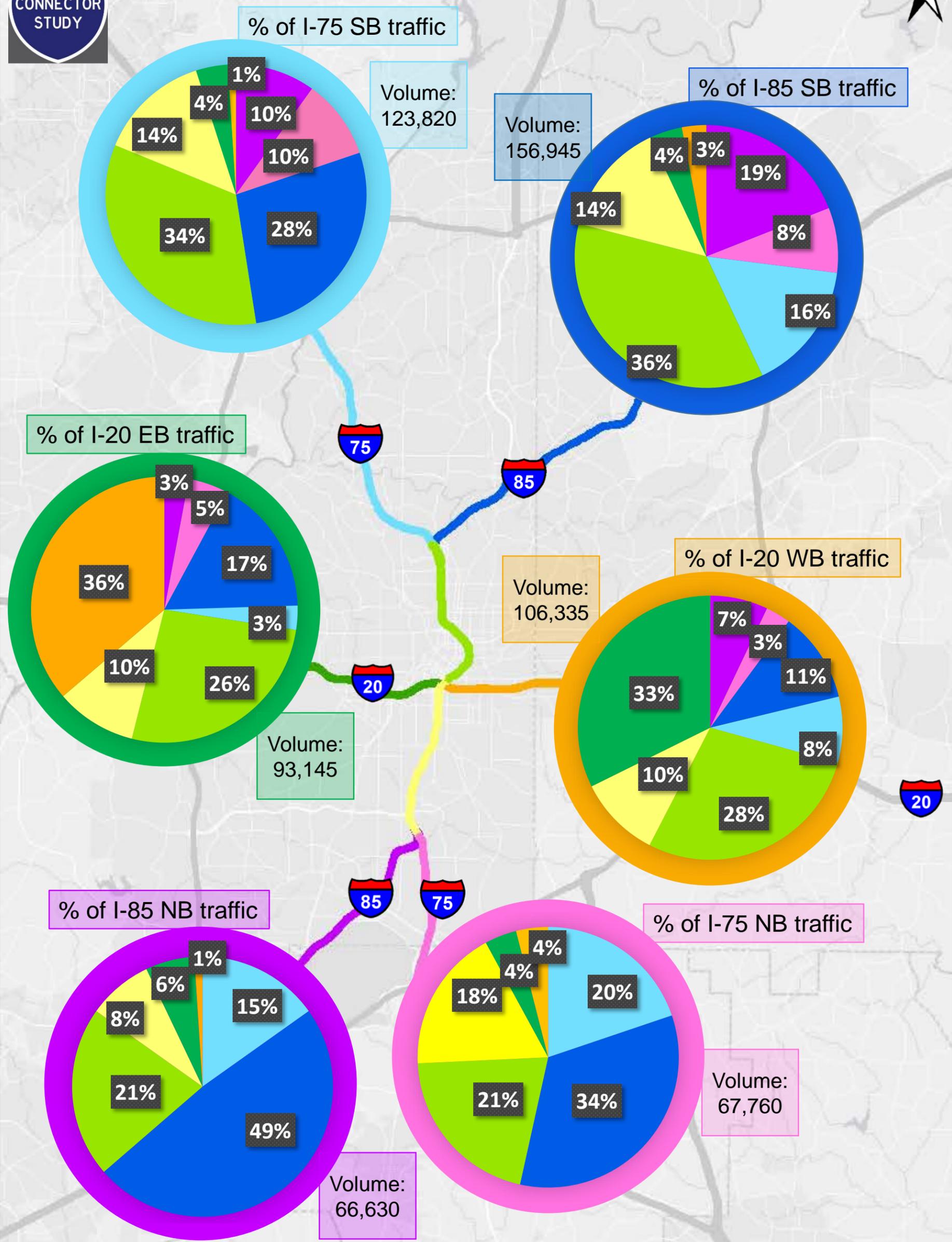
Figure 8: Through Traffic Percentages

### O-D Patterns

StreetLight index results created trip destination patterns for each approach within the study area. Figures 9 through 11 show the distribution of trip destinations inside the perimeter. These trips originate anywhere along an inbound approach and either end along the Connector or continue along an interstate within the study area. The O-D patterns for daily, AM, and PM peak are similar. Local traffic percentages – shown as the yellow and light green segments and corresponding slices of the pie charts – remain high for each approach. Through traffic is roughly 40% of all traffic on the Connector.



Figure 9: Who Uses the Connector? Daily ITP Trip Patterns



Volumes listed represent existing **DEMAND VOLUME**. Demand volume is the sum of throughput (source: GDOT GeoCounts) and measured queue (calculated based on queue length estimated using Google Maps traffic function and aerial video) that accumulates over the peak hour on the mainlines, entrance ramps, and exit ramps. Inbound queue volume is distributed proportionally across the system. Percentages listed are percentages of inbound traffic (source: StreetLight Data).

## Origin-Destination by Facility Daily



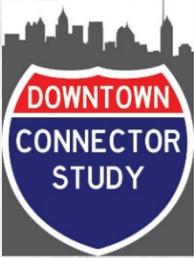
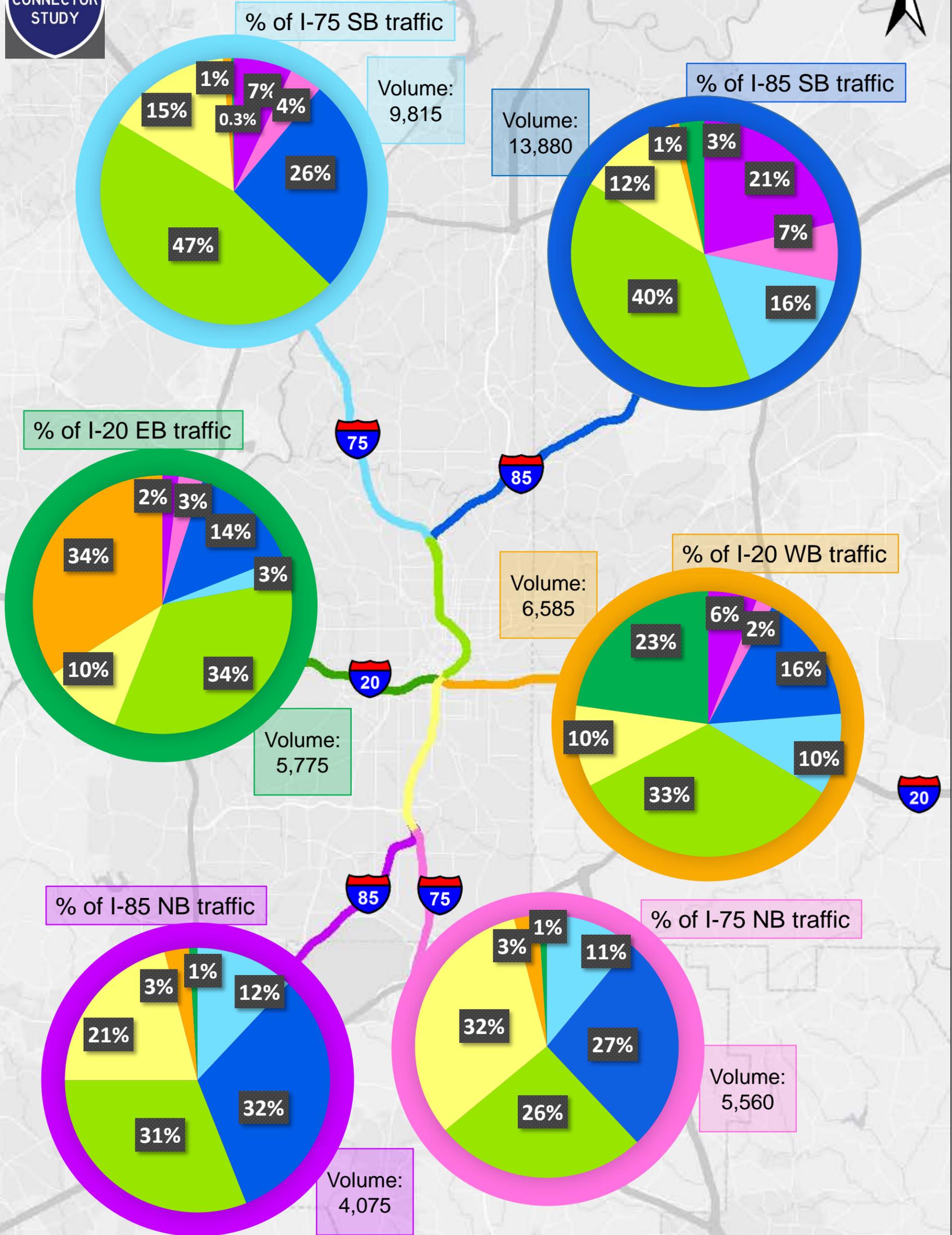


Figure 10: Who Uses the Connector? AM ITP Trip Patterns



Volumes listed represent existing **DEMAND VOLUME**. Demand volume is the sum of throughput (source: GDOT GeoCounts) and measured queue (calculated based on queue length estimated using Google Maps traffic function and aerial video) that accumulates over the peak hour on the mainlines, entrance ramps, and exit ramps. Inbound queue volume is distributed proportionally across the system. Percentages listed are percentages of inbound traffic (source: StreetLight Data).

## Origin-Destination by Facility

AM



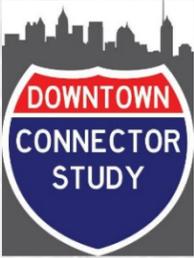
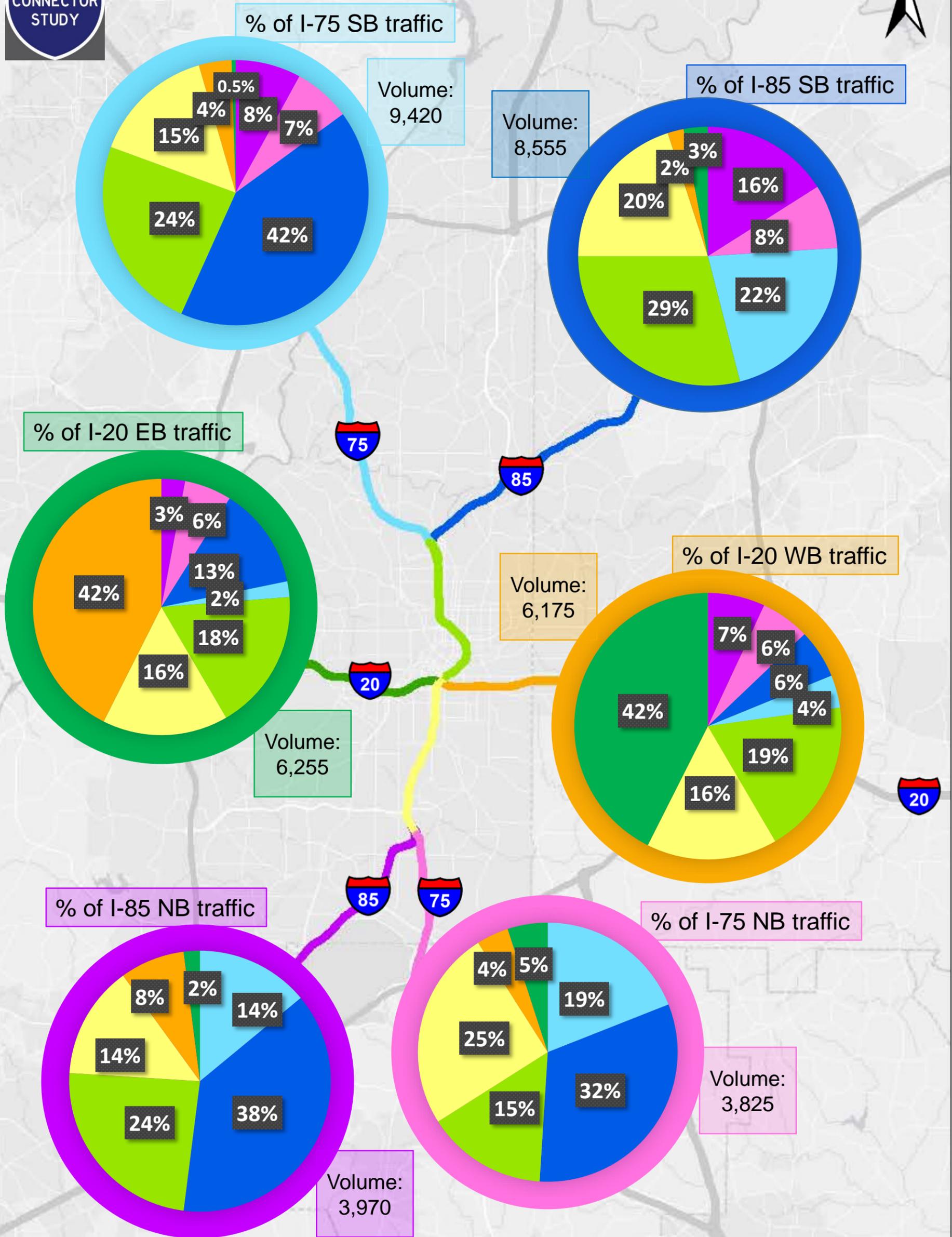


Figure 11: Who Uses the Connector? PM ITP Trip Patterns



Volumes listed represent existing **DEMAND VOLUME**. Demand volume is the sum of throughput (source: GDOT GeoCounts) and measured queue (calculated based on queue length estimated using Google Maps traffic function and aerial video) that accumulates over the peak hour on the mainlines, entrance ramps, and exit ramps. Inbound queue volume is distributed proportionally across the system. Percentages listed are percentages of inbound traffic (source: StreetLight Data).

## Origin-Destination by Facility

PM





In the AM peak hour, the I-85 southbound volume is higher than all other approaches followed by I-75 southbound. 26% of I-75 southbound traffic is traveling to I-85 northbound at the Brookwood interchange, and 16% of I-85 southbound traffic is traveling to I-75 northbound. More than 50% of southbound traffic from I-75 and I-85 is traveling to destinations along the Connector, 76% of which exits north of I-20.

In the PM peak hour, I-85 and I-75 volumes are comparable. 42% of I-75 southbound traffic is traveling to I-85 northbound at the Brookwood interchange, and 22% of I-85 southbound traffic is traveling to I-75 northbound. A significant portion of I-85 southbound traffic exits along the Connector in the PM peak hour, but a smaller percentage of I-75 southbound does.

Note that a significant percentage of traffic from I-20 transitions onto the Downtown Connector, and then exits to a surface street. These trips represent approximately 1/3 of all I-20 traffic.

OTP to OTP trip patterns represent trips that originate outside of the I-285 perimeter, travel through the interior of I-285, and then continue travel outside of the perimeter. Daily, AM, and PM OTP to OTP patterns are shown in Figures 12 – 14. The O-D patterns for daily, AM, and PM peak are less similar than the ITP trip patterns.

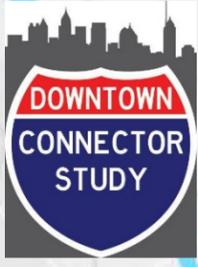
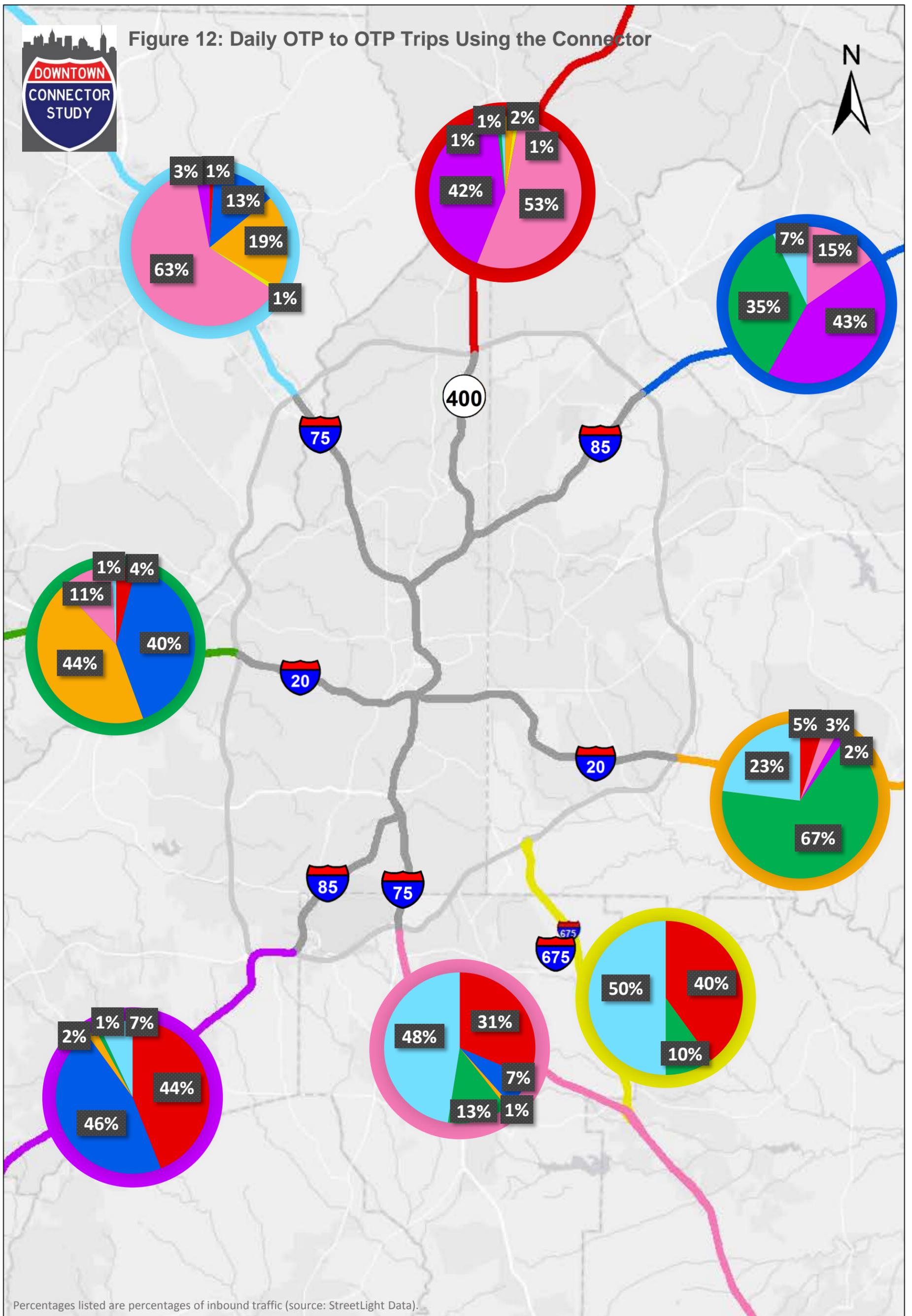


Figure 12: Daily OTP to OTP Trips Using the Connector



Percentages listed are percentages of inbound traffic (source: StreetLight Data).

# OTP-to-OTP Trip Breakdown

## Daily



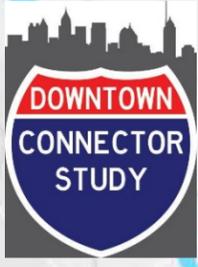
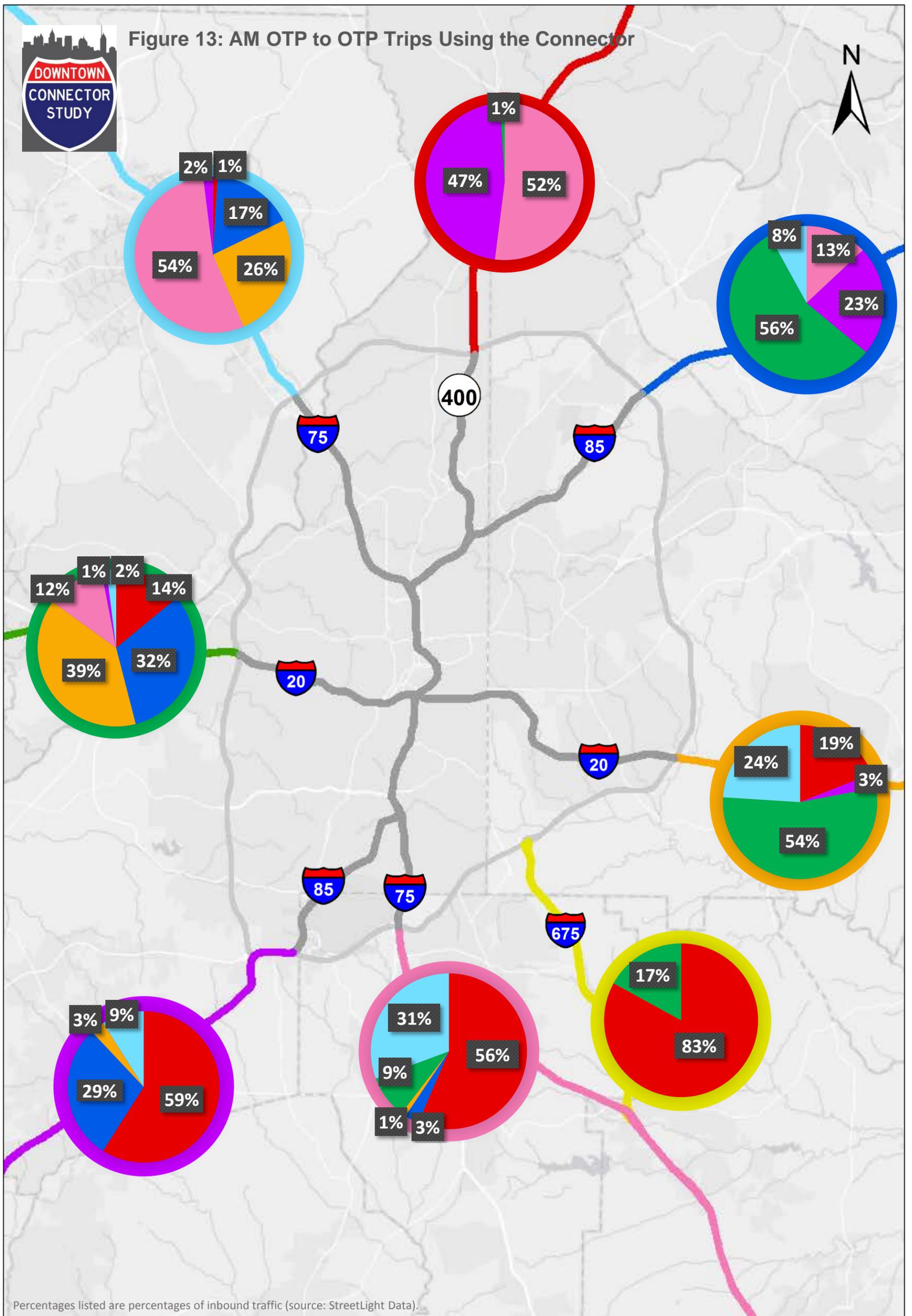


Figure 13: AM OTP to OTP Trips Using the Connector



Percentages listed are percentages of inbound traffic (source: StreetLight Data).

# OTP-to-OTP Trip Breakdown

## AM Peak Period 6 – 10 AM



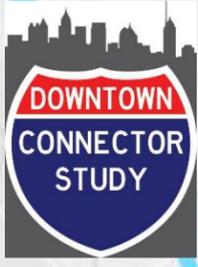
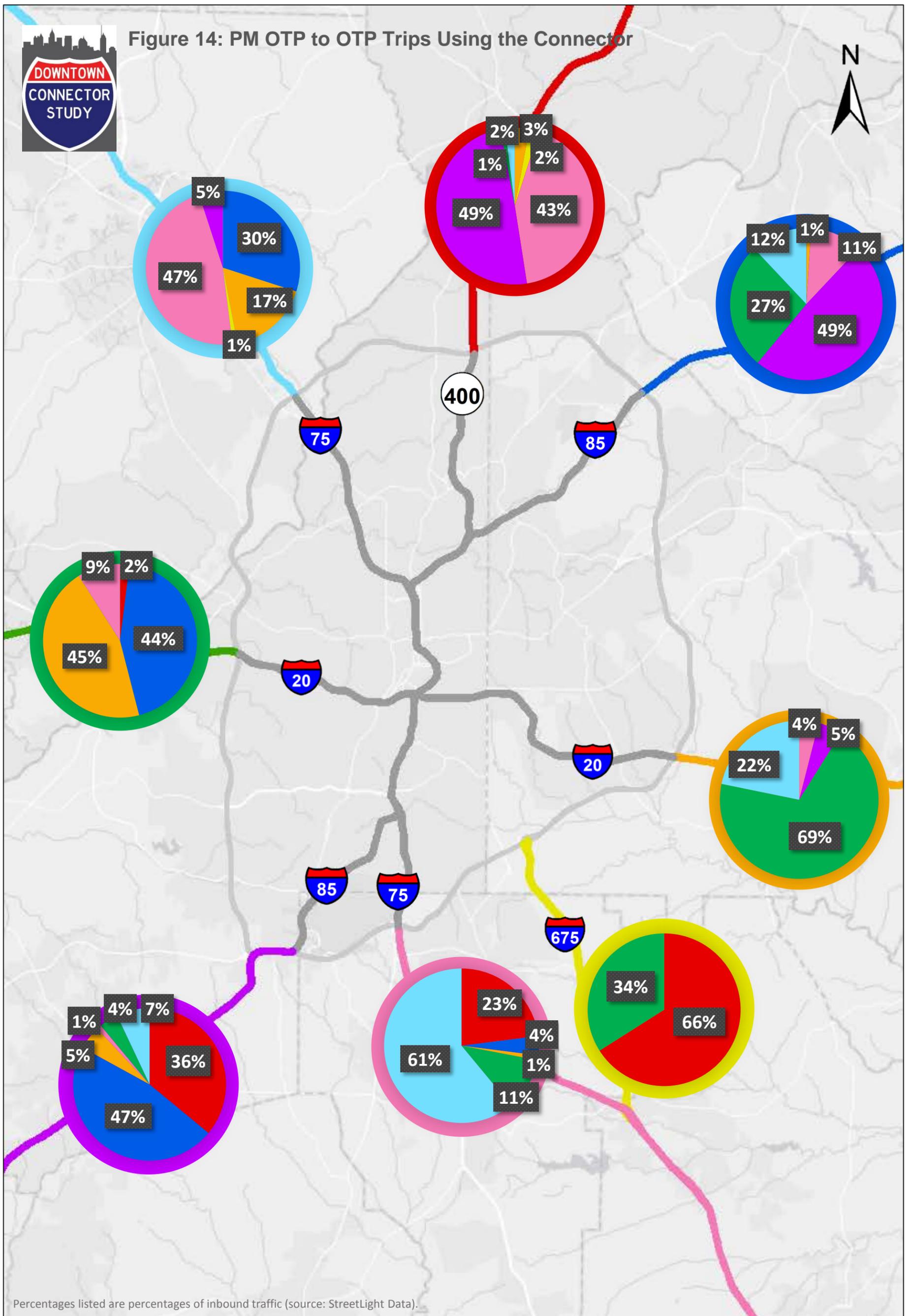


Figure 14: PM OTP to OTP Trips Using the Connector



# OTP-to-OTP Trip Breakdown

PM Peak Period

3 – 7 PM





Arcadis U.S., Inc.

2410 Paces Ferry Road

#400

Atlanta, Georgia 30339

Tel 770 431 8666

Fax 770 435 2666

[www.arcadis.com](http://www.arcadis.com)



# Attachments



# **Attachment 1: Raw Traffic Counts, Queue Volumes, & Resulting Final Volumes**

## Northbound Ramp Volumes

	Month & Year of Collection	AM			PM			Daily
		Throughput	Queue volume	Demand volume	Throughput	Queue volume	Demand volume	Throughput
		(vehicles)	(vehicles)	(vehicles)	(vehicles)	(vehicles)	(vehicles)	(vehicles)
I-75 Northbound	Sept 2015	7013	0	7015	4375	0	4375	83145
Langford Pkwy exit from I-75	Apr 2016	2200	0	2200	1013	0	1015	17860
I-85 Northbound	Sept 2015	5115	0	5115	4468	0	4470	74840
Langford Pkwy exit from I-85	Feb 2016	49	0	50	134	0	135	2015
Langford Pkwy EB entrance	Apr 2016	706	0	705	891	0	890	14845
Langford Pkwy WB entrance	Apr 2016	2142	0	2140	1681	0	1680	27150
University Ave exit	Mar 2016	483	14	495	332	0	330	6890
University Ave entrance	Mar 2016	488	21	510	583	0	585	11370
Ormond St exit	Jan 2014	196	22	220	126	0	125	2345
Central Ave/Fulton St exit	Mar 2016	1267	90	1355	591	0	590	12665
I-20 exit	Apr 2016	700	0	700	2425	0	2425	29505
Memorial Dr HOV exit	Apr 2016	76	0	75	28	0	30	765
Fulton St entrance	Jan 2014	774	0	775	369	0	370	6590
I-20 entrance	Apr 2016	3564	2483	6045	2611	0	2610	57595
MLK Jr Dr entrance	Apr 2016	1218	0	1220	846	0	845	13290
Edgewood Ave exit	Jan 2014	246	15	260	567	99	665	7845
Andrew Young Intl Blvd/Freedom Pk	Feb 2016	2078	0	2080	2218	149	2365	37445
Piedmont Ave HOV exit	Feb 2016	180	15	195	125	0	125	1885
Irwin St entrance	Mar 2012	500	72	570	722	0	720	8370
Freedom Pkwy/Ellis St entrance	Jan 2014	3268	0	3270	2777	62	2840	51070
Pine St exit	Feb 2016	297	0	295	277	87	365	6805
Spring St exit	Feb 2016	472	17	490	312	87	400	9390
Spring St/Williams St entrance	Feb 2016	1647	175	1820	2788	0	2790	33465
Williams St HOV entrance	Jan 2014	260	0	260	114	0	115	2140
Williams St exit	Jan 2014	964	0	965	600	0	600	16495
17th St exit	Feb 2016	905	0	905	645	0	645	19160
16th St entrance (onto I-75)	Feb 2016	870	0	870	2505	239	2745	19160

Throughput volume source: GDOT GeoCounts. The most recent, accepted count was collected from each station in order to most closely represent existing year volumes. The GDOT Office of Transportation Data reviews volumes collected at temporary count locations to ensure that the volumes fall within an acceptable range dictated by historic counts at each location. "Accepted" counts are those that have been approved by the GDOT OTD. There are instances in which collected traffic counts are rejected, likely due to equipment failure or anomalous activity on the day or days counts were collected. In the instance of count rejection, volumes are not available on the GDOT GeoCounts Traffic Counts application.

Queue volume source: Calculated based on queue length estimated using Google Maps traffic function.

## Southbound Ramp Volumes

	Month & Year of Collection	AM			PM			Daily
		Throughput	Queue volume	Demand volume	Throughput	Queue volume	Demand volume	Throughput
		(vehicles)	(vehicles)	(vehicles)	(vehicles)	(vehicles)	(vehicles)	(vehicles)
I-75 Southbound	Sept 2015	9213	300	9515	8046	659	8705	123820
I-85 Southbound	Sept 2015	10261	3146	13405	8085	234	8320	156945
I-75 SB to I-85 NB	Jan 2011	2406	149	2555	3106	188	3295	31875
I-75 SB HOV to I-75 SB HOV	Jan 2014	486	0	485	586	0	585	6890
I-85 SB to I-75 NB	Jan 2011	1622	72	1695	1656	0	1655	23135
17th St exit from I-85 SB	Aug 2011	1398	0	1400	1158	52	1210	21895
10th, 14th, 16th St exit from I-75 SB	Feb 2016	1262	0	1260	1104	208	1310	13930
10th St entrance	Feb 2016	961	23	985	1284	0	1285	21060
North Ave exit	Jan 2014	1458	88	1545	574	0	575	17410
Williams St HOV exit	Jan 2014	260	0	260	114	0	115	2140
Williams St exit	Jan 2014	1482	102	1585	448	0	450	15125
Spring-Techwood Connector entrance	Jan 2014	632	46	680	1562	0	1560	18615
Courtland St exit	Feb 2016	1639	99	1740	218	0	220	12240
Freedom Pkwy exit	Feb 2016	506	0	505	778	0	780	10440
John Wesley Dobbs Ave exit	Feb 2016	586	0	585	305	0	305	6280
John Portman Blvd entrance	Feb 2016	102	0	100	288	0	290	2355
Ellis st entrance	Feb 2016	370	0	370	380	0	380	8095
Freedom Pkwy entrance	Feb 2016	976	0	975	870	58	930	14085
Edgewood Ave entrance	Jan 2014	325	0	325	962	0	960	8520
MLK Jr Dr exit	Jan 2014	980	0	980	104	0	105	7655
I-20 exit	Apr 2016	1229	0	1230	1187	108	1295	24070
Fulton St exit	Apr 2016	320	0	320	284	0	285	6105
I-20 entrance	Apr 2016	1141	2559	3700	2677	0	2675	33255
Memorial Dr HOV entrance	Apr 2016	30	0	30	154	0	155	1000
Pulliam St entrance	Apr 2016	442	0	440	2483	0	2485	16255
Ralph David Abernathy Blvd entrance	Mar 2016	40	0	40	472	0	470	4140
University Ave exit	Jan 2014	573	0	575	800	0	800	11550
University Ave entrance	Mar 2016	257	0	255	589	0	590	7220
Langford Pkwy exit	Apr 2016	2572	0	2570	2848	0	2850	27150
Langford Pkwy entrance onto I-85	Apr 2016	1268	0	1270	1735	0	1735	22520
Langford Pkwy entrance onto I-75	Apr 2016	732	0	730	1144	0	1145	13575

Throughput volume source: GDOT GeoCounts. The most recent, accepted count was collected from each station in order to most closely represent existing year volumes. The GDOT Office of Transportation Data reviews volumes collected at temporary count locations to ensure that the volumes fall within an acceptable range dictated by historic counts at each location. "Accepted" counts are those that have been approved by the GDOT OTD. There are instances in which collected traffic counts are rejected, likely due to equipment failure or anomalous activity on the day or days counts were collected. In the instance of count rejection, volumes are not available on the GDOT GeoCounts Traffic Counts application.

Queue volume source: Calculated based on queue length estimated using Google Maps traffic function.



# **Attachment 2: Queue Calculations**

Mainline Ramp Queues

	AM										PM													
	7:00			7:30			8:00			7-8 ΔQueue	5:00			5:30			6:00			5-6 ΔQueue				
	Link	Distance (ft)	Lanes	Vehicles	Link	Distance (ft)	Lanes	Vehicles	Link		Distance (ft)	Lanes	Vehicles	Link	Distance (ft)	Lanes	Vehicles	Link	Distance (ft)		Lanes	Vehicles		
<b>I-85 Southbound</b>	Ramp from SR 400	2075	2	166	Peachtree to Buford-Spring entrance	2287	5	457	Peachtree to Buford-Spring entrance	2287	5	457	To Piedmont	5438	4	870	To Piedmont	5438	4	870	To Piedmont	5438	4	870
	On I-85 to SR 400/I-85 merge	3434	4	549	To Piedmont	7075	4	1132	To Piedmont	7075	4	1132	To I-85/SR 400 split	2639	5	528	To I-85/SR 400 split	2639	5	528	To I-85/SR 400 split	2639	5	528
	I-85 after SR 400 merge	8131	4	1301	To I-85/SR 400 split	2639	5	528	To I-85/SR 400 split	2639	5	528	Ramp from SR 400	2741	2	219	Ramp from SR 400	2741	2	219	Ramp from SR 400	2741	2	219
					Ramp from SR 400	2741	2	219	Ramp from SR 400	2741	2	219	To end of queue on SR 400	26136	3	3136	To end of queue on SR 400	30040	3	3605	To end of queue on SR 400	30040	3	3605
					To end of queue on SR 400	2813	3	338	To end of queue on SR 400	2813	3	338	On I-85 to SR 400/I-85 merge	1460	3	175	On I-85 to SR 400/I-85 merge	1460	3	175	On I-85 to SR 400/I-85 merge	1460	3	175
					On I-85 to SR 400/I-85 merge	1460	3	175	On I-85 to SR 400/I-85 merge	1460	3	175	To SR 400 N exit ramp	1418	4	227	To SR 400 N exit ramp	1418	4	227	To SR 400 N exit ramp	1418	4	227
					To SR 400 N exit ramp	1899	4	304	To SR 400 N exit ramp	1899	4	304	To end of queue on I-85	1274	5	255	To end of queue on I-85	1270	5	254	To end of queue on I-85	1270	5	254
					To Cheshire Bridge exit ramp	1277	5	255	To Cheshire Bridge exit ramp	1277	5	255				5410			5878					468
					To Druid Hills entrance ramp	3417	6	820	To Druid Hills entrance ramp	3417	6	820												
					To end of queue on I-85	7022	5	1404	To end of queue on I-85	7022	5	1404												
				2016				5633				3617												
<b>I-75 Southbound</b>	N/A			0	N/A			0	To Northside Drive entrance ramp	433	5	87	I-75 ramps at Brookwood interchange	3254	3	390	I-75 ramps at Brookwood interchange	3254	3	390	I-75 ramps at Brookwood interchange	3254	3	390
				0				0	To end of queue on I-75	3211	4	514	To Northside Drive entrance ramp	2124	5	425	To Northside Drive entrance ramp	2124	5	425	To Northside Drive entrance ramp	2124	5	425
				0				0				600	600											
				0				0					6441	4	1031	To end of queue on I-75	14678	4	2348	To end of queue on I-75	14678	4	2348	
				0				0							1455								1318	
<b>I-85 Northbound</b>	N/A			0	N/A			0	N/A			0	0	N/A			N/A			N/A			0	
<b>I-75 Northbound</b>	N/A			0	N/A			0	N/A			0	0	N/A			N/A			N/A			0	



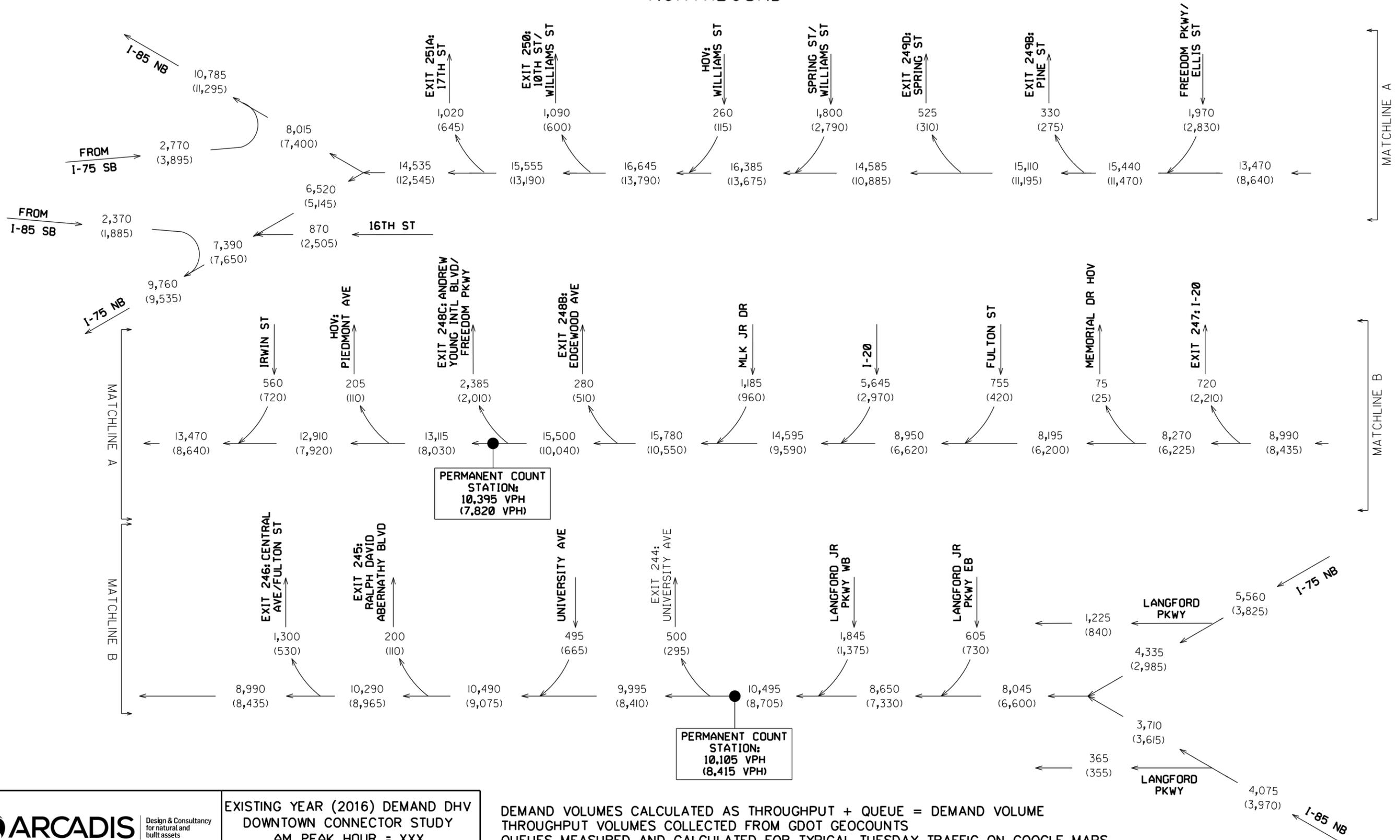
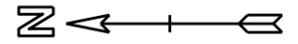
Southbound Ramp Queues

	AM										PM																	
	7:00				7:30				8:00				7-8 Δ Queue	5:00				5:30				6:00				7-8 Δ Queue		
	Link	Distance	Lanes	Vehicles	Link	Distance	Lanes	Vehicles	Link	Distance	Lanes	Vehicles		Link	Distance	Lanes	Vehicles	Link	Distance	Lanes	Vehicles	Link	Distance	Lanes	Vehicles		Link	Distance
I-75 SB to I-85 NB					On ramp	1635	2	131	On ramp	1635	2	131	131	Beginning of ramp - orange	1005	2	80	Entire ramp	3066	2	245	Entire ramp	3066	2	245	165		
I-75 SB HOV to I-75 SB HOV																												
I-85 SB to I-75 NB					On ramp	1574	1	63	On ramp	1574	1	63	63	On ramp	1574	1	63	On ramp	1574	1	63	On ramp	1574	1	63	0		
17th St exit from I-85 SB													0	Beginning of ramp - orange	1177	1	47	Entire ramp - orange	2333	1	93	Entire ramp - orange	2333	1	93	46		
10th, 14th, 16th St exit from I-75 SB					On ramp	3070	2	246					0	Entire ramp to Techwood	1896	2	152	Entire ramp to Techwood	1896	2	152	Entire ramp to Techwood	1896	2	152	152		
10th St entrance					On ramp	500	1	20	On ramp	500	1	20	20	EB on 10th St	3562	2	285	EB on 10th St	3562	2	285	EB on 10th St	3562	2	285			
														WB on 10th St	2170	2	174	WB on 10th St	2170	2	174	WB on 10th St	2170	2	174			
														SB C/D	1824	2	146	SB C/D	1824	2	146	SB C/D	1824	2	146			
														On ramp	666	1	27	On ramp	666	1	27	On ramp	666	1	27			
																631				631				631	0			
North Ave exit					On ramp	515	1	21	On ramp	515	1	21	21	On ramp	515	1	21	On ramp	515	1	21	On ramp	515	1	21	0		
						715	2	57		715	2	57	57		715	2	57		715	2	57		715	2	57	0		
								78				78	78			78				78				78	0			
Williams St HOV exit													0	Beginning of ramp - orange	1027	1	41	Entire ramp - orange	1741	1	70	Beginning of ramp - orange	1036	1	41	0		
Williams St exit					Entire ramp - orange	1230	1	49	Entire ramp - orange	1230	1	49	49	Entire ramp - orange	1230	1	49	Entire ramp - orange	1230	1	49	Entire ramp - orange	1230	1	49	0		
						335	3	40		335	3	40	40		335	3	40		335	3	40		335	3	40	0		
								89				89	89			89				89				89	0			
Spring-Techwood Connector entrance					On ramp - orange	1001	1	40	On ramp - orange	1001	1	40	40	Entire ramp - red	2280	1	91	Entire ramp - red	2280	1	91	Entire ramp - red	2280	1	91	0		
					Williams (to Ivan Allen)	0	-	0	Williams (to Ivan Allen)	0	-	0	0	Williams (to Ivan Allen)	487	2	39	Williams (to Ivan Allen)	487	2	39	Williams (to Ivan Allen)	487	2	39	0		
								40				40	40			130				130				130	0			
Courtland St exit									Entire ramp - orange	558	1	22	22	Beginning of ramp - orange	558	1	22	Entire ramp - orange	558	1	22	Beginning of ramp - orange	486	1	19			
										812	2	65	65		812	2	65		812	2	65		-	-	-	-53		
												87	87			53				87				87				
Freedom Pkwy exit													0	Beginning of ramp - orange	951	2	76	Beginning of ramp - orange	712	2	65	Beginning of ramp - orange	723	1	33			
John Wesley Dobbs Ave exit													0	Entire ramp	687	1	27	Entire ramp	687	1	27	Beginning of ramp - orange	716	1	29			
															669	2	54		669	2	54		-	-	-			
																81				81		-	-	-				
John Portman Blvd HOV entrance					EB on John Portman (nearly to Ptree)	1791	2	143					0	Entire ramp	1927	1	77	Entire ramp	1927	1	77	Entire ramp	1927	1	77	0		
Ellis st entrance														On ramp	977	2	78	On ramp	977	2	78	On ramp	977	2	78			
															478	1	19		478	1	19		478	1	19			
														NB Piedmont (to Auburn)	1029	4	165	NB Piedmont (to Auburn)	1029	4	165	NB Piedmont (to Auburn)	1029	4	165			
														EB Ellis	1178	2	94	EB Ellis	1178	2	94	EB Ellis	1178	2	94			
																356				356				356	0			
Freedom Pkwy entrance													0	On ramp	1300	2	104	On ramp	1300	2	104	On ramp	1300	2	104			
															1029	1	41		1029	1	41		1029	1	41			
																145				145				145	0			
Edgewood Ave entrance													0	Entire ramp - red	1567	1	63	Entire ramp - red	1567	1	63	Entire ramp - red	1567	1	63	0		
MLK Jr Dr exit													0	On ramp	1331	1	53	On ramp	1331	1	53	On ramp	930	1	37	-16		
I-20 exit													0	On ramp	1400	2	112	On ramp	1400	2	112	On ramp	1400	2	112			
														I-20 EB ramp	865	1	35	I-20 EB ramp	2961	1	118	I-20 EB ramp	2961	1	118			
																147				230				230	84			
Fulton St exit													0												0			
I-20 WB entrance	On I-20	1017	5	203	On I-20	2772	4	444	On I-20	4866	4	779																
		2609	4	417		524	5	105		524	5	105																
		1463	5	293		2047	4	328		2047	4	328																
		1212	6	291		706	5	141		706	5	141																
		912	5	182		2676	4	428		2676	4	428																
		1165	4	186		1375	5	275		1375	5	275																
		2062	2	165		1590	5	318		1590	5	318																
	On ramp	885	1	35		2600	4	416		2600	4	416																
						1466	5	293		1466	5	293																
						1201	6	288		1201	6	288																
						930	5	186		930	5	186																
						1260	4	202		1260	4	202																
						2061	2	165		2061	2	165																
						885	1	35	On ramp	885	1	35	35															
					1773			3624				3959	2185															
I-20 EB entrance									On ramp - orange	840	2	67	67															
Memorial Dr HOV entrance													0															
Pulliam St entrance													0															
Ralph David Abernathy Blvd entrance													0	Entire ramp and some access road	1460	1	58	Entire ramp and some access road	1460	1	58	Entire ramp and some access road	1460	1	58	0		
University Ave exit													0															
University Ave entrance													0															
Langford Pkwy exit													0															
Langford Pkwy entrance onto I-85													0															
Langford Pkwy entrance onto I-75													0															

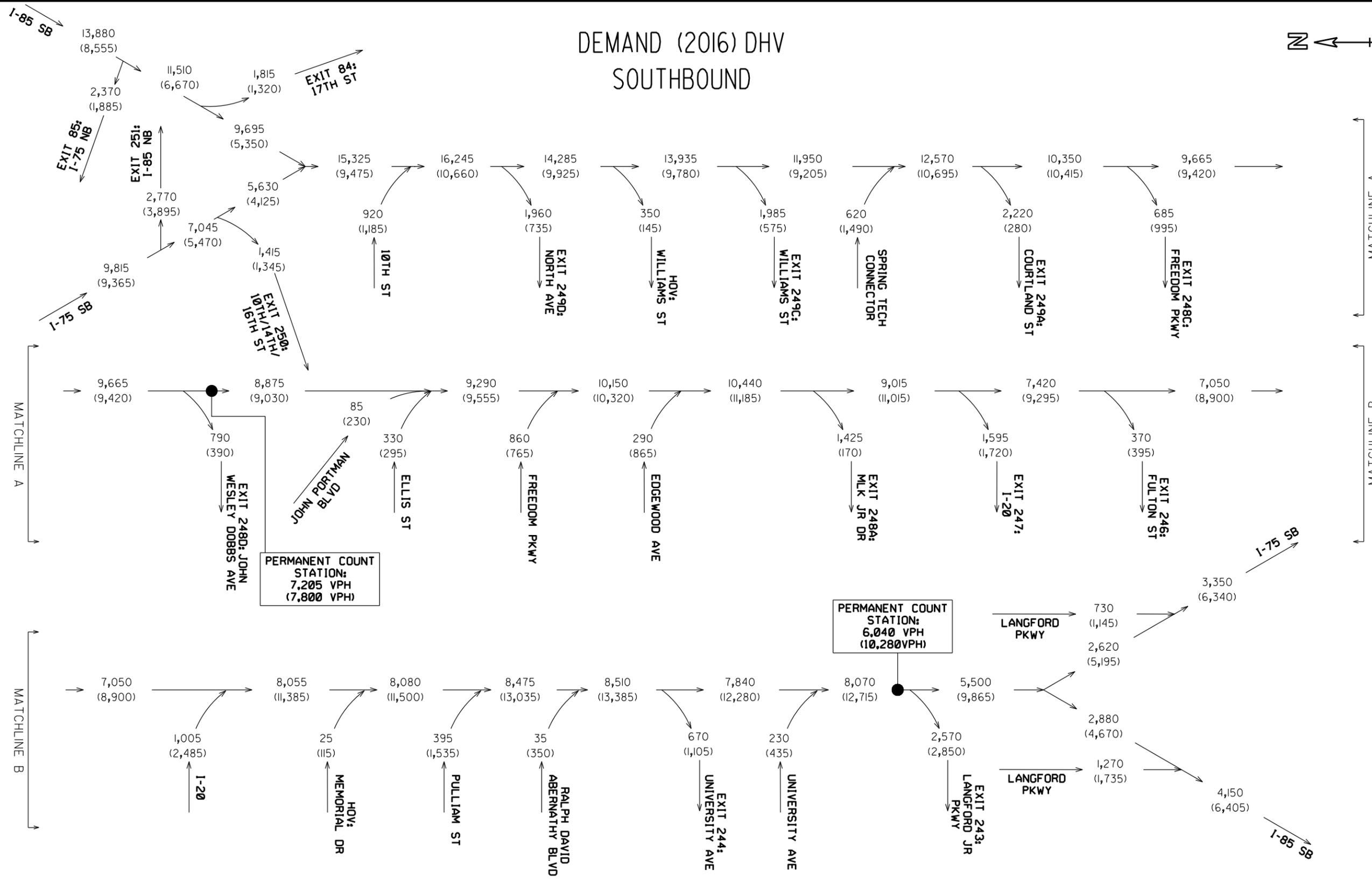
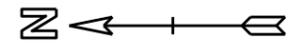


# **Attachment 3: Volume Diagrams**

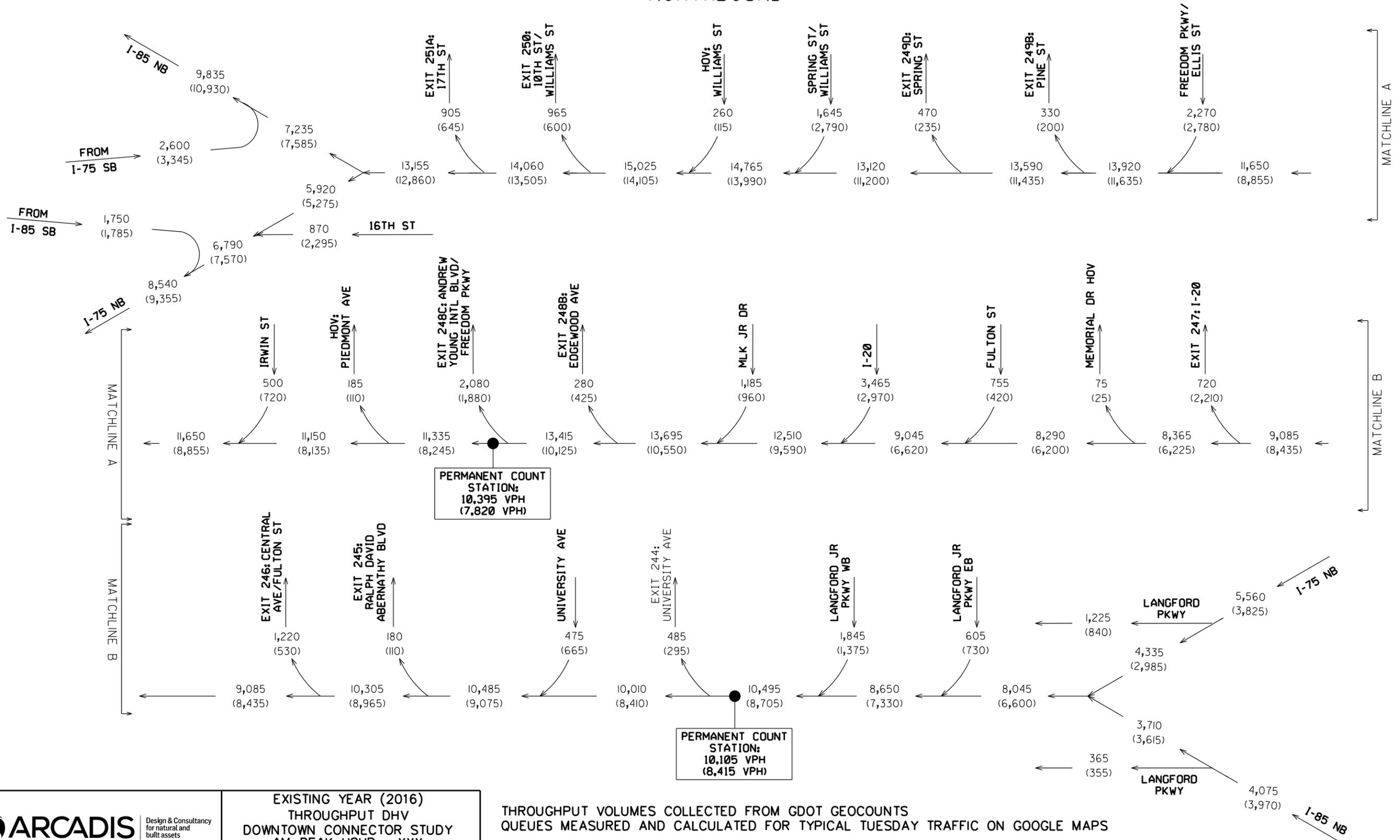
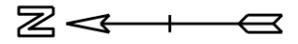
# DEMAND (2016) DHV NORTHBOUND



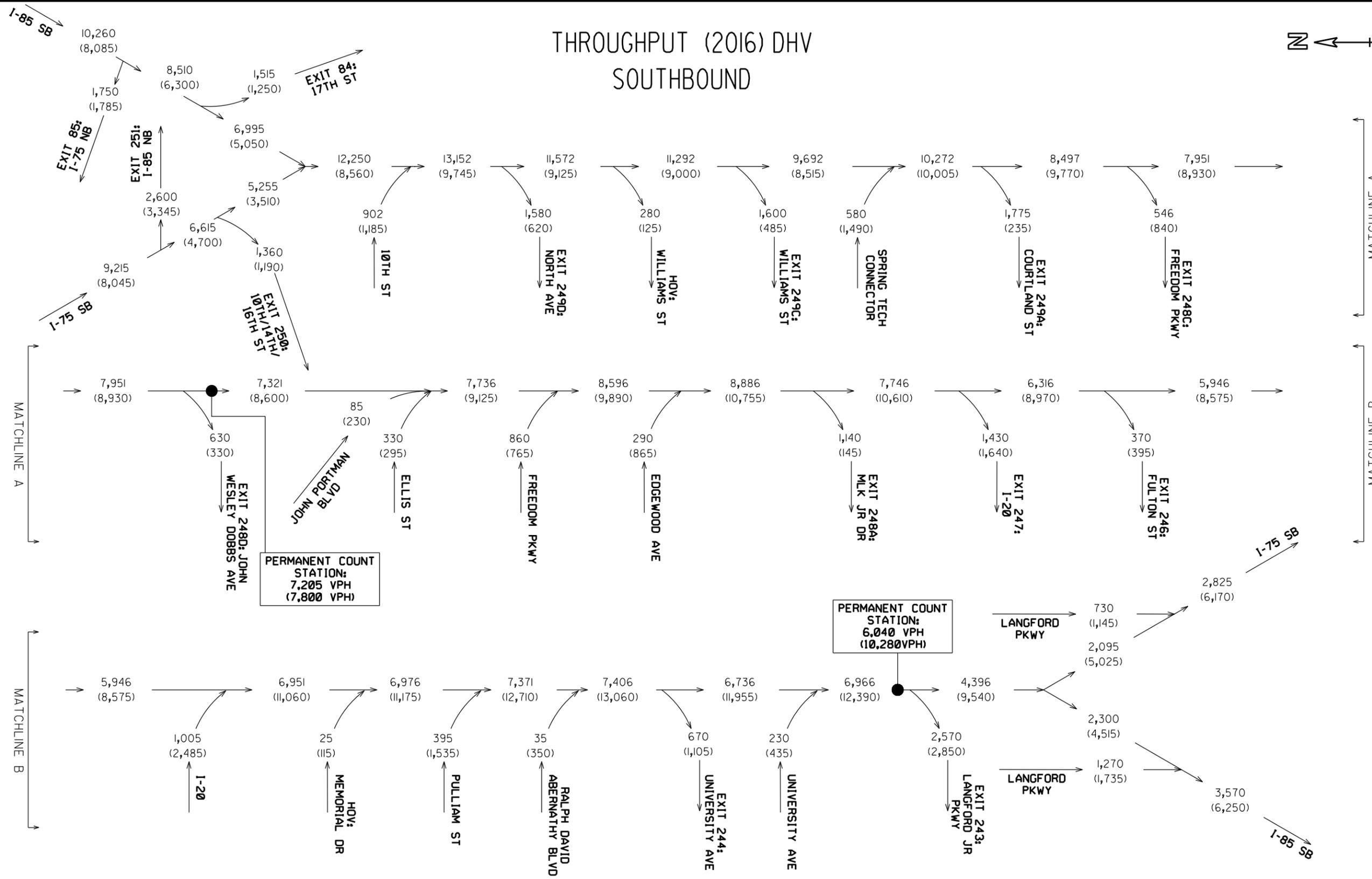
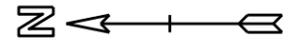
# DEMAND (2016) DHV SOUTHBOUND



# THROUGHPUT (2016) DHV NORTHBOUND



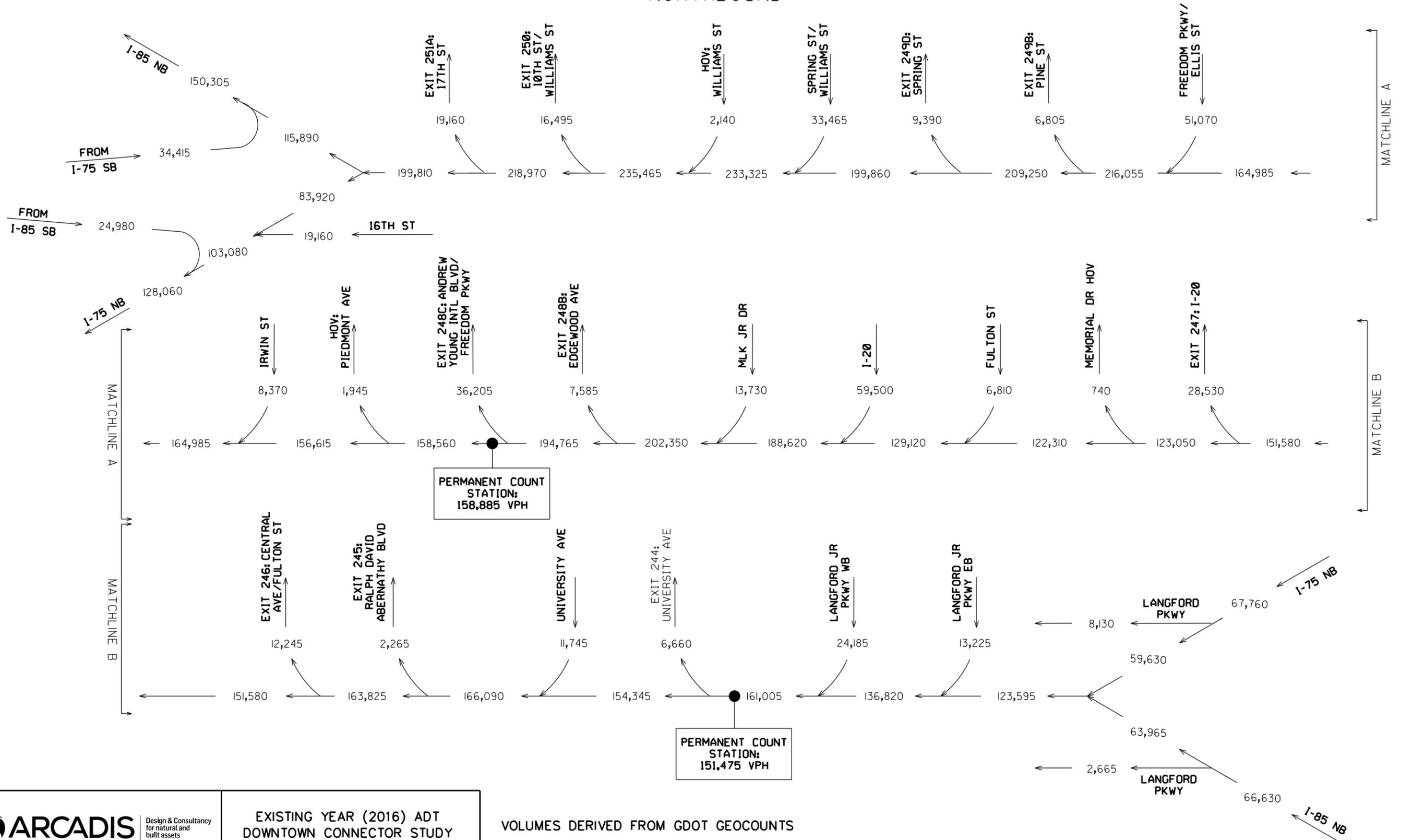
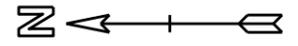
# THROUGHPUT (2016) DHV SOUTHBOUND



EXISTING YEAR (2016)  
 THROUGHPUT DHV  
 DOWNTOWN CONNECTOR STUDY  
 AM PEAK HOUR = XXX  
 PM PEAK HOUR = (XXX)

THROUGHPUT VOLUMES COLLECTED FROM GDOT GEOCOUNTS  
 QUEUES MEASURED AND CALCULATED FOR TYPICAL TUESDAY TRAFFIC ON GOOGLE MAPS

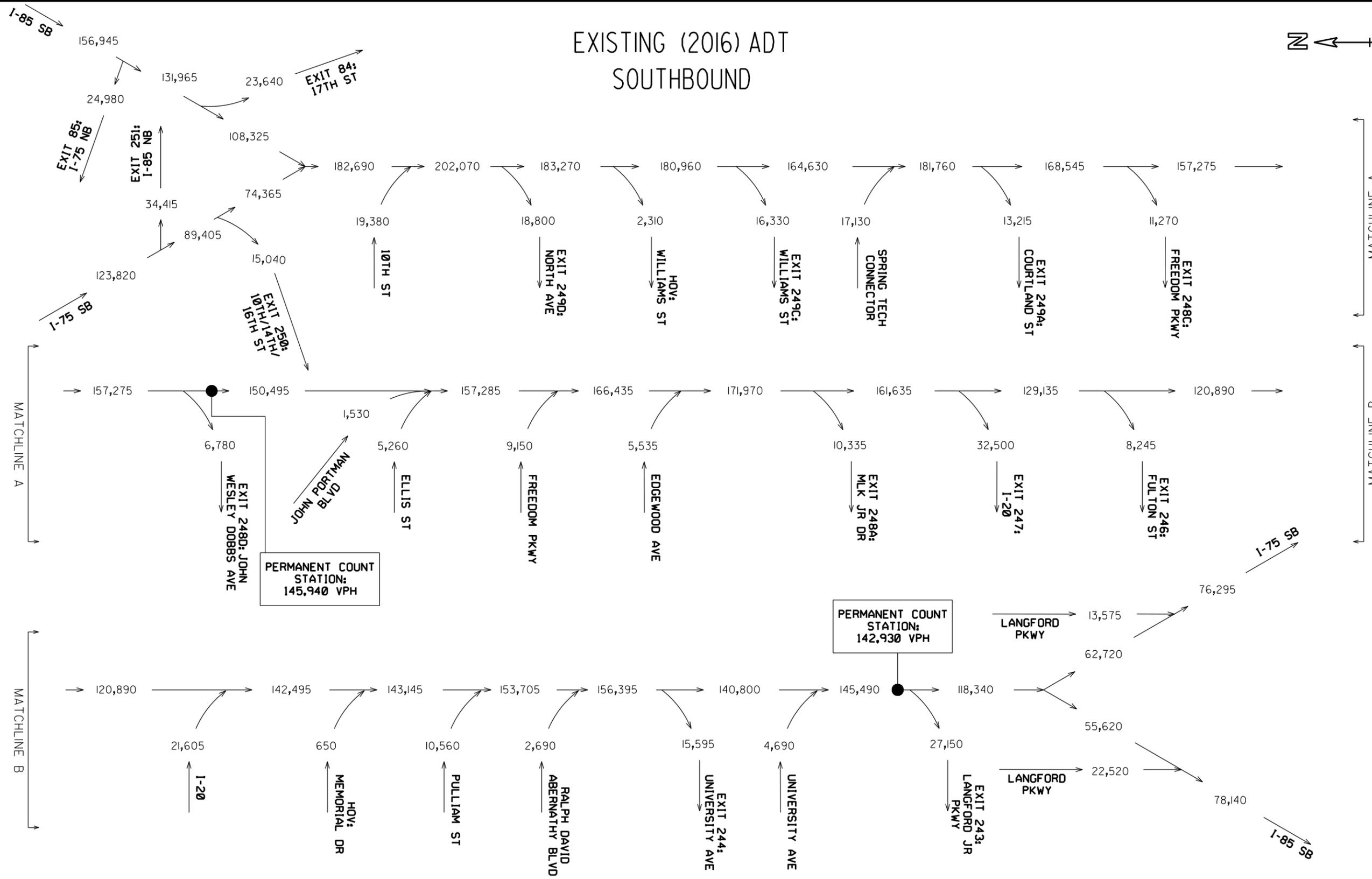
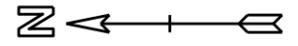
# EXISTING (2016) ADT NORTHBOUND



PERMANENT COUNT  
STATION:  
158,885 VPH

PERMANENT COUNT  
STATION:  
151,475 VPH

# EXISTING (2016) ADT SOUTHBOUND





# **Attachment 4:**

## **O-D Zone**

### **Combinations & Calculations**

## **OTP to OTP Trips**

Zone combinations for this trip type are:

- Zone 100 through Zone 10 to Zone 700
- Zone 100 through Zone 10 to Zone 600
- Zone 100 through Zone 10 to Zone 500
- Zone 100 through Zone 8 to Zone 400
- Zone 100 through Zone 8 to Zone 800
- Zone 100 through Zone 1 to Zone 200
- Zone 100 through Zone 1 to Zone 300
- Zone 200 through Zone 2 to Zone 100
- Zone 200 through Zone 8 to Zone 400
- Zone 200 through Zone 8 to Zone 800
- Zone 200 through Zone 10 to Zone 500
- Zone 200 through Zone 10 to Zone 600
- Zone 200 through Zone 10 to Zone 700
- Zone 300 through Zone 2 to Zone 100
- Zone 300 through Zone 8 to Zone 400
- Zone 300 through Zone 8 to Zone 800
- Zone 300 through Zone 10 to Zone 500
- Zone 300 through Zone 10 to Zone 600
- Zone 300 through Zone 10 to Zone 700
- Zone 400 through Zone 12 to Zone 800
- Zone 400 through Zone 7 to Zone 100
- Zone 400 through Zone 7 to Zone 200
- Zone 400 through Zone 7 to Zone 300
- Zone 400 through Zone 10 to Zone 500
- Zone 400 through Zone 10 to Zone 600
- Zone 400 through Zone 10 to Zone 700
- Zone 500 through Zone 7 to Zone 100
- Zone 500 through Zone 7 to Zone 200
- Zone 500 through Zone 7 to Zone 300
- Zone 500 through Zone 9 to Zone 800
- Zone 500 through Zone 9 to Zone 400
- Zone 600 through Zone 7 to Zone 100
- Zone 600 through Zone 7 to Zone 200

- Zone 600 through Zone 7 to Zone 300
- Zone 600 through Zone 9 to Zone 800
- Zone 600 through Zone 9 to Zone 400
- Zone 700 through Zone 7 to Zone 100
- Zone 700 through Zone 7 to Zone 200
- Zone 700 through Zone 7 to Zone 300
- Zone 700 through Zone 9 to Zone 400
- Zone 700 through Zone 9 to Zone 800

### **OTP to OTP Through Trips**

Zone combinations for this trip type are:

- Zone 20 through Zone 3 to Zone 40
- Zone 20 through Zone 4 to Zone 50
- Zone 20 through Zone 1 to Zone 30
- Zone 30 through Zone 3 to Zone 40
- Zone 30 through Zone 4 to Zone 50
- Zone 30 through Zone 2 to Zone 20
- Zone 40 through Zone 1 to Zone 20
- Zone 40 through Zone 2 to Zone 30
- Zone 50 through Zone 1 to Zone 20
- Zone 50 through Zone 2 to Zone 30

### **ITP to OTP Trips**

Zone combinations for this trip type are:

- (Zone 1 through Zone 3 to Zone 40) – (Zone 20 through Zone 3 to Zone 40)
- (Zone 1 through Zone 4 to Zone 50) – (Zone 20 through Zone 4 to Zone 50)
- (Zone 2 through Zone 3 to Zone 40) – (Zone 30 through Zone 3 to Zone 40)
- (Zone 2 through Zone 4 to Zone 50) – (Zone 30 through Zone 4 to Zone 50)
- (Zone 3 through Zone 1 to Zone 20) – (Zone 40 through Zone 1 to Zone 20)
- (Zone 3 through Zone 2 to Zone 30) – (Zone 40 through Zone 2 to Zone 30)
- (Zone 4 through Zone 1 to Zone 20) – (Zone 50 through Zone 1 to Zone 20)
- (Zone 4 through Zone 2 to Zone 30) – (Zone 50 through Zone 2 to Zone 30)

### **OTP to ITP Trips**

Zone combinations for this trip type are:

- (Zone 20 through Zone 10 to Zone 3) – (Zone 20 through Zone 3 to Zone 40)
- (Zone 20 through Zone 10 to Zone 4) – (Zone 20 through Zone 4 to Zone 50)

## **OTP to OTP Trips**

Zone combinations for this trip type are:

- Zone 100 through Zone 10 to Zone 700
- Zone 100 through Zone 10 to Zone 600
- Zone 100 through Zone 10 to Zone 500
- Zone 100 through Zone 8 to Zone 400
- Zone 100 through Zone 8 to Zone 800
- Zone 100 through Zone 1 to Zone 200
- Zone 100 through Zone 1 to Zone 300
- Zone 200 through Zone 2 to Zone 100
- Zone 200 through Zone 8 to Zone 400
- Zone 200 through Zone 8 to Zone 800
- Zone 200 through Zone 10 to Zone 500
- Zone 200 through Zone 10 to Zone 600
- Zone 200 through Zone 10 to Zone 700
- Zone 300 through Zone 2 to Zone 100
- Zone 300 through Zone 8 to Zone 400
- Zone 300 through Zone 8 to Zone 800
- Zone 300 through Zone 10 to Zone 500
- Zone 300 through Zone 10 to Zone 600
- Zone 300 through Zone 10 to Zone 700
- Zone 400 through Zone 12 to Zone 800
- Zone 400 through Zone 7 to Zone 100
- Zone 400 through Zone 7 to Zone 200
- Zone 400 through Zone 7 to Zone 300
- Zone 400 through Zone 10 to Zone 500
- Zone 400 through Zone 10 to Zone 600
- Zone 400 through Zone 10 to Zone 700
- Zone 500 through Zone 7 to Zone 100
- Zone 500 through Zone 7 to Zone 200
- Zone 500 through Zone 7 to Zone 300
- Zone 500 through Zone 9 to Zone 800
- Zone 500 through Zone 9 to Zone 400
- Zone 600 through Zone 7 to Zone 100
- Zone 600 through Zone 7 to Zone 200

- Zone 600 through Zone 7 to Zone 300
- Zone 600 through Zone 9 to Zone 800
- Zone 600 through Zone 9 to Zone 400
- Zone 700 through Zone 7 to Zone 100
- Zone 700 through Zone 7 to Zone 200
- Zone 700 through Zone 7 to Zone 300
- Zone 700 through Zone 9 to Zone 400
- Zone 700 through Zone 9 to Zone 800

### **OTP to OTP Through Trips**

Zone combinations for this trip type are:

- Zone 20 through Zone 3 to Zone 40
- Zone 20 through Zone 4 to Zone 50
- Zone 20 through Zone 1 to Zone 30
- Zone 30 through Zone 3 to Zone 40
- Zone 30 through Zone 4 to Zone 50
- Zone 30 through Zone 2 to Zone 20
- Zone 40 through Zone 1 to Zone 20
- Zone 40 through Zone 2 to Zone 30
- Zone 50 through Zone 1 to Zone 20
- Zone 50 through Zone 2 to Zone 30

### **ITP to OTP Trips**

Zone combinations for this trip type are:

- (Zone 1 through Zone 3 to Zone 40) – (Zone 20 through Zone 3 to Zone 40)
- (Zone 1 through Zone 4 to Zone 50) – (Zone 20 through Zone 4 to Zone 50)
- (Zone 2 through Zone 3 to Zone 40) – (Zone 30 through Zone 3 to Zone 40)
- (Zone 2 through Zone 4 to Zone 50) – (Zone 30 through Zone 4 to Zone 50)
- (Zone 3 through Zone 1 to Zone 20) – (Zone 40 through Zone 1 to Zone 20)
- (Zone 3 through Zone 2 to Zone 30) – (Zone 40 through Zone 2 to Zone 30)
- (Zone 4 through Zone 1 to Zone 20) – (Zone 50 through Zone 1 to Zone 20)
- (Zone 4 through Zone 2 to Zone 30) – (Zone 50 through Zone 2 to Zone 30)

### **OTP to ITP Trips**

Zone combinations for this trip type are:

- (Zone 20 through Zone 10 to Zone 3) – (Zone 20 through Zone 3 to Zone 40)
- (Zone 20 through Zone 10 to Zone 4) – (Zone 20 through Zone 4 to Zone 50)