METRO ATLANTA NORTHWEST CORRIDOR COMMUTER SURVEY RESULTS – ASSESSING EXPRESS LANE IMPACTS ON INCREASED CORRIDOR THROUGHPUT

A Dissertation
Presented to
The Academic Faculty

by

William Taylor Morgan

In Partial Fulfillment
of the Requirements for the Degree
Master of Science in Civil Engineering in the
School of Civil and Environmental Engineering, College of Engineering

Georgia Institute of Technology
May 2023

METRO ATLANTA NORTHWEST CORRIDOR COMMUTER SURVEY RESULTS – ASSESSING EXPRESS LANE IMPACTS ON INCREASED CORRIDOR THROUGHPUT

Approved by:

Dr. Randall L. Guensler, Advisor
School of Civil and Environmental Engineering
Georgia Institute of Technology

Dr. Michael O. Rodgers
School of Civil and Environmental Engineering
Georgia Institute of Technology

Dr. Angshuman Guin
School of Civil and Environmental Engineering
Georgia Institute of Technology

Date Approved: April 28, 2023

ACKNOWLEDGEMENTS

This study was funded by a grant from the National Center for Sustainable Transportation (NCST), supported by the United States Department of Transportation (USDOT) through the University Transportation Centers (UTC) program. The author would like to thank the NCST and USDOT for their support of university-based research in transportation, and for supporting this project.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS AND ABBREVIATIONS

AFV	Alternative Fuel Vehicle
ARC	Atlanta Regional Commission
ETC	Electronic Toll Collection
HOT	High Occupancy Toll
HOV	High Occupancy Vehicle
ISTEA	Intermodal Surface Transportation Efficiency Act
MPO	Metropolitan Planning Organization
NCST	National Center for Sustainable Transportation
NWC	Northwest Corridor
SRTA	State Road & Tollway Authority
TAZ	Traffic Analysis Zone
TEA-21	Transportation Efficiency Act for the 21st Century
USDOT	United States Department of Transportation
UTC	University Transportation Centers
VMT	Vehicle Miles Traveled

SUMMARY

In 2022, a survey was developed to try to gain insight into why a significant increase in morning peak traffic volumes was observed on the I-75/I-575 Northwest Corridor (NWC) in the Atlanta metropolitan area after the opening of the Express Lanes. It seemed unlikely that the increase was due to induced demand (increased total vehicle miles traveled (VMT) that was suppressed due to congestion), as most morning peak trips are generally mandatory trips such as work trips, school trips, and daycare trips. The previous research team suspected that the increase may have come from a diversion of commute traffic from arterials onto the freeway corridor, or from a shift of traffic from the shoulders of the peak to the center of the peak once the Express Lanes opened and congestion declined. Where the significant increase in traffic volumes on the NWC came from is an important question, especially for transportation planners, because it helps decision-makers get a better understanding of what the effects of opening new managed lane capacity along a corridor might be on traffic patterns around that corridor.

Survey invitations were distributed through two different channels: email invitations and postcard invitations. Email invitations got a response rate of 3.26% and postcard invitations got a response rate of 2.88%. It was found that 53.4% of the observed 35% increase in vehicle throughput came from sources that would not be expected to increase total VMT (39.7% from route reassignment and 13.7% from departure time of day shift). The other 46.5% of the observed increase in vehicle throughput came from sources that could increase total VMT (1.7% from changes in mode split, 5.7% from trip redistribution, and the remaining 39.1% from trip generation). These numbers assume that

the sample of respondents is representative of the NWC service area, which may not be the case. Additionally, the behavior of the relatively large number of Express Lanes users is not likely to be representative of the corridor users overall. In future work, this should be checked and adjusted for. These numbers also fail to capture non-commuters who may have used the NWC in the morning peak hours, which may be a source of error causing trip generation to be overestimated. Assuming that the induced demand numbers presented herein are correct, after the opening of the NWC Express Lanes, total VMT in the corridor's service area may have increased by 16.3%.

One method that many agencies and governments are using to try and reduce total VMT is paying for incentives to encourage carpooling. This survey's findings that 49.0% of adult carpools are fampools (carpools consisting of only family members, who are likely to have carpooled anyway without the incentive) confirm others' findings that a substantial proportion of carpools are fampools on urban highways (Poole and Balaker, 2005; Li et al, 2007). Induced demand generating an increase in total VMT is of particular concern to transportation planners because it reduces the congestion reduction benefit that can result from increased road capacity and it increases external costs (Litman, 2001), such as parking demand, uncompensated crash damages, and environmental impacts (such as emissions and pollution). Induced demand is something that transportation planners should investigate when considering new transportation infrastructure or substantial expansions to existing transportation infrastructure.

CHAPTER 1. INTRODUCTION

The Northwest Corridor (NWC) Express Lanes were completed and opened to traffic on September 18, 2018. Within the Atlanta Metropolitan Area, the NWC Express Lanes are inside of the I-75/I-575 corridor, outside of the I-285 perimeter, carrying traffic between Atlanta and Cobb and Cherokee counties. The NWC Express Lanes added 29.7 miles of express lanes along I-75 from Akers Mill Road to Hickory Grove Road and along I-575 from I-75 to Sixes Road (see Figure 1). There are two lanes for paying electronic toll collection (ETC) vehicles along I-75 between I-285 and I-575, with one lane continuing on I-575 until Sixes Road and the other lane continuing on I-75 until just past Hickory Grove Road. The reversible express lanes operate southbound in the morning and northbound in the evening, adding capacity to the general-purpose lanes. Vehicles with more than 2 axles or more than 6 wheels are not allowed in the Express Lanes. Unlike the I-85 high-occupancy toll (HOT) Express Lanes (northeast of Atlanta), where all registered 3+ person carpools can use the lanes for free, only state-registered transit vehicles and vanpools, law enforcement vehicles, and emergency vehicles can ride for free on the NWC Express

Lanes. State-registered alternative fuel vehicles (AFVs), motorcycles, and carpools must pay tolls on the NWC Express Lanes (Peach Pass, 2023).

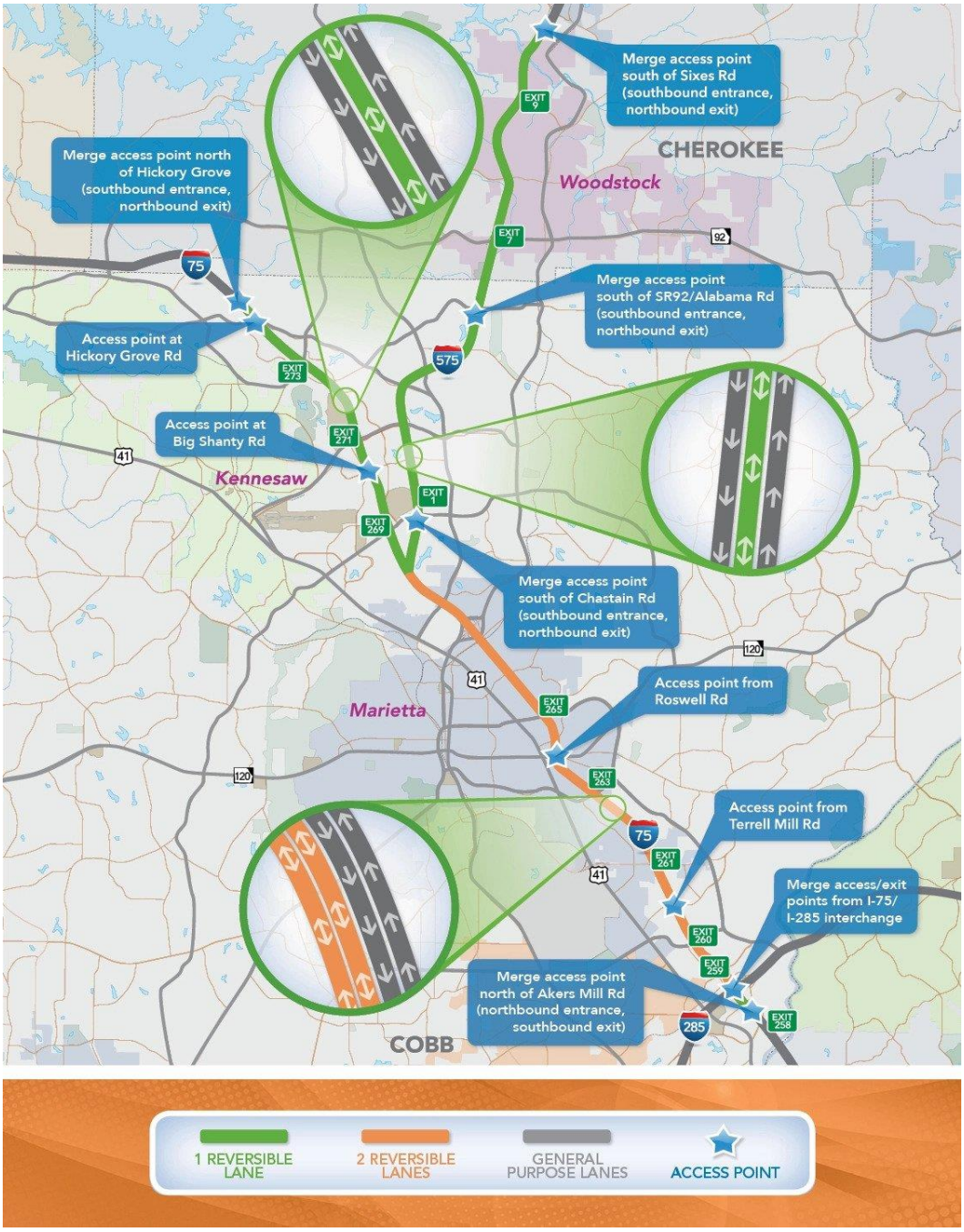


Figure 1 - Diagram of the Northwest Corridor (NWC) Express Lanes in the northwest Atlanta, Georgia metropolitan area

The goal of the 2023 Atlanta Metropolitan Area Northwest Corridor Commuter Survey is to gather information from metropolitan area residents about changes in their commute travel to work on the I-75 Northwest Corridor (NWC) over time. The survey looks at commute travel before and after the NWC Express Lanes opened, during the height of the COVID-19 pandemic, and finally at anticipated changes after the pandemic is behind us.

CHAPTER 2. LITERATURE REVIEW

Many different value-priced and High Occupancy Toll (HOT) lane(s) projects at various sites around the United States were initiated through the Congestion Pricing Pilot Program (funded through the Intermodal Surface Transportation Efficiency Act (ISTEA)) and the Value Pricing Pilot Program (funded through the Transportation Efficiency Act for the 21st Century (TEA-21)) (Carson, 2005). All Georgia Express Lanes rely on variable-price tolling to maintain free-flowing traffic even during peak travel times (SRTA, 2023). One of the major goals/objectives of a value-priced/HOT lane(s) project is to increase overall mobility during recurring and nonrecurring congestion, which can be evidenced by increased throughput, while also maintaining accessibility. There are many different performance measures for increased throughput, including total, daily, and hourly volume (managed-lanes-volume / general-purpose-lanes-volume, person-volume / vehicle-volume), vehicle occupancy (persons/vehicle), temporal shift, and mode shift (Carson, 2005).

The Georgia Express Lane Corridors Vehicle Occupancy and Throughput Study 2018-2020 Volume I: Vehicle and Person Throughput Analysis Before and After the I-75 Northwest Corridor and I-85 Express Lanes Extension (Guensler et al., 2022a) studied both vehicle volume and person throughput (by collecting vehicle occupancy data) and Volume II assessed the changes in user demographic characteristics (Guensler et al., 2022b). In a large-scale data collection effort for vehicle occupancy across all general-purpose freeway lanes and from SRTA's Express Lanes over a two-year period (before-and-after the opening of the Express Lanes), between 2018 and 2019, researchers observed a decrease

in average vehicle occupancy (persons/vehicle), coupled with a significant increase in traffic volumes, especially on the Northwest Corridor (NWC). Vehicle throughput increased by more than 35% on I-575 in the AM and PM peaks, and by the same on I-75 in the AM peaks (only minor increases were noted in the PM peaks). The researchers suspected that the increase was likely due to the diversion of commuter traffic from parallel arterials onto the freeway corridor once the Express Lanes opened and congestion declined. The combined effect of increased traffic volumes and decreased occupancy still led to an overall increase in person throughput at all sites. Based upon vehicle throughput and occupancy distributions, the largest share of the increase in vehicle throughput in the peak periods came from an influx of single-occupant vehicle activity onto the corridor. Even though the number of carpools traversing the I-575 corridor increased slightly during the morning peak, the overall carpool mode share (proportion of carpools) decreased after the much greater numbers of single-occupant vehicles began using the corridor (Guensler et al., 2022a).

For transportation planners, induced demand should be taken into consideration when examining how to improve a region's transportation system. According to Litman (2001), "Road improvements that reduce users' travel costs tend to attract traffic from other routes, times, and modes, and encourage longer and more frequent vehicle trips." This *generated traffic* on a corridor may include travel diverted from other times and routes. However, moving travel demand from congested arterials to a newly uncongested freeway may have significant local benefits. A portion of this additional traffic usually consists of *induced travel*, sometimes referred to as latent demand, referring to increases in total vehicle trips and distance traveled, excluding diverted traffic. According to Abelson and

Hensher (2001), “Just as there is no single correct definition of traffic, so there is no single correct definition of induced traffic.” The United Kingdom Department of Transport (1993) identifies five main ways in which road improvements may result in induced travel:

1. Trip generation: new trips are made that were not made previously on any transport mode.
2. Trip redistribution: trips change destination. Faster travel speeds may encourage people to switch from a closer destination to a more distant one that is more attractive. In some cases, a network upgrade may make a closer destination more attractive than before.
3. Changes in mode split: trips are now made by car instead of by some other mode.
4. Route reassignment: traffic traveling between an origin and a destination switches routes, so that there are induced trips on the improved route although not necessarily in the network.
5. Time of day: trips traveling between an origin and a destination switch trip times, so that there are induced trips at certain times (probably peak hours) on the improved route although not necessarily more trips on the network over the day.

Of the five scenarios listed above, in the first three scenarios vehicle miles traveled (VMT) increase on both the improved link(s) and over the whole road network. Many writers identify induced demand only with these increases in VMT. In scenarios 4 and 5, traffic increases on certain routes or at certain times, but not over the whole road network (Abelson and Hensher, 2001). One of the main goals of the Metro Atlanta NWC commuter survey is to differentiate, among those who started making morning commute trips on the I-75/I-575 NWC after the Express Lanes were constructed, what proportion of them

represent trip generation, trip redistribution to new destinations, or changes in mode split (which increase total VMT), and what proportion of them represent route reassignment or changes in trip time of day (which do not increase total VMT). VMT is of particular concern because it reduces the congestion reduction benefit that can result from increased road capacity and it potentially increases external costs, such as parking demand, uncompensated crash damages, and environmental impacts (e.g., emissions and pollution). However, in the short run, increasing roadway capacity can reduce some external costs. Pollutant emissions per mile and crash rates can decrease when traffic flows more freely, but these benefits may decline over time with urban growth and may be completely offset as generated traffic leads to renewed congestion and as induced travel increases total vehicle trips and distance traveled, assuming continuing economic development and growth in the metropolitan area (Litman, 2001). One possible concern with using total VMT as a measure of induced demand is that it does not account for changes in population in the area, so one potential improvement would be to use total VMT per capita as a measure of induced demand, although that brings with it the complications of quantifying VMT for an entire area instead of just along one corridor.

A study conducted by van der Loop, Haaijer, and Willigers (2016), using the total VMT definition of induced demand, found that "Based on multivariate analyses of detailed data in the Netherlands from 2000-2012, it is concluded that the amount of induced demand in total is relatively low and that the relatively large increase in traffic volume during peak hours on roads that were congested before adding lanes mainly has been caused by shifts in route and departure time." The results of this study line up with the hypothesis that the dramatic observed increase in throughput on the I-75/I-575 NWC in the morning peak is

not induced demand (using the total VMT definition). This is because relief of traffic congestion is unlikely to increase work trips, school trips, or daycare trips. Additionally, shopping and recreation trips are generally not morning peak trips. Thus, it seems like the large increase in observed trips must have come from either the shoulders of the peak or from parallel local road routes who now find that the freeways are no longer too congested. If those extra observed trips had come from the shoulders of the peak, while they would not increase total VMT over the whole road network, they may increase downstream congestion (Litman, 2001).

An approach to reducing VMT per capita and increasing corridor throughput is to encourage carpooling, with incentives like access to high occupancy vehicle (HOV) lanes, employer carpool incentives, or preferred parking at work. However, some people will carpool anyway without encouragement. So, to assess how effective method(s) of encouragement are at getting people to carpool, one needs to differentiate between those who would have carpooled without any carpooling incentives and those carpools which formed because of the incentives offered. One method to differentiate between these two groups is to quantify "fampools", which are carpools consisting only of family members. This method assumes that fampools would naturally form, regardless of the presence of supplemental carpooling incentives, because the total cost of travel is shared within the household. There are other types of carpools which may form without the presence of carpooling incentives that this method does not capture, such as coworkers who live in the same building, but the literature shows that fampools make up a significant proportion of total carpools. According to Poole and Balaker (2005), "Fampools constitute between one-third and two-thirds of HOV lane users, depending on the facility." A survey of travelers

in Dallas-Fort Worth and Houston in Texas found, “a significant amount of “fampooling”, with nearly 75% of carpools consisting of family members” (Li et al., 2007). In another survey which investigated the I-85 HOV to HOT lanes conversion in northeast Metro Atlanta’s impacts on carpooling, it was found that the share of fampools increased from 62% to 70% after the installation of the HOT lanes, but the survey respondent sample size was small (Guensler et al., 2016). The proportion of fampools among carpoolers who responded to this Metro Atlanta NWC commuter survey is also high and will be discussed later. It is important to note that one difference between the other sources and this survey is that the other sources studied corridors with HOV and HOV/HOT lanes, respectively, while this survey studies a corridor with reversible, dynamically tolled lanes without incentives for carpooling. So, one might hypothesize that the observed proportion of fampools should be even greater on the NWC. However, the adjacent section of I-75, towards downtown Atlanta, has an HOV 2+ lane in each direction, which does a pre-Express Lanes incentive in the form of time savings which had already encouraged carpooling to some extent.

CHAPTER 3. SURVEY OVERVIEW

The team designed the NWC Commuter Survey for administration as an online survey. The survey attempts to integrate and reconcile all relevant questions employed across major commute-related surveys implemented in the Atlanta Metro Area over the past 20 years. The expectation is that any specific survey implementation would use a subset of questions that are relevant to the agency's purpose for that survey. The questions and structure of this survey were derived from the following surveys:

- 2002 ARC Household Travel Diary Survey
- 2003 Commute Atlanta Survey
- 2004 Georgia Tech Commute Options Survey
- 2010 Atlanta Regional Commission (ARC) Onboard Transit Survey
- 2011 ARC Household Travel Diary Survey (for regional travel demand model development)
- 2016 Georgia Tech I-85 Express Lane Commuter Survey
- 2017 SRTA Express Lanes User Survey
- 2017 SRTA Xpress Bus Online Customer Satisfaction Survey
- 2018 Atlanta Regional Commission (ARC) Onboard Transit Survey
- 2018 ETC Xpress Bus On-board Rider Survey
- 2021 SRTA Peach Pass Customer Satisfaction Survey

The demographic question response options, such as income group and age cut points, have been reconciled across all these surveys. The research team's goal in reconciling demographic question response options was to support as much inter-comparison as possible across previous surveys conducted in the region, so that data collected over time remain comparable. The team converted the formats of the existing surveys and then modified, re-worded, and combined questions and response options as needed during survey development to provide a consistent look and feel and facilitate a smooth survey flow. The survey design team added the standard response options of "Don't know" and "Prefer not to answer" to all questions, when appropriate. Georgia Tech and SRTA teams reviewed and discussed these questions to reach agreement on formats and wording, as well as which questions should be incorporated into the 2023 NWC Commuter Survey.

The I-75/I-575 Northwest Corridor lanes opened in September 2018. The survey asks about commute travel in the first eight months of 2018 (before the Express Lanes opened and before the pandemic), 2019 (after the Express Lanes opened and before the pandemic began), and 2020/2021 (after the Express Lanes opened and after the pandemic began), to assess changes in travel behavior associated with these events.

After an initial Welcome Page (Section 1), survey sections focus on basic commute activity in 2018, 2019, and 2020/2021 (Section 2). The researchers hypothesize that the increase on corridor travel noted in 2019 was likely associated with diversion of trips from local roads or from pre-6:00AM travel into the peak period on the NWC. Hence, Section 3 asks additional questions of those individuals who identify as having changed their commute from local roads into the freeway corridor. Section 4 gathers additional

information on home and work locations (zip code level) for use in commute travel time assessment. System-wide Express Lane activity questions appear in Section 5. Section 6 assesses changes in transportation mode (drive-alone, carpool, transit, etc.), and Section 7 asks follow-up questions associated with noted changes in Express Lane use or transportation modes. Per SRTA's request, Section 8 asks for general perceptions of Express Lane performance in 2019. Section 9 asks a basic set of demographic questions for 2019, and Section 10 asks what demographic factors changed in the household during the pandemic. The Thank You page appears as Section 11. The survey instrument can be found in Appendix A.

CHAPTER 4. METHODS

The survey was designed for administration as an online survey using the Qualtrics online survey platform. Automated Qualtrics routines track survey progress and collect survey response data. Survey invitations were distributed through two different channels: email invitations and postcard invitations. The email invitations were sent to Georgia State Road & Tollway Authority (SRTA) Peach Pass customers whose ETC data indicated that they predominantly used the Northwest Corridor (NWC). The team programmed a dedicated email server (Python code) to generate emails to each selected Peach Pass customer containing their link to the online survey. A unique survey access web address link was generated through the Qualtrics platform for each contact, and each invited participant received a customized invitation email with their unique link to the survey. In total, email invitations were sent to 32,352 customers.

Postcard invitations were sent out about a month later to Atlanta Regional Commission (ARC) Metropolitan Planning Organization (MPO) households observed on the NWC (in 2018 or 2019 on either the general purpose or Express Lanes) (44,602 invitations) and Floyd, Gordon, and Pickens County households observed on the NWC (these counties are outside of the ARC MPO area) (5,363 invitations). In total, postcard invitations were sent to 49,965 residents. The postcards had unique web address links and QR codes which gave the invitee access to the online survey. Because the web address links and QR codes are unique, it is possible to track which invited respondents participated in the survey. The main purpose of this survey was to assess the household travel patterns in the corridor and try to explain why there was such a large increase in pre-construction

completion versus post-construction completion corridor throughput. Random stratified sampling was employed, with strata based on income, household size, and race/ethnicity. All Floyd, Gordon, and Pickens County households observed on the NWC in the Volume II study were sampled. These counties were included because the research team wanted to assess the travel patterns of exurban NWC users identified in Volume II of the Georgia Express Lane Corridors Vehicle Occupancy and Throughput Study 2018-2020 (Guensler, et al., 2022b).

CHAPTER 5. RESULTS

In this chapter, survey response rates by invitation method will be presented first. Next, the responses to the questions regarding induced demand, which was the primary focus of this survey, will be presented. Then, responses to the questions regarding carpooling will be presented. Finally, responses to the demographic questions will be presented at the end of this chapter.

5.1 Survey Response Rates by Invitation Method

Qualtrics automatically collects the survey responses of each respondent as one record, along with the survey start and end date, record timestamp, survey status (started and not completed vs. completed), progress, and duration (time it took the respondent to take the survey). The data were extracted by the research team from Qualtrics in csv format.

Table 1 summarizes the responses by invitation method, including the number of invitations sent, number of surveys completed, and response rate from each invitation method. The number of responses from email invitees (3.26% response rate) slightly exceeded expectations while the number of responses from postcard invitees (2.88% response rate) fell short of expectations. The target population of this survey was all users of the NWC, so it is worth keeping in mind that Express Lanes customers are overrepresented in the survey results. The postcards sent to exurban NWC users garnered a lower response rate (1.94%) compared to the suburban NWC users (2.99%). Perhaps their response rate is lower because they live further away from the topic of the survey.

Table 1 - Survey Responses by Invitation Method

Invitation Method	Invitees	Survey Responses	Response Rate
Emails to Express Lanes Customers	32,352	1,054	3.26%
Postcards to Suburban General Purpose Lanes Users	44,602	1,335	2.99%
Postcards to Exurban General Purpose Lanes Users	5,363	104	1.94%
Total	82,317	2,493	3.03%

It should be noted that the number of responses presented in the table represent individuals that accessed their survey link. In the following section, the reader will note that there are fewer responses to the mode shift questions than those for the route and time shift questions. This is due to respondent attrition over the length of the survey. According to Qualtrics' tracking of survey progress, many respondents left the survey early on, with the rate of attrition decreasing greatly after the first 13-question section, where about 22% of respondents departed the survey. About 16% of the initial respondents departed at various points along the remainder of the survey. Looking at response counts for individual questions, of the 2,493 respondents who entered the survey, 2,268 respondents answered the first question of the survey. Of the 2,268 survey respondents that answered the first question of the survey, 1,916 respondents (84.5%) started the second section of the survey, and 1,554 respondents (68.5%) completed the entire survey.

5.2 Questions Regarding Induced Demand

The following figures show the responses to questions which asked respondents if/how their morning commute on the NWC changed from 2018 to 2019 (before/after the Express Lanes opened) and from 2019 to 2020/2021 (pre-pandemic/post-onset of pandemic). These questions ask about route reassignment, departure time of day shifts, and changes in mode split. Some of these questions (route and mode shift, Figures 2 and 5) allowed respondents to check all answers that applied to them. To make it so that respondents who took a variety of routes or modes are not counted more than respondents who took just one route or mode, the value of each respondent's response was divided by their total number of responses to check all that apply questions regarding induced demand. A major drawback of this method is that it does not capture differences in frequencies of use among routes and modes, but since that information was not asked of respondents, this is the simplest way to make the option total add up to 100% to try to get a rough picture of shifts in option choices over time.

As illustrated in Figure 2, after the opening of the Express Lanes, the proportion of respondents who commuted in the morning using the NWC freeway general purpose lanes decreased by 16.4% and those using NWC arterials decreased by 7.5%. Those using I-75/I-575 (combining the freeway with the Express Lanes) increased by 8.6%. Finally, those using a different metro area corridor only decreased by 1.1%. After the onset of the pandemic, the proportion of respondents who commuted in the morning using the NWC freeway general purpose lanes increased by 0.3%, those using the Express Lanes increased by 0.3%, those using NWC arterials decreased by 0.1%, and those using a different metro area corridor decreased by 0.6%. One thing to note is the large decrease in total responses to the question about route choice after the pandemic. This is because the route choice

question for each time frame was only asked to respondents who indicated that they were commuters during that time frame and many workers post-pandemic began working at home. So, while the route split did not change much after the onset of the pandemic, the number of commuters did.

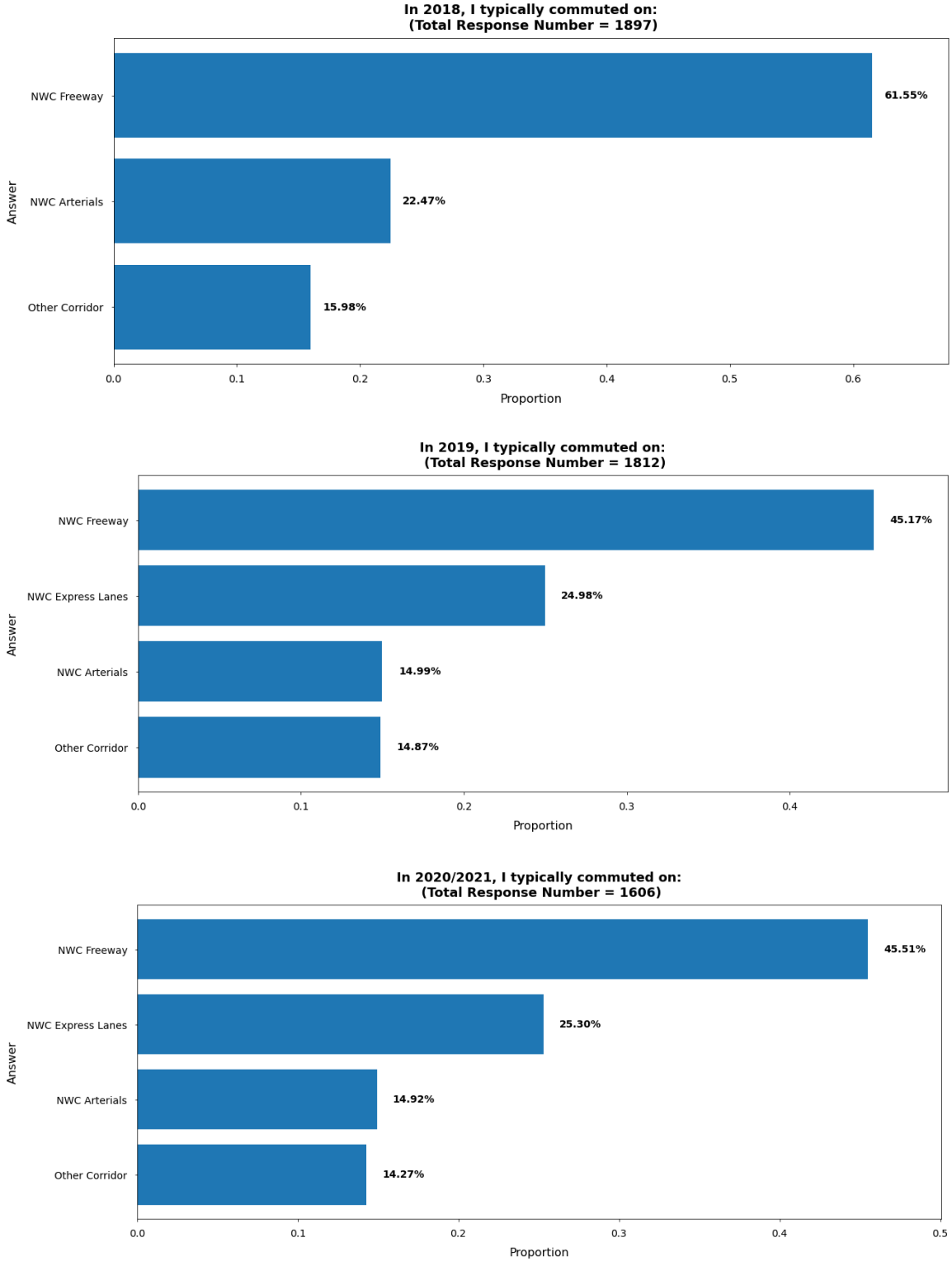


Figure 2 – Change in Route Choice Over Time

As illustrated in Figure 3, when respondents indicated that after the Express Lanes opened in 2019, their route changed from NWC arterials to the NWC freeways or the new Express Lanes, they were asked to indicate all reasons why they changed their route. About 37.6% of respondents indicated that they had previously used the freeway but had temporarily diverted to NWC arterials in 2018 because construction had created too much congestion along I-75 or I-575, and once construction was complete in 2019, they moved back to the freeway. About 41.9% of respondents changed because after the freeway became less congested in 2019 it provided a better commute for them. About 10.1% of respondents changed because NWC arterials became too congested in 2019. And 29.5% of respondents changed because of some other reason. The most frequently chosen response option for why respondents changed their route from NWC arterials being that the freeway became less congested in 2019 is an important finding, as it indicates that corridor demand was suppressed pre-opening of the Express Lanes. Future studies will need to account for this.

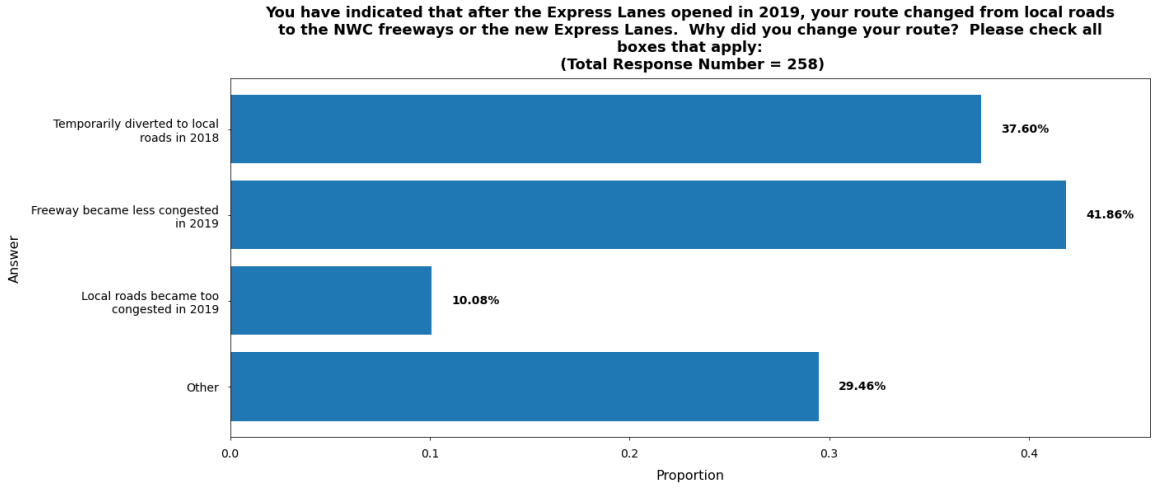


Figure 3 – Reasons for Diversion from NWC Arterials in 2019

As illustrated in Figure 4, after the opening of the Express Lanes, there appears to be a shift toward later departure times for the morning commute to work. Excluding those who answered "Don't know" or "Prefer not to answer", the proportion of respondents who departed before 7AM decreased by 2.6% while those who departed after 7AM increased by 2.6%. Again, this is showing a significant shift in addition to respondents who changed their routes after the opening of the Express Lanes. The pandemic appears to have further shifted departure times toward later in the morning for those who still had to commute to work. The proportion of respondents who departed before 8AM decreased by 7.4% while those who departed after 8AM increased by 7.4%.

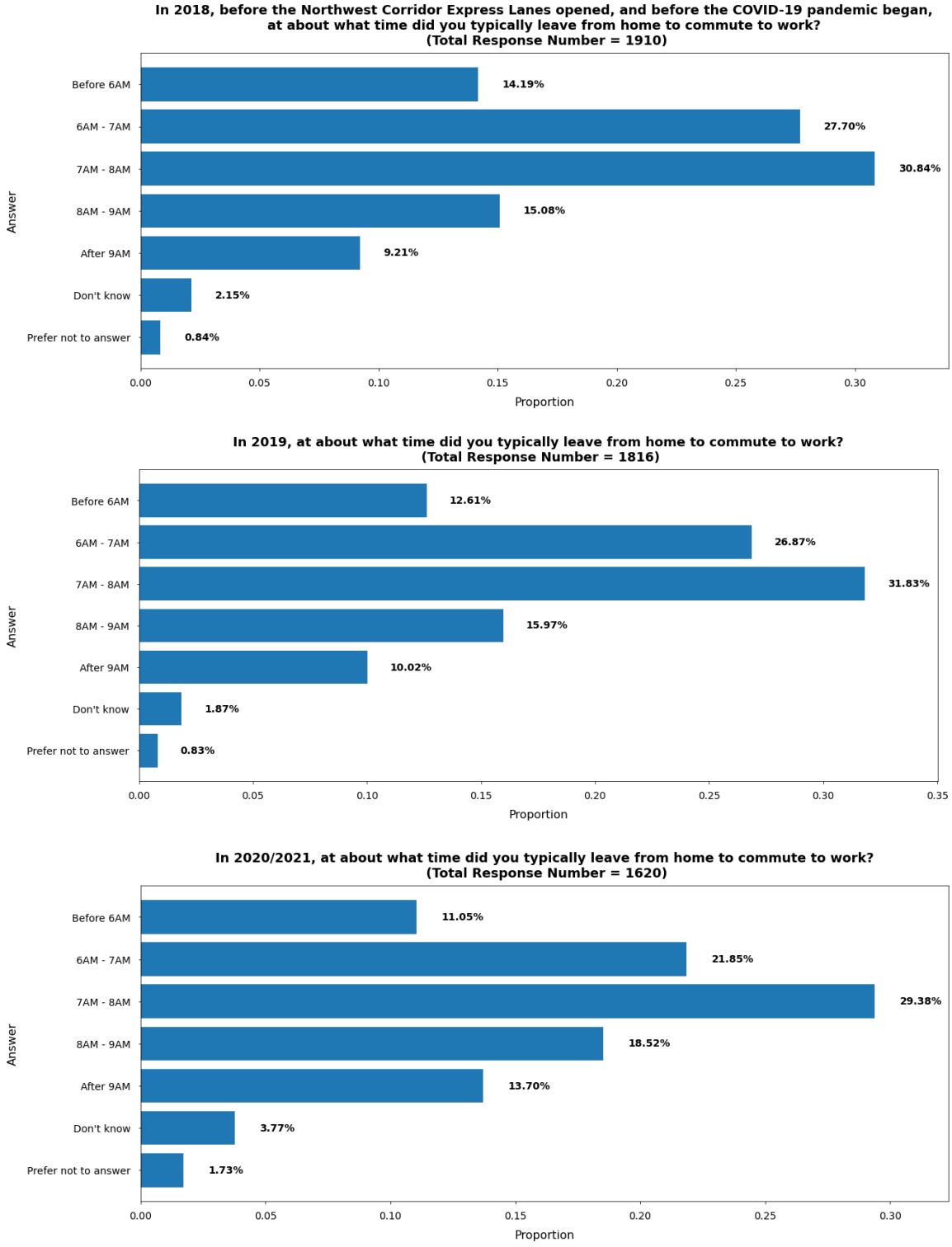


Figure 4 – Change in Morning Commute Departure Time

As illustrated in Figure 5, after the opening of the Express Lanes, the proportion of survey respondents who drove alone only increased by 0.3%. Survey respondents indicated that the pandemic caused a much greater mode shift, with the proportion of respondents who drove alone decreasing by 5.7% and those who worked from home increasing by 7.1%. While the directions of these shifts are in line with expectations, the magnitudes are smaller than expected.

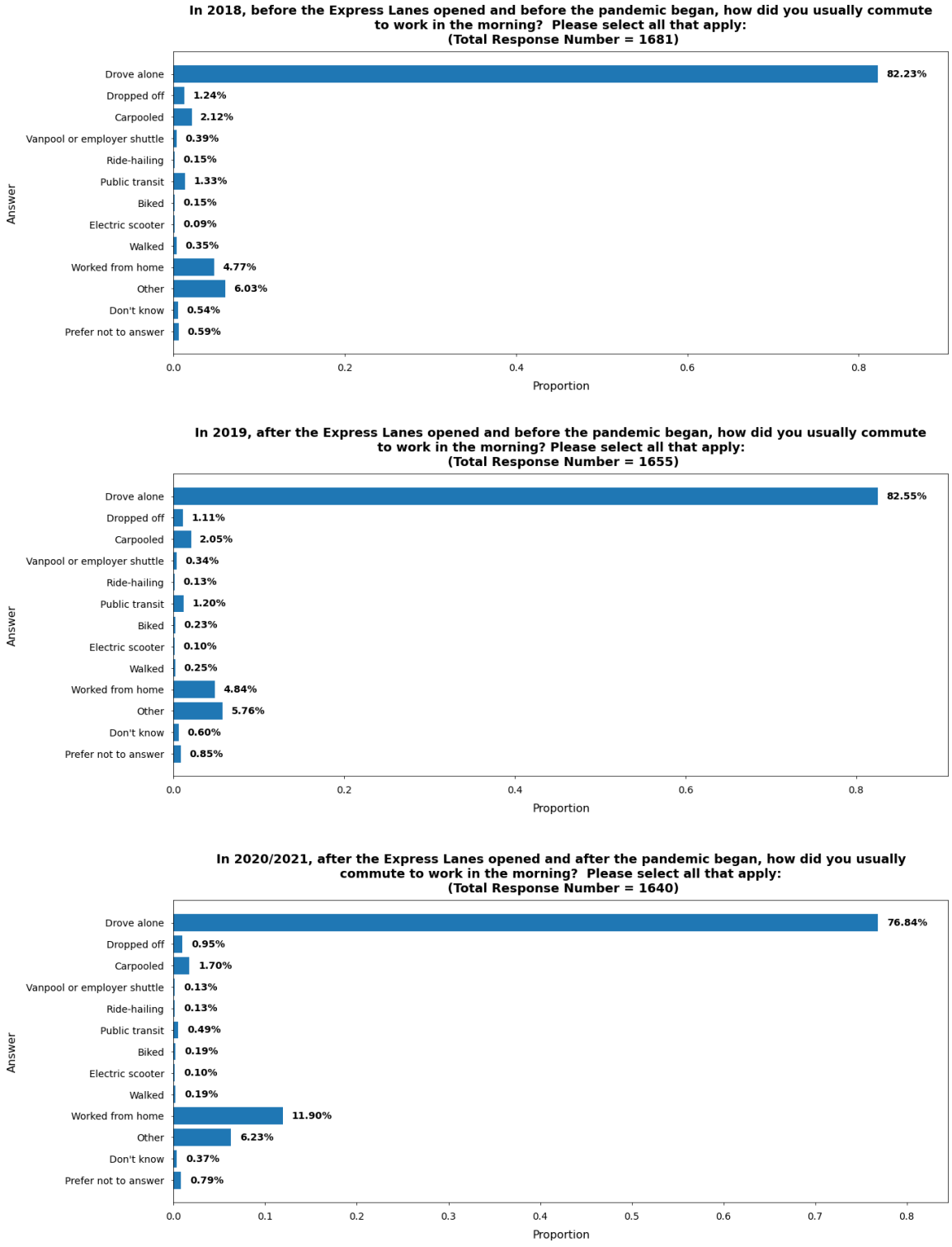


Figure 5 – Mode Shift for the Morning Commute

Based on these survey questions, one can begin to get a rough idea of how much extra traffic came from different sources after the opening of the Express Lanes. Regarding route reassignment and potential trip redistribution to new destinations, traffic using I-75/I-575 (combining the freeway with the Express Lanes) increased by 8.6%, but those using NWC arterials decreased by 7.5% (probably little impact on total VMT) and those using a different metro area corridor decreased by 1.1% (potentially an impact on total VMT). In future work, to confirm if those who switched from a different metro area corridor qualify as trip redistribution, one would need to investigate how their origin and/or destination changed. Regarding departure time of day shift, the proportion of respondents who departed before 7AM decreased by 2.6% while those who departed after 7AM increased by 2.6% (which likely had little impact on total VMT). And regarding changes in mode split, the proportion of respondents who drove alone increased by 0.3% (Potentially substantial impact on total VMT). It might be argued that the remainder of the extra traffic had to have come from trip generation, which are new trips that were not made previously on any transport mode. But without directly asking respondents about their morning trip frequency on I-75/I-575, and their daily morning activity trip purposes, it is difficult to tell how much trip generation took place. Table 2 summarizes these results below.

To get a rough estimate of the increase in traffic after the Express Lanes opened, the percentage shift from each source was divided by the percent of respondents who used the NWC freeway before the Express Lanes opened. To get the percentage of respondents who used the NWC freeway before the Express Lanes opened, nonresponses had to be accounted for. A total of 2,166 respondents answered the second question in their survey, 53.9% of which commuted in the morning using the NWC freeway in 2018. The percentage

of total increase was obtained by dividing the percentage increase from each source after the Express Lanes opened by the 35% observed increase in vehicle throughput on I-75/I-575 in the AM peaks (Guensler et al., 2022a). There are some assumptions to be conscious of when examining these results. First, respondents who indicated that they did not commute were not shown the route choice question. Thus, it is assumed that those who are not commuting to work are not making trips during the morning peak hours. This may not be the case for stay-at-home parents who drop their children off at school, or undertake morning social/recreational activities, for example. Secondly, it is assumed that the sample of respondents is representative of the NWC corridor population, which is probably not the case given the small sample size. The behavior of the relatively large number of Express Lanes users is not likely to be representative of the corridor users overall. In future work, this bias could be mitigated by looking at responses to demographic questions, comparing responses across population demographics for activity, and then weighting answers accordingly.

Table 2 – Breakdown of Extra Trips on I-75/I-575 from Different Sources

Source of Extra Trips on I-75/I-575	% increase after Express Lanes opened	% of total increase	Total VMT Increase?
Trip generation	13.7%	39.1%	Yes
Trip redistribution to new destinations	2.0%	5.7%	Likely
Changes in mode split	0.6%	1.7%	Yes
Route reassignment	13.9%	39.7%	No
Departure time of day shift	4.8%	13.7%	No

5.3 Questions Regarding Carpooling

As illustrated in Figure 6, of respondents who indicated that they at least sometimes carpool for their morning commute, for 75.5% of them, only two people (including the driver) were usually in their morning carpool. About 15.1% usually had three people, 1.9% usually had four people, and 1.9% usually had 5 or more people. For 5.7% of carpools, the number of people that were usually in their morning carpool were reported as varying a lot.

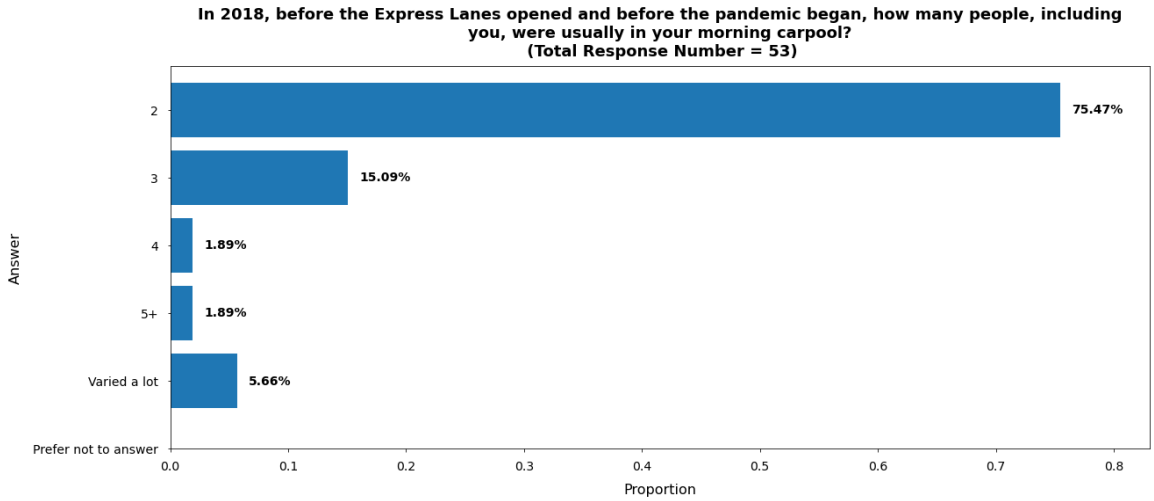


Figure 6 – Carpool Size

As illustrated in Figure 7, when asked to select all types of people that rode in the morning carpool with them in 2018, 51.9% indicated that they carpooled with adults in their family, 5.8% indicated that they carpooled with children in their family, 53.9% indicated that they carpooled with co-workers, 1.9% indicated that they carpooled with children not in their family, and 7.7% indicated that they carpooled with people who did not fall into any of the categories listed. This is a check all that apply question, so for the following two figures, unique combinations of responses were separated out. Thus,

individual carpool members with multiple listed roles could be identified, such as where there are co-workers in the same family.

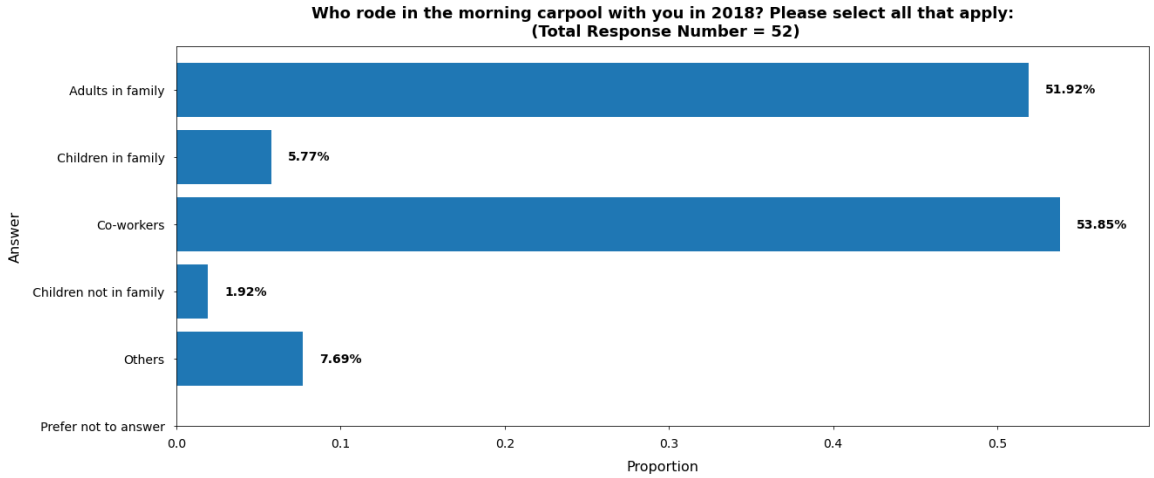


Figure 7 – Carpool Composition

The vast majority (94.2%) of respondents' carpools consisted of only adults. After filtering out carpools with children in them, as illustrated in Figure 8, 49.0% of respondents' carpools with only adults in them are fampools.

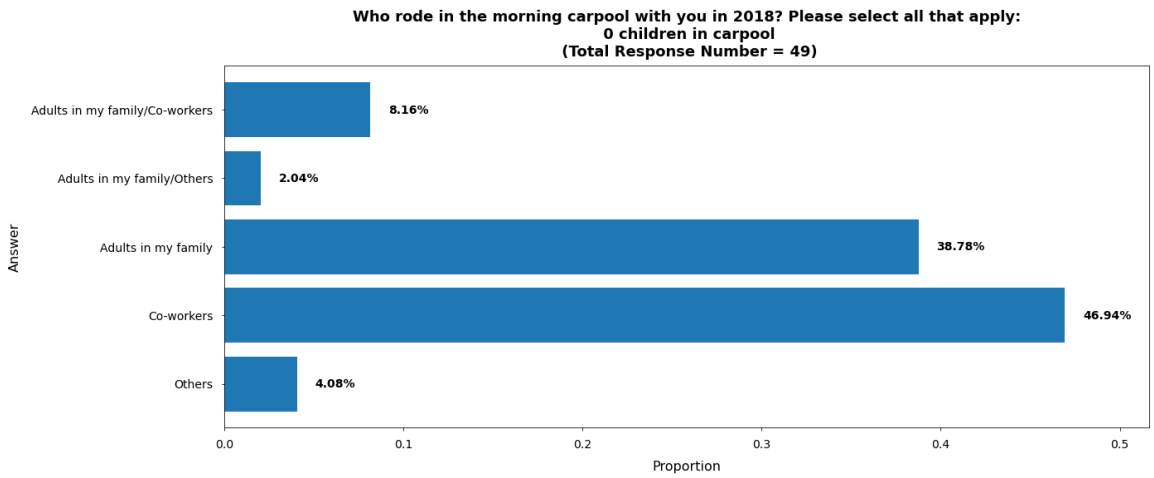


Figure 8 – Adult Carpool Composition

And the fampool proportion increases if large carpools (3+ occupants) are considered separately. As illustrated in Figure 9, 61.5% of carpools composed of two adults are fampools. The lower bound of the number of fampools (carpools consisting of only family members) is actually determined by the responses in Figure 9, which only includes carpools with two adults, so if the "Adults in my family" box was checked, then their carpool must be a fampool. All 10 reported carpools of size greater than two did not contain a family member. Admittedly, response numbers are small for the carpooling questions, so if the response rate was better, then these numbers could change. But these numbers appear reasonable, as they fall within the fampool proportion range seen in the literature (33%-75%) (Poole and Balaker, 2005; Li et al, 2007). Like the induced demand calculations presented earlier, the survey derived fampool statistics assume that the sample of respondents is representative of the NWC corridor population, which is probably not the case. Again, in future work, this bias could be mitigated by looking at responses to demographic questions, comparing it to population data, and then weighting answers accordingly.

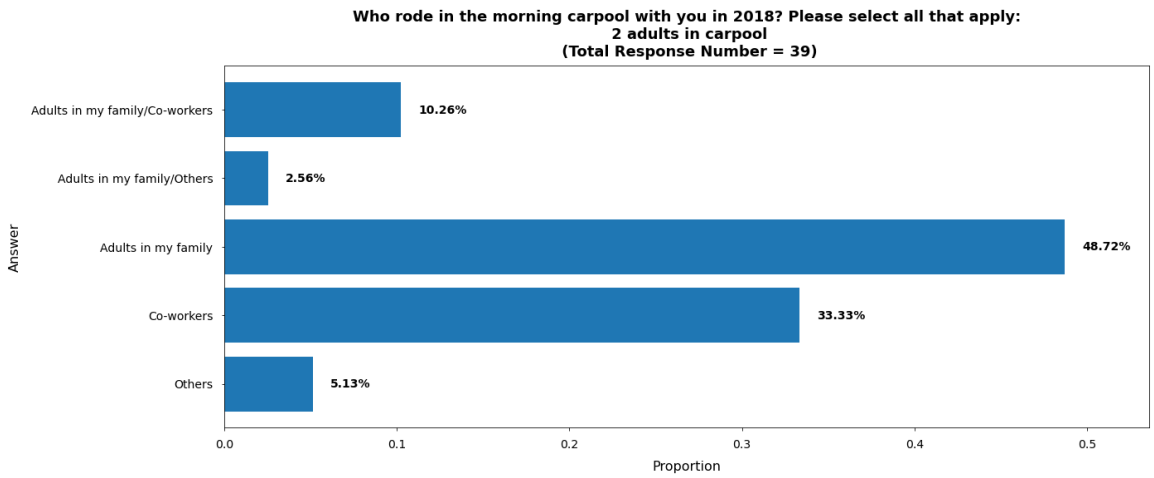


Figure 9 – Adult Carpool Composition (Only 2 Carpool Members)

5.4 Demographic Questions

Collection of respondents' household demographic information will be helpful in the crosstab analysis that will be completed for a larger report to potentially identify what demographic groups were more likely to switch routes and shift departure time. It would also be potentially interesting to look at whether certain demographic groups are more likely to carpool and fampool. Because the main purpose of this survey was to identify how people's commute behavior changed after the opening of the NWC Express Lanes, respondents were asked to give their demographic information for the year 2019.

As illustrated in Figure 10, 2.2% of respondents were between 18-24 years old in 2019, 10.5% were between 25-34 years old, 19.7% were between 35-44 years old, 28.0% were between 45-54 years old, 24.9% were between 55-64 years old, 11.7% were between 65-74 years old, 2.3% were 75 years old or older, and 0.7% declined to answer. Any respondent who indicated that they were under 18 years old had their entire survey record discarded.

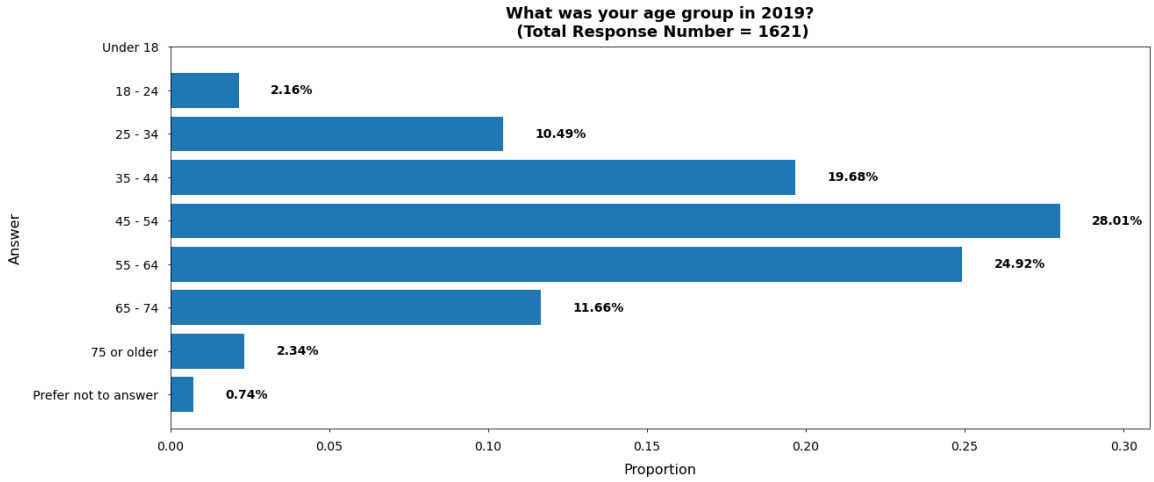


Figure 10 – Distribution of Age Groups among Respondents

As illustrated in Figure 11, most respondents (75.5%) were married and living with their spouse in 2019, 16.3% were single, 4.8% were single but living with a relationship partner, 1.1% were married and living apart, 1.5% were in a situation other than those listed above, and 0.9% declined to answer.

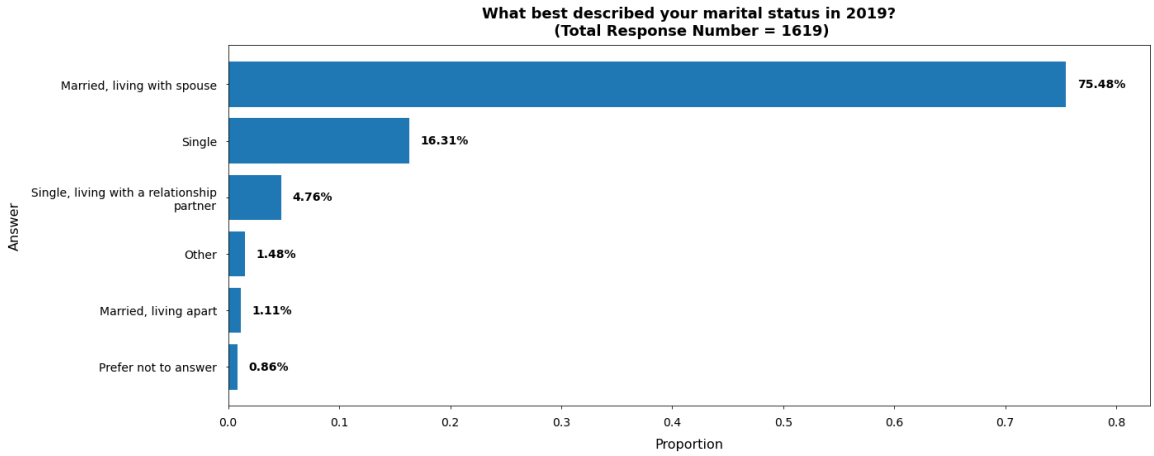


Figure 11 – Marital Status of Respondents

As illustrated in Figure 12, more respondents (55.5%) identified as male than female (43.1%). About 0.6% of respondents identified as another gender, and 0.8% declined to answer.

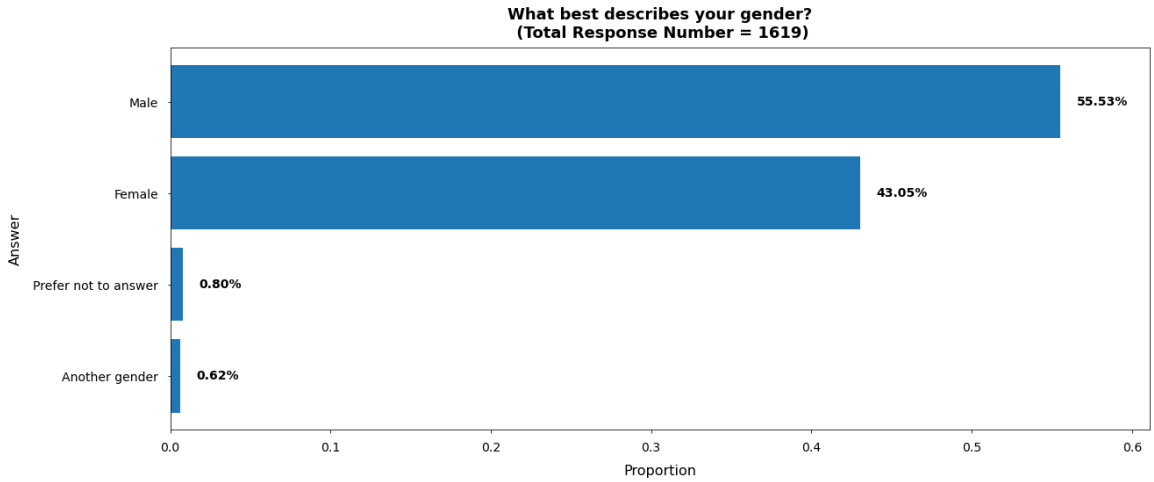


Figure 12 – Gender of Survey Respondents

As illustrated in Figure 13, the vast majority (95.1%) of respondents were not students in 2019. About 4.7% indicated that they were students while 0.3% indicated that they did not know if they were students in 2019.

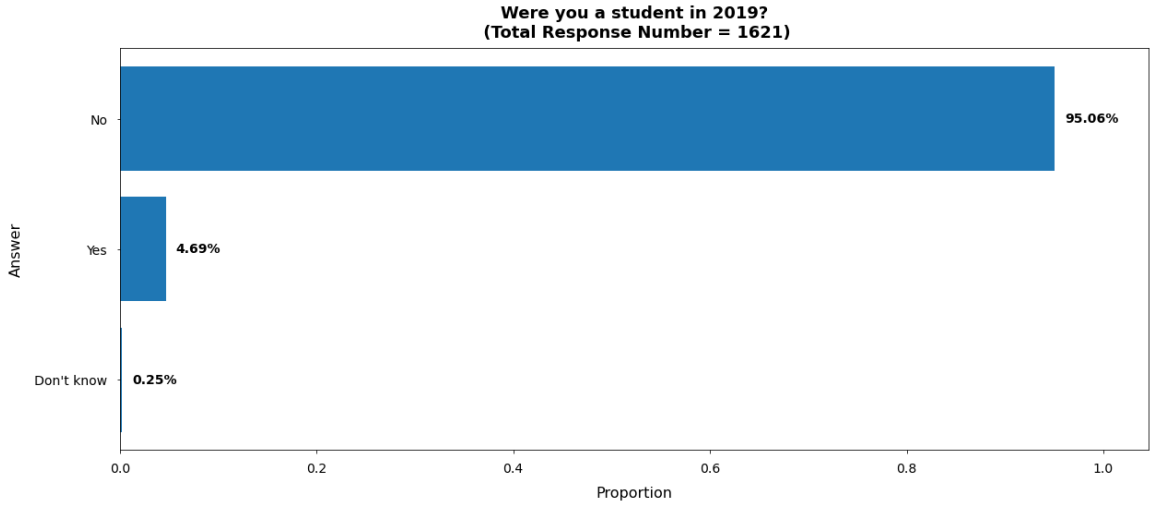


Figure 13 – Student Status of Respondents

Of respondents who indicated that they were students in 2019, as illustrated in Figure 14, 60.0% were full-time college students, 36.0% were part-time college students, 1.3% were full-time K-12 students, and 2.7% were a different type of student.

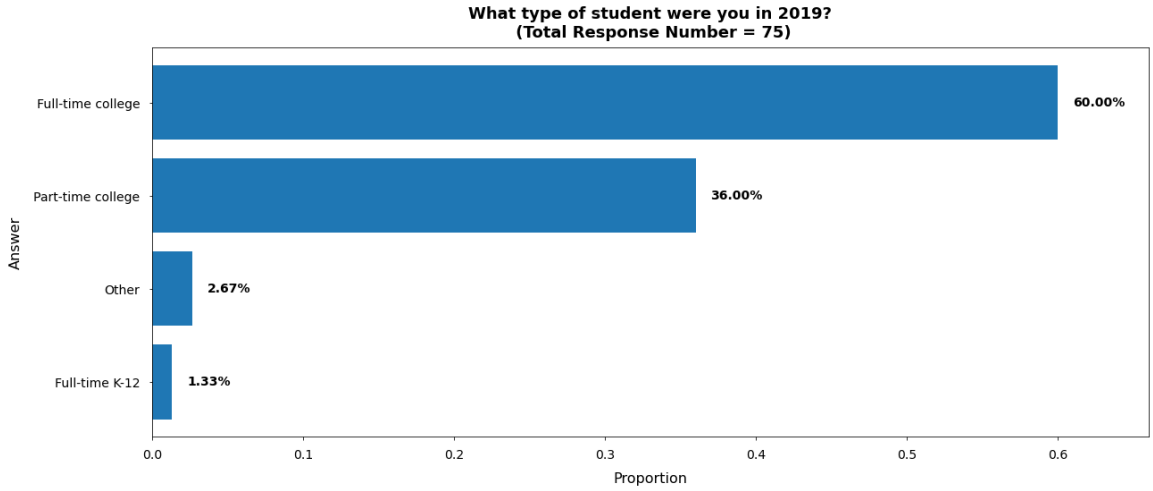


Figure 14 – Student Types of Student Survey Respondents

As illustrated in Figure 15, 0.3% of respondents opted out of high school for work or another activity, 3.8% are high school graduates or have a GED, 11.2% completed some

college level courses, 10.1% have an associate's, technical school, or other two-year college degree, 40.7% have a bachelor's or other four-year undergraduate degree, 23.0% have a master's degree, 9.0% have a Ph.D. or professional doctoral degree such as M.D., D.D.S., J.D., etc., 0.1% did not know their highest education level that applied in 2019, and 1.9% declined to answer.

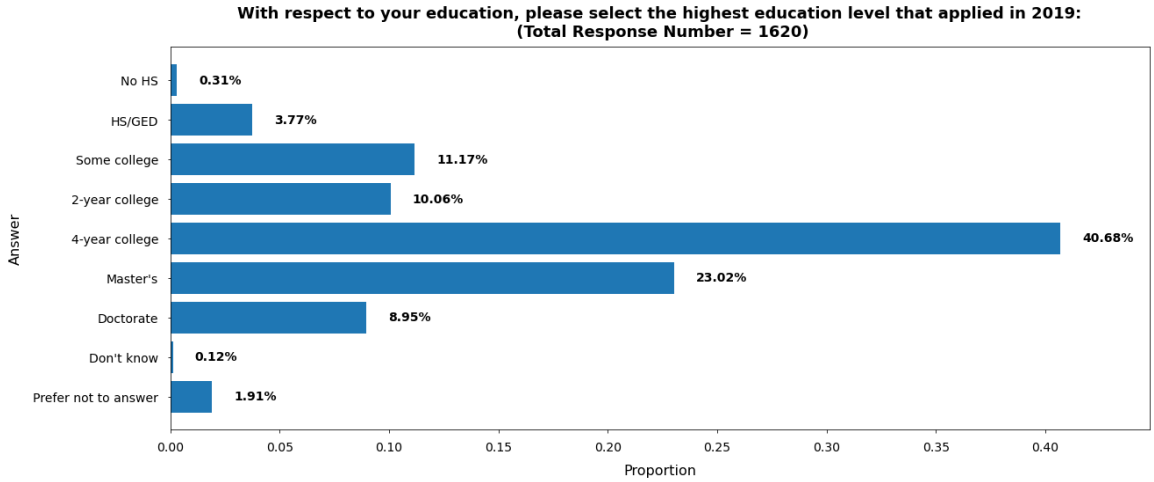


Figure 15 – Education Level of Respondents

As illustrated in Figure 16, 8.1% of respondents lived in 1-person households in 2019, 36.0% lived in 2-person households, 19.8% lived in 3-person households, 23.8% lived in 4-person households, 6.9% lived in 5-person households, and 2.7% lived in households with 6 or more people. About 4.7% of respondents' households had no workers in 2019, 25.8% had one worker, 53.5% had two workers, and 9.8% had three workers. About 90.3% of respondents' households had no children younger than school age and 5.4% had one child younger than school age. About 57.6% of respondents' households had no children of school age, 16.0% had one child of school age, 17.5% had two children of school age, and 5.5% had three children of school age.

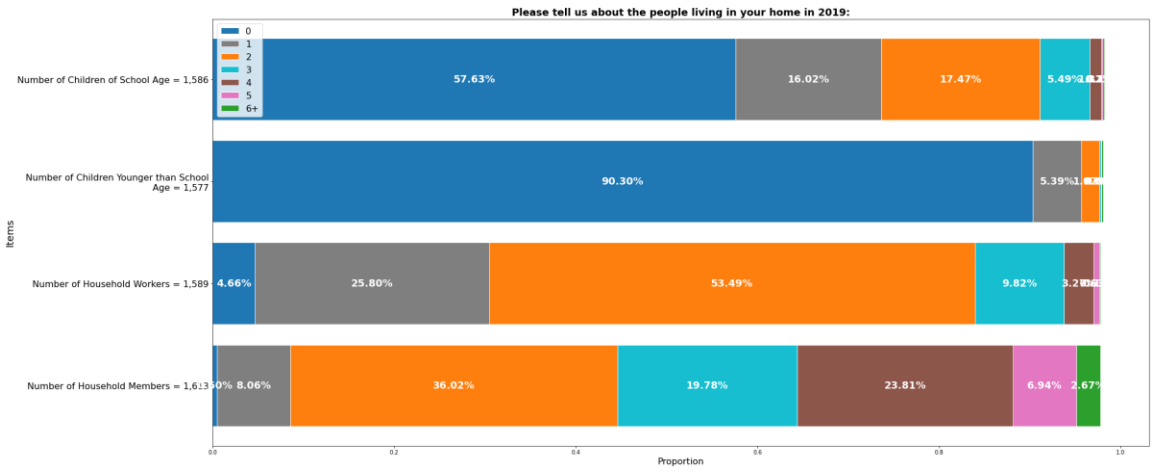


Figure 16 – Household Composition of Respondents

As illustrated in Figure 17, when respondents were asked to select all categories which best described the race or ethnicity of their household in 2019, 7.0% identified as Black/African-American, 4.3% identified as Hispanic, Latin American, Central American, 2.7% identified as Asian, 0.3% identified as Native Hawaiian/Pacific Islander, 1.0% identified as American Indian/Native Alaskan, 81.9% identified as White/Caucasian, 4.0% identified as Multi-racial, 0.6% identified as a race or ethnicity not provided above, 0.3% did not know their race or ethnicity, and 6.4% declined to answer.

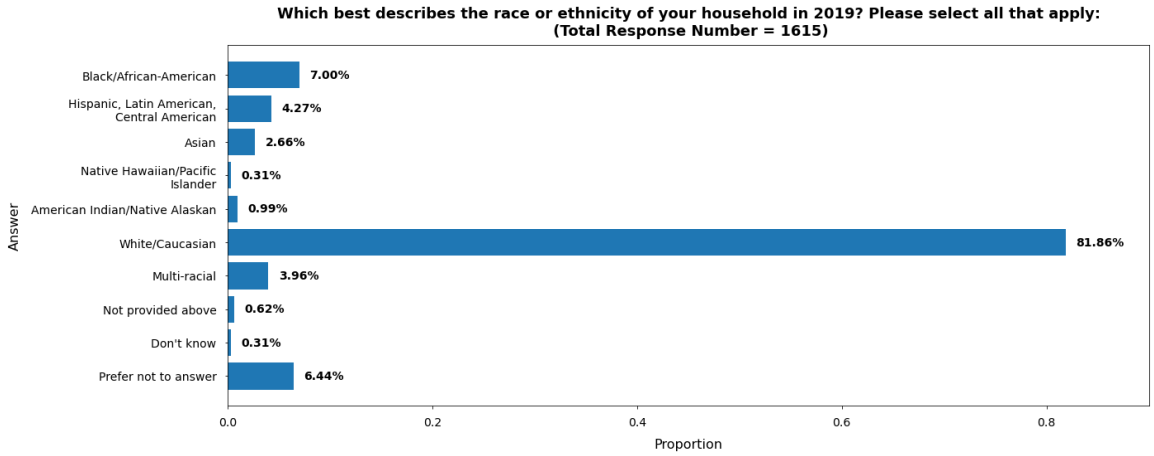


Figure 17 – Race or Ethnicity of Survey Respondents

As illustrated in Figure 18, most respondents (88.0%) indicated that they were homeowners. About 9.2% indicated that they were renters, 0.2% did not know if they owned or rented where they lived in 2019, and 2.6% declined to answer. Most respondents (90.0%) lived in a stand-alone house. About 5.0% indicated that they lived in a condominium or townhome, 2.4% indicated that they lived in an apartment, 0.2% indicated that they lived somewhere other than the options listed above in 2019, 0.1% indicated that they did not know what kind of home they lived in, and 2.4% declined to answer.

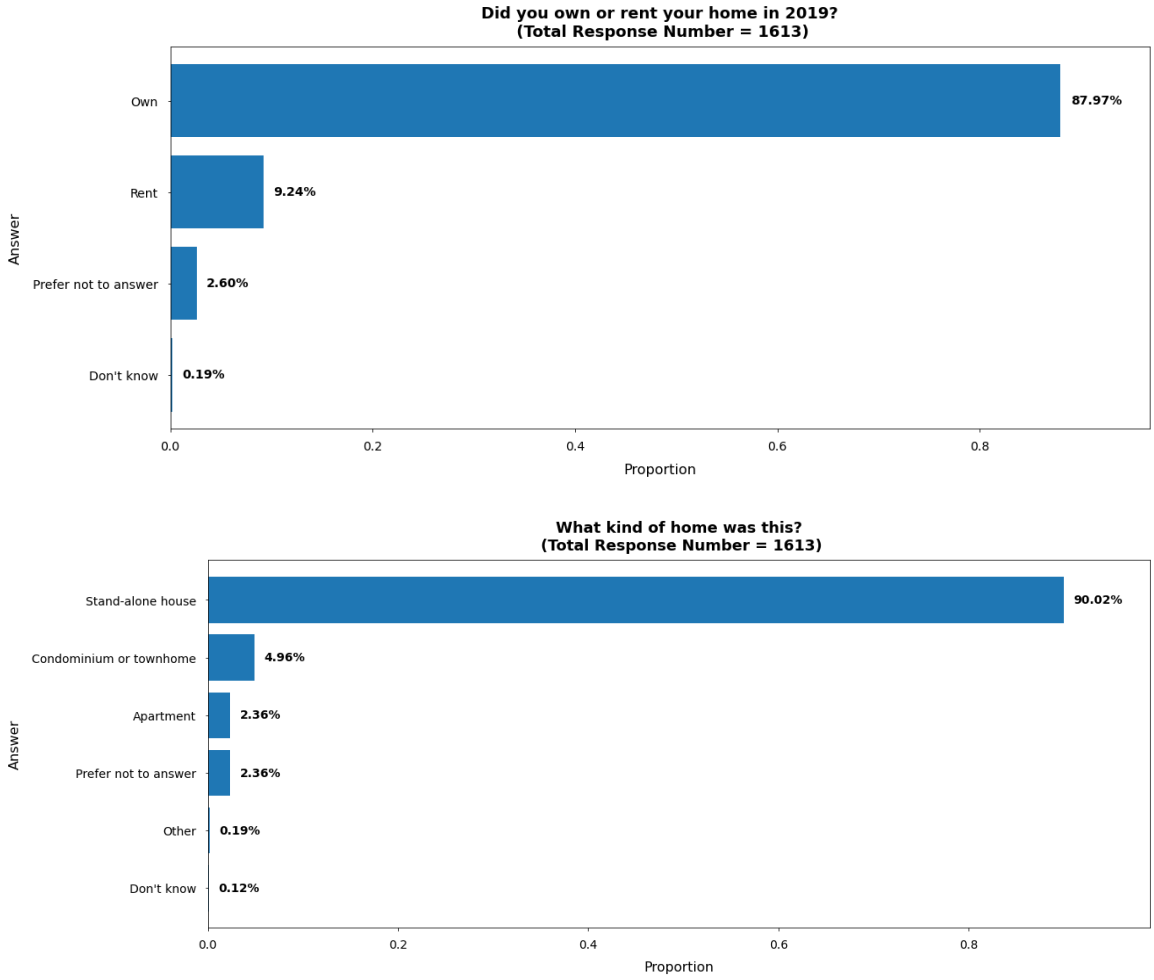


Figure 18 – Housing Types of Respondents

As illustrated in Figure 19, 0.1% of respondent households had zero motor vehicles in 2019, 8.9% had one, 50.1% had two, 25.1% had three, 10.2% had four, 2.6% had five, and 1.2% had six or more. About 1.7% declined to answer.

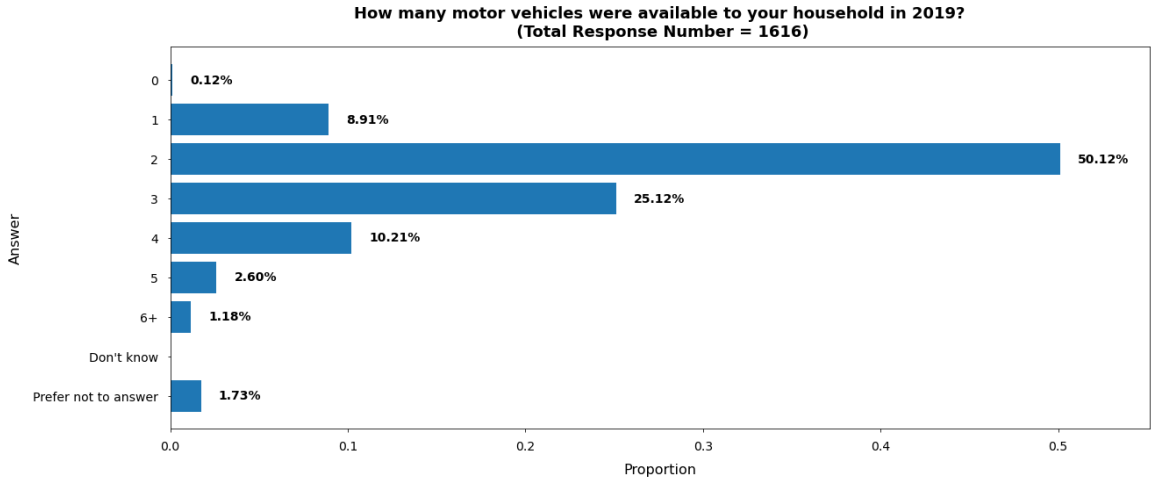


Figure 19 – Distribution of Motor Vehicles per Household among Respondents

As illustrated in Figure 20, 17.9% of respondents' household income was greater than $200,000 in 2019, 18.0% was between $150,000 and $200,000, 25.7% was between $100,000 and $150,000, 12.3% was between $75,000 and $100,000, 6.6% was between $60,000 and $75,000, 3.4% was between $50,000 and $60,000, 2.4% was between $40,000 and $50,000, 0.8% was between $30,000 and $40,000, 1.6% was between $20,000 and $30,000, 0.5% was between $10,000 and $20,000, and 0.3% was less than $10,000. About 0.4% did not know and 10.2% declined to answer.

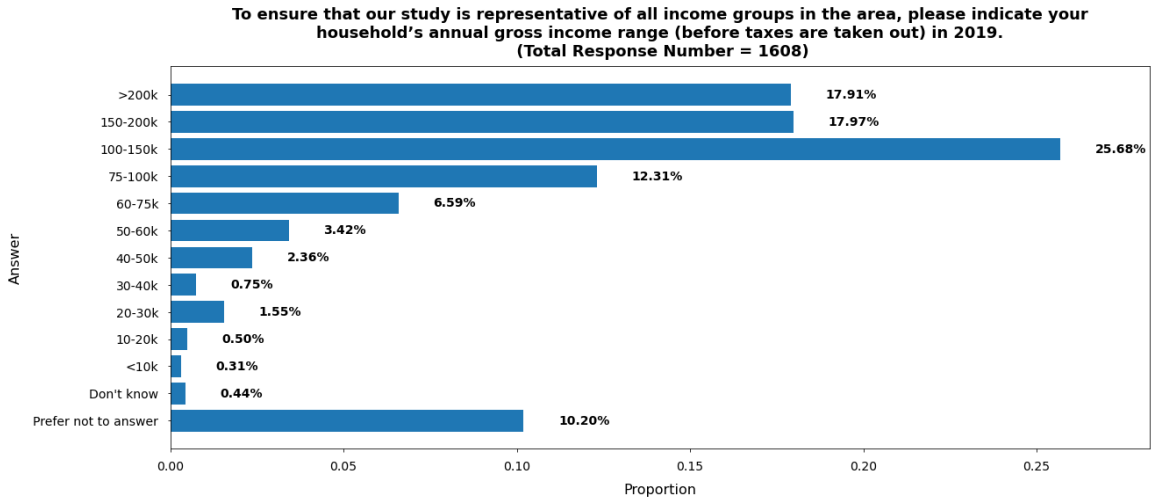


Figure 20 – Distribution of Income Groups among Respondents

CHAPTER 6. CONCLUSIONS

Induced demand is something that transportation planners should investigate when considering new transportation infrastructure or substantial expansions to existing transportation infrastructure. This is because induced demand may increase total vehicle miles traveled (VMT), which reduces the congestion reduction benefit that can result from increased road capacity and increases external costs, like parking demand, uncompensated crash damages, and environmental impacts (such as emissions and pollution) (Litman, 2001). To investigate how much of the observed increase in vehicle throughput on the I-75/I-575 Northwest Corridor (NWC) in the AM peaks after the opening of the reversible, dynamically tolled Express Lanes represents an increase in total VMT, an online survey was conducted. Email invitations were distributed to Express Lanes customers whose most frequently used corridor was the NWC and postcard invitations were distributed to addresses all over the NWC service area.

The 2023 Atlanta Metropolitan Area Northwest Corridor Commuter Survey garnered a decent response. The survey covered many different topic areas and presents the opportunity for many research questions to be investigated. The focus of this thesis is limited to the main purpose of the survey, which is to investigate different sources of induced demand. It was found that 53.4% of the observed increase in vehicle throughput came from sources that would not be expected to increase total VMT (39.7% from route reassignment and 13.7% from departure time of day shift). The extra trips which shifted from earlier in the morning, while they would not increase total VMT over the whole road network, they may increase downstream congestion (Litman, 2001). Whether or not this

happened could be looked at in future work, though with only a 4.8% increase in traffic over a 3-hour period, it may be difficult to find anything significant. The other 46.5% of the observed increase in vehicle throughput came from sources that could increase total VMT (1.7% from changes in mode split, 5.7% from trip destination redistribution, and the remaining 39.1% from trip generation). These numbers assume that the sample of respondents is representative of the NWC service area, which may not be the case. Additionally, the behavior of the relatively large number of Express Lanes users is not likely to be representative of the corridor users overall. An assessment of the demographic characteristics of the respondents for representativeness in sampling and for likely changes in behavior is needed. For example, if retirees increased travel in the morning peak, that is an important finding. In future work, this should be monitored by implementing comprehensive household-level, before-and-after travel behavior studies for new facilities. These numbers also fail to capture non-commuters who may have used the NWC in the morning peak hours, which may be a significant source of error. By classifying all the remaining extra traffic as trip generation, some of these individuals' trips are captured, but some of their trips may be better classified under the other sources of extra traffic. So, if there is a substantial amount of non-commuters who used the NWC in the morning peak hours, then trip generation is currently being overestimated and the other sources of extra traffic are being underestimated.

Assuming that the induced demand numbers presented herein are correct, after the opening of the NWC Express Lanes, total VMT in the corridor's service area increased by 16.3%. But in the short run, increasing roadway capacity can reduce some external costs. Vehicle emission rates per mile of travel and crash rates decrease when traffic flows more

freely; however, these benefits may decline over time as continued regional growth and generated traffic leads to renewed congestion, and as induced travel increases total vehicle trips and distance traveled (Litman, 2001). It could be interesting to do a cost-benefit analysis between induced traffic and traffic flowing more freely. Something else to consider is that since the additional capacity is tolled, users of the Express Lanes' toll revenue could be used to offset the external costs of their extra traffic.

Attempting to encourage carpooling is a strategy that many agencies and governments use to try to reduce VMT per capita. This survey's findings that 49.0% of adult carpools are fampools, and that 61.5% of 2-person adult carpools are fampools, confirm others' findings that a substantial proportion of carpools are fampools on urban highways. The NWC does not have traditional carpool lanes to encourage carpooling; hence, these fampools have likely been formed because there are inherent household-level cost reductions to sharing one household vehicle. Given the inherent benefits of the shared fampools' ride, it seems unlikely that additional incentives would lead to an increase in fampools formation. Rather, any fampools would receive the incentives without reducing the number of vehicles on the road. Because carpool incentives come with implementation costs, it may be wise to target new carpool incentives to carpools that contain members from more than one household. Other research indicates that in areas with HOV/HOT lanes to encourage carpooling, the observed proportion of fampools is not too different from what was found in this survey (Poole and Balaker, 2005; Li et al, 2007). This survey's finding that fampools make up a greater proportion of 2-adult carpools compared to adult carpools overall was slightly surprising. More data from another source is needed to ensure

that this is an actual corridor-level trend and not just the result of the specific individuals that responded to this survey.

Future research with this survey will need to be refining the responses by weighting responses according to some demographic questions, trying to get a better understanding of trip redistribution based on responses to the home and work location questions, and investigating responses to other questions to see if any patterns seem out of the ordinary. In the longer term, future research could include investigating land use changes potentially caused by the Express Lanes improving mobility along the NWC. Because Georgia is building more Express Lanes, another survey looking at where new traffic comes from which takes into account non-commuters who drive during the morning peak period could help give an idea of how much information this survey was missing out on by not including them in the route and departure time of day shift questions. Another potential improvement which should be implemented in future surveys is adding a trip-based section to get at trip purposes of corridor users. Such an improvement would also solve the problem of comparing the percentages of responses for the route choice and mode choice questions because it would capture differences in frequencies of use among routes and modes.

In conclusion, because extra traffic can come from many sources, when one sees a sudden increase in vehicle throughput after a capacity upgrade, not all of it is necessarily contributing to an increase in total VMT. Finding out where the extra traffic came from would be very useful to transportation planners because it affects the cost-benefit of the project substantially, which may affect the chances of future projects like it getting built. Even though a 35% increase in vehicle throughput was observed on the NWC during the morning peak period, survey results indicate that an 18.7% increase in trips (53.4% of the

total observed increase) came from sources (route reassignment and departure time of day shift) which do not result in an increase in total VMT. While further analysis is needed to determine the proportion of the increase in trips which came from sources that do not result in an increase in total VMT more accurately, these preliminary results show that many survey respondents changed their trip behavior after the opening of the NWC Express Lanes. These trips represent traffic taken off local arterials, taken off freeway lanes, and shifting to departing later in the morning. Less traffic on local arterials can make local trips more pleasurable, less traffic on freeway lanes makes it easier for large trucks to get through the area, and shifting to departing later in the morning can increase quality of life for commuters, who can now go to sleep later at night or get more sleep.

APPENDIX A. SURVEY INSTRUMENT

A Few Minutes of Your Time
Will Help Transportation Planners Manage Congestion

Dear Atlanta Metropolitan Area Resident:

This online survey is collecting information about your morning commute travel to work, to volunteer work (20+ hours per week), and working at home. The primary goal of the survey is to gather data on changes in commute patterns over time. A secondary goal of the survey is to identify whether your morning commute from home to work changed after new Express Lanes on the Northwest Corridor opened in the fall of 2018. The final goal of the survey is to assess changes in commute travel resulting from the influence of COVID-19 pandemic. For non-drivers, there is also a series of questions on transit, vanpool, and commuter bus activity. The survey results will help transportation planners better understand travel preferences and inform future planning efforts. This commute study is being conducted by researchers at Georgia Tech. Thank you for helping us to understand local commute travel and the performance of the NWC freeway and Express Lanes!

Post Card:

Dear Northwest Metro Atlanta Resident:

Georgia Tech is conducting a survey of households along the Northwest Corridor (NWC) to understand recent changes in work, volunteer, and work-at-home activity. The survey is exploring changes in morning commute activity after the Express Lanes on the Northwest Corridor opened in late 2018, and again after the pandemic began. For non-drivers, there is also a series of questions for transit, vanpool, and commuter bus activity. By logging in to the site below and taking the NWC commuter survey, you will help transportation planners to better understand your travel preferences and inform future planning efforts.

2023 Atlanta Metropolitan Area Commuter Survey

Section 1 - Welcome Page

Thank you for volunteering to take the Metro Atlanta Northwest Corridor Commuter Survey, conducted by Georgia Tech. The goals of the survey are to gather data on commute activity to identify how morning commutes from home to work changed after the new Express Lanes opened in the fall of 2018 on the Northwest Corridor (NWC), and then how commute travel changed again due to the COVID-19 pandemic.

If you are under the age of 18, you should not take this survey. If you are currently located in the EU or an EEA country, or in the People's Republic of China, you are not eligible to participate in this study. Before starting, please read the following information.

You are being asked to volunteer in a research study. The purpose of this research is to assess your commute to work experience. The survey should take less than 15 minutes to complete. The risks involved in taking this survey are no greater than those involved in daily activities. You will not benefit, nor will you be compensated for participating in this study. This survey does collect personally-identifiable data that can link you with your responses. All personally-identifiable data (such as names and addresses) contained in your response will be stored on a secure server at Georgia Institute of Technology. Only the principal researchers will have access to the original encrypted survey data that contain personally identifiable information. During the data analysis process, names and other personal details will be replaced with unique numbers that can only be linked back to the original data on the secure server by the principal researchers, in the secure laboratory, using an encryption key. The Georgia Institute of Technology will comply with any applicable laws and regulations regarding confidentiality.

To make sure that this research is being carried out properly, the Georgia Institute of Technology Institutional Review Board (IRB) may review study records. The Office for Human Research Protections may also look at study records and data security provisions. If you have any questions about the study, you may contact the research team director, Dr. Randall Guensler of the Georgia Institute of Technology, at telephone (404) 894-0405. If you have any questions about your rights as a research subject, you may contact the Georgia Institute of Technology Office of Research Integrity Assurance at IRB@gatech.edu.

Your participation in this survey is voluntary:

- You do not have to participate in this study if you don't want to participate.
- You have the right to change your mind and leave the study at any time without giving any reason and without any penalty.
- You do not waive any of your legal rights by agreeing to participate in the study.
- Your completion of this survey provides your consent to participate in the study.

Thank you very much for your participation!

Section 2 – Commute Questions (2018, 2019, 2020/2021)

Please tell us about your work and commute in 2018, before the Northwest Corridor Express Lanes opened, and before the COVID-19 pandemic began.
Please check all boxes that apply:

□ Employed full-time in 2018, typically commuting to a single location

□ Employed part-time in 2018, typically commuting to a single location

□ Employed full time in 2018, commuting to various locations

□ Employed in one or more part-time jobs in 2018, commuting to various locations

□ I sometimes worked from home in 2018

□ I did not regularly work in 2018

[If a commute option is selected, show these options and metro area map image with corridors labeled]
In 2018, I typically commuted on:

□ Northwest Corridor freeway lanes (along I-75 or I-575)

□ Non-freeway roads (arterials and local roads) in the I-75 or I-575 area

□ A different Metro Area corridor

In 2018, before the Northwest Corridor Express Lanes opened, and before the COVID-19 pandemic began, at about what time did you typically leave from home to commute to work?
[Ask if the respondent selected work options above]

○ Before 6:00 A.M.

○ Between 6:00 A.M. and 7:00 A.M.

○ Between 7:00 A.M. and 8:00 A.M.

○ Between 8:00 A.M. and 9:00 A.M.

○ After 9:00 A.M.

○ Don't know

○ Prefer not to answer

In 2018, in a typical 40-hour workweek, about how many hours did you usually work from home, rather than going to a work location?
[Ask if 'sometimes' worked from home' option was selected above]

In 2018, I typically worked from home about _____ hours, out of every 40 work hours

○ My work at home time varied a lot from day-to-day

○ Don't know

○ Prefer not to answer

Please tell us about your work and commute in 2019, after the I-75 Northwest Corridor Express Lanes opened, and before the COVID-19 pandemic began:
Please check all boxes that apply:

□ Employed full-time in 2019, typically commuting to a single location

□ Employed part-time in 2019, typically commuting to a single location

□ Employed full time in 2019, commuting to various locations

□ Employed in one or more part-time jobs in 2019, commuting to various locations

□ I sometimes worked from home in 2019

□ I did not regularly work in 2019

[If a commute option is selected, show these options and metro area map image with corridors labeled]
In 2019, I typically commuted on:

□ Northwest Corridor freeway lanes (along I-75 or I-575)

□ Northwest Corridor Express lanes (along I-75 or I-575)

□ Non-freeway roads (arterials and local roads) in the I-75 or I-575 area

□ A different Metro Area corridor

In 2019, at about what time did you typically leave from home to commute to work?
[Ask if the respondent selected work options above]

○ Before 6:00 A.M.

○ Between 6:00 A.M. and 7:00 A.M.

○ Between 7:00 A.M. and 8:00 A.M.

○ Between 8:00 A.M. and 9:00 A.M.

○ After 9:00 A.M.

○ Don’t know

○ Prefer not to answer

In 2019, in a typical 40-hour workweek, about how many hours did you usually work from home, rather than going to a work location?
[Ask if ‘sometimes’ worked from home’ option was selected above]

In 2019, I typically worked from home about _____ hours, out of every 40 work hours

○ My work at home time varied a lot from day-to-day

○ Don’t know

○ Prefer not to answer

Please tell us about your work and commute in 2020/2021, after the I-75 Northwest Corridor Express Lanes opened, and after the COVID-19 pandemic began:
Please check all boxes that apply:

□ Employed full-time in 2020/2021, typically commuting to a single location

□ Employed part-time in 2020/2021, typically commuting to a single location

□ Employed full time in 2020/2021, commuting to various locations

□ Employed in one or more part-time jobs in 2020/2021, commuting to various locations

□ I sometimes worked from home in 2020/2021

□ I did not regularly work in 2020/2021

[If a commute option is selected, show these options and metro area map image with corridors labeled]
In 2020/2021, I typically commuted on:

□ Northwest Corridor freeway lanes (along I-75 or I-575)

□ Northwest Corridor Express lanes (along I-75 or I-575)

□ Non-freeway roads (arterials and local roads) in the I-75 or I-575 area

□ A different Metro Area corridor

In 2020/2021, at about what time did you typically leave from home to commute to work?
[Ask if the respondent selected work options above]

○ Before 6:00 A.M.

○ Between 6:00 A.M. and 7:00 A.M.

○ Between 7:00 A.M. and 8:00 A.M.

○ Between 8:00 A.M. and 9:00 A.M.

○ After 9:00 A.M.

○ Don’t know

○ Prefer not to answer

In 2020/2021, in a typical 40-hour workweek, about how many hours did you usually work from home, rather than going to a work location?
[Ask if ‘sometimes’ worked from home’ option was selected above]

In 2020/2021, I typically worked from home about _____ hours, out of every 40 work hours

○ My work at home time varied a lot from day-to-day

○ Don’t know

○ Prefer not to answer

Section 3 - Shift from Arterials Questions (2018, 2019, 2020/2021)

[If respondent changed their route from arterials to Freeways or Express Lanes in 2019 (route2018to2019AF or route2018to2019AX), ask the following question:]
You have indicated that after the Express Lanes opened in 2019, your route changed from local roads to the NWC freeways or the new Express Lanes. Why did you change your route? Please check all boxes that apply:

□ I had previously used the freeway, but had temporarily diverted to local roads in 2018 because construction had created too much congestion along I-75 or I-575. Once construction was complete in 2019, I moved back to the freeway

□ I had previously used local roads, but after the freeway became less congested in 2019 it provided a better commute for me along I-75 or I-575

□ Non-freeway roads (arterials and local roads) became too congested in 2019

□ Other (please specify):

_____
_____

_____
_____

_____
_____

_____
_____

Section 4 – Home and Work Locations (2018, 2019, 2020/2021)

[Home Location Questions 2018]

Please tell us about your residential location in 2018, before the I-75 Northwest Corridor Express Lanes opened, and before the COVID-19 pandemic began:

In what zip code did you live in 2018, before the Express Lanes opened and before the pandemic began?

Zip Code: _____

○ Don't know

○ In a different state

○ Prefer not to answer

[If don't know is selected and different state is not selected]

In what County did you live in 2018?

Georgia County: _____

○ Don't know

○ Prefer not to answer

[Work Location Questions 2018]

[Skip if respondent did not work in 2018]
Please tell us about your work location in 2018, before the I-75 Northwest Corridor Express Lanes opened, and before the COVID-19 pandemic began:

In what zip code did you work in 2018, before the Express Lanes opened and before the pandemic began?

Zip Code: _____

○ Don't know

○ In a different state

○ Prefer not to answer

[If don't know is selected and different state is not selected]

In what County did you work in 2018?

Georgia County: _____

○ Don't know

○ Prefer not to answer

[Home Location Questions 2019]

In 2019, after the I-75 Northwest Corridor Express Lanes opened, and before the COVID-19 pandemic began, did you live in the same location as you did in 2018?

○ Yes

○ No

○ Prefer not to answer

[If no, show the supplemental questions]

In what zip code did you live in 2019, after the Express Lanes opened and before the pandemic began?

Zip Code: _____

○ Don't know

○ In a different state

○ Prefer not to answer

[If don't know is selected and different state is not selected]

In what County did you live in 2019?

Georgia County: _____

○ Don't know

○ Prefer not to answer

[Work Location Questions 2019]

In 2019, after the I-75 Northwest Corridor Express Lanes opened, and before the COVID-19 pandemic began, did you work in the same location as you did in 2018?

○ Yes

○ No

○ Prefer not to answer

[If no, show the supplemental questions]

[Skip if respondent did not work in 2019]
In what zip code did you work in 2019, after the Express Lanes opened and before the pandemic began?

Zip Code: _____

○ Don't know

○ In a different state

○ Prefer not to answer

[If don't know is selected and different state is not selected]

In what County did you work in 2019?

Georgia County: _____

○ Don't know

○ Prefer not to answer

[Home Location Questions 2020/2021]

In 2020/2021, after the Express Lanes had opened and after the COVID-19 pandemic began, did you live in the same location as you did in 2019?

○ Yes

○ No

○ Prefer not to answer

[If no, show the supplemental questions]

In what zip code did you live in 2020/2021, after the Express Lanes opened and after the pandemic began?

Zip Code: _____

○ Don't know

○ In a different state

○ Prefer not to answer

[If don't know is selected and different state is not selected]

In what County did you live in 2020/2021?

Georgia County: _____

○ Don't know

○ Prefer not to answer

[Work Location Questions 2020/2021]

In 2020/2021, after the Express Lanes had opened and after the COVID-19 pandemic began, did you work in the same location as you did in 2019?

○ Yes

○ No

○ Prefer not to answer

[If no, show the supplemental questions]

[Skip if respondent did not work in 2020/2021]
In what zip code did you work in 2020/2021, after the Express Lanes opened and after the pandemic began?

Zip Code: _____

○ Don't know

○ In a different state

○ Prefer not to answer

[If don't know is selected and different state is not selected]

In what County did you work in 2020/2021?

Georgia County: _____

○ Don't know

○ Prefer not to answer

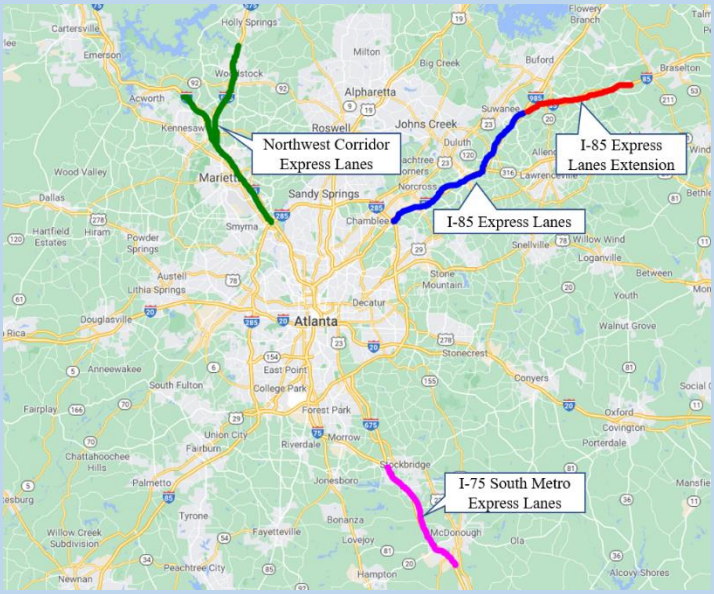
Section 5 - Express Lane Use Questions (2018, 2019, 2020/2021)

Are you a Georgia Express Lanes Peach Pass customer?

- ○ Yes, I became a customer after the NWC Express Lanes opened
- ○ Yes, I was already a customer before the NWC Express Lanes opened
- ○ No, I have never used the Express Lanes as a Peach Pass customer
- ○ Don't know
- ○ Prefer not to answer

[If respondent was never an Express Lanes customer, skip to the next Section]

In 2019, <u>after</u> the NWC Express Lanes Extension opened, and <u>before</u> the pandemic began, which of the Georgia Express Lanes did you use, and how often (please refer to the map below for corridors associated with each Express Lane facility)?



	Never	<1 time a **month**	1-3 times a **month**	1-2 times a **week**	3-4 times a **week**	5+ times a **week**
Northwest Corridor Express Lanes	○	○	○	○	○	○
I-85 Express Lanes (HOT)	○	○	○	○	○	○
I-85 Express Lanes Extension	○	○	○	○	○	○
I-75 South Metro Express Lanes	○	○	○	○	○	○

○ Don't know

○ Prefer not to answer

[If respondent used the NWC Express Lanes in 2019, show the following question]
For what purpose did you use the Northwest Corridor Express Lanes in 2019?
Please check all boxes that apply:

□ Commuting to or from work/school/volunteer

□ Taking a family member to events or appointments (school, sports, doctor, etc.)

□ Going to or from work-related appointments (training, meeting)

□ Going to or from personal appointments (doctor, gym, hair salon, shopping)

□ Going to or from a place of leisure or entertainment

□ Other (please specify):

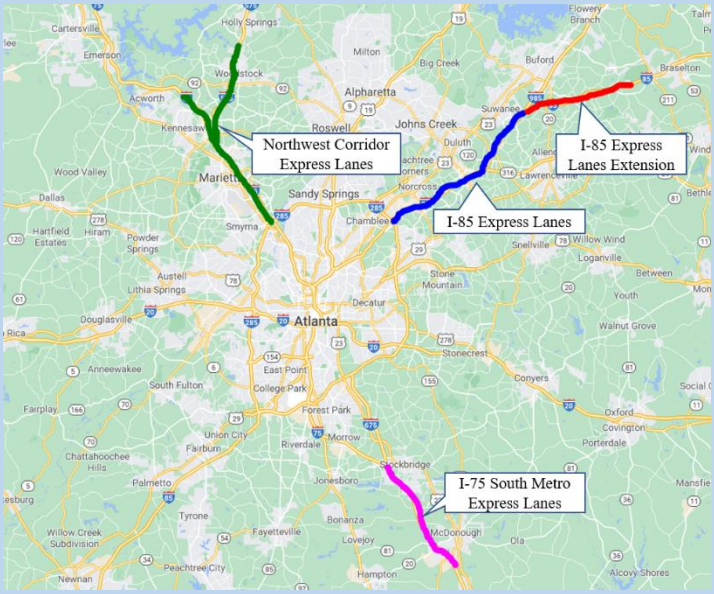
_____
_____

_____
_____

_____
_____

_____
_____

In 2020/2021, <u>after</u> the NWC Express Lanes Extension opened, and <u>after</u> the pandemic began, which of the Georgia Express Lanes did you use, and how often (please refer to the map below for corridors associated with each Express Lane facility)?



	Never	<1 time a **month**	1-3 times a **month**	1-2 times a **week**	3-4 times a **week**	5+ times a **week**
Northwest Corridor Express Lanes	○	○	○	○	○	○
I-85 Express Lanes (HOT)	○	○	○	○	○	○
I-85 Express Lanes Extension	○	○	○	○	○	○
I-75 South Metro Express Lanes	○	○	○	○	○	○

○ Don't know

○ Prefer not to answer

[If respondent used the NWC Express Lanes in 2020/2021, show the following question]
For what purpose did you use the Northwest Corridor Express Lanes in 2020/2021?
Please check all boxes that apply:

□ Commuting to or from work/school/volunteer

□ Taking a family member to events or appointments (school, sports, doctor, etc.)

□ Going to or from work-related appointments (training, meeting)

□ Going to or from personal appointments (doctor, gym, hair salon, shopping)

□ Going to or from a place of leisure or entertainment

□ Other (please specify):

_____
_____

_____
_____

_____
_____

_____
_____

How did your Express Lane usage change during the pandemic?
Please select the best option:

○ No change – I used them just as often as I did before the pandemic

○ Increase – I used the Express Lanes more often during the pandemic

○ Decrease – I used the Express Lanes less often during the pandemic

○ Temporary stop - I stopped using the Express Lanes, but have either started again or plan to start using the lanes again soon

○ Permanent stop - I don't use the Express Lanes now and do not plan to start using the lanes again anytime soon

○ Don't know

○ Prefer not to answer

[Ask if respondent decreased use or stopped using Express Lanes in 2020/2021]
Why did your use of the Express Lanes decrease (or stop) during the pandemic?
Please check all that apply:

□ My employment status changed

□ My work schedule changed

□ I sometimes or always worked from home

□ My school schedule changed

□ There were fewer cars on the road, so I did not drive on the Express Lanes

□ Other (please specify):

_____
_____

_____
_____

_____
_____

_____
_____

○ Don't know

○ Prefer not to answer

[Ask if the respondent is not using Express Lanes in 2020/2021]
Do you plan to start using the Express Lanes, once the pandemic is behind us?

○ Definitely yes

○ Probably yes

○ Maybe

○ Probably not

○ Definitely not

○ Don't know

○ Prefer not to answer

[Ask if the respondent is using Express Lanes in 2020/2021]
Compared to 2019, what is your anticipated use of the Express Lanes after the pandemic is behind us?

○ My Express Lane use will increase greatly

○ My Express Lane use will increase somewhat

○ My Express Lane use will remain about the same

○ My Express Lane use will decrease somewhat

○ My Express Lane use will decrease greatly

○ It depends….

[If selected, ask for dependencies]

What factors will likely affect your commute travel after the pandemic ends?

_____

_____

_____

○ Don't know

○ Prefer not to answer

[New question sub-section associated with direct access ramps]

Do you regularly drive through any of the four NWC intersections that provide direct access ramps onto the NWC Express Lanes?
Please select all that apply:

□ Yes, the Hickory Grove access point intersection

□ Yes, the Big Shanty access point intersection

□ Yes, the Roswell Road access point intersection

□ Yes, the Terrell Mill Road access point intersection

□ No, I do not regularly drive through any of these Express Lane access intersections

○ Don't know

○ Prefer not to answer

Do you regularly use any of the four NWC direct access ramps onto the NWC Express Lanes?
Please select all that apply:

□ Yes, the Hickory Grove access point

□ Yes, the Big Shanty access point

□ Yes, the Roswell Road access point

□ Yes, the Terrell Mill Road access point

□ No, I do not use any of these Express Lane access points

○ Don’t know

○ Prefer not to answer

[Ask next two questions if respondent responded yes to either of the previous questions]

How has your overall experience been with the interchanges with Express Lane direct access ramps?

○ Very Positive

○ Mostly Positive

○ Neutral

○ Mostly Negative

○ Very Negative

Please provide any positive or negative experiences associated with the interchanges with Express Lane direct access ramps below:

_____

_____

_____

Section 6 – Changes in Commute Mode

In 2018, before the Express Lanes opened and before the pandemic began, how did you usually commute to work in the morning?
Please select all that apply:

□ Drove alone [If selected show options]

□ Drove alone in a car

□ Drove alone in a sport-utility vehicle (SUVs include trucks, vans, etc.)

□ Drove alone in a rental vehicle (including Zipcar)

□ Rode alone on a motorcycle

□ Dropped off at work by a family member, friend, or colleague

□ Carpooled with others [If selected show options]

□ Carpooled in a car

□ Carpooled in a sport-utility vehicle (SUVs include trucks, vans, etc.)

□ Carpooled in a rental vehicle (including Zipcar)

□ Carpooled with someone on a motorcycle

□ Rode in a vanpool or employer shuttle [If selected show options]

□ Rode in an Enterprise vanpool

□ Rode in another vanpool service

□ Rode in an employer shuttle

□ Rode in some other type of vanpool (please specify):

_____

□ Used a ride-hailing vehicle [If selected show options]

□ Rode in a taxi

□ Rode in a mobility company vehicle (such as Uber or Lyft)

□ Rode in public transit [If selected show options]

□ Took MARTA [If selected, show access options]

What MARTA Routes did you take? [Add drop-down for MARTA route checkboxes]

How did you get to the transit stop or station from home?

[Show all non-transit options again as access mode]

□ Took County transit [If selected, show access options]

What County Routes did you take? [Add drop-down for county route checkboxes]

How did you get to the transit stop or station from home?

[Show all non-transit options again as access mode]

□ Took a (GRTA) Xpress commuter coach [If selected, show transit access options]

What XPRESS Routes did you take? [Add drop-down for Xpress route checkboxes]

How did you get to the transit stop or station from home?

[Show all non-transit options in the main list again as the access mode]

□ Bicycled [If selected, show options]

□ Bicycled using a personal bike

□ Bicycled using a bike share (such as Relay)

□ Bicycled using an electric bike (such as Jump)

□ Rode an electric scooter (such as Bird or Lime)

□ Walked

□ Worked from home

□ Other (please specify):

_____

□ Don't know

○ Prefer not to answer

[If carpool is selected, ask the following:]
In 2018, before the Express Lanes opened and before the pandemic began, how many people, including you, were usually in your morning carpool?

○ 2

○ 3

○ 4

○ 5+

○ Carpool size varied a lot

○ Prefer not to answer

[If carpool is selected, ask the following:]
How many of the morning carpool riders were children?

○ 0

○ 1

○ 2

○ 3

○ 4

○ 5+

○ Number of children varies a lot

○ Prefer not to answer

[If carpool is selected, ask the following:]
Who rode in the morning carpool with you in 2018?
Please select all that apply:

- □ Adults in my family
- □ Children in my family
- □ Co-workers
- □ Children not in my family
- □ Others
- ○ Prefer not to answer

In 2019, after the Express Lanes opened and before the pandemic began, did you change the way you traveled to work in the morning?

- ○ No, I continued to use the same transportation mode that I just identified for 2018
- ○ Yes, I started carpooling or taking another transportation mode
- ○ Yes, I stopped carpooling or taking another transportation mode
- ○ Don't know
- ○ Prefer not to answer

[If carpool is selected, ask the following:]
In 2019, after the Express Lanes opened and before the pandemic began, did your carpool structure change?

- ○ No, the same people were in the carpool in 2019
- ○ Yes, some of the people in the carpool changed in 2019
- ○ Don't know
- ○ Prefer not to answer

[If carpool is selected, and some people changed, ask the following:]
Did any of your 2018 carpool members leave your morning carpool group in 2019?
Please select all that apply:

□ Yes, one or more of our carpool members left the morning carpool and began driving alone

□ Yes, one or more of our carpool members left the morning carpool and began taking transit

□ Yes, one or more of our carpool members left the morning carpool to use Express Lanes

□ Yes, one or more of our participants left the morning carpool for some other reason.

Please explain:

_____
_____

_____
_____

_____
_____

○ No, nobody left the morning carpool

○ Prefer not to answer

[If there is no change in mode and no change in carpool, skip the next question:]

In 2019, after the Express Lanes opened and before the pandemic began, how did you usually commute to work in the morning?
Please select all that apply:

□ Drove alone [If selected show options]

□ Drove alone in a car

□ Drove alone in a sport-utility vehicle (SUVs include trucks, vans, etc.)

□ Drove alone in a rental vehicle (including Zipcar)

□ Rode alone on a motorcycle

□ Dropped off at work by a family member, friend, or colleague

□ Carpooled with others [If selected show options]

□ Carpooled in a car

□ Carpooled in a sport-utility vehicle (SUVs include trucks, vans, etc.)

□ Carpooled in a rental vehicle (including Zipcar)

□ Carpooled with someone on a motorcycle

□ Rode in a vanpool or employer shuttle [If selected show options]

□ Rode in an Enterprise vanpool

□ Rode in another vanpool service

□ Rode in an employer shuttle

□ Rode in some other type of vanpool (please specify):

_____

□ Used a ride-hailing vehicle [If selected show options]

□ Rode in a taxi

□ Rode in a mobility company vehicle (such as Uber or Lyft)

□ Rode in public transit [If selected show options]

□ Took MARTA [If selected, show access options]

What MARTA Routes did you take? [Add drop-down for MARTA route checkboxes]

How did you get to the transit stop or station from home?

[Show all non-transit options again as access mode]

□ Took County transit [If selected, show access options]

What County Routes did you take? [Add drop-down for county route checkboxes]

How did you get to the transit stop or station from home?

[Show all non-transit options again as access mode]

□ Took a (GRTA) Xpress commuter coach [If selected, show transit access options]

What XPRESS Routes did you take? [Add drop-down for Xpress route checkboxes]

How did you get to the transit stop or station from home?

[Show all non-transit options in the main list again as the access mode]

□ Bicycled [If selected, show options]

□ Bicycled using a personal bike

□ Bicycled using a bike share (such as Relay)

□ Bicycled using an electric bike (such as Jump)

□ Rode an electric scooter (such as Bird or Lime)

□ Walked

□ Worked from home

□ Other (please specify):

_____

□ Don't know

○ Prefer not to answer

In 2020/2021, after the Express Lanes opened and after the pandemic began, did you change the way you traveled to work in the morning?

○ No, I continued to use the same transportation mode that I just identified for 2019

○ Yes, I started carpooling or taking another transportation mode

○ Yes, I stopped carpooling or taking another transportation mode

○ Don't know

○ Prefer not to answer

[If carpool is selected, ask the following:]
In 2020/2021, after the Express Lanes opened and after the pandemic began, did your carpool structure change?

○ No, the same people were in the carpool in 2020/2021

○ Yes, some of the people in the carpool changed in 2020/2021

○ Don't know

○ Prefer not to answer

[If carpool is selected, and some people changed, ask the following:]
Did any of your 2019 carpool members leave your morning carpool group in 2020/2021?
Please select all that apply:

□ Yes, one or more of our carpool members left the morning carpool and began driving alone

□ Yes, one or more of our carpool members left the morning carpool and began taking transit

□ Yes, one or more of our carpool members left the morning carpool to use Express Lanes

□ Yes, one or more of our participants left the morning carpool for some other reason.

Please explain:

_____
_____

_____
_____

_____
_____

○ No, nobody left the morning carpool

○ Prefer not to answer

[If there is no change in mode and no change in carpool, skip the next question:]

In 2020/2021, after the Express Lanes opened and after the pandemic began, how did you usually commute to work in the morning?
Please select all that apply:

□ Drove alone [If selected show options]

□ Drove alone in a car

□ Drove alone in a sport-utility vehicle (SUVs include trucks, vans, etc.)

□ Drove alone in a rental vehicle (including Zipcar)

□ Rode alone on a motorcycle

□ Dropped off at work by a family member, friend, or colleague

□ Carpooled with others [If selected show options]

□ Carpooled in a car

□ Carpooled in a sport-utility vehicle (SUVs include trucks, vans, etc.)

□ Carpooled in a rental vehicle (including Zipcar)

□ Carpooled with someone on a motorcycle

□ Rode in a vanpool or employer shuttle [If selected show options]

□ Rode in an Enterprise vanpool

□ Rode in another vanpool service

□ Rode in an employer shuttle

□ Rode in some other type of vanpool (please specify):

_____

□ Used a ride-hailing vehicle [If selected show options]

□ Rode in a taxi

□ Rode in a mobility company vehicle (such as Uber or Lyft)

□ Rode in public transit [If selected show options]

□ Took MARTA [If selected, show access options]

What MARTA Routes did you take? [Add drop-down for MARTA route checkboxes]

How did you get to the transit stop or station from home?

[Show all non-transit options again as access mode]

□ Took County transit [If selected, show access options]

What County Routes did you take? [Add drop-down for county route checkboxes]

How did you get to the transit stop or station from home?

[Show all non-transit options again as access mode]

□ Took a (GRTA) Xpress commuter coach [If selected, show transit access options]

What XPRESS Routes did you take? [Add drop-down for Xpress route checkboxes]

How did you get to the transit stop or station from home?

[Show all non-transit options in the main list again as the access mode]

□ Bicycled [If selected, show options]

□ Bicycled using a personal bike

□ Bicycled using a bike share (such as Relay)

□ Bicycled using an electric bike (such as Jump)

□ Rode an electric scooter (such as Bird or Lime)

□ Walked

□ Worked from home

□ Other (please specify):

_____

□ Don't know

○ Prefer not to answer

Section 7 – 2019 Change in Commute Questions

[Ask if respondent carpooled in 2018, and stopped carpooling in 2019]
Your responses indicate that you stopped carpooling for your morning commute in 2019.
Please select all of the reasons why you stopped carpooling for your morning commute:

□ Change of my home, work, or school address prevented me from carpooling

□ Change of my schedule at home, work, or school prevented me from carpooling

□ One or more of the carpooling partners quit the morning carpool

□ I switched to transit

□ I switched to a vanpool

□ The cost of carpooling increased

□ The morning carpool no longer provided any time savings on the commute

□ Driving alone is faster than traveling by carpool

□ Driving alone is safer than traveling by carpool

□ Driving alone is more reliable than traveling by carpool

□ Driving alone is more enjoyable than traveling by carpool

□ Other (please specify):

_____
_____

_____
_____

_____
_____

○ Prefer not to answer

[If respondent did not carpool in 2018, and started carpooling in 2019]
Your responses indicate that you started carpooling in 2019.
Please select all of the reasons why you started carpooling:

□ To save time

□ To share the toll with other carpool passengers

□ To share the cost of gasoline

□ To share the cost of parking

□ Change of home, work, or school address allowed me to carpool

□ Change of schedule at home, work, or school allowed me to carpool

□ Carpooling is less stressful

□ Carpooling is more convenient

□ Carpooling is safer

□ Carpooling is more environmentally-friendly

□ Carpooling allows social interaction

□ Carpooling allows me to do other activities while riding to work

□ My employer provided an incentive

□ Georgia Commute Options provided an incentive

□ Other (please specify):

_____

_____

_____

○ Prefer not to answer

[If respondent did not use Express Lanes in 2019, skip question]
Your responses indicate that you started using the Express Lanes for your morning commute in 2019.
Please select all of the reasons why you switched to the Express Lanes for your morning commute:

□ My trip is faster using the Express Lanes

□ My trip is safer using the Express Lanes

□ My trip is more reliable using the Express Lanes

□ I had previously used the freeway, but had temporarily diverted to local roads in 2018 because construction had created too much congestion along I-75 or I-575. Once construction was complete in 2019, I started using Express Lanes

□ We have a carpool, which reduces the toll cost in the Express Lanes

□ I'm using transit or vanpool in the Express Lanes

□ My employer pays for the toll

□ I enjoy driving on the Express Lanes

□ Other (please specify):

_____
_____

_____
_____

_____
_____

○ Prefer not to answer

[Show this question if respondent is not using the Express Lanes in 2019]
Your responses indicate that you decided not to switch to the Express Lanes when they opened in 2019.
Please select all of the reasons why:

□ The regular freeway lanes are not congested

□ The regular freeway lanes are more reliable

□ The Express Lanes are too expensive

□ I do not wish to use a credit card

□ The amount of travel time saved is not worth the cost

□ It is too difficult to get into or out of the Express Lanes

□ It is too difficult to register for a toll tag

□ It is too expensive to register for a toll tag

□ Driving on the Express Lanes is not enjoyable

□ Other (please specify):

_____
_____

_____
_____

_____
_____

○ Prefer not to answer

Section 8 - General Perceptions of Express Lane Performance in 2019

Did the Express Lanes improve your personal commute on the NWC in 2019?

- ○ Don't know
- ○ Definitely no
- ○ Probably no
- ○ No opinion
- ○ Probably yes
- ○ Definitely yes
- ○ Prefer not to answer

Did the Express Lanes reduce traffic congestion on the NWC regular freeway lanes in 2019?

- ○ Don't know
- ○ Definitely no
- ○ Probably no
- ○ No opinion
- ○ Probably yes
- ○ Definitely yes
- ○ Prefer not to answer

Was building the NWC Express Lanes a good idea?

- ○ Yes
- ○ No
- ○ Don't know
- ○ Prefer not to answer

Please add any comments of interest:

_____

_____

_____

_____

Is it fair that 3-person carpools are required to pay a toll to use the Express Lanes on the NWC?

- ○ Definitely no
- ○ Probably no
- ○ No opinion
- ○ Probably yes
- ○ Definitely yes
- ○ Don’t know
- ○ Prefer not to answer

Is it fair that 2-person carpools are required to pay a toll to use the Express Lanes on the NWC?

- ○ Definitely no
- ○ Probably no
- ○ No opinion
- ○ Probably yes
- ○ Definitely yes
- ○ Don’t know
- ○ Prefer not to answer

In your opinion, do the Express Lanes impose a burden on low-income commuters?

○ Yes

○ No

○ Don't know

○ Prefer not to answer

Please add any comments of interest:

_____

_____

_____

_____

In your opinion, do the Express Lanes impose a burden on middle-income commuters?

○ Yes ○ No ○ Don't know

○ Prefer not to answer

Please add any comments of interest:

_____

_____

_____

_____

In your opinion, do the Express Lanes impose a burden on high-income commuters?

○ Yes ○ No ○ Don't know

○ Prefer not to answer

Please add any comments of interest:

_____

_____

_____

_____

Section 9 – About You and Your 2019 Household (Demographics)

We are almost done with the survey. You have answered all of the travel pattern questions. Your answers to these final questions will allow us to project the results from this small sample to the regional population as a whole. Please answer these questions for 2019, after the Express Lanes opened and before the pandemic began. Your responses are confidential and will only be reported in combination with others:

What was your age group in 2019?

- ○ Under 18
- ○ 18-24
- ○ 25-34
- ○ 35-44
- ○ 45-54
- ○ 55-64
- ○ 65-74
- ○ 75 or older
- ○ Prefer not to answer

What best describes your marital status in 2019?

- ○ Single
- ○ Single, living with a relationship partner
- ○ Married, living with spouse
- ○ Married, living apart
- ○ Other (please specify):

  _____

- ○ Don't know
- ○ Prefer not to answer

What best describes your gender?

- ○ Male
- ○ Female
- ○ Another gender [text entry]
- ○ Prefer not to answer

Were you a student in 2019?

- ○ Yes
- ○ No
- ○ Don’t know

[If yes, show options]

What type of student were you in 2019?

- ○ Full-time student, K-12
- ○ Full-time student, college/university
- ○ Part-time student, college/university
- ○ Other type of student

With respect to your education, please select the highest education level that applied in 2019:

- ○ Opted out of high school for work or other activity
- ○ High school graduate or GED
- ○ Completed some college-level courses
- ○ Associate, technical school, or other two-year college degree
- ○ Bachelor’s or other four-year undergraduate degree
- ○ Master’s degree
- ○ Ph.D. or professional doctoral degrees such as M.D., D.D.S., J.D., etc.
- ○ Don’t know
- ○ Prefer not to answer

<Screen Break>

What category best describes the employment sector in which you worked in 2019?

Employment Sector: [Show second level list if first box is selected]

○ Education Sector

What kind of education sub-sector were you in?

○ K-12

○ College/University

○ Other Education Sector (please specify):

_____

○ Government Sector

What kind of government sub-sector were you in?

○ Federal

○ State

○ Regional/Local

○ Other Government Sector (please specify):

_____

○ Healthcare Sector

What kind of healthcare sub-sector were you in?

○ Public Healthcare

○ Private Healthcare

○ Other Healthcare Sector (please specify):

_____

○ Private Sector

What kind of private sub-sector were you in?

○ Business/Professional Services

○ Commerce/Sales/Trade

○ Construction

○ Financial Services

○ Food Services

○ Information/Data

○ Leisure/Entertainment/Hospitality

○ Manufacturing

○ Other Private Sector (please specify):

_____

○ Non-profit Sector

○ Utilities/Transportation Sector

What kind of utilities/transportation sub-sector were you in?

○ Energy/Natural Resources

○ Telecommunications

○ Transportation

○ Water/Sewage

○ Other Utilities Sector (please specify):

_____

○ Other Employment Sector (please specify):

_____

○ Don’t know

○ Prefer not to answer

What best describes the type of work that you did in 2019?

- ○ Administrative/Support Staff
- ○ Artist/Designer/Entertainer
- ○ Attorney/Legal Professional
- ○ Customer Service Specialist
- ○ Data Analyst
- ○ Engineer/Architect
- ○ Equipment Operator
- ○ Healthcare Professional
- ○ Manager
- ○ Personal/Social Services
- ○ Production Worker
- ○ Repair/Construction/Maintenance Worker
- ○ Retail Sales/Marketing
- ○ Scientist/Technician
- ○ Teacher/Educator
- ○ Other: (Please Specify)
- ○ Don’t know
- ○ Prefer not to answer

[Household Questions]

Please tell us about the people living in your home in 2019:

How many people, including you, currently live in your home?

○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6+

How many people in your home, including you, are currently employed?

○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6+

How many of the people in your home are currently school children?

○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6+

How many of the people in your home are currently too young for school?

○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6+

○ Prefer not to answer

<Screen Break>

Which best describes the race or ethnicity of your **household** in 2019?
Please select all that apply:

□ Black/African-American

□ Hispanic, Chicano, Latin American, Central American

□ Asian/Asian-American

□ Native Hawaiian/Pacific Islander

□ American Indian/ Native Alaskan

□ White/Caucasian

□ Multi-racial

□ Not provided above (please specify)

_____

○ Don't know

○ Prefer not to answer

Did you own or rent your home in 2019?

○ Own

○ Rent

○ Don't know

○ Prefer not to answer

What kind of home was this?

○ Stand-alone house

○ Condominium or townhome

○ Apartment

○ Other (please specify):

_____

_____

_____

_____

○ Don’t know

○ Prefer not to answer

<Screen Break>

How many motor vehicles were available to your household in 2019?

○ 0

○ 1

○ 2

○ 3

○ 4

○ 5

○ 6+

○ Don’t know

○ Prefer not to answer

[Ask if respondent used a car, SUV, or truck in 2019, else skip to next Section]
Do you know the make, model, and model year of the car, sport utility vehicle, pickup truck or other personal vehicle for your morning commute trips in 2019 (after the Express Lanes opened, and before the pandemic began)?

- ○ Yes, I know the vehicle information
- ○ No, I do not know the vehicle information
- ○ Prefer not to answer

[If Yes is selected, show the following two questions]

What was the model year of the vehicle that you usually used for your morning commute trips in 2019? _____

What was the make and model of the vehicle you usually used for your morning commute trips in 2019?

Make: _____ (e.g., Ford, Toyota, Nissan, etc.)

Model: _____ (e.g., F150, Corolla, Sentra, etc.)

To ensure that our study is representative of all income groups in the area, please indicate your household's annual gross income range (before taxes are taken out) in 2019.

- ○ Less than $10,000
- ○ Between $10,000 and $20,000
- ○ Between $20,000 and $30,000
- ○ Between $30,000 and $40,000
- ○ Between $40,000 and $50,000
- ○ Between $50,000 and $60,000
- ○ Between $60,000 and $75,000
- ○ Between $75,000 and $100,000
- ○ Between $100,000 and $150,000
- ○ Between $150,000 and $200,000
- ○ More than $200,000
- ○ Don't know
- ○ Prefer not to answer

Section 10 – Changes in Household Demographics During the Pandemic

Recall that the pandemic emerged as a threat in March 2020. Compared to your household structure in 2019, what changes have taken place in your life / household since the pandemic began? Please indicate any changes in the number of people in your household, for each of the following categories:

		Decreased	*Remained the same*	*Increased*
a.	adults in the household	☐	☐	☐
b.	children in the household	☐	☐	☐
c.	full-time workers in the household	☐	☐	☐
d.	part-time workers in the household	☐	☐	☐
e.	drivers in the household	☐	☐	☐
f.	teleworkers in the household	☐	☐	☐
g.	people needing special care in the household	☐	☐	☐

Did you experience any of the following specific changes to the demographic make-up of your household during the pandemic (Please select all that apply)?

□ One or more household members moved to a different city/country

□ One or more household members stopped working at their pre-pandemic jobs

□ One or more household members started working at new jobs

□ One or more household members retired

□ One or more household members returned home

□ One or more household members left home

□ Added another vehicle

□ Other (please specify):

_____

_____

_____
_____

_____
_____

○ Don’t know

○ Prefer not to answer

Section 11 – Thank You Page

Thank you again for volunteering to take this survey. We value your feedback. Georgia Tech sincerely appreciates the time and effort you have taken to complete this survey.

[END OF SURVEY]

Survey References

ARC, Atlanta Regional Commission (2003). Commute Atlanta Survey.

ARC, Atlanta Regional Commission (2011). Household Travel Survey.

Georgia Tech, Georgia Institute of Technology (2012). Commute Atlanta Survey. School of Civil and Environmental Engineering.

GaTech (2016). I-85 Express Lane Commute Survey. School of Civil and Environmental Engineering.

GCO, Georgia Commute Options (n.d.). Employer Commute Options Survey.

MARTA, Metropolitan Atlanta Rapid Transit Authority (2018). FY'18 Xpress On-board Rider Survey.

SRTA, State Road and Tollway Authority (2017a). 2017 SRTA Express Lanes Survey.

SRTA, State Road and Tollway Authority (2017b). Xpress Online Customer Survey.

SRTA, State Road and Tollway Authority (2018). ETC Xpress On-board Rider Survey.

STRIDE (n.d.). STRIDE carpool survey.

REFERENCES

Abelson, P. W., & Hensher, D. A. (2001). Induced Travel and User Benefits: Clarifying Definitions and Measurement for Urban Road Infrastructure. In K. J. Button & D. A. Hensher (Eds.), *Handbook of Transport Systems and Traffic Control* (Vol. 3, pp. 125–141). Emerald Group Publishing Limited. https://doi.org/10.1108/9781615832460-009

Carson, J. (2005). *Monitoring and Evaluating Managed Lane Facility Performance* (FHWA/TX-06/0-4160-23). Texas Transportation Institute. http://tti.tamu.edu/documents/0-4160-23.pdf

Guensler, R., Ko, J., Kim, D., Sheikh, A., Khoeini, S., & Xu, Y. "Ann." (2016). *HOV to HOT Conversion Impacts on Carpooling* (Final Report, Contract #DTRT12GUTC12). National Center for Transportation Systems Productivity and Management (NCTSPM), USDOT Office of the Assistant Secretary for Research and Technology (OST-R).

Guensler, R., Liu, H., Lu, H., Chang, C.-H. "Chris," Dai, Z., Fu, Z., Liu, D., Kim, D., Zhao, Y., & Guin, A. (2022a). *Atlanta Metro Area Managed Lane 2018-2020 Vehicle and Person Throughput Analysis Volume I: Vehicle Occupancy, Vehicle Throughput, and Person Throughput Analysis for the I-75 Northwest Corridor and I-85 Express Lanes* (220 pages). Georgia State Road and Tollway Authority.

Guensler, R., Liu, H., Lu, H., Chang, C.-H. "Chris," Dai, Z., Fu, Z., Liu, D., Kim, D., Zhao, Y., & Guin, A. (2022b). *Atlanta Metro Area Managed Lane 2018-2020 Vehicle and Person Throughput Analysis Volume II: Commutershed and Demographic Analysis for the I-75 Northwest Corridor and I-85 Express Lanes* (120 pages). Georgia State Road and Tollway Authority.

Li, J., Embry, P., Mattingly, S. P., Sadabadi, K. F., Rasmidatta, I., & Burris, M. W. (2007). Who Chooses to Carpool and Why?: Examination of Texas Carpoolers. *Transportation Research Record*, *2021*(1), 110–117. https://doi.org/10.3141/2021-13

Litman, T. (2001). Generated Traffic: Implications for Transport Planning. *ITE Journal*, 38–47.

Peach Pass. (2023). *I - 75 Northwest Corridor Express Lanes*. Peach Pass | Keep Moving. Retrieved April 22, 2023, from https://peachpass.com/where-can-i-use-peach-pass/northwest-corridor/

Poole, R., & Balaker, T. (2005, September 1). *Virtual Exclusive Busways*. Reason Foundation. https://reason.org/policy-study/virtual-exclusive-busways/

SRTA. (2023). *Express Lanes*. State Road and Tollway Authority. Retrieved April 22, 2023, from https://srta.ga.gov/georgia-express-lanes/

Ungemah, D., Goodin, G., Dusza, C., & Burris, M. (2007). Examining Incentives and Preferential Treatment of Carpools on Managed Lane Facilities. *Journal of Public Transportation*, *10*(4), 151–169. https://doi.org/10.5038/2375-0901.10.4.8

van der Loop, H., Haaijer, R., & Willigers, J. (2016). New Findings in the Netherlands about Induced Demand and the Benefits of New Road Infrastructure. *Transportation Research Procedia*, *13*, 72–80. https://doi.org/10.1016/j.trpro.2016.05.008