

Metropolitan Transportation Commission

# 2023 BAY AREA TRAVEL STUDY FINAL REPORT

September 10, 2025



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## LIST OF ABBREVIATIONS

ABS	Address-based sample
ACS	American Community Survey
ADA	Americans with Disabilities Act
BATS	Bay Area Travel Survey
CBO	Community Based Organization
HH	Household
HTS	Household travel survey
MPO	Metropolitan Planning Organization
MSG	Marketing Systems Group
MTC	Metropolitan Transportation Commission
PUMA	Public Use Microdata Area
PUMS	Public Use Microdata Sample
QAQC	Quality assurance and quality control
SFCTA	San Francisco County Transportation Authority
TNC	Transportation Network Company
VTA	Valley Transportation Authority
WBT	Walk/Bike/Transit

## 0.0 EXECUTIVE SUMMARY

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### 0.1 SURVEY OBJECTIVES

The Bay Area Travel Study is Metropolitan Transportation Commission's (MTC) planned recurring household travel survey (HTS) of the nine-county region around the San Francisco Bay Area in California. The program includes input and support from the San Francisco County Transportation Authority (SFCTA) and the Santa Clara Valley Transportation Authority (VTA), both of whom contributed to methodological discussions and design decisions. This study used a modern research approach to collect demographic and travel pattern information from residents in the spring and fall of 2023 with final data collection in January 2024.

A key element of the survey objective was to gather as much data as possible to understand how travelers in the Bay Area change their behavior from day-to-day. A host of technologies have arisen, the use of which indicates a more dynamic and unpredictable variation in daily itineraries since the last time a large survey of this type was executed for this population in the 2019 survey of Transportation Network Company (TNC) users and the 2010 statewide household travel survey. Collecting data for multiple days will support the examination of such questions.

In addition to partners from SFCTA and VTA, this project also utilized funds to add sample to examine the question of who in the region uses freeways, bridges, and express lanes. The data collected on a smartphone app provides more detailed information on which facilities people use, and when, which researchers at MTC hope to inform future policy for Bay Area facilities.

An important application of the data collected in this survey is the ability to answer pressing questions facing the region regarding travel demand and changes in the way residents move around the region. The ultimate and primary use of the data collected in this survey is to calibrate and inform the Activity Based Models built and maintained by MTC, Travel Model One<sup>1</sup> as well as the future Travel Model Two. These models serve multiple purposes including forecasting future demand on the network and emissions.

This report is intended to provide an overview of the survey methodology (including questionnaire design, sampling, branding and participant engagement, data quality assurance and quality control (QAQC), data cleaning, weighting, etc) as well as key results related to the number of households, persons, and trips surveyed and in the final dataset. Selected descriptive statistics are also presented.

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<sup>1</sup> <https://github.com/BayAreaMetro/travel-model-one>

## 0.2 SUMMARY RESULTS

The Bay Area Travel Study collected a rich set of demographic and travel behavior data from a representative sample of 8,258 households in the San Francisco Bay Area. The study collected data from 15,985 persons, representing 365,831 trips across 89,112 person-days from May 9, 2023 through January 19, 2024. Table 1 on the opposite page shows the figures collected for each of these categories and how things changed at each stage of the quality control procedure. Note that the first column provides figures when the total counts are filtered to match only records which met the complete task order 4 criteria of consisting of either one full day of travel for browser and call-center-based surveys and at least five full days for smartphone-based surveys. See the appendix of this document for links to memoranda and data delivery files.

## 0.3 EXAMPLE INSIGHTS

The Bay Area Travel Study (BATS 2023) collected a comprehensive set of demographic and travel behavior data from a representative sample of 8,258 households in the San Francisco Bay Area. This amount represents a sample rate of 0.286% of the regional population. The following highlight significant insights derived from the study based on preliminary review of data and based on unlinked trips. MTC staff are presently applying a methodology for creating linked trip results and additional analysis will be forthcoming, including in SFCTA's Downtown Travel Study Report.<sup>2</sup>

The result of using unlinked trips in this initial analysis is that these findings include data on the component parts of a trip. For example, a trip to work taken via transit with a walk, a bus, a train, and a walk segment will have three mode-change purposes with only the final segment having a work purpose. In the linked trip variation of the data, that sequence will be combined as a single transit trip to work, with the distance and duration summed. This means that this preliminary data underestimates the duration and distance of the final trip purpose for trips taken via transit because ultimately all the unlinked components will contribute to both metrics:

1. **Travel Mode, Time, and Distance:** Walking is a common mode of travel, with 85% of walking trips being less than 1 mile and 31% taking 15 minutes or more. Car trips are more evenly distributed, with 18% of trips being less than 1 mile and 21% being between 1-2 miles 43% taking more than 15 minutes. Over 65% of transit trips travel 6 or fewer miles but nearly 74% of these trips take more than 15 minutes. Bike trips span less than 5 miles, 80% of the time in the Bay Area. These trips tend to take 15 minutes or more about half the time.







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<sup>2</sup> [https://www.sfcta.org/sites/default/files/2025-05/Downtown\\_Travel\\_Study\\_Report\\_250513.pdf](https://www.sfcta.org/sites/default/files/2025-05/Downtown_Travel_Study_Report_250513.pdf)

2. **Trip Duration and Travel Mode:** Nearly 65% of transit trips take 20 minutes or more. A little more than half of Taxi and TNC trips also take 20 or more minutes, whereas car trips made in personal vehicles only take more than 20 minutes about a quarter of the time.
3. **Trip Duration and Trip Purpose:** About 28% of trips to home take 20 minutes or more, and roughly 43% of work trips take 20 minutes or more.
4. **Trip Rates:** The weighted person trip rate for an average weekday is 3.96 meaning that the average Bay Area resident makes just under 4 trips per day. This implies that most people make two trips beyond going to and from work or school.
5. **Travel Time of Day:** About 60% of trips made during the AM Peak are made by fully employed individuals, who also make the largest share of trips across all other times of the day, with only mid-day travel not exceeding 50% of all trips (38% of trips made in midday are made by fully employed individuals).
6. **Vehicle Ownership:** In San Francisco County, roughly 34% of households have zero vehicles. The next highest share of zero-vehicle households is in Alameda County with approximately 13% of households reporting no vehicle ownership. Only 10% of households in other counties report having zero vehicles.
7. **Other Purpose and Travel Time Highlights:** The study found that 32% of social or recreational trips take 20 minutes or more. Approximately 10% of school and 10% of work trips take less than 5 minutes. Trips where the destination purpose is to change to a different mode take more than 20 minutes, about half of the time. These trips are almost always transit related. This indicates that transit trips, when linked, will have longer trip times, and cover longer distances than the unlinked data represented in this preliminary report.

These findings provide a comprehensive overview of the travel behaviors and demographic characteristics of the San Francisco Bay Area population, offering valuable insights for future transportation planning and policy development.

**TABLE 1: RESULTS OVERVIEW**

	<b>MET TASK ORDER CRITERIA<sup>3</sup></b>	<b>SURVEYED<sup>4</sup></b>	<b>MET RSG'S COMPLETION CRITERIA<sup>5</sup></b>	<b>POST DATA DELETION<sup>6</sup></b>	<b>FILTERED FOR TUE/WED/THU<sup>7</sup></b>	<b>WEIGHTED TOTALS<sup>8</sup></b>
 Households	<b>6,860</b>	<b>9,277</b>	<b>8,864</b>	<b>8,842</b>	<b>8,258</b>	<b>2,876,747</b>
 Browser + Call Center	<b>1,339</b>	<b>1,881</b>	<b>1,783</b>	<b>1,776</b>	<b>1,339</b>	<b>N/A</b>
 Smartphone App	<b>5,521</b>	<b>7,396</b>	<b>7,081</b>	<b>7,066</b>	<b>6,919</b>	<b>2,884,975<sup>9</sup></b>
 Persons	<b>13,920</b>	<b>18,347</b>	<b>17,233</b>	<b>17,188</b>	<b>15,985</b>	<b>7,326,898</b>
 Days	<b>78,461</b>	<b>97,857</b>	<b>91,835</b>	<b>91,581</b>	<b>89,112</b>	<b>7,326,898<sup>10</sup></b>
 Trips	<b>334,267</b>	<b>390,321</b>	<b>374,410</b>	<b>373,406</b>	<b>365,830</b>	<b>29,573,783</b>

<sup>3</sup> These records met the criteria specified in Task Order 4 between RSG and MTC: one full day of travel for browser and call center households, and five full days for rMove households.

<sup>4</sup> Records which completed reporting travel for at least one full day of travel for all household members.

<sup>5</sup> Records which cleared RSG's completion criteria in post processing QA/QC steps.

<sup>6</sup> Records remaining after data deletion requests received from respondents were completed. Monday households are included in this total, but they were not used in the weighting applied in the final step. These are represented in the raw data file posted on 6/10/2025.

<sup>7</sup> Records which were complete on Tuesday, Wednesday, or Thursday and eligible to be weighted. These appear in the weighted dataset posted to Box on 2/21/2025. Whereas the total days and trips reported in this column reflect any complete day associated with a household eligible for weighting, the number of weighted days and trips are lower than displayed in this table with 30,485 and 121,969 respectively.

<sup>8</sup> Totals after summing the weights for all 8,258 records where weights were applied. These appear in the weighted dataset posted to Box on 2/21/2025.

<sup>9</sup> Calculated by developing weights for only the subset of records that completed using the rMove application. This represents the region using only households with multi-day, app-based travel behavior.

<sup>10</sup> This value is the same as total weighted persons because each day receives an equal fraction of the person weight to ensure the variability of day patterns are represented without overrepresenting the individual.

## 0.4 METHODOLOGY

The highlights of the innovative approach applied to collecting this data include the following:

- **A two-part survey:**
  - Part one (the “recruit survey”) gathered data on the household’s demographic composition and typical travel behaviors.
  - Part two (the “travel diary”) gathered individual travel data during a specified travel period for all members of the household (HH).
- **Multiple modes of data collection:**
  - Households where all adults owned a qualifying smartphone were assigned to complete their travel diaries using the rMove™ smartphone app for up to seven consecutive days.
  - Households without smartphones or households who were not willing to participate via rMove participated by completing their travel diary online (rMove for Web) or by calling into the survey call center. These households reported travel for one day (Monday, Tuesday, Wednesday, or Thursday). See the appendix for the final design of the invitation materials.
  - Ultimately, 86% of households utilized the app for reporting with the remaining 14% using the online diary or call center.
- **An address-based sample (ABS) and mailed survey invitations:**
  - The ABS included compensatory oversampling to improve the representativeness and quality of the final dataset by ensuring that populations normally underrepresented in survey responses would be boosted in the final sample. Compensatory oversampling focused on low-income households; households with higher proportions of walk, bike, and transit work trips; and households with demographics reflecting Black, Indigenous, or Persons of Color (BIPOC).
  - Over the course of two weeks, invited households received an initial letter packet with comprehensive details about the survey and then a follow-up postcard as a reminder.
- **Aligned questionnaires:**
  - The smartphone-based (rMove) and online-based (rMove for Web) questionnaires were aligned to ensure a single, consistent dataset at the end of the survey.
  - Prior to programming, the questionnaire was compared to the previous survey conducted in 2019 which focused on Transportation Network Companies (TNC) and the use of such services in the region. Any changes to the questionnaire design were discussed and approved by MTC and partners to align with HTS best practice and reduce measurement error.

- **Advanced technologies and methods:**

- The rMove app was the primary mode for travel data collection, which offered significant benefits for data quality and quantity (e.g., detailed trip paths, and lower degrees of underreporting).
- The Bing Maps API helped capture and validate location and travel data by displaying captured trips on a map, enabling participants to see and confirm the accuracy of the location. The API was also used to find and geocode habitual locations like home, work, and school.
- The survey employed American Community Survey (ACS) data, along with RSG’s market research experience and expertise, to develop the sampling plan and data weighting approaches.

- **Minimized respondent burden and increased engagement:**

- The survey offered gift card incentives to households that completed the survey to improve the response rates (and thereby lower the overall mailing costs) and improve representativeness of the dataset. Depending on the sampling segment, incentives provided for participation were \$15, \$25, or \$35 gift cards.
- Survey respondents received customized reminders by email, telephone, or within the rMove smartphone app to encourage survey completion.
- Survey respondents could also contact user support by telephone, email, or within the rMove smartphone app. Responses were generally provided within one business day.
- The survey branding included an engaging logo and customized website to legitimize the survey and encourage responses.
- For the fall of 2023, MTC incorporated the project website into the agency website to further bolster the ties to the agency and the sense of legitimacy.
- One adjustment to the materials from the spring to the fall was the change made to the survey name. Whereas the spring test used Bay Area Transportation Survey, the fall materials were re-dubbed as the Bay Area Travel Study. The name change was motivated by the observation that the use of the term “transportation” was potentially confusing to laypeople who might consider transportation more of a commercial activity and that the term “survey” can be viewed in a negative and burdensome light.

## 0.5 PROJECT TIMELINE

Table 2 documents the project schedule.

**TABLE 2: SURVEY TIMELINE**

PHASE	TIMELINE
Design the survey approach and questionnaire	February 2023
Create the sample plan	March 2023
Field spring surveys	April – May 2023
Refine survey and survey materials	June – August 2023
Field fall surveys	October 2023 – January 2024
Clean and weight survey data	Spring 2024 – Winter 2025
Final Report	June 2025

## 1.0 INTRODUCTION

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### 1.1 MTC'S HOUSEHOLD TRAVEL SURVEY PROGRAM: CONTEXT SETTING

MTC is the regional transportation, land use, and municipal planning organization for the San Francisco Bay Area. It is the designated Metropolitan Planning Organization (MPO) for the region under federal laws. MTC's mission statement is a focus on building a better transportation system that works for everyone while supporting a resilient economy and environment.

In the past, HTS studies were usually repeated about once every ten years. Current best practices include smaller more frequent studies providing more useful continuous data for activity based travel models like the ones built by MTC. The travel model helps support planning and policy development for the region. RSG previously performed a 2019 travel survey focused on use of Transportation Network Companies (TNC). Given MTC's commitment to equity, there was a strong desire for a mixed methods approach to sampling and recruiting marginalized and hard-to-survey populations. The project's primary goal is to deliver datasets of the highest quality to inform travel modeling and travel analysis to support planning and policy development.

### 1.2 SURVEY OBJECTIVES

The Bay Area Travel Study is MTC's planned recurring household travel survey (HTS) of the nine-county region around the San Francisco Bay Area in California. The program includes input and support from the San Francisco County Transportation Authority (SFCTA) and the Santa Clara Valley Transportation Authority (VTA), both of whom contributed to methodological discussions and design decisions. This study used a modern research approach to collect demographic and travel pattern information from residents in the spring and fall of 2023.

One key element of the survey objective was to gather as much data as possible to understand how travelers in the Bay Area change their behavior from day-to-day. There are a host of technologies that have arisen, the use of which indicate a more dynamic and unpredictable variation in daily itineraries since the last time a large survey of this type was executed for this population in 2010. By collecting data for multiple days, this study and the resulting data will support the examination of such questions.

In addition to partners from SFCTA and VTA, this project also utilized funds to add more sample to examine the question of who in the region uses freeways, bridges, and express lanes. The data collected on a smartphone app will provide more detailed information on which facilities people use, and when, which researchers at MTC hope will inform policy for Bay Area facilities in the future.

The ultimate and primary use of the data collected in this survey will be to calibrate and inform the activity based travel models built and maintained by MTC. These models serve multiple purposes including forecasting future demand on the network and emissions.

## 1.3 METHODOLOGY HIGHLIGHTS AND FINDINGS

This study used a modern research approach to collect demographic and travel pattern information from residents throughout San Francisco Bay Area in California.

The highlights of this innovative approach include the following:

- **A two-part survey:**
  - Part one (the “recruit survey”) gathered data on the household’s demographic composition and typical travel behaviors.
  - Part two (the “travel diary”) gathered individual travel data during a specified travel period for all members of the household (HH).
- **Multiple modes of data collection:**
  - Households where all adults owned a qualifying smartphone were assigned to complete their travel diaries using the rMove™ smartphone app for up to seven consecutive days.
  - Households without smartphones or households who were not willing to participate via rMove participated by completing their travel diary online (rMove for Web) or by calling into the survey call center. These households reported travel for one day (Tuesday, Wednesday, or Thursday).
  - Ultimately, 86% of households utilized the app for reporting with the remaining 14% using the online diary or call center.
- **An address-based sample (ABS) and mailed survey invitations:**
  - The ABS included compensatory oversampling to improve the representativeness and quality of the final dataset by ensuring that populations normally underrepresented in survey responses would be boosted in the final sample. Compensatory oversampling focused on low-income households; households with higher proportions of walk, bike, and transit work trips; and households with demographics reflecting Black, Indigenous, or Persons of Color (BIPOC).
  - Over the course of two weeks, invited households received an initial letter packet with comprehensive details about the survey and then a follow-up postcard as a reminder.

- **Aligned questionnaires:**

- The smartphone-based (rMove) and online-based (rMove for Web) questionnaires were aligned to ensure a single, consistent dataset at the end of the survey.
- Prior to programming, the questionnaire was compared to the previous survey conducted in 2019 which focused on Transportation Network Companies (TNC) and the use of such services in the region. Any changes to the questionnaire design were discussed and approved by MTC and partners to align with HTS best practice and reduce measurement error.

- **Advanced technologies and methods:**

- The rMove app was the primary mode for travel data collection, which offered significant benefits for data quality and quantity (e.g., detailed trip paths, and lower degrees of underreporting).
- The Bing Maps API helped capture and validate location and travel data in post processing via use of the geocoding engine available via the API. This tool allowed for any locations with coordinates to be paired with complete addresses.
- The survey employed American Community Survey (ACS) data, along with RSG's market research experience and expertise, to develop the sampling plan and data weighting approaches.

- **Minimized respondent burden and increased engagement:**

- The survey offered gift card incentives to households that completed the survey to improve the response rates (and thereby lower the overall mailing costs) and improve representativeness of the dataset. Depending on the sampling segment, incentives provided for participation were \$15, \$25, or \$35 gift cards.
- Survey respondents received customized reminders by email, telephone, or within the rMove smartphone app to encourage survey completion.
- Survey respondents could also contact user support by telephone, email, or within the rMove smartphone app. Responses were generally provided within one business day.
- The survey branding included an engaging logo and customized website to legitimize the survey and encourage responses. For the fall of 2023, MTC incorporated the project website into the agency website to further bolster the ties to the agency and the sense of legitimacy.
- One adjustment to the materials from the spring to the fall was the change made to the survey name. Whereas the spring test used Bay Area Transportation Survey, the fall materials were re-dubbed as the Bay Area Travel Study. The name change was motivated by the observation that the use of the term "transportation" was potentially confusing to laypeople who might consider transportation more of a

commercial activity and that the term “survey” can be viewed in a negative and burdensome light.

These innovative approaches and RSG’s experience both with the technologically advanced rMove app for mixed mode data collection and customized outreach and engagement methods led to a successful study. RSG exceeded total target sample sizes for data collection.

## 2.0 STUDY SAMPLING

### 2.1 SAMPLING GOALS

RSG aimed to collect data from 5,902 households which would result in a 0.21% target sample rate (based on the 2017–2021 ACS). RSG collected data from 8,258 households (0.299% sample rate), surpassing the target by approximately 42%. Table 3 shows the HTS targets by sampling method.

**TABLE 3: SAMPLE COUNTS BY METHOD**

SAMPLING METHOD	PROJECTED SAMPLE
Address-Based Sampling Wave 1 (Spring)	625
Address-Based Sampling Wave 2 (Fall)	3,477
Supplemental Sampling	1,860
Total Sample Target	5,902

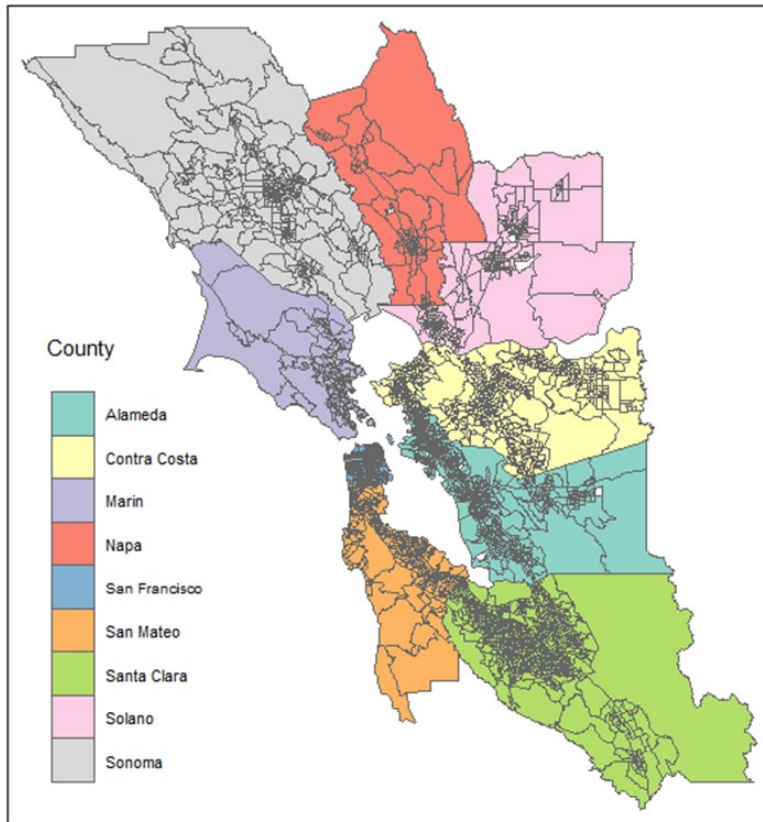
### 2.2 SAMPLING FRAME AND METHOD

The sampling frame for the study included the list of all households in Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties, which comprise the study region. RSG primarily used Address-Based Sampling (ABS) to select households and invite them to participate in this study. ABS involves drawing a random sample of addresses from all the residential addresses in that area. With this method, all households in a given sampling stratum have an equal chance of selection for the sample. ABS sample was purchased from Marketing Systems Group (MSG), which maintains the Computer Delivery Sequence file from the U.S. Postal Service.

### 2.3 SAMPLE STRATIFICATION/SEGMENTATION

RSG designed sampling strata using data from the 2017-2021 five-year ACS. The most detailed way to stratify the sample is to use Census Block Groups, which are the smallest geography for which ACS tables are publicly available. Each Block Group generally contains between 600 and 3,000 people. The study region includes 5,161 Block Groups which contain a total population of 2,754,719 households in the weighted ACS data. The Block Group data allows the study sample to target or oversample certain places within San Francisco Bay Area based on a wide array of demographic and geographic attributes, all at a very fine level. Figure 1 shows the extent of the study area, delineated by Block Groups and Counties.

**FIGURE 1: MTC STUDY AREA**



RSG used the following mutually exclusive and collectively exhaustive sample segments<sup>11</sup>, which were intended to ensure representation of groups that are typically hard-to-survey and provide a larger sample of groups of particular interest.

- 1) **General population:** Comprised of census block groups in the study region that do not qualify for oversampling segments below.
- 2) **BIPOC / Low-Income Oversample:** Comprised of census block groups in the sample frame that met the following criteria
  - a. The criterion for the BIPOC oversampled segment is that the block group must be in the 10% of block groups with the highest percentage of Black, Indigenous, and Persons of Color (BIPOC) or Hispanic households within each county.

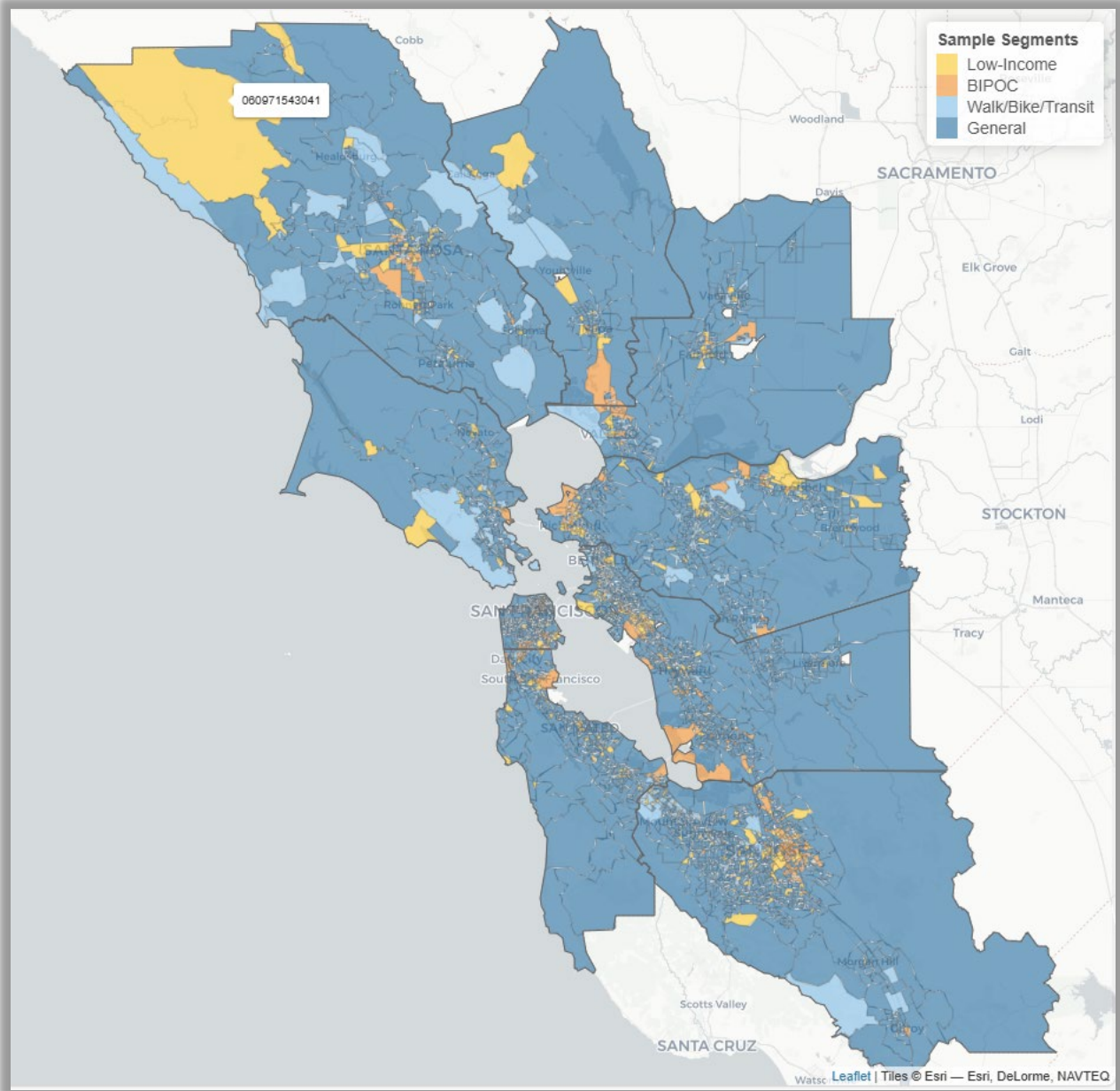
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<sup>11</sup> If block groups qualified for multiple segments, the prioritization was to include them in the BIPOC/Low-Income group first, then the Other Hard-to-Survey group, and then the Transportation segment last before the general population group.

- b. The criterion for low-income households utilizes the 90<sup>th</sup> percentile of block groups with households that have an annual income of \$25,000 or less within each county (Low-Income).
- 3) **San Francisco Quadrant Oversample:** Comprised of census block groups in the sample frame within San Francisco County. All census block groups in the county were oversampled, and the block groups in the northeast (NE), southeast (SE), and southwest (SW) were oversampled more so.
- 4) **Transportation Oversample:** Comprised of census block groups in the sample frame that meet the following criteria
  - a. The criterion for the Walk/Bike/Transit (WBT) Oversample block groups utilizes the 90<sup>th</sup> percentile of block groups within each county, e.g., any block group where WBT means of transportation to work shares are in the 90<sup>th</sup> percentile of counts across the region will be oversampled for this segment.

Figure 2, provides a visual representation of the proposed sampling strata.

**FIGURE 2: MAP OF 2023 SAMPLING STRATA**



The projected sample targets based on the segments, invitations, and previous response rates are delineated in Table 4 and Table 5 below.

**TABLE 4: EXPECTED SAMPLE BY ABS SAMPLE SEGMENT (SPRING)**

METHOD	STRATUM	BLOCK GROUPS	RELATIVE SAMPLE RATE	EXPECTED RESPONSE RATE	HOUSEHOLDS	INVITATION RATE	MAILED INVITATIONS	PROJECTED SAMPLE	PROJECTED SAMPLE WITH OVERSAMPLE
Address-Based Sample	Low-Income Oversample	520	2.0	1.4%	271,317	3.2%	8,860	62	124
	BIPOC Oversample	413	2.0	1.4%	191,656	3.2%	6,150	43	86
	Walk/Bike/Transit Oversample	381	2.0	1.4%	194,042	3.2%	6,290	44	88
	General Population	3,847	1.0	1.6%	2,097,704	1.0%	20,440	327	327
	Total	5,161		1.5%	2,754,719	1.5%	41,740	476	625

**TABLE 5: EXPECTED SAMPLE BY ABS SAMPLE SEGMENT (FALL)**

COUNTY	STRATUM	EXPECTED RESPONSE RATE	MAILED INVITATIONS	PROJECTED BASE SAMPLE	PROJECTED SAMPLE FROM GENERAL OVERSAMPLE	PROJECTED FROM QUADRANT OVERSAMPLE
Santa Clara	Low-Income	0.7%	21,160	102	46	-
	BIPOC	0.7%	14,580	70	32	-
	Walk/Bike/Transit	0.7%	17,870	86	39	-
	General	0.9%	79,820	267	351	-
	Total	-	199,160	525	468	-
San Francisco NE	Low-Income	0.7%	17,440	46	76	-
	BIPOC	0.7%	1,440	4	6	-
	Walk/Bike/Transit	0.7%	11,440	30	50	-
	General	0.9%	24,140	68	116	-
	Total	-	54,460	148	248	-
San Francisco NW	Low-Income	0.7%	2,207	2	4	12
	General	0.9%	25,103	28	47	137
	Total	-	27,310	30	51	149
San Francisco SE	Low-Income	0.7%	4,099	8	12	11
	BIPOC	0.7%	15,386	28	46	43
	General	0.9%	10,165	19	32	31
	Total	-	29,650	55	90	85

**TABLE 5: (CONTINUED) EXPECTED SAMPLE BY ABS SAMPLE SEGMENT (FALL)**

COUNTY	STRATUM	EXPECTED RESPONSE RATE	MAILED INVITATIONS	PROJECTED BASE SAMPLE	PROJECTED SAMPLE FROM GENERAL OVERSAMPLING	PROJECTED FROM QUADRANT OVERSAMPLING
San Francisco SW	Low-Income	0.7%	2,440	4	6	9
	Walk/Bike/Transit	0.7%	913	2	2	3
	General	0.9%	24,837	40	68	96
	Total	-	28,190	46	76	108
All Other	Low-Income	0.7%	39,150	274	-	-
	BIPOC	0.7%	28,290	198	-	-
	Walk/Bike/Transit	0.7%	27,430	192	-	-
	General	0.9%	81,560	734	-	-
	Total	0.75%	449,470	2,202	933	342

For Address-Based Sampling, the overall response rates for each of the four strata were lower than expected in Wave 1. As a result, the actual response rates from Wave 1 were used to compute the Wave 2 invitation rate and quantities for each stratum.

## 3.0 SURVEY DESIGN

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### 3.1 METHODOLOGY OVERVIEW

The HTS combined multiple data collection methods, including smartphone, online, and telephone. While 45% of households completed their travel diaries by smartphone, 88% of all trips were collected by smartphone due to the extended travel period from the smartphone app (up to 7 days) compared with the single-day online reporting. The survey design included two stages, or study components, to recruit and collect data about households, their members, and their travel behaviors during the assigned travel period.

#### Study Components

Part 1 (recruit survey) collected general demographic information (e.g., household size and person age) and established information to facilitate Part 2 (e.g., home/school/work addresses and number of vehicles). Part 2 (travel diary) collected all trip and travel day information and any person-level information (e.g., how often the participant uses transit).

### 3.2 QUESTIONNAIRE CONSISTENCY WITH PRIOR MTC HOUSEHOLD TRAVEL SURVEYS

The questionnaire for this study was developed to be consistent with past MTC HTS projects, while also incorporating industry best practices evolutions in questionnaire design. For example, in the past, the HTS asked adult participants whether they had a “valid driver’s license.” Research has shown that participants may perceive this question to be invasive or may drive without having a valid driver’s license. As this question is not required for travel demand modeling, RSG now recommends asking adult participants, “Do you drive?”. These types of recommendations and refinements were discussed with MTC and incorporated appropriately into the survey questionnaire. Respondents who participated in the spring fielding were excluded from participating in the fall fielding.

### 3.3 DATA COLLECTION METHODOLOGY AND PARTICIPATION METHODS

This study used an ABS approach with mailed recruitment materials (shown in the Appendix of this report) supplemented with oversampling of areas with estimated high use of managed lanes and from a predetermined list of housing units provided to RSG. The mailed materials instructed households to download the app, visit the study website, or call a toll-free number to complete Part 1 (the demographic “recruit” survey). Households received instructions for Part 2 (the travel diary) shortly after completing Part 1.

## Access Codes and Sign-up Survey

Each invited household was provided with one unique password for the duration of the study. This initial password was used across all materials (print and online) to streamline survey participation and reduce attrition. As a two-factor authentication measure, a second password was sent after participants started the recruitment process to verify each contact and continue the questionnaire online or in the rMove app. These mailings included English and Spanish content to communicate each of the available survey participation options to invited households. In the recruit survey, each household member was identified with a unique nickname, initials, or name. Households completed the recruit questionnaire as soon as they received their initial invitation, providing data on the household's demographic composition, typical travel behaviors, and administrative information used to determine the household's method and schedule for completing their travel diaries. All households completed an identical recruit survey by downloading the app, going online, or calling the call center to complete the questions.

At the end of the online recruit survey, if all adults in the household owned smartphones, they received different text outlining the next steps than non-smartphone households; each household only saw the text relevant to them. When all adults in the household reported owning smartphones, they were offered the option to either download rMove and participate for a travel period of seven consecutive days for a higher incentive or participate for a 24-hour travel period and complete the study online or through the call center for a lower incentive. Households where not all adults owned smartphones were asked to complete a one-day traditional travel diary online or over the telephone. If a person did the recruit survey directly on the app, as long as the other adults in their household had smartphones, they were directed to complete the travel diary using the app. If not all adults in the household had smartphones, they were re-directed to use the online or call center diary.

## Travel Date Assignments

Participants were assigned their travel day using an assignment method meant to maximize the likelihood of participation by minimizing the time between sign up and reporting while also leaving sufficient time to coordinate app installation for other household members.

- rMove participants (up to seven travel days):
  - Household Size=1: Households with a single household member were assigned the next day following their sign-up survey as their first assigned travel day.
  - Household Size>1: Households with more than one member were assigned their first travel day three days following their sign-up survey. This is to allow time for all adults to download and install the rMove app.
- rMove for Web or Call Center participants (a single, weekday travel day):

All rMove for Web/Call Center participants were assigned a Monday, Tuesday, Wednesday, or Thursday 24-hour travel day. RSG's data collection platform balances a project's travel day assignments across the four weekday travel days, resulting in a final dataset that is reflective of regional, weekday travel. For example, a household that completes the sign-up survey on a Thursday, may be assigned the following Tuesday, Wednesday, or Thursday as their travel day to balance the number of households reporting travel on any individual weekday. There are multiple ways to ensure that the assigned travel periods are evenly divided across the weekdays of the month, with the simplest method being to ensure that the schedule of mailed invitations is aligned with the expected participant recruitment activity and the resulting travel diary periods. RSG's historical experience and results have successfully used this setup. This was done, in part, to allow for efficient automation of reminders and communications with participants, as well as ensuring that user support was readily available when participants first download and began using rMove (e.g., not the weekend).

### **Proxy Reporting for Child Trips**

Among rMove households, only adults related to the main respondent were required to use the app on their smartphones. One rMove adult in each household was designated to proxy report travel information for all children (under 18) in the household on a single travel day. If a child in an rMove household was reported as a travel party member on the designated reporter's trips, the trip was copied to the child's record. This adult was also asked to add trips to a child's roster if the child made an independent trip (e.g., riding the bus to school) or made a trip with someone outside of the household (e.g., getting a ride with a friend's parents).

Among online households, one adult was required to complete a full one-day travel diary for all children in the household. Like rMove, adult proxy reporters could copy children's trips from other adults and report new trips that the children made on their own.

## **3.4 REAL-TIME MONITORING, QA/QC AND DATA VALIDATION**

All collected data (passive and surveys) described above are encrypted and sent to a secure cloud server where they are stored for monitoring and processing.

### **Real-time monitoring**

RSG monitored the data for response and quality throughout the study. RSG continuously monitored the survey database and performed regular QA/QC during survey fielding. Response monitoring tools and procedures implemented during survey fielding included:

- Provision of a secure, real-time online dashboard that provided MTC with results such as response rates, progress toward sample targets, and comparison to ACS control data in real-time.

- RSG maintained a second, internal dashboard accessible by the RSG team allowing team members to view travel data and assist participants having difficulty completing the survey. This dashboard included the ability to view individual trips and metadata (e.g., smartphone type) to assist with troubleshooting.
- RSG provided information on data collection at recurring project progress meetings, including: survey response forecasts and effectiveness of oversampling efforts, updates on any issues encountered, actions to address those issues if warranted, and notes documenting these items and key decisions points.

## **QA/QC and Data Validation**

The rMove and online travel diary included numerous real-time validation and data quality features. Examples include the following:

- All locations provided by survey participants are geocoded and validated in real-time within our survey instruments (rMove and rMove for Web) including frequently visited locations such as home, work, and school as well as all trip origin and destination locations.
- Trip-level logic ensures consistency, such as ensuring that trip start and end times neither overlap nor have negative trip durations.
- Ability to enter address, business name, or place a marker on the map using Google Maps provides real-time geocoding of each location.
- For rMove for Web, household members can copy joint trip data to their roster to ensure data consistency across household members and reduce burden for larger households.
- Logic confirms that survey responses follow the survey questionnaire logic agreed upon.
- Household members who report that they did not make any trips on their assigned travel day skip the trip diary section of the online survey and are asked why they did not make any trips. The records of all persons reporting no trips are reviewed as part of the QA/QC process to determine whether the reasons provided (e.g., worked from home, sick, etc.) appear valid. Suspicious records are flagged and removed from the list for final deliverable tables.
- Additional scripted checks were added to the post-processing pipeline to summarize the quality of GPS trace data collected by the rMove app. These checks flagged trips, persons, and days affected by GPS point collection error prevalent in data collected by participants using iOS 16.4. Trips were flagged if they had fewer than 1.5 GPS location points per minutes, or a distribution of points such that the distance between any two subsequent points was 30% more than the expected distance if points were evenly distributed along the trip path. In the final data deliverables, these flags are provided, as well as weights, that allow the user to use strict or lenient criteria when including data for final analysis.

### 3.5 COMPLETION CRITERIA

Development of the study’s completion criteria was guided by industry best practices. Households were included in the data deliverable when they met the following conditions:

1. **The household completed the sign-up (recruitment) survey by answering all required questions.** Some responses could be a refusal to answer but responses to household size and the number of household vehicles were both required and did not allow for a refusal response – failure to provide a number in each resulted in the survey ending.
2. **All related household members completed at least one, concurrent 24-hour travel diary regardless of survey participation mode (smartphone, online, or call center).** For the purposes of household travel surveys, ‘related’ household members include spouses, unmarried partners, children, parents, siblings, and other relatives. Roommates/friends, household help, and other nonrelatives were not included in ‘related’ household members for the purpose of data collection. However, during weighting, households with unrelated adults were treated in the same manner as Census to enable reasonable comparisons to targets.

### 3.6 SURVEY INCENTIVES

The Wave 1 incentive methodology was based on industry best practice, findings from similar studies conducted in 2021, and anticipated response rates based on RSG’s understanding of the San Francisco Bay Area. The study’s differential incentive structure is summarized within Table 6.

**TABLE 6: WAVE 1 DIFFERENTIAL INCENTIVES STRUCTURE**

	<b>RMOVE</b>	<b>RMOVE FOR WEB OR CALL CENTER</b>
Hard-to-Survey Differential	\$35 per adult	\$25 per household
All Other Participating Households	\$25 per adult	\$15 per household

The differential incentives approach offered incentives within the study invitation materials, and again at the end of the sign-up (recruitment) survey to maximize effectiveness and improve participation rates. MTC staff were not involved in processing or distribution incentives; RSG managed all logistics for incentives qualification, tracking, and distribution.

### ***Incentives Within Invitation Materials***

- Hard-to-Reach: Study area Block Groups with the highest percentage of known populations that are traditionally hard-to-reach or with the highest percentage of populations of interest were offered a higher incentive in invitations. These groups are detailed in the sample plan. Households were provided the choice of participating using the rMove™ app (\$35 per participating adult) or participating by either rMove for Web or through the call center (\$25 per participating household).
- All other households were offered the choice of \$25 per participating adult (rMove) or \$15 per participating household (rMove for Web/Call center) within their invitation materials.

*Opportunities and Constraints of Differential Incentives in Invitation Materials.* When offering differential incentives within the invitation materials, households in hard-to-reach sample segments are offered a higher incentive than households in the other segments based on the Block Group of their home address. This higher incentive is offered with the initial invitation, resulting in an increase in recruitment rates. This method has been shown to be effective at increasing response rates but increases the overall recruitment cost and also results in paying higher incentives to some respondents who are not among the targeted population groups but happen to live in the targeted areas (e.g., non-BIPOC households or higher income households who live in low-income or high-BIPOC Block Groups).

### ***Incentives After Sign-up/Recruitment***

- For households not already flagged for the differential incentive, above, the study additionally offered differential incentives (\$35/adult rMove or \$25/household rMove for Web/call center) at the end of the sign-up/recruitment survey if the household met at least one of the following conditions:
  - Reported household income less than \$35,000; and/or,
  - The participant completing the sign-up survey selects any race other than white or selects Hispanic ethnicity.

*Opportunities and Constraints of Differential Incentives After Recruitment.* Compared to offering a higher incentive before recruitment, this method tends to have less effect on overall response rates because most households decline to participate at the recruitment stage. Consequently, this extra incentive only serves to reduce attrition rates among recruited households. On the other hand, this type of incentive costs less and can be targeted more efficiently toward hard-to-reach population groups. It is also applied across all Block Groups in the study area so has less geographic bias.

### ***No Incentive Option***

The incentives methodology also included a 'Decline Incentive' option. Where RSG has offered this option in past studies, many participants have selected it.

### ***Incentives Processing***

As households completed the study, RSG identified which households eligible to receive an incentive (including those flagged for differential incentives) and processed those households for either physical or digital gift cards (at the households' individual preference) within one to two weeks of survey completion. Physical gift cards were issued as Visa gift cards. Electronic gift card options included Walmart, Amazon, and Target e-card.

## 4.0 STUDY BRANDING, COMMUNICATION, AND ADMINISTRATION

### 4.1 STUDY BRANDING

RSG developed a custom project logo (Figure 5) and color palette to be used in public-facing materials, complementary to the color palette of MTC's recently updated agency logo. The goal of this project component is to have a set of engaging, professional materials to support the project's credibility and response rates. The project logo and branding were used consistently throughout the survey's invitation materials (i.e., envelope, letter, postcard), a public-facing website consistent with Section 508 guidelines for accessibility, and participant email templates. The intended effect of this coordination is to connect invitations, reminders, and other notices about the project.

FIGURE 3. 2019 TNC SURVEY LOGO AND BRANDING



FIGURE 4. SAN FRANCISCO BAY AREA TRAVEL SURVEY - SPRING LOGO AND BRANDING



FIGURE 5: SAN FRANCISCO BAY AREA TRAVEL STUDY - REVISED LOGO AND BRANDING



## 4.2 PUBLIC-FACING PROJECT WEBSITE

The public-facing project website served as both the entryway to the online survey instruments as well as a validating resource for participants with questions about the project ([bayareatravelsurvey.com](http://bayareatravelsurvey.com)). RSG developed the website to describe the study and facilitate participation. This site was simple, intuitive, and easy to navigate on desktop computers and mobile devices. While the study was open to respondents, participants could access the survey by entering their access code on the website's home page.

This website was available in both English and Spanish, and provided key project information including frequently asked questions, contact information, the project's data privacy policy, and more. RSG coordinated with MTC on development of the website content and ensured that it was consistent with guidelines provided within the Americans with Disabilities Act (ADA), Section 508 of the Rehabilitation Act, and Executive Order 13166.

## 4.3 STUDY INVITATION MATERIALS

Each invited household received two mailings:

- **Invitation Packet:** The cover letter explained the survey purpose and described the steps necessary to complete the study. The invitation packet also included a frequently asked questions sheet.
- **Reminder Invitation Postcard:** The reminder invitation postcard arrived at each household approximately 4 – 12 days after the invitation packet. These cards included the study phone number, website address, and participant login information.

## 5.0 PARTICIPANT SUPPORT

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This study utilized both inbound and outbound participant support. “Inbound” refers to communications that participants initiated, and “outbound” refers to communications that RSG initiated.

### 5.1 OUTBOUND PARTICIPANT SUPPORT

RSG used several types of outbound participant support (beyond the previously mentioned website and invitation materials) to aid study administration. The primary sources of outbound support were automated email reminders, reminder phone calls, and in-app reminders or notifications (rMove participants only).

#### ***Email Reminders and Phone Calls***

RSG required all rMove participants to provide email addresses or sign up through the call center. Online participants could provide both an email address (required for most households, unless participating through the call center) and an optional phone number. Any household that provided an email address received email reminders, while households that only provided a phone number were reminded by phone.

The study call center conducted all phone reminders. These reminders occurred on the following schedule:

- One day before each household’s travel date.
- One day after each household’s travel date.
- Three to five days after each household’s travel date (if the household had not yet completed the survey).

Reminder emails occurred on a similar schedule, although more frequently. RSG sent email reminders/notifications throughout the travel period to all households that provided an email address during Part 1 of the survey. Households received emails within an hour of completing Part 1, prior to the rMove travel periods (reminding participants to activate the app), the day before the travel period began, the day after each travel period ended, and 3–5 days after the end of the travel period if the household had not yet completed the survey.

#### ***In-App Reminders (rMove)***

rMove participants also had in-app reminders to encourage them to complete all surveys during their travel periods. Participants received notifications as soon as a new survey was available—either several minutes after the end of a trip or the morning after a travel day. rMove participants reporting their children’s trips by proxy also received reminders to review and add to their children’s trip rosters.

## **5.2 INBOUND PARTICIPANT SUPPORT**

In addition to all outbound participant support, RSG provided three primary means through which participants could contact survey administrators. All participants could call a toll-free number to reach the survey call center or submit questions through the contact form on the website. rMove participants also had the option to submit feedback directly through the app.

## **5.3 LANGUAGE OPTIONS**

The invitation materials, project website ([bayareatravelsurvey.com](http://bayareatravelsurvey.com)) and survey instrument were all translated into English, Spanish, Simplified Chinese, Traditional Chinese, and Vietnamese. Respondents with limited proficiency in the languages listed could call the study call center to participate (or ask questions) in other languages. Those participants would be directed to leave a message on the project's toll-free hotline, and a translator would call the participant back in the appropriate language, and answer questions, or assist the participant in completing the study in real-time.

## 6.0 DATASET PREPARATION

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### 6.1 DATA QUALITY CONTROL AND QUALITY ASSURANCE

Throughout the study, RSG implemented strict dataset preparation and quality control checks to ensure data was properly collected, stored, and analyzed. Before study fielding, survey instrument testing confirmed that study responses were recorded correctly. During data collection, survey instruments employed real-time validations and logic checks to ensure consistent coding and logical response combinations and to prevent skipped questions. After the data collection period ended, additional time was spent reviewing, cleaning, and processing the raw data to prepare the unweighted dataset for analysis (described further below). The full steps and details of data processing are provided in the separate, accompanying dataset guide.

#### *Initial Data Review*

Before reviewing the data for completion, RSG removed households from the dataset that met the following exclusion criteria:

1. Household reported a home location outside San Francisco Bay Area. Most households dropped during initial review were excluded for this reason.
2. Household reported contact information that matches other households (indicating duplicates). In these cases, RSG kept the first “household” to report their travel diary and removed the subsequent records.

#### ***Completion and Exclusion Criteria***

Following the initial data review, households were then further reviewed for survey completion. Households were considered complete if they met the following conditions:

1. The household completed the recruit survey by answering all required questions.
2. The household completed a travel diary for all participating household members on at least one concurrent weekday.

All online households had a single complete travel day. rMove households had at least one complete travel day (where all surveys are completed on the same day by all household adults) but may have up to seven completed travel days. Partially complete rMove travel days were included in the final dataset but flagged accordingly.

Additional notes about data cleaning are included in the study dataset user’s guide (provided separately).

## **QA/QC – iOS Trip Trace Irregularities**

The release of iOS 16.4 by Apple on March 27, 2023, brought about significant changes to background location tracking, affecting apps such as rMove, which rely on collecting location information. Consequently, iPhone users with iOS 16.4 or later experienced irregular trip traces within the rMove app, impacting data accuracy for Spring 2023. To address this issue, RSG swiftly updated the rMove app and monitoring scripts to mitigate inconsistencies in future data collection. Despite these efforts, the Spring 2023 dataset remained affected. To manage the impact on the dataset and downstream processes, RSG developed a series of criteria to identify suspect trips and flag individuals or households accordingly. The dataset guide contains descriptions of these flags for data user reference.

## 7.0 EXPANSION AND WEIGHTING

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This section describes the analysis and methodology used to expand<sup>12</sup> the data collected in the MTC HTS to the 2023 ACS Public Use Microdata Sample (PUMS)<sup>13</sup> 1-year data. This section describes the analysis and methodology used to expand<sup>14</sup> the data collected in the Wave 1 and Wave 2 MTC HTS to the 2023 ACS Public Use Microdata Sample (PUMS)<sup>15</sup> 1-year data. The weighting methodology applied adjusts for survey non-response, survey participation mode, and geographic bias due to oversampling and other factors. In addition, RSG adjusted trip rates between the participation methods offered for the survey: online, call center, or smartphone app.

### The applied weighting process included four primary steps:

1. **Initial Expansion:** Calculating an “initial weight” based on the probability of selection in the sample design. This step essentially “reverses” the sample plan, providing higher initial weights to areas where less sampling occurred.
2. **Reweighting to account for non-response bias:** Performing an entropy maximization-based list balancing routine to match several key household and person dimensions to ensure the weighted data accurately represent the entire survey region (and reduce sampling biases). This routine is performed using the open-source application, PopulationSim<sup>16</sup>. To do this step, missing values for income, gender, and race/ethnicity were imputed for those who did not provide that information.
3. **Creating day-level weights to account for multi-day survey data:** Adjusting the day-level and trip-level data to account for the fact that smartphone respondents provided multi-day travel diaries, while online respondents provided a single-day travel diary (this is the “multi-day adjustment”). These relatively simple adjustments ensure that travel analyses accurately reflect the entire survey region for a “typical” weekday (Mon-Thu) and do not over-represent smartphone respondents with multiple travel days.
4. **Adjusting for non-response bias in day-pattern and trip rates:** Adjusting the trip-level weights by data collection method (smartphone vs. online vs. call center) to account for underreporting biases that RSG has detected in this survey and prior travel surveys. These adjustments help make the day and trip-level data more consistent and increase the accuracy of trip rates across survey participation methods.

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<sup>12</sup> For the purposes of this technical memorandum, the terms expansion, expansion factors, and weights are used interchangeably and are synonymous. They all represent the concept of an expansion weight.

<sup>13</sup> <https://www.census.gov/programs-surveys/acs/microdata/access/2019.html>

<sup>14</sup> For the purposes of this technical memorandum, the terms expansion, expansion factors, and weights are used interchangeably and are synonymous. They all represent the concept of an expansion weight.

<sup>15</sup> <https://www.census.gov/programs-surveys/acs/microdata/access/2019.html>

<sup>16</sup> <https://activitysim.github.io/populationsim/>

The overall goal is to make the survey sample representative of the entire survey area across several key dimensions related to travel behavior.

The full weighting memo provided to MTC contains a detailed description of the weighting process. The full weighting process is delineated in a separate weighting memo provided with the final dataset delivery. Links to both documents are available in the appendix of this report.

## **7.1 NOTES FOR DATA USERS**

Although HTS data provides opportunities for many types of analysis, data users should always consider the context when applying the data. The San Francisco Bay Area Travel Study was designed to collect typical weekday data from residents in San Francisco Bay Area. Therefore, the HTS dataset is not ideal for understanding weekend or visitor analysis (for example).

Data users should always use weighted data in any analysis intended to draw conclusions about the region (as opposed to survey takers). Note that only Tuesday, Wednesday, and Thursday days were weighted in this study with the aim of representing an average weekday of travel. Weighted analyses do not represent travel on other days. Monday trips have a slightly lower percentage of mandatory trips than Tuesday through Thursday; however, there is more value in the model to include Mondays as they provide additional weekday data. These days have been provided and MTC has the needed scripts to run weighting with these dates included.

Finally, data users should ensure sufficient sample size (and acknowledge margins of error) in any analysis. The smaller the sample size, the larger the margin of error. Sample sizes and margins of error are a complicated topic, but a typical rule of thumb is to ensure at least 30 unweighted (?) observations of a behavior to draw reasonable conclusions.

## 8.0 SURVEY RESULTS

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### 8.1 RESULTS OVERVIEW

The San Francisco Bay Area Transportation Study collected a rich set of demographic and travel behavior data from a representative sample of Bay Area households. Data was collected beginning in spring of 2023 with the majority of surveys collected in fall of 2023. Ultimately, 8,258 households were delivered with travel recorded on a Tuesday, Wednesday, or Thursday. An additional 570 households were delivered with only Monday travel recorded.

In the spring wave, this study targeted 500 households with complete travel surveys with the goal of testing the effects of deploying an assignment of the rMove app compared to allowing residents to opt-in to the app. In assignment, households with qualifying devices were assigned the app as their means of participation. Opt-in households were allowed to decide between the app and web/call-center survey. Response rates for assignment were 60% of the opt-in design (0.9% versus 1.5%). However, due to the much higher share of multi-day data, the team elected to pursue an assignment design in the larger fall data collection.

For the fall wave of data collection, MTC and partners aimed to collect survey responses for 6,277 total households. Once data collection reached maturity (e.g., sufficient samples had completed from the first mailings to assess the results) the team was able to identify that the actual completion rate in the fall was 1.2% -- leading to 8,258 households used in the weighted dataset, or approximately 23% more households than initially planned. As higher than expected response rates resulted in additional completed surveys, RSG and MTC decided not to slow down nor to stop data collection, and instead allowed for the additional data to be collected and incorporated into final dataset and model. The majority of households (6,919) were recorded using the mobile app platform representing 83.7% of all participants. The average number of days reported was nearly 5.

### 8.2 SAMPLE PLAN EVALUATION

This section evaluates the sample plan against the actual performance of the survey. The plan assumed an overall response rate of 0.75% for fall data collection, with 449,470 addresses selected to be invited. The projected base sample of completed households was 3,477. The aim was to collect 2,150 households in the base sample, with an additional 1,255 coming from the SFCTA add-on, 465 sample coming from State Route 37, 1,255 sample from Express Lane funds, and 467 samples from VTA for a total of 5,592. Additional sample was included to cover the missing samples impacted by the spring 2023 data collection issue related to changes in iOS leading to a fall target of 5,733 samples. To attain the full target of completes, it was necessary to mail 656,480 total samples. This assumed a 0.87% response rate overall. Combined with the spring sample, this meant mailing to 698,220 households in the region.

Table 7 shows the response rates for the ABS sample segments across the spring and fall data collection waves. It includes a row for pairwise sample selected in the City of San Francisco, of households with and without subsidy programs designed to shift residents to alternate modes of travel.

**TABLE 7: RESPONSE BY ABS AND SUPPLEMENTAL SAMPLING SEGMENTS**

SEASON	SEGMENT	APPROACH	INVITATIONS	COMPLETION RATE	COMPLETES
Spring	General	Assignment	10,220	0.9%	87
Spring	General	Opt-in	10,220	1.2%	127
Spring	Hard-to-Reach	Assignment	10,650	0.9%	93
Spring	Hard-to-Reach	Opt-in	10,650	1.3%	136
Fall	General	Assignment	430,413	1.2%	5,066
Fall	Hard-to-Reach	Assignment	222,342	1.2%	2,688
Fall	Pairwise	Assignment	3,727	1.6%	61
<b>Total</b>			<b>698,222</b>	<b>1.2%</b>	<b>8,258</b>

Table 8 shows the response rates by ABS sampling segments. Response rates rose from spring to fall, with the walk-bike-transit segments and low-income segments proving to be more responsive than the general population segments in either season of data collection.

**TABLE 8: RESPONSE BY ABS SAMPLING SEGMENTS**

SEGMENT	SEASON	INVITATIONS	RECRUITS	COMPLETES	RECRUIT RATE (%)	CONVERSION RATE (%)	COMPLETION RATE (%)
General	Spring	41,740	940	214	2.3%	23%	0.5%
General	Fall	409,111	10,317	5,066	2.5%	49%	1.2%
General	Fall + Spring	450,851	11,257	5,280	2.5%	47%	1.2%
Low income	Fall	96,378	2,329	1,115	2.4%	48%	1.2%
BIPOC	Fall	81,549	1,578	665	1.9%	42%	0.8%
Walk-bike-transit	Fall	65,715	2,176	1,137	3.3%	52%	1.7%

SEGMENT	SEASON	INVITATIONS	RECRUITS	COMPLETES	RECRUIT RATE (%)	CONVERSION RATE (%)	COMPLETION RATE (%)
Pairwise	Fall	3,727	136	61	3.6%	45%	1.6%
<b>Total</b>	<b>All</b>	<b>1,149,071</b>	<b>28,733</b>	<b>13,538</b>	<b>2.5%</b>	<b>47%</b>	<b>1.2%</b>

Table 9 shows the planned and final actual response rate from the two broad sample segments (general and hard to reach) as well as at the county level. The final column of the table shows the improvement in response over planned for each grouping ranging from 0.28 to 1.03 percentage points more than expected. The net effect of this difference was that 8,787 households completed the survey. Some of these households would later be removed from the data deliverable for reasons covered in section 8.3 leading to a final delivery of 8,258 total complete cases.

**TABLE 9. SUMMARY OF PLANNED AND ACTUAL RESPONSE RATES BY SAMPLE SEGMENT AND COUNTY**

GROUPING	SEGMENT	PLANNED RESPONSE	ACTUAL RESPONSE	DIFFERENCE FROM PLANNED
Sample segment	General	0.84%	1.24%	0.40%
Sample segment	Hard-to-reach	0.71%	1.29%	0.58%
County	San Francisco	0.79%	1.07%	0.28%
County	Santa Clara	0.78%	1.80%	1.03%
County	All others	0.74%	1.24%	0.50%

One lesson learned from this round of BATS is that how hard-to-reach populations are defined requires re-thinking for future waves. The proportion of sample that were completed from geographies marked as hard-to-reach out-performed expectations substantially, which led to completing 180% of the expected total of completes for this stratum. This has real costs to the project as households identified in these strata are offered higher incentives for their participation.

Table 10 shows the share of households by the mode used to report, as well as the number of persons and trips collected by each survey mode. This sample plan assumed an assignment approach to data collection wherein qualified households were assigned to use an app (based on all adults owning a compatible device).

**TABLE 10. SHARES OF COMPLETES BY SURVEY MODE AND LEVEL OF ANALYSIS**

TABLE	REMOVE COUNTS	BROWSER COUNTS	CALL CENTER COUNTS	TOTAL
Household	6,919	1,096	243	8,258

TABLE	RMOVE COUNTS	BROWSER COUNTS	CALL CENTER COUNTS	TOTAL
Person	13,027	2,635	323	15,985
Trip	357,167	7,437	1,227	365,831

Future rounds of the survey should leverage these results to prepare a plan tailored to the response rates and design of the survey observed in 2023. However, careful testing is still recommended as changes in survey response propensities continue to be observed.

### 8.3 DATA QUALITY CONTROL AND QUALITY ASSURANCE

This section is an abridged version of the technical memorandum delivered in May of 2023 with the subject *Final Bay Area Travel Survey Quality Assurance and Control Memorandum*. That memorandum documented the methods and procedures used for data cleaning, processing, and data quality assurance and quality control (QA/QC). This served as a guide for the Bay Area Travel Survey (BATS), establishing standards and methods for data processing and QA/QC of study data. The objective of the Bay Area Travel Survey was to collect a regionally representative sample of households within the study region. The study structure included two parts:

- Part one, also called the “recruit survey,” collected information about household composition, demographics, and typical travel behavior.
- Part two, also called the “travel diary,” required participants to record their travel during an assigned travel period.

RSG performed a combination of human-driven and automated, tool-driven data cleaning processes to provide a high-quality dataset that had been through rigorous QA/QC. To meet RSG’s QA/QC standards, “complete” households met the following conditions:

- The household completed the recruit survey in full.
- The household completed a travel diary for all household members on at least one concurrent travel day.

#### Identifying participating household members

The household member who completed the signup survey was referred to as “person 1.” All household members whose relationship to person 1 was spouse or unmarried partner, child, parent, sibling, or other relative reported their travel and were considered participating household members. These persons could be identified by the relationship column in the person data table. Roommates/friends, household help, and other nonrelatives living in the household

did not report travel and were not considered participating household members. As described above, households in which all participating household members completed all travel diary surveys on at least one concurrent travel day were considered “complete.”

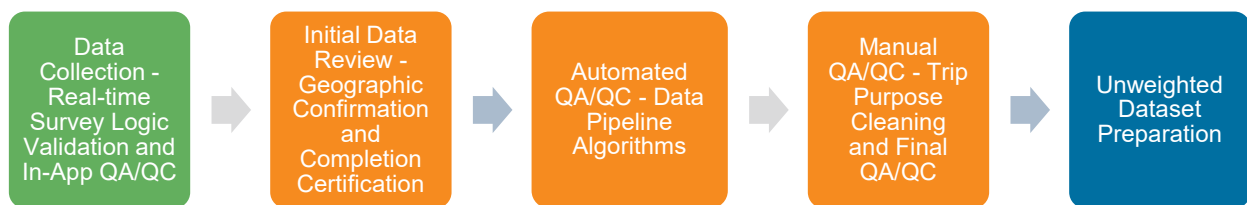
## Dataset Composition

The final unweighted dataset included six distinct data tables: Household, Person, Vehicle, Day, Trip, and Location. These tables include all user-input survey variables, certain survey metadata (e.g., survey completion mode), variables collected by the rMove™ smartphone application (e.g., trip origin and destination locations), and variables derived to support data analysis.

## Data Processing Workflow

The workflow for the data processing and QA/QC was composed of three main parts as described below and schematized in Figure 6.

**FIGURE 6: SCHEMATIC REPRESENTATION OF THE DATA PROCESSING WORKFLOW**



## In-App QA/QC

Most of the data collected was validated in real-time through survey logic programmed into the survey instrument. This survey logic was rigorously tested by the project team using manual and automated testing tools. Real-time in-app survey logic included:

- Geocoding and validating all locations provided by survey participants in real-time within our survey instruments (rMove™ and rMove for Web) including frequently visited locations such as home, work, and school, as well as all trip origin and destination locations.
- Ensuring consistency through trip level logic, such as ensuring that trip start and end times neither overlapped nor had negative trip durations.
- Constraining the questions and response options to those relevant to the respondent based on agreed upon survey questionnaire logic (e.g., only those who reported being employed were asked work-related questions or choices that only applied to children were hidden for households who reported no minors).
- Skipping the trip diary section of the online survey for household members who reported that they did not make any trips on their assigned travel day and asking why they did not make any trips. The records of all persons reporting no trips were reviewed as part of the

QA/QC process to determine whether the reasons provided (e.g., worked from home, sick) appeared valid.

- Providing a “copy trips” feature in the rMove for Web travel diary that allowed household members to easily copy a trip (and the associated trip details) from another household member’s already reported diary. Over the years, RSG found this greatly helped with data quality and data consistency. An example was that the first adult in the household reported a joint trip to the grocery in their diary. When the second adult in the household began their travel diary, they could simply select and copy that trip to their diary (saving the time to add the trip and ensuring data consistency).

## **Initial Data Review**

The Initial Data Review step took place after data collection and after the above-mentioned real-time validation steps had already occurred. It was the first step in the Data Processing Workflow, conducted to identify and flag complete households and household members and to create the working data tables. During this step, RSG also calculated geographic variables and removed households from the dataset that met the following exclusion criteria:

- Households who reported a home location outside the desired study region. Most households dropped during initial review were excluded for this reason.
- Households who did not complete one concurrent travel day and were therefore considered incomplete.
- Households that completed the survey more than once based on duplication rules involving home addresses and contact information.
- Households that experienced significant technological challenges when completing the surveys via the rMove application. While rare, these households do have abnormal data and therefore were excluded from delivery.
- Households that, following completion of the survey, requested their data be deleted as allowed by privacy laws and regulations.

## **Calculation of Geographic Variables**

Census PUMA and block group shapefiles were downloaded via the R Tigris package and spatially joined to all reported coordinates, including the reported home address, the sampled home address (if different), school and work locations (if applicable), and trip origin and destination locations. The reported home block group did not always match the block group ascribed to the household’s sample address (which was used to determine the sample segment) for a few reasons: Sample addresses were geocoded differently than survey addresses, sample addresses were sometimes coded to a mailbox location rather than a home location, and home addresses in the survey were not always geocoded to a person’s exact

home (e.g., a cross street nearby). Because a person's reported home address was considered more recent and typically more accurate than the sample address, the geographic variables were derived using this address.

## **Automated QA/QC Data Pipeline Algorithms**

The Initial Data Review step occurred after data collection and real-time validation steps. It was the first step in the Data Processing Workflow, aimed at identifying and flagging complete households and household members to create working data tables. During this step, RSG calculated geographic variables and removed households that met specific exclusion criteria, such as those reporting a location outside the study region or those that did not complete a concurrent travel day. Households that completed the survey more than once, experienced technological challenges, or requested data deletion were also excluded.

Automated QA/QC was then performed using proprietary machine-learning algorithms that identified trips requiring manual review by trained analysts. These algorithms, built using a train-test framework with data from various regions and trip types, helped clean and review smartphone GPS data for accuracy. The data processing pipeline included over 150 data quality checks to ensure consistency and high quality, with any discrepancies corrected or removed before final delivery. Analysts added a secondary level of quality control by carefully reviewing the actions recommended by the algorithms.

## **Trip Purpose Cleaning**

The trip purpose cleaning process applied a series of logical rules to correct inconsistencies in reported trip data. This involved verifying the destination purpose against the location type, identifying and correcting any swapped or missing trips, and filling in gaps by sampling from other similar trips. The aim was to ensure that the reported purposes aligned with the actual trip traces collected by the smartphone app.

Problematic trips were flagged when the destination purpose did not match the location type. For example, trips reported as "work" that did not occur at the primary work location were reclassified as "work-related." Similarly, a new category of "school-related" was used for trips reported as "school" but not occurring at the primary school location. This meticulous process helped avoid mismatches to ensure accurate data for analysis.

## **Final QA/QC**

Before delivery, the dataset was reviewed by the project team including by a data scientist looking for any final dataset inconsistencies. This included a comprehensive review of every data column in the dataset.

## 8.4 DESCRIPTIVE SUMMARY OF DEMOGRAPHIC AND TRAVEL BEHAVIORS

### Household Characteristics

Table 11 through Table 13 in this section provide summaries of the weighted data by county with the household level characteristics of household size (number of members), household income, and household vehicles (the count of vehicles owned by the household). These characteristics are comparable to ACS or PUMS data, and the results have been summarized in the final weighting validation report available on the MTC Box site here: <https://mtcdrive.box.com/s/vp91hn4q3q6u4d2n2lsg1b16olw9ag2d>. That report includes sections comparing the weighted data to target data by county.

This section of the final report provides estimates of the same demographics for combinations of geography and household characteristics. Note that throughout the results sections that follow, cells with a blank should be interpreted to mean no observations were available to generate an estimate. If a cell contains 0.0%, this implies that while there were observations to use to generate an estimate, the weighted total is a share that cannot round up to the nearest tenth decimal.

**TABLE 11. WEIGHTED DISTRIBUTION OF HOUSEHOLD SIZE BY COUNTY**

HOUSEHOLD SIZE	ALAMEDA COUNTY	CONTRA COSTA COUNTY	SAN FRANCISCO COUNTY	SAN MATEO COUNTY	SANTA CLARA COUNTY	SOLANO COUNTY	SONOMA COUNTY	MARIN AND NAPA COUNTIES
1 person	25.9%	21.6%	39.5%	23.1%	22.3%	23.0%	27.2%	26.0%
2 people	31.6%	32.8%	32.7%	32.7%	31.8%	31.5%	36.3%	35.6%
3 people	17.8%	18.4%	12.7%	14.4%	18.4%	19.1%	12.5%	17.3%
4 people	14.0%	15.0%	9.5%	23.9%	15.5%	13.2%	19.2%	18.4%
5 or more people	10.8%	12.2%	5.6%	5.8%	12.0%	13.2%	4.8%	2.7%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Unweighted Total</b>	<b>1,853.00</b>	<b>966.00</b>	<b>2,585.00</b>	<b>417.00</b>	<b>1,333.00</b>	<b>497.00</b>	<b>316.00</b>	<b>291.00</b>
<b>Weighted Total</b>	<b>616,302.00</b>	<b>419,191.00</b>	<b>368,364.00</b>	<b>276,974.00</b>	<b>681,666.00</b>	<b>163,015.00</b>	<b>194,058.00</b>	<b>157,172.00</b>

**TABLE 12. WEIGHTED DISTRIBUTION OF INCOME BY COUNTY**

INCOME	ALAMEDA COUNTY	CONTRA COSTA COUNTY	SAN FRANCISCO COUNTY	SAN MATEO COUNTY	SANTA CLARA COUNTY	SOLANO COUNTY	SONOMA COUNTY	MARIN AND NAPA COUNTIES
Under \$25,000	10.1%	9.2%	12.6%	6.7%	7.5%	10.3%	8.6%	7.9%
\$25,000-\$49,999	9.9%	9.2%	10.3%	8.6%	8.1%	13.0%	13.6%	9.1%
\$50,000-\$74,999	11.2%	12.2%	9.2%	8.8%	8.1%	13.2%	13.6%	11.8%
\$75,000-\$99,999	9.3%	10.0%	8.5%	8.5%	8.3%	11.7%	11.3%	9.2%
\$100,000-\$199,999	24.3%	27.8%	19.5%	21.8%	22.5%	29.6%	29.1%	23.1%
\$200,000 or more	26.5%	23.7%	29.1%	34.9%	33.3%	15.7%	19.2%	30.0%
Prefer not to answer	8.7%	8.0%	10.8%	10.7%	12.3%	6.4%	4.4%	8.9%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Unweighted Total</b>	<b>1,853.00</b>	<b>966.00</b>	<b>2,585.00</b>	<b>417.00</b>	<b>1,333.00</b>	<b>497.00</b>	<b>316.00</b>	<b>291.00</b>
<b>Weighted Total</b>	<b>616,302.00</b>	<b>419,191.00</b>	<b>368,364.00</b>	<b>276,974.00</b>	<b>681,666.00</b>	<b>163,015.00</b>	<b>194,058.00</b>	<b>157,172.00</b>

**TABLE 13. WEIGHTED DISTRIBUTION OF HOUSEHOLDS BY NUMBER OF VEHICLES OWNED BY COUNTY**

HH VEHICLES	ALAMEDA COUNTY	CONTRA COSTA COUNTY	SAN FRANCISCO COUNTY	SAN MATEO COUNTY	SANTA CLARA COUNTY	SOLANO COUNTY	SONOMA COUNTY	MARIN AND NAPA COUNTIES
0 Vehicles	11.1%	4.9%	31.0%	4.8%	5.6%	5.1%	4.3%	3.9%
1 vehicle	33.0%	30.0%	45.5%	30.1%	29.9%	26.7%	25.7%	31.2%
2 vehicles	38.7%	40.2%	17.6%	46.5%	46.0%	36.6%	49.1%	44.4%
3 vehicles	12.4%	18.4%	4.7%	15.1%	11.8%	26.0%	12.7%	11.9%
4 vehicles	3.0%	5.0%	1.1%	2.4%	6.3%	3.9%	4.5%	8.3%
5 or more vehicles	1.8%	1.5%	0.0%	1.2%	0.4%	1.6%	3.7%	0.2%
<b>Total</b>	<b>100.00%</b>	<b>99.99%</b>	<b>100.00%</b>	<b>100.01%</b>	<b>99.99%</b>	<b>100.00%</b>	<b>100.01%</b>	<b>100.00%</b>
<b>Unweighted Total</b>	<b>1,853.00</b>	<b>966.00</b>	<b>2,585.00</b>	<b>417.00</b>	<b>1,333.00</b>	<b>497.00</b>	<b>316.00</b>	<b>291.00</b>
<b>Weighted Total</b>	<b>616,302.00</b>	<b>419,191.00</b>	<b>368,364.00</b>	<b>276,974.00</b>	<b>681,666.00</b>	<b>163,015.00</b>	<b>194,058.00</b>	<b>157,172.00</b>

### Person Characteristics

This section provides estimates of common person-level characteristics with both unweighted and weighted counts and percentages for age, gender, race, and ethnicity in Table 14 and through Table 20. The weighting validation report shows how well the weighted results fit to the same set of variables for each sampling area. These tables utilize imputed results for records where there was a missing response. Imputation was done using a probabilistic assignment of the characteristic pegged to the composition of the census region where the person and household reside.

**TABLE 14. WEIGHTED AND UNWEIGHTED COUNTS AND SHARES OF DISTRIBUTION OF AGE**

AGE	UNWEIGHTED COUNT	UNWEIGHTED PERCENT	WEIGHTED ESTIMATE	WEIGHTED PERCENT
0 to 4	580	3.6%	350,568	4.8%
5 to 15	1,260	7.9%	889,107	12.1%
16 to 17	220	1.4%	182,244	2.5%
18 to 24	785	4.9%	500,904	6.8%
25 to 44	5,991	37.5%	2,189,701	29.9%
45 to 64	4,182	26.2%	1,925,257	26.3%
65 and over	2,967	18.6%	1,289,118	17.6%
<b>Total</b>	<b>15,985</b>	<b>100.0%</b>	<b>7,326,899</b>	<b>100.0%</b>

**TABLE 15. WEIGHTED AND UNWEIGHTED COUNTS AND SHARES OF DISTRIBUTION OF RACE**

RACE	UNWEIGHTED COUNT	UNWEIGHTED PERCENT	WEIGHTED ESTIMATE	WEIGHTED PERCENT
African American or Black	722	4.5%	395,229	5.4%
Asian or Pacific Islander	5,401	33.8%	2,289,823	31.2%
Other	2,076	13.0%	1,907,698	26.0%
White	7,786	48.7%	2,734,147	37.3%
<b>Total</b>	<b>15,985</b>	<b>100.0%</b>	<b>7,326,897</b>	<b>100.0%</b>

**TABLE 16. WEIGHTED AND UNWEIGHTED COUNTS AND SHARES OF DISTRIBUTION OF ETHNICITY**

ETHNICITY	UNWEIGHTED COUNT	UNWEIGHTED PERCENT	WEIGHTED ESTIMATE	WEIGHTED PERCENT
Hispanic	2,130	13.3%	1,782,214	24.3%
Not Hispanic	13,855	86.7%	5,544,685	75.7%
<b>Total</b>	<b>15,985</b>	<b>100.0%</b>	<b>7,326,899</b>	<b>100.0%</b>

**TABLE 17. WEIGHTED AND UNWEIGHTED COUNTS AND SHARES OF DISTRIBUTION OF GENDER**

GENDER	UNWEIGHTED COUNT	UNWEIGHTED PERCENT	WEIGHTED ESTIMATE	WEIGHTED PERCENT
Female	7,435	48.9%	3,554,157	48.5%
Male	7,004	46.0%	3,481,008	47.5%
Non-binary	174	1.1%	49,774	0.7%
Other/prefer to self-describe	31	0.2%	25,516	0.3%
Prefer not to answer	566	3.7%	216,443	3.0%
<b>Total</b>	<b>15,210</b>	<b>100.0%</b>	<b>7,326,898</b>	<b>100.0%</b>

**TABLE 18. WEIGHTED AND UNWEIGHTED COUNTS AND SHARES OF DISTRIBUTION OF EMPLOYMENT STATUS**

EMPLOYMENT STATUS	UNWEIGHTED COUNT	UNWEIGHTED PERCENT	WEIGHTED ESTIMATE	WEIGHTED PERCENT
Employed full-time (paid)	7,252	51.3%	2,991,472	49.1%
Employed part-time (paid)	1,122	7.9%	820,473	13.5%
Self-employed	919	6.5%	166,471	2.7%
Not employed and not looking for work (e.g., retired, stay-at-home parent, student)	3,805	26.9%	1,673,808	27.5%
Unemployed and looking for work	751	5.3%	276,785	4.5%
Unpaid volunteer or intern	148	1.0%	91,121	1.5%
Employed, but not currently working (e.g., on leave, furloughed 100%)	148	1.0%	67,095	1.1%
<b>Total</b>	<b>14,145</b>	<b>100.0%</b>	<b>6,087,225</b>	<b>100.0%</b>

**TABLE 19. WEIGHTED DISTRIBUTION OF AGE BY COUNTY/SAMPLE AREA**

AGE GROUP	ALAMEDA COUNTY	CONTRA COSTA COUNTY	SAN FRANCISCO COUNTY	SAN MATEO COUNTY	SANTA CLARA COUNTY	SOLANO COUNTY	SONOMA COUNTY	MARIN AND NAPA COUNTIES
0 to 4	5.2%	5.1%	3.7%	4.8%	5.0%	5.3%	3.5%	4.2%
5 to 15	12.2%	14.0%	7.6%	11.9%	12.6%	13.1%	12.0%	12.6%
16 to 17	2.6%	2.8%	1.8%	2.6%	2.5%	2.6%	2.5%	2.4%
18 to 24	6.7%	7.3%	5.7%	6.5%	7.4%	7.5%	6.9%	5.8%
25 to 44	31.9%	25.6%	37.0%	28.6%	31.1%	28.2%	26.8%	22.0%
45 to 64	25.4%	27.6%	25.7%	27.6%	26.2%	24.8%	24.2%	29.7%
65 and over	16.1%	17.6%	18.6%	18.0%	15.3%	18.4%	24.1%	23.3%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Unweighted Total</b>	<b>3,776.00</b>	<b>1,968.00</b>	<b>4,504.00</b>	<b>859.00</b>	<b>2,765.00</b>	<b>998.00</b>	<b>587.00</b>	<b>528.00</b>
<b>Weighted Total</b>	<b>1,581,750.00</b>	<b>1,140,618.00</b>	<b>777,523.00</b>	<b>710,959.00</b>	<b>1,835,368.00</b>	<b>437,859.00</b>	<b>469,097.00</b>	<b>373,719.00</b>

**TABLE 20. WEIGHTED DISTRIBUTION OF EMPLOYMENT STATUS BY COUNTY**

EMPLOYMENT	ALAMEDA COUNTY	CONTRA COSTA COUNTY	SAN FRANCISCO COUNTY	SAN MATEO COUNTY	SANTA CLARA COUNTY	SOLANO COUNTY	SONOMA COUNTY	MARIN AND NAPA COUNTIES
Employed full-time (paid)	50.4%	45.0%	53.3%	50.8%	53.2%	44.4%	40.7%	40.2%
Employed part-time (paid)	13.0%	14.5%	11.9%	12.3%	12.8%	14.3%	17.5%	15.3%
Self-employed	1.9%	4.2%	2.5%	3.1%	1.3%	2.8%	5.0%	5.5%
Not employed and not looking for work (e.g., retired, stay-at-home parent, student)	27.1%	30.7%	24.3%	25.3%	25.9%	29.4%	31.7%	31.0%
Unemployed and looking for work	5.5%	3.5%	4.6%	4.2%	5.0%	4.6%	1.9%	4.9%
Unpaid volunteer or intern	0.7%	1.3%	2.5%	3.1%	0.7%	1.3%	2.9%	2.1%
Employed, but not currently working (e.g., on leave, furloughed 100%)	1.4%	0.6%	0.8%	1.0%	1.0%	3.3%	0.3%	0.8%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Unweighted Total</b>	<b>3,242.00</b>	<b>1,692.00</b>	<b>4,152.00</b>	<b>745.00</b>	<b>2,440.00</b>	<b>866.00</b>	<b>530.00</b>	<b>478.00</b>
<b>Weighted Total</b>	<b>1,306,693.00</b>	<b>922,505.00</b>	<b>689,506.00</b>	<b>591,799.00</b>	<b>1,512,488.00</b>	<b>357,262.00</b>	<b>396,122.00</b>	<b>310,843.00</b>

## Trip Analysis

The estimates presented in the following trip analysis section are developed using unlinked trips (e.g., trips where each leg is reported separately such that travel from home to the first transit station is regarded as a single trip versus linked trips where all transit trips would be collapsed as part of the larger trip to work or school, etc.) from Tuesday, Wednesday, and Thursday travel, and can be interpreted as representing an average weekday of travel. Unlinked trips will include any instance where a transit rider changed from one mode to another as a separate trip. This effectively increases the trip rates of transit using households and persons.

**TABLE 21. WEIGHTED AND UNWEIGHTED TRIPS BY DAY OF WEEK WITH UNWEIGHTED AND WEIGHTED TRIP RATES**

TRAVEL_DOW	UNWEIGHTED DAYS	UNWEIGHTED TRIPS	WEIGHTED DAYS	WEIGHTED TRIPS	UNWEIGHTED TRIP RATE	WEIGHTED TRIP RATE
Monday	12,317	45,943	0	0	3.73	
Tuesday	13,352	54,256	2,585,889	10,500,544	4.06	4.06
Wednesday	13,309	54,385	2,285,914	9,153,244	4.09	4.00
Thursday	13,183	54,764	2,455,095	9,919,995	4.15	4.04
Friday	12,317	55,732	0	0	4.52	
Saturday	12,317	54,870	0	0	4.45	
Sunday	12,317	45,880	0	0	3.72	
<b>Total</b>	<b>89,112</b>	<b>365,830</b>	<b>7,326,898</b>	<b>29,573,783</b>	<b>4.11</b>	<b>4.04</b>

Table 22 shows the trip rates before and after weighting for households by income bin. The largest change resulting from the weighting is observable in households earning \$200,000 per year or more, with weighting adding .17 trips to the average for the overall average of this population segment. The variation in person trip rates between income groupings is minor with a range of 3.84 up to 4.36 trips per day. Note that when interpreting the data in this table, readers should be mindful of the fact that the data includes unlinked trips where each leg of the trip is reported separately. This could mean that transit using households have higher overall trip rates than they would when transit trips are linked. Generally, populations in lower income groups tend to be transit dependent so inflation of trip rates may be higher in lower income bands. MTC is currently developing a linked trip dataset which will be useful for understanding this dynamic more clearly. Table 23 shows a similar breakdown with mode of the trip, showing that weighting reduced the share of walk trips by about 0.4 person trips while boosting car trip rates by 0.4 person trips.

**TABLE 22. UNWEIGHTED AND WEIGHTED PERSON TRIP RATE BY HOUSEHOLD INCOME**

INCOME	UNWEIGHTED DAYS	UNWEIGHTED TRIPS	WEIGHTED DAYS	WEIGHTED TRIPS	UNWEIGHTED TRIP RATE	WEIGHTED TRIP RATE
Under \$25,000	5,373	22,171	521,344	2,149,752	4.13	4.12
\$25,000-\$49,999	5,695	23,700	586,528	2,525,482	4.16	4.31
\$50,000-\$74,999	6,858	30,178	692,178	3,018,505	4.40	4.36
\$75,000-\$99,999	8,424	34,578	643,874	2,639,683	4.10	4.10
\$100,000-\$199,999	26,426	109,936	1,781,550	7,174,995	4.16	4.03
\$200,000 or more	27,884	113,710	2,359,038	9,218,204	4.08	3.91
Prefer not to answer	8,452	31,557	742,386	2,847,163	3.73	3.84
<b>Total</b>	<b>89,112</b>	<b>365,830</b>	<b>7,326,898</b>	<b>29,573,784</b>	<b>4.11</b>	<b>4.04</b>

**TABLE 23. UNWEIGHTED AND WEIGHTED PERSON TRIP RATE BY TRIP MODE**

MODE TYPE	UNWEIGHTED DAYS	UNWEIGHTED TRIPS	WEIGHTED DAYS	WEIGHTED TRIPS	UNWEIGHTED TRIP RATE	WEIGHTED TRIP RATE
Walk	89,112	100,866	7,326,898	5,723,068	1.13	0.78
Bike	89,112	9,217	7,326,898	444,254	0.10	0.06
Bikeshare	89,112	630	7,326,898	26,438	0.01	0.00
Scotershare	89,112	262	7,326,898	20,451	0.00	0.00
Taxi	89,112	281	7,326,898	23,802	0.00	0.00
TNC	89,112	3,878	7,326,898	302,460	0.04	0.04
Other	89,112	1,853	7,326,898	189,312	0.02	0.03
Car	89,112	217,273	7,326,898	21,090,880	2.44	2.88
Carshare	89,112	376	7,326,898	32,661	0.00	0.00
School bus	89,112	49	7,326,898	19,367	0.00	0.00
Shuttle/vanpool	89,112	1,425	7,326,898	102,599	0.02	0.01
Ferry	89,112	338	7,326,898	28,082	0.00	0.00
Transit	89,112	20,004	7,326,898	1,217,713	0.22	0.17
Long distance passenger	89,112	892	7,326,898	43,140	0.01	0.01
Missing Response	89,112	8,486	7,326,898	309,558	0.10	0.04
<b>Total</b>	<b>89,112</b>	<b>365,830</b>	<b>7,326,898</b>	<b>29,573,785</b>	<b>4.11</b>	<b>4.04</b>

The majority of trip rates in Table 24 remained steady following adjustments in the weighting with only minor increases in work, work-related, and school trips, but a substantive increase in escort trips. This is attributable to the fact that the weighting procedure attempts to adjust day-patterns based on trip rates observed in app-based data collection that often go unreported in other survey modes. Note again that this data includes 2.6 million trips currently assigned to 'Change mode' which will eventually be linked to the ultimate purpose at the destination (e.g., work, school, social recreational, home, etc.). Also note that there are two categories in the trip purpose results for work including 'Work' and 'Work related' separately. For this report, the categories have been combined. Whereas the former is used when a person goes to their office and works, the latter is used anytime a person works offsite (telecommuting from a co-working space) or works in a profession which provides services at a variety of locations during the course of a day (plumbers, real estate agents, delivery drivers, cleaning services, etc.).

**TABLE 24. WEIGHTED AND UNWEIGHTED PERSON TRIP RATE BY TRIP PURPOSE (SOME DATA WAS IMPUTED FOR THESE DESTINATION PURPOSES)**

DESTINATION PURPOSE CATEGORY	UNWEIGHTED DAYS	UNWEIGHTED TRIPS	WEIGHTED DAYS	WEIGHTED TRIPS	UNWEIGHTED TRIP RATE	WEIGHTED TRIP RATE
Not imputable	89,112	3,278	7,326,898	8,186	0.04	0.00
Home	89,112	98,917	7,326,898	8,559,436	1.11	1.17
Work or work related	89,112	34,407	7,326,898	3,829,924	0.39	0.52
School	89,112	3,130	7,326,898	698,021	0.04	0.10
School related	89,112	2,168	7,326,898	281,908	0.02	0.04
Escort	89,112	25,855	7,326,898	3,362,837	0.29	0.46
Shop	89,112	39,514	7,326,898	2,731,580	0.44	0.37
Meal	89,112	31,778	7,326,898	2,074,405	0.36	0.28
Social or recreational	89,112	51,150	7,326,898	2,793,892	0.57	0.38
Errand	89,112	17,369	7,326,898	1,489,069	0.19	0.20
Change mode	89,112	42,003	7,326,898	2,602,724	0.47	0.36
Overnight	89,112	14,446	7,326,898	882,629	0.16	0.12
Other	89,112	1,815	7,326,898	259,171	0.02	0.04
<b>Total</b>	<b>89,112</b>	<b>365,830</b>	<b>7,326,898</b>	<b>29,573,782</b>	<b>4.11</b>	<b>4.04</b>

Table 25 and Table 26 show trip durations binned and crossed with trip mode and trip purpose whereas Table 27 and Table 28 show trip distances binned and crossed with trip mode and trip purpose.

**TABLE 25. WEIGHTED SHARE OF TRIPS BY TRIP DURATION GROUPED BY TRAVEL MODE**

DURATION	WALK	SCHOOL BUS	SHUTTLE/ VANPOOL	FERRY	TRANSIT	LONG DISTANCE PASSENGER	BIKE	BIKESHARE	SCOOTER- SHARE	TAXI	TNC	OTHER	CAR	CARSHARE
< 1 minute	6.4%		0.2%	0.1%	0.5%	1.5%	3.6%	0.7%	1.1%	1.7%	0.3%	2.2%	1.3%	0.5%
1-5 minutes	17.4%		1.8%	0.2%	4.5%	4.0%	15.6%	10.7%	24.6%	1.4%	2.1%	24.5%	10.9%	2.7%
5-10 minutes	26.7%	1.3%	4.5%	0.2%	10.4%	5.3%	22.9%	27.8%	33.8%	13.2%	13.1%	24.2%	24.2%	3.2%
10-15 minutes	19.2%	1.6%	4.8%	1.0%	11.7%	4.5%	16.8%	12.8%	17.3%	5.2%	16.7%	9.4%	20.1%	3.9%
15-20 minutes	10.3%	24.9%	16.9%	18.8%	11.1%	0.7%	11.7%	13.2%	15.2%	18.9%	11.6%	15.3%	13.6%	18.6%
>= 20 minutes	20.0%	72.2%	71.9%	79.7%	61.7%	84.1%	29.4%	34.9%	8.1%	59.6%	56.3%	24.3%	29.9%	71.1%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Unweighted Total</b>	<b>90,526</b>	<b>49</b>	<b>1,425</b>	<b>338</b>	<b>20,004</b>	<b>892</b>	<b>8,969</b>	<b>630</b>	<b>158</b>	<b>281</b>	<b>3,778</b>	<b>1,693</b>	<b>216,516</b>	<b>376</b>
<b>Weighted Total</b>	<b>4,685,411</b>	<b>19,366</b>	<b>102,598</b>	<b>28,082</b>	<b>1,217,712</b>	<b>43,139</b>	<b>435,038</b>	<b>26,437</b>	<b>4,791</b>	<b>23,802</b>	<b>273,824</b>	<b>184,336</b>	<b>21,017,923</b>	<b>32,660</b>

**TABLE 26. WEIGHTED SHARE OF TRIPS BY TRIP DURATION GROUPED BY DESTINATION PURPOSE**

DURATION IN MINUTES	HOME	ERRAND	CHANGE MODE	OVERNIGHT	OTHER	WORK	WORK RELATED	SCHOOL	SCHOOL RELATED	ESCORT	SHOP	MEAL	SOCIAL OR RECREATIONAL
< 1 minute	1.6%	1.7%	3.2%	2.7%	1.8%	2.1%	2.9%	0.3%	9.2%	0.9%	2.5%	4.2%	3.4%
1-5 minutes	10.8%	11.4%	12.9%	11.6%	9.7%	8.1%	12.4%	8.2%	8.7%	13.8%	14.5%	16.1%	10.8%
5-10 minutes	24.9%	24.2%	16.0%	21.5%	15.0%	18.0%	17.3%	26.3%	27.9%	27.1%	27.5%	29.1%	22.0%
10-15 minutes	20.1%	19.1%	12.6%	21.2%	10.3%	14.3%	16.2%	27.3%	26.2%	22.5%	21.3%	18.9%	17.8%
15-20 minutes	14.0%	15.4%	9.4%	11.1%	8.9%	13.9%	11.3%	12.0%	12.7%	12.6%	11.4%	12.1%	14.7%
>= 20 minutes	28.5%	28.3%	45.9%	32.0%	54.3%	43.6%	39.8%	25.9%	15.3%	23.1%	22.8%	19.6%	31.3%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Unweighted Total</b>	<b>97,022.00</b>	<b>17,106.00</b>	<b>35,585.00</b>	<b>14,269.00</b>	<b>1,779.00</b>	<b>14,916.00</b>	<b>18,291.00</b>	<b>3,009.00</b>	<b>2,117.00</b>	<b>25,744.00</b>	<b>39,186.00</b>	<b>31,385.00</b>	<b>50,435.00</b>
<b>Weighted Total</b>	<b>8,361,534.00</b>	<b>1,468,242.00</b>	<b>2,011,316.00</b>	<b>845,056.00</b>	<b>241,779.00</b>	<b>1,774,282.00</b>	<b>1,918,687.00</b>	<b>648,280.00</b>	<b>277,806.00</b>	<b>3,343,145.00</b>	<b>2,692,010.00</b>	<b>2,057,669.00</b>	<b>2,756,686.00</b>

**TABLE 27. WEIGHTED SHARE OF TRIPS BY TRIP DISTANCE GROUPED BY TRAVEL MODE**

DISTANCE IN MILES	WALK	SCHOOL BUS	SHUTTLE /VANPOOL	FERRY	TRANSIT	LONG DISTANCE PASSENGER	BIKE	BIKESHARE	SCOOTER-SHARE	TAXI	TNC	OTHER	CAR	CARSHARE
< 1 mile	85.5%	16.9%	6.4%	0.8%	13.9%	0.6%	40.1%	25.8%	54.7%	14.8%	7.0%	46.7%	18.0%	14.6%
1-2 miles	9.0%	10.3%	7.0%	0.3%	18.9%	0.0%	20.7%	35.7%	29.8%	20.7%	9.6%	16.3%	19.9%	9.1%
2-4 miles	3.3%	39.0%	13.2%	0.4%	21.0%	0.4%	21.8%	26.7%	12.7%	24.9%	27.5%	21.8%	23.2%	1.4%
4-6 miles	0.9%	7.6%	5.3%	18.1%	11.1%	0.3%	5.8%	11.2%	1.4%	1.8%	14.9%	3.7%	10.9%	4.5%
6-8 miles	0.5%	2.3%	2.5%	2.4%	5.6%	0.1%	6.1%	0.1%	0.9%	0.1%	6.8%	1.6%	7.2%	2.9%
8-10 miles	0.2%	10.7%	9.7%	3.0%	4.6%	0.3%	2.5%	0.0%		1.0%	3.7%	2.8%	4.2%	1.5%
10-12 miles	0.2%	3.9%	18.5%	0.9%	3.3%	0.6%	0.4%	0.1%		0.0%	3.4%	1.2%	3.1%	2.2%
12-14 miles	0.0%		1.2%	57.1%	2.6%	0.0%	0.3%			12.0%	4.4%	1.5%	1.9%	0.9%
14-16 miles	0.0%	2.7%	1.6%	0.2%	2.3%	0.0%	0.3%			1.0%	1.8%	2.5%	1.8%	0.5%
16-18 miles	0.1%		1.1%	0.7%	2.1%		1.7%			0.0%	0.7%	0.0%	1.3%	0.2%
18-20 miles	0.0%		1.0%	0.9%	1.2%	0.2%	0.0%	0.2%		0.7%	4.4%	0.2%	1.1%	0.6%
>= 20 miles	0.3%	6.5%	32.7%	15.2%	13.4%	97.5%	0.2%	0.1%	0.6%	23.0%	15.8%	1.7%	7.5%	61.7%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Unweighted Total</b>	<b>90,526</b>	<b>49</b>	<b>1,425</b>	<b>338</b>	<b>20,004</b>	<b>892</b>	<b>8,969</b>	<b>630</b>	<b>158</b>	<b>281</b>	<b>3,778</b>	<b>1,693</b>	<b>216,516</b>	<b>376</b>
<b>Weighted Total</b>	<b>4,685,411</b>	<b>19,366</b>	<b>102,598</b>	<b>28,082</b>	<b>1,217,712</b>	<b>43,139</b>	<b>435,038</b>	<b>26,437</b>	<b>4,791</b>	<b>23,802</b>	<b>273,824</b>	<b>184,336</b>	<b>21,017,923</b>	<b>32,660</b>

**TABLE 28. WEIGHTED SHARE OF TRIPS BY TRIP DISTANCE GROUPED BY DESTINATION PURPOSE**

DISTANCE IN MILES	HOME	ERRAND	CHANGE MODE	OVERNIGHT	OTHER	WORK	WORK RELATED	SCHOOL	SCHOOL RELATED	ESCORT	SHOP	MEAL	SOCIAL OR RECREATIONAL
< 1 mile	26.0%	24.3%	36.3%	21.2%	33.3%	24.2%	27.1%	28.5%	46.1%	21.4%	35.4%	38.9%	43.2%
1-2 miles	18.6%	17.7%	14.2%	18.0%	12.9%	10.7%	11.5%	20.5%	16.1%	21.4%	20.2%	21.8%	17.0%
2-4 miles	22.0%	19.4%	14.9%	21.4%	15.3%	12.8%	14.0%	26.7%	19.3%	26.1%	19.6%	17.8%	15.6%
4-6 miles	9.7%	12.6%	8.0%	9.9%	7.5%	11.3%	8.7%	7.7%	4.8%	10.5%	7.8%	6.4%	7.1%
6-8 miles	6.7%	7.8%	4.0%	5.4%	11.0%	6.9%	6.7%	5.2%	2.2%	5.4%	5.1%	4.2%	4.9%
8-10 miles	3.4%	4.8%	3.3%	3.6%	1.5%	4.6%	5.2%	4.6%	3.9%	3.6%	2.3%	2.1%	2.9%
10-12 miles	3.0%	3.3%	2.3%	2.3%	1.1%	6.2%	4.2%	1.3%	1.4%	1.9%	1.9%	1.0%	1.3%
12-14 miles	1.4%	1.7%	2.6%	1.9%	1.3%	3.6%	2.7%	0.9%	0.3%	1.4%	1.5%	0.6%	1.1%
14-16 miles	1.4%	1.9%	1.6%	1.8%	0.0%	2.0%	2.7%	1.0%	1.9%	1.3%	1.3%	0.8%	1.1%
16-18 miles	1.0%	0.4%	1.4%	1.7%	0.5%	2.0%	2.6%	0.9%	0.0%	0.8%	0.8%	0.6%	0.8%
18-20 miles	0.7%	1.0%	0.9%	1.9%	0.8%	2.1%	2.2%	0.0%	0.8%	0.5%	0.6%	1.1%	0.8%
>= 20 miles	6.0%	5.1%	10.5%	10.7%	14.8%	13.4%	12.4%	2.5%	3.1%	5.8%	3.4%	4.8%	4.1%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Unweighted Total</b>	<b>97,022.00</b>	<b>17,106.00</b>	<b>35,585.00</b>	<b>14,269.00</b>	<b>1,779.00</b>	<b>14,916.00</b>	<b>18,291.00</b>	<b>3,009.00</b>	<b>2,117.00</b>	<b>25,744.00</b>	<b>39,186.00</b>	<b>31,385.00</b>	<b>50,435.00</b>
<b>Weighted Total</b>	<b>8,361,534.00</b>	<b>1,468,242.00</b>	<b>2,011,316.00</b>	<b>845,056.00</b>	<b>241,779.00</b>	<b>1,774,282.00</b>	<b>1,918,687.00</b>	<b>648,280.00</b>	<b>277,806.00</b>	<b>3,343,145.00</b>	<b>2,692,010.00</b>	<b>2,057,669.00</b>	<b>2,756,686.00</b>

Table 29 displays the weighted share of trips by employment status, grouped by time-of-day. For the five time-of-day categories in this table and throughout this report:

- 'AM Peak' refers to the hours of 6:00 AM to 8:59 AM,
- 'Midday' refers to 9:00 AM through 2:59 PM,
- 'PM Peak' refers to 3:00 PM through 5:59 PM,
- 'Evening' refers to 6:00 PM through 7:59 PM, and
- 'Night' refers to 8:00 PM through the next morning at 5:59 AM.

The largest number of trips in the region are made by full-time employed people during midday between the hours of 9:00 AM and 2:59 PM with approximately 3.9 million trips (54,000 unweighted trips).

**TABLE 29. WEIGHTED SHARE OF TRIPS BY EMPLOYMENT STATUS GROUPED BY TIME-OF-DAY**

EMPLOYMENT STATUS	AM PEAK	MIDDAY	PM PEAK	EVENING	NIGHT
Employed full-time (paid)	61.7%	39.4%	55.5%	66.7%	60.4%
Employed part-time (paid)	13.2%	16.9%	15.2%	11.9%	14.5%
Self-employed	2.1%	3.9%	2.2%	2.8%	2.9%
Not employed and not looking for work (e.g., retired, stay-at-home parent, student)	17.8%	31.2%	20.2%	12.8%	14.7%
Unemployed and looking for work	2.8%	5.1%	4.0%	4.0%	5.0%
Unpaid volunteer or intern	1.2%	2.3%	1.7%	0.8%	1.0%
Employed, but not currently working (e.g., on leave, furloughed 100%)	1.2%	1.2%	1.1%	1.0%	1.5%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
Unweighted Total	<b>44,204.00</b>	<b>141,481.00</b>	<b>86,961.00</b>	<b>37,999.00</b>	<b>31,061.00</b>
Weighted Total	<b>4,666,497.00</b>	<b>10,053,724.00</b>	<b>6,655,304.00</b>	<b>2,829,139.00</b>	<b>2,401,230.00</b>

**TABLE 30. WEIGHTED SHARE OF TRIPS BY INCOME BIN GROUPED BY TIME-OF-DAY**

<b>INCOME</b>	<b>AM PEAK</b>	<b>MIDDAY</b>	<b>PM PEAK</b>	<b>EVENING</b>	<b>NIGHT</b>
Under \$25,000	5.7%	8.6%	6.1%	7.0%	9.0%
\$25,000-\$49,999	7.3%	10.1%	7.3%	6.7%	10.9%
\$50,000-\$74,999	10.1%	11.5%	9.1%	9.8%	8.8%
\$75,000-\$99,999	9.3%	9.6%	8.2%	7.9%	8.7%
\$100,000-\$199,999	24.1%	23.1%	25.0%	26.2%	24.9%
\$200,000 or more	33.3%	27.0%	34.0%	35.7%	29.8%
Prefer not to answer	10.3%	10.1%	10.2%	6.7%	8.0%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Unweighted Total</b>	<b>48,756.00</b>	<b>149,592.00</b>	<b>94,454.00</b>	<b>40,850.00</b>	<b>32,178.00</b>
<b>Weighted Total</b>	<b>5,557,601.00</b>	<b>10,676,244.00</b>	<b>7,604,722.00</b>	<b>3,195,561.00</b>	<b>2,539,653.00</b>

**TABLE 31. WEIGHTED AND UNWEIGHTED PERSON TRIP RATES BY MANAGED LANE USE**

MANAGED_LANE_USE	UNWEIGHTED DAYS	UNWEIGHTED TRIPS	WEIGHTED DAYS	WEIGHTED TRIPS	UNWEIGHTED TRIP RATE	WEIGHTED TRIP RATE
Yes	89,112	2,265	7,326,898	238,325	0.03	0.03
No	89,112	135,468	7,326,898	12,728,084	1.52	1.74
Missing Response	89,112	228,097	7,326,898	16,607,375	2.56	2.27
<b>Total</b>	<b>89,112</b>	<b>365,830</b>	<b>7,326,898</b>	<b>29,573,784</b>	<b>4.11</b>	<b>4.04</b>

### Trip Purpose Analysis

This section presents estimates of trip purpose by home county and by income. The distributions are largely consistent, though San Francisco County shows the largest share of trips where the purpose is to switch to a different mode (~25%). This county also has the lowest estimated share of trips made for the purpose of escorting another person (6.5% versus generally more than 10% in other parts of the region).

**TABLE 32. WEIGHTED SHARE OF TRIPS BY DESTINATION TRIP PURPOSE GROUPED BY HOME COUNTY**

DESTINATION PURPOSE	ALAMEDA COUNTY	CONTRA COSTA COUNTY	SAN FRANCISCO COUNTY	SAN MATEO COUNTY	SANTA CLARA COUNTY	SOLANO COUNTY	SONOMA COUNTY	MARIN AND NAPA COUNTIES
Home	29.4%	28.3%	24.5%	28.4%	32.1%	28.0%	27.5%	29.3%
Errand	4.6%	5.9%	4.0%	5.2%	4.9%	5.6%	5.9%	5.2%
Change mode	8.3%	6.8%	24.6%	9.1%	5.0%	6.3%	4.0%	6.2%
Overnight	2.6%	4.1%	2.7%	2.7%	2.4%	2.3%	3.4%	4.8%
Other	0.6%	1.2%	0.8%	1.2%	0.6%	0.9%	0.7%	1.8%
Work	6.1%	6.3%	5.6%	5.3%	7.5%	6.7%	6.2%	5.6%
Work related	6.1%	6.1%	4.8%	7.9%	5.8%	9.2%	10.6%	7.0%
School	2.5%	2.1%	1.9%	2.9%	2.6%	2.1%	1.5%	2.9%
School related	1.0%	1.1%	0.5%	0.8%	1.3%	0.6%	0.8%	0.6%
Escort	13.0%	13.0%	6.8%	11.5%	11.6%	10.0%	10.9%	11.3%
Shop	9.4%	9.8%	7.1%	8.6%	9.8%	11.8%	8.3%	8.7%
Meal	6.8%	7.2%	6.2%	7.6%	6.6%	7.5%	8.4%	7.6%
Social or recreational	9.3%	7.9%	10.5%	8.8%	9.8%	8.9%	12.0%	9.2%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Unweighted Total</b>	<b>85,651.00</b>	<b>41,529.00</b>	<b>114,163.00</b>	<b>18,459.00</b>	<b>56,954.00</b>	<b>20,822.00</b>	<b>12,865.00</b>	<b>12,109.00</b>
<b>Weighted Total</b>	<b>6,337,816.00</b>	<b>4,510,653.00</b>	<b>3,508,274.00</b>	<b>2,971,307.00</b>	<b>6,775,089.00</b>	<b>1,875,865.00</b>	<b>2,043,150.00</b>	<b>1,543,439.00</b>

**TABLE 33. WEIGHTED SHARE OF TRIPS BY DESTINATION TRIP PURPOSE GROUPED BY HOUSEHOLD INCOME**

DESTINATION PURPOSE	UNDER \$25,000	\$25,000-\$49,999	\$50,000-\$74,999	\$75,000-\$99,999	\$100,000-\$199,999	\$200,000 OR MORE	PREFER NOT TO ANSWER
Home	24.6%	25.5%	24.2%	30.5%	29.7%	31.3%	29.4%
Errand	5.6%	5.3%	4.9%	5.5%	4.8%	4.9%	5.2%
Change mode	20.3%	16.8%	11.6%	5.0%	6.7%	5.8%	8.7%
Overnight	3.7%	2.2%	2.2%	2.9%	3.4%	3.0%	2.7%
Other	0.9%	1.5%	0.9%	1.4%	0.7%	0.8%	0.3%
Work	3.6%	5.7%	6.6%	6.0%	7.8%	5.8%	7.0%
Work related	3.1%	6.5%	9.8%	4.9%	7.0%	6.2%	7.8%
School	2.0%	1.8%	3.0%	2.8%	2.0%	2.5%	2.4%
School related	2.4%	0.5%	1.0%	0.6%	1.1%	0.9%	0.3%
Escort	7.9%	6.1%	11.6%	12.0%	10.4%	13.3%	13.8%
Shop	11.6%	9.7%	10.4%	11.6%	9.4%	7.4%	9.2%
Meal	8.1%	8.0%	5.7%	7.2%	7.7%	7.0%	4.9%
Social or recreational	6.0%	10.5%	8.0%	9.6%	9.3%	10.9%	8.1%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Unweighted Total</b>	<b>21,564.00</b>	<b>23,304.00</b>	<b>29,915.00</b>	<b>34,195.00</b>	<b>109,141.00</b>	<b>113,085.00</b>	<b>31,348.00</b>
<b>Weighted Total</b>	<b>2,149,722.00</b>	<b>2,525,080.00</b>	<b>3,018,191.00</b>	<b>2,639,413.00</b>	<b>7,170,492.00</b>	<b>9,215,735.00</b>	<b>2,846,961.00</b>

### Trip Mode Analysis

This section examines trip modes. Table 34 shows that trips made by walking account for between 17% and 22% of all trips regardless of the time of day, with car trips representing nearly all the remaining mode share with roughly 70% of trips regardless of the time of day. All other modes account for about 10% of trips throughout the day. Transit modes represent approximately 4-5% of trips throughout the day. Table 35 presents the estimated shares of the combinations of mode and destination purpose. Note that empty cells indicate no estimate could be generated due to too few samples, whereas a cell containing 0.0% indicates a very small share

has been estimated, such that it does not round up to a tenth of a percent. Similarly, Table 36 presents mode shares by home county. San Francisco County has the highest shares of transit and walk modes in the region, and the lowest shares of car mode-based trips. Table 37 shows travel mode grouped by income and reveals that households earning under \$25,000 annually make approximately 32% of all trips by walking and another 10% of trips via public transit. Table 38 and Table 39 summarize trip mode by age and by trip purpose. These results are not intuitive, and the MTC project team plans to investigate this further.

**TABLE 34. WEIGHTED SHARE OF TRIPS BY TRIP MODE GROUPED BY TIME-OF-DAY**

MODE TYPE	AM PEAK	MIDDAY	PM PEAK	EVENING	NIGHT
Walk	17.1%	22.2%	18.4%	17.9%	19.1%
School bus	0.2%	0.1%	0.0%	0.0%	0.0%
Shuttle/vanpool	0.6%	0.2%	0.5%	0.1%	0.3%
Ferry	0.2%	0.0%	0.1%	0.0%	0.3%
Transit	5.0%	4.0%	4.1%	3.5%	4.0%
Long distance passenger	0.2%	0.1%	0.1%	0.2%	0.2%
Bike	1.8%	1.6%	1.5%	1.2%	0.9%
Bikeshare	0.1%	0.1%	0.1%	0.1%	0.1%
Scotershare	0.0%	0.1%	0.1%	0.0%	0.1%
Taxi	0.0%	0.1%	0.0%	0.1%	0.3%
TNC	0.8%	1.0%	0.7%	0.9%	2.9%
Other	0.7%	0.8%	0.6%	0.2%	0.7%
Car	73.1%	69.6%	73.6%	75.6%	71.0%
Carshare	0.1%	0.0%	0.3%	0.1%	0.0%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Unweighted Total</b>	<b>48,009.00</b>	<b>145,977.00</b>	<b>92,489.00</b>	<b>39,944.00</b>	<b>30,925.00</b>
<b>Weighted Total</b>	<b>5,535,286.00</b>	<b>10,541,654.00</b>	<b>7,543,736.00</b>	<b>3,147,533.00</b>	<b>2,496,015.00</b>

**TABLE 35. WEIGHTED SHARE OF TRIPS BY DESTINATION PURPOSE GROUPED BY TRAVEL MODE**

DESTINATION PURPOSE	WALK	SCHOOL BUS	SHUTTLE/ VANPOOL	FERRY	TRANSIT	LONG DISTANCE PASSENGER	BIKE	BIKESHARE	SCOOTER- SHARE	TAXI	TNC	OTHER	CAR	CARSHARE
Home	25.8%	21.6%	8.7%	17.1%	0.0%	3.8%	34.4%	19.7%	15.3%	20.0%	28.7%	29.9%	31.8%	8.0%
Errand	2.7%		0.4%	0.1%	0.0%	0.0%	4.7%	0.9%	1.6%	1.6%	5.0%	2.5%	6.0%	6.7%
Change mode	18.1%	0.2%	25.0%	48.1%	100.0%	28.4%	11.2%	10.2%	53.0%	5.3%	10.7%	5.1%	0.9%	4.3%
Overnight	2.2%		1.7%	0.0%		22.2%	2.1%	1.3%	0.0%	18.9%	11.6%	2.0%	3.2%	0.6%
Other	0.8%	0.7%	0.1%	0.0%		13.5%	0.1%			0.8%	1.6%	1.9%	0.8%	0.0%
Work	6.2%	0.1%	24.5%	3.3%		0.3%	8.2%	3.8%	15.4%	1.9%	9.7%	4.1%	6.6%	1.4%
Work related	5.2%		28.3%	27.6%		28.1%	3.2%	31.8%	3.9%	19.4%	12.2%	15.7%	7.0%	1.9%
School	2.6%	63.9%	0.5%			0.0%	4.2%	0.0%	1.3%	0.3%	3.2%	6.0%	2.4%	0.2%
School related	1.7%	13.6%	3.1%				3.8%	0.0%	0.2%	0.0%	0.1%	0.8%	0.7%	0.1%
Escort	3.3%		1.7%	0.0%		0.1%	3.3%	0.1%		3.4%	1.7%	7.5%	14.8%	4.8%
Shop	4.7%		0.2%	0.0%		0.1%	7.8%	2.7%	2.5%	0.7%	2.8%	7.0%	11.2%	3.2%
Meal	7.2%		1.1%	0.1%	0.0%	0.1%	3.9%	15.0%	1.5%	2.0%	3.5%	5.5%	7.4%	62.1%
Social or recreational	19.6%		4.7%	3.7%	0.0%	3.3%	12.9%	14.3%	5.3%	25.8%	9.3%	12.0%	7.1%	6.7%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Unweighted Total</b>	<b>100,843</b>	<b>49</b>	<b>1,423</b>	<b>338</b>	<b>20,004</b>	<b>890</b>	<b>9,217</b>	<b>630</b>	<b>262</b>	<b>279</b>	<b>3,862</b>	<b>1,851</b>	<b>217,178</b>	<b>376</b>
<b>Weighted Total</b>	<b>5,723,067</b>	<b>19,366</b>	<b>102,598</b>	<b>28,082</b>	<b>1,217,712</b>	<b>43,139</b>	<b>444,253</b>	<b>26,437</b>	<b>20,451</b>	<b>23,802</b>	<b>302,460</b>	<b>189,311</b>	<b>21,090,880</b>	<b>32,660</b>

**TABLE 36. WEIGHTED SHARE OF TRIPS BY TRIP MODES GROUPED BY HOME COUNTY**

<b>MODE TYPE</b>	<b>ALAMEDA COUNTY</b>	<b>CONTRA COSTA COUNTY</b>	<b>SAN FRANCISCO COUNTY</b>	<b>SAN MATEO COUNTY</b>	<b>SANTA CLARA COUNTY</b>	<b>SOLANO COUNTY</b>	<b>SONOMA COUNTY</b>	<b>MARIN AND NAPA COUNTIES</b>
Walk	19.8%	12.5%	44.0%	19.2%	16.2%	13.4%	15.3%	12.0%
School bus	0.0%	0.0%	0.1%	0.2%	0.1%		0.0%	
Shuttle/vanpool	0.2%	0.2%	0.4%	1.5%	0.3%	0.1%	0.1%	0.2%
Ferry	0.1%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	1.3%
Transit	4.0%	3.2%	12.2%	3.8%	2.2%	3.1%	1.9%	2.4%
Long distance passenger	0.2%	0.0%	0.2%	0.4%	0.1%	0.0%	0.1%	0.1%
Bike	2.1%	0.3%	1.8%	2.1%	1.6%	0.7%	1.5%	1.8%
Bikeshare	0.0%	0.0%	0.4%	0.1%	0.0%			0.4%
Scotershare	0.0%	0.1%	0.1%	0.1%	0.1%	0.0%	0.3%	
Taxi	0.0%	0.0%	0.3%	0.1%	0.0%	0.0%	0.2%	0.0%
TNC	1.0%	1.0%	1.7%	1.2%	1.0%	0.8%	0.5%	0.6%
Other	0.6%	0.7%	0.6%	0.4%	0.6%	0.8%	0.7%	1.4%
Car	71.9%	82.0%	37.8%	70.9%	77.6%	80.9%	79.2%	79.7%
Carshare	0.0%	0.0%	0.3%	0.0%	0.3%	0.0%	0.0%	0.0%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Unweighted Total</b>	<b>84,366.00</b>	<b>40,948.00</b>	<b>112,778.00</b>	<b>18,180.00</b>	<b>56,016.00</b>	<b>20,489.00</b>	<b>12,697.00</b>	<b>11,870.00</b>
<b>Weighted Total</b>	<b>6,269,551.00</b>	<b>4,473,415.00</b>	<b>3,482,642.00</b>	<b>2,927,677.00</b>	<b>6,711,049.00</b>	<b>1,860,162.00</b>	<b>2,021,350.00</b>	<b>1,518,376.00</b>

**TABLE 37. WEIGHTED SHARE OF TRIPS BY TRIP MODES GROUPED BY HOUSEHOLD INCOME**

<b>MODE TYPE</b>	<b>UNDER \$25,000</b>	<b>\$25,000-\$49,999</b>	<b>\$50,000-\$74,999</b>	<b>\$75,000-\$99,999</b>	<b>\$100,000-\$199,999</b>	<b>\$200,000 OR MORE</b>	<b>PREFER NOT TO ANSWER</b>
Walk	31.9%	25.4%	20.5%	13.9%	16.5%	19.1%	18.5%
School bus	0.2%	0.1%	0.0%	0.0%	0.0%	0.1%	0.0%
Shuttle/vanpool	0.7%	0.1%	0.0%	0.2%	0.2%	0.7%	0.2%
Ferry	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.4%
Transit	10.2%	8.8%	5.8%	2.3%	3.1%	2.3%	4.1%
Long distance passenger	0.0%	0.0%	0.0%	0.0%	0.2%	0.2%	0.2%
Bike	1.9%	1.4%	1.6%	1.0%	1.7%	1.7%	0.7%
Bikeshare	0.1%	0.1%	0.1%	0.0%	0.1%	0.1%	0.2%
Scotershare	0.0%	0.0%	0.1%	0.1%	0.1%	0.0%	0.0%
Taxi	0.1%	0.2%	0.0%	0.1%	0.0%	0.1%	0.0%
TNC	2.8%	1.8%	0.5%	1.1%	0.9%	0.9%	0.2%
Other	1.6%	0.9%	0.9%	0.8%	0.3%	0.3%	1.4%
Car	49.6%	60.9%	70.4%	80.4%	76.8%	74.3%	74.0%
Carshare	0.9%	0.2%	0.1%	0.0%	0.0%	0.0%	0.1%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Unweighted Total</b>	<b>21,271.00</b>	<b>22,920.00</b>	<b>29,496.00</b>	<b>33,723.00</b>	<b>107,449.00</b>	<b>111,539.00</b>	<b>30,946.00</b>
<b>Weighted Total</b>	<b>2,142,312.00</b>	<b>2,503,457.00</b>	<b>2,995,837.00</b>	<b>2,608,628.00</b>	<b>7,074,687.00</b>	<b>9,128,467.00</b>	<b>2,810,833.00</b>

**TABLE 38. WEIGHTED SHARE OF TRIPS BY TRIP MODES GROUPED BY AGE**

<b>MODE TYPE</b>	<b>0 TO 4</b>	<b>5 TO 15</b>	<b>16 TO 17</b>	<b>18 TO 24</b>	<b>25 TO 44</b>	<b>45 TO 64</b>	<b>65 AND OVER</b>
Walk	12.1%	11.8%	13.4%	27.7%	21.9%	16.5%	21.8%
School bus		0.7%	0.4%	0.2%	0.0%		
Shuttle/vanpool	0.1%	0.1%		1.7%	0.4%	0.2%	0.0%
Ferry				0.0%	0.2%	0.1%	0.0%
Transit	0.8%	2.0%	3.6%	8.9%	4.5%	3.1%	5.0%
Long distance passenger	0.0%	0.0%	0.5%	0.1%	0.2%	0.1%	0.0%
Bike	0.9%	1.0%	1.1%	3.8%	1.4%	1.2%	1.9%
Bikeshare	0.0%	0.0%		0.0%	0.2%	0.1%	0.0%
Scootershare	0.0%	0.0%		0.0%	0.2%	0.0%	
Taxi		0.1%		0.0%	0.1%	0.1%	0.1%
TNC	0.0%	0.4%		1.8%	1.6%	0.5%	0.9%
Other	0.0%	0.8%	2.0%	0.6%	0.6%	0.5%	0.8%
Car	85.7%	82.9%	79.0%	54.6%	68.6%	77.5%	69.3%
Carshare	0.5%	0.1%		0.7%	0.1%	0.0%	0.1%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Unweighted Total</b>	<b>8,246.00</b>	<b>15,878.00</b>	<b>1,718.00</b>	<b>16,183.00</b>	<b>160,194.00</b>	<b>103,286.00</b>	<b>51,839.00</b>
<b>Weighted Total</b>	<b>801,447.00</b>	<b>2,166,439.00</b>	<b>401,261.00</b>	<b>2,097,164.00</b>	<b>10,230,763.00</b>	<b>8,821,992.00</b>	<b>4,745,156.00</b>

**TABLE 39. WEIGHTED SHARE OF TRIPS BY TRIP MODES GROUPED BY TRIP PURPOSE**

MODE TYPE	HOME	ERRAND	CHANGE MODE	OVERNIGHT	OTHER	WORK	WORK RELATED	SCHOOL	SCHOOL RELATED	ESCORT	SHOP	MEAL	SOCIAL OR RECREATIONAL
Walk	17.4%	10.5%	39.9%	14.2%	20.7%	19.2%	15.6%	21.2%	34.3%	5.6%	9.9%	20.1%	40.8%
School bus	0.0%		0.0%		0.0%	0.0%		1.8%	0.9%				
Shuttle/vanpool	0.1%	0.0%	1.0%	0.2%	0.0%	1.4%	1.5%	0.1%	1.1%	0.0%	0.0%	0.1%	0.2%
Ferry	0.1%	0.0%	0.5%	0.0%	0.0%	0.0%	0.4%			0.0%	0.0%	0.0%	0.0%
Transit	0.0%	0.0%	46.9%									0.0%	0.0%
Long distance passenger	0.0%	0.0%	0.5%	1.1%	2.5%	0.0%	0.6%	0.0%		0.0%	0.0%	0.0%	0.0%
Bike	1.8%	1.4%	1.9%	1.1%	0.2%	1.9%	0.7%	2.7%	6.2%	0.4%	1.3%	0.9%	2.1%
Bikeshare	0.1%	0.0%	0.1%	0.0%		0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.2%	0.1%
Scotershare	0.0%	0.0%	0.4%	0.0%		0.2%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
Taxi	0.1%	0.0%	0.0%	0.5%	0.1%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
TNC	1.0%	1.0%	1.2%	4.0%	2.1%	1.6%	1.9%	1.4%	0.1%	0.1%	0.3%	0.5%	1.0%
Other	0.7%	0.3%	0.4%	0.4%	1.6%	0.4%	1.6%	1.6%	0.6%	0.4%	0.5%	0.5%	0.8%
Car	78.8%	86.5%	7.0%	78.4%	72.7%	75.2%	76.9%	71.2%	56.8%	93.2%	87.9%	76.7%	54.6%
Carshare	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.1%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Unweighted Total</b>	<b>97,974.00</b>	<b>17,164.00</b>	<b>41,687.00</b>	<b>14,197.00</b>	<b>1,150.00</b>	<b>15,517.00</b>	<b>18,088.00</b>	<b>3,121.00</b>	<b>2,108.00</b>	<b>25,623.00</b>	<b>39,009.00</b>	<b>31,340.00</b>	<b>50,224.00</b>
<b>Weighted Total</b>	<b>8,508,919.00</b>	<b>1,475,582.00</b>	<b>2,594,002.00</b>	<b>870,775.00</b>	<b>231,714.00</b>	<b>1,857,100.00</b>	<b>1,919,662.00</b>	<b>696,574.00</b>	<b>276,775.00</b>	<b>3,341,450.00</b>	<b>2,699,481.00</b>	<b>2,040,127.00</b>	<b>2,752,058.00</b>

Table 40 and Table 41 present reported work commute modes from pre-Covid, and currently. Weighted results suggest that the use of household vehicles has increased in the post-covid era by about 10% whereas transit trips made by bus and rail combined have decreased by about the same percentage. Rates of use of other modes are generally similar before and after Covid. Note that the unweighted counts in these tables are nearly 33% lower in the post-covid data. This is because, whereas the first question was asked of anyone who was old enough to be a worker, the second question was only asked of anyone who actually reported working, and who did not report teleworking.

**TABLE 40. COMPARISON OF TRIP MODE TO WORK BEFORE COVID**

COMMUTE MODE PRE-COVID	UNWEIGHTED COUNT	UNWEIGHTED ESTIMATE	WEIGHTED ESTIMATE	WEIGHTED PERCENT
Walk (or jog/wheelchair)	624	6.4%	214,082	4.9%
Medical transportation service	3	0.0%	7,131	0.2%
Household vehicle (or motorcycle)	5,612	57.2%	3,024,780	69.2%
Other vehicle (e.g., friend's car, rental, carshare, work car)	220	2.2%	119,844	2.7%
Bus, shuttle, or vanpool	1,113	11.3%	301,202	6.9%
Bicycle	490	5.0%	118,285	2.7%
Other	183	1.9%	69,432	1.6%
Rail (e.g., train, light rail, trolley, BART, MUNI Metro)	1,433	14.6%	453,415	10.4%
Uber/Lyft, taxi, car service	108	1.1%	55,232	1.3%
Micromobility (e.g., scooter, moped, skateboard)	29	0.3%	9,652	0.2%
<b>Total</b>	<b>9,815</b>	<b>100.0%</b>	<b>4,373,055</b>	<b>100.0%</b>

**TABLE 41. COMPARISON OF TRIP MODE TO WORK AFTER COVID**

COMMUTE MODE POST-COVID	UNWEIGHTED COUNT	UNWEIGHTED ESTIMATE	WEIGHTED ESTIMATE	WEIGHTED PERCENT
Walk (or jog/wheelchair)	364	5.3%	116,634	3.7%
Medical transportation service	2	0.0%	3,708	0.1%
Household vehicle (or motorcycle)	4,155	60.3%	2,457,236	77.1%
Other vehicle (e.g., friend's car, rental, carshare, work car)	142	2.1%	96,368	3.0%
Bus, shuttle, or vanpool	699	10.1%	146,800	4.6%
Bicycle	373	5.4%	70,261	2.2%
Other	127	1.8%	50,833	1.6%
Rail (e.g., train, light rail, trolley, BART, MUNI Metro)	935	13.6%	188,924	5.9%
Uber/Lyft, taxi, car service	69	1.0%	44,761	1.4%
Micromobility (e.g., scooter, moped, skateboard)	30	0.4%	10,862	0.3%
<b>Total</b>	<b>6,896</b>	<b>100.0%</b>	<b>3,186,387</b>	<b>100.0%</b>

## Employment Related Travel Behavior Analysis

This section provides estimates of work-related travel behavior like the percentages of teleworking by county, income, and household size (Table 42 through Table 44). Table 45 through Table 47 provide estimates of commute activity by the same county, income, and household size groupings. Finally, Table 48 shows the share of commute subsidy use by county and Table 49 shows typical telework habits after Covid. Note this last table includes many fewer responses than the total number of people for whom data was collected. This is because the data is calculated using a question asked of a subset of people in the survey whenever a person did not report commuting full-time or when people only work remotely.

**TABLE 42. REPORTED TYPICAL TELEWORK FREQUENCY BY HOME COUNTY**

TELEWORK FREQUENCY	ALAMEDA COUNTY	CONTRA COSTA COUNTY	SAN FRANCISCO COUNTY	SAN MATEO COUNTY	SANTA CLARA COUNTY	SOLANO COUNTY	SONOMA COUNTY	MARIN AND NAPA COUNTIES
6-7 days a week	3.0%	2.2%	3.0%	1.4%	2.7%	0.3%	4.8%	3.4%
5 days a week	9.1%	6.1%	7.5%	12.7%	7.5%	5.2%	4.5%	5.0%
4 days a week	6.2%	4.7%	8.6%	5.6%	4.0%	3.8%	4.1%	6.9%
3 days a week	7.2%	7.8%	12.2%	9.7%	9.4%	7.6%	7.0%	8.2%
2 days a week	14.1%	6.2%	16.2%	11.1%	16.7%	8.9%	8.2%	6.9%
1 day a week	7.3%	7.5%	8.8%	4.2%	6.4%	5.4%	2.5%	7.8%
1-3 days a month	6.2%	7.1%	5.8%	11.1%	8.5%	3.9%	7.5%	8.0%
Less than monthly	6.2%	7.0%	4.5%	11.2%	3.1%	9.1%	4.7%	4.0%
Never	40.6%	51.4%	33.3%	33.1%	41.7%	55.9%	56.7%	49.7%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Unweighted Total</b>	<b>1,726.00</b>	<b>795.00</b>	<b>2,162.00</b>	<b>413.00</b>	<b>1,276.00</b>	<b>413.00</b>	<b>221.00</b>	<b>219.00</b>
<b>Weighted Total</b>	<b>687,692.00</b>	<b>481,435.00</b>	<b>370,027.00</b>	<b>339,445.00</b>	<b>859,527.00</b>	<b>200,836.00</b>	<b>224,537.00</b>	<b>156,223.00</b>

**TABLE 43. REPORTED TYPICAL TELEWORK FREQUENCY BY HOUSEHOLD INCOME**

TELEWORK FREQUENCY	UNDER \$25,000	\$25,000-\$49,999	\$50,000-\$74,999	\$75,000-\$99,999	\$100,000-\$199,999	\$200,000 OR MORE	PREFER NOT TO ANSWER
6-7 days a week	3.9%	1.7%	4.4%	3.1%	2.9%	2.1%	1.9%
5 days a week	5.3%	6.9%	6.2%	4.6%	6.1%	11.4%	5.8%
4 days a week	6.2%	2.4%	1.0%	2.8%	4.2%	8.0%	8.0%
3 days a week	10.3%	5.3%	7.0%	5.6%	7.7%	12.3%	6.7%
2 days a week	6.6%	5.6%	10.2%	6.3%	12.4%	18.2%	10.6%
1 day a week	8.2%	5.7%	4.7%	4.5%	5.9%	7.9%	7.1%
1-3 days a month	4.4%	3.4%	5.0%	5.7%	7.1%	11.4%	4.6%
Less than monthly	1.6%	6.6%	3.4%	5.7%	7.0%	6.7%	3.7%
Never	53.4%	62.3%	57.9%	61.8%	46.7%	22.0%	51.6%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Unweighted Total</b>	<b>274.00</b>	<b>490.00</b>	<b>586.00</b>	<b>668.00</b>	<b>2,226.00</b>	<b>2,303.00</b>	<b>678.00</b>
<b>Weighted Total</b>	<b>152,848.00</b>	<b>290,067.00</b>	<b>327,656.00</b>	<b>268,020.00</b>	<b>869,906.00</b>	<b>1,061,317.00</b>	<b>349,909.00</b>

**TABLE 44. REPORTED TYPICAL TELEWORK FREQUENCY BY HOUSEHOLD SIZE**

TELEWORK FREQUENCY	1 PERSON	2 PEOPLE	3 PEOPLE	4 PEOPLE	5 OR MORE PEOPLE
6-7 days a week	3.1%	1.6%	1.7%	4.3%	2.9%
5 days a week	7.3%	6.7%	7.5%	8.6%	8.8%
4 days a week	6.4%	6.9%	4.0%	5.2%	3.8%
3 days a week	9.3%	10.1%	8.3%	7.4%	8.3%
2 days a week	14.8%	16.1%	12.4%	11.4%	6.5%
1 day a week	9.3%	6.3%	7.1%	5.3%	6.1%
1-3 days a month	6.4%	7.9%	9.0%	7.0%	6.0%
Less than monthly	7.8%	4.7%	5.9%	7.1%	4.7%
Never	35.7%	39.8%	44.0%	43.7%	52.9%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Unweighted Total</b>	<b>1,976.00</b>	<b>2,786.00</b>	<b>1,132.00</b>	<b>889.00</b>	<b>442.00</b>
<b>Weighted Total</b>	<b>367,182.00</b>	<b>973,261.00</b>	<b>676,032.00</b>	<b>732,825.00</b>	<b>570,423.00</b>

**TABLE 45. REPORTED TYPICAL COMMUTE FREQUENCY BY HOME COUNTY**

<b>COMMUTE FREQUENCY</b>	<b>ALAMEDA COUNTY</b>	<b>CONTRA COSTA COUNTY</b>	<b>SAN FRANCISCO COUNTY</b>	<b>SAN MATEO COUNTY</b>	<b>SANTA CLARA COUNTY</b>	<b>SOLANO COUNTY</b>	<b>SONOMA COUNTY</b>	<b>MARIN AND NAPA COUNTIES</b>
6-7 days a week	5.3%	7.6%	4.0%	4.5%	5.5%	3.5%	8.4%	10.1%
5 days a week	36.7%	41.0%	30.6%	37.2%	39.6%	47.6%	36.5%	30.3%
4 days a week	12.2%	13.7%	12.2%	9.1%	11.1%	14.9%	7.7%	15.6%
3 days a week	17.7%	15.7%	22.8%	16.7%	20.3%	14.0%	18.8%	15.4%
2 days a week	9.3%	8.2%	11.9%	10.5%	11.2%	11.0%	5.5%	7.4%
1 day a week	7.3%	2.9%	8.0%	7.0%	5.3%	1.4%	8.8%	6.5%
1-3 days a month	5.0%	6.1%	7.2%	8.1%	2.8%	3.8%	6.5%	4.2%
Less than monthly	4.1%	2.5%	2.2%	4.2%	1.8%	2.0%	3.5%	4.0%
Never	2.3%	2.2%	1.1%	2.8%	2.4%	1.8%	4.3%	6.5%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Unweighted Total</b>	<b>1,706.00</b>	<b>775.00</b>	<b>2,130.00</b>	<b>401.00</b>	<b>1,255.00</b>	<b>401.00</b>	<b>219.00</b>	<b>216.00</b>
<b>Weighted Total</b>	<b>683,664.00</b>	<b>474,336.00</b>	<b>365,855.00</b>	<b>326,665.00</b>	<b>848,741.00</b>	<b>194,972.00</b>	<b>222,162.00</b>	<b>152,183.00</b>

**TABLE 46. REPORTED TYPICAL COMMUTE FREQUENCY BY INCOME**

COMMUTE FREQUENCY	UNDER \$25,000	\$25,000-\$49,999	\$50,000-\$74,999	\$75,000-\$99,999	\$100,000-\$199,999	\$200,000 OR MORE	PREFER NOT TO ANSWER
6-7 days a week	13.7%	12.4%	12.4%	4.9%	5.3%	2.0%	4.2%
5 days a week	30.3%	43.2%	43.5%	48.7%	42.6%	29.9%	35.0%
4 days a week	13.7%	14.9%	10.2%	13.8%	12.3%	10.4%	12.0%
3 days a week	10.7%	13.4%	13.6%	13.9%	16.4%	23.6%	21.6%
2 days a week	10.9%	6.3%	9.9%	9.6%	10.0%	10.6%	9.3%
1 day a week	6.4%	3.4%	3.9%	1.8%	4.5%	8.5%	8.1%
1-3 days a month	3.6%	2.1%	1.4%	6.2%	4.5%	7.7%	4.7%
Less than monthly	3.9%	2.5%	0.8%	1.1%	1.4%	4.9%	3.6%
Never	6.8%	1.8%	4.3%	0.1%	2.9%	2.2%	1.4%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Unweighted Total</b>	<b>261.00</b>	<b>461.00</b>	<b>567.00</b>	<b>657.00</b>	<b>2,199.00</b>	<b>2,290.00</b>	<b>668.00</b>
<b>Weighted Total</b>	<b>149,253.00</b>	<b>280,983.00</b>	<b>317,698.00</b>	<b>262,874.00</b>	<b>855,906.00</b>	<b>1,054,597.00</b>	<b>347,268.00</b>

**TABLE 47. REPORTED TYPICAL COMMUTE FREQUENCY BY HOUSEHOLD SIZE**

COMMUTE FREQUENCY	1 PERSON	2 PEOPLE	3 PEOPLE	4 PEOPLE	5 OR MORE PEOPLE
6-7 days a week	4.1%	5.2%	5.3%	5.9%	8.3%
5 days a week	33.4%	32.3%	40.3%	38.1%	46.8%
4 days a week	13.5%	12.5%	12.2%	13.2%	7.4%
3 days a week	22.0%	21.0%	19.3%	15.7%	13.4%
2 days a week	10.0%	11.0%	9.6%	9.2%	8.5%
1 day a week	6.8%	7.0%	4.4%	6.9%	4.0%
1-3 days a month	6.1%	6.7%	3.2%	6.5%	2.5%
Less than monthly	2.1%	2.2%	3.2%	1.9%	5.4%
Never	2.0%	2.1%	2.4%	2.5%	3.7%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Unweighted Total</b>	<b>1,948.00</b>	<b>2,750.00</b>	<b>1,120.00</b>	<b>868.00</b>	<b>417.00</b>
<b>Weighted Total</b>	<b>363,090.00</b>	<b>966,333.00</b>	<b>670,379.00</b>	<b>722,892.00</b>	<b>545,887.00</b>

**TABLE 48. PROPORTION OF PEOPLE WHO REPORT COMMUTE SUBSIDY USE BY WORK COUNTY**

COMMUTE SUBSIDY USE	ALAMEDA COUNTY	CONTRA COSTA COUNTY	SAN FRANCISCO COUNTY	SAN MATEO COUNTY	SANTA CLARA COUNTY	SOLANO COUNTY	SONOMA COUNTY	ANOTHER COUNTY IN CALIFORNIA	MARIN AND NAPA COUNTIES
Free (fully subsidized) parking at work	70.9%	79.7%	17.2%	79.0%	75.7%	80.4%	80.8%	60.0%	87.3%
Discounted (partially subsidized) parking at work	1.2%	0.3%	7.3%	0.6%	1.6%	0.1%	2.0%	13.1%	4.3%
Ability to work from home	30.3%	24.2%	51.7%	33.0%	39.1%	17.4%	34.8%	27.5%	21.0%
Free/discount transit fare	5.7%	0.8%	21.2%	4.5%	7.2%	0.1%	1.5%	5.4%	4.4%
Free/discount vanpool	0.8%	0.0%	0.1%	0.5%	0.6%	1.7%			
Cash or incentives for carpooling, walking, or biking to work	0.8%	0.9%	2.7%	0.7%	1.7%	0.0%	2.0%	2.4%	0.1%
Free/discount Uber, Lyft, or other smartphone-app ride service	0.2%		2.3%	0.6%	1.0%		0.0%	2.4%	
Free/discount carshare membership/use (e.g., ZipCar)	0.2%		0.2%	0.1%	0.0%				
Free/discount shuttle service	3.1%	0.0%	4.0%	3.8%	6.9%			0.2%	
Free/discount bikeshare membership	0.1%		0.6%	0.0%	0.7%				
Free/discount bicycle tune-up/maintenance	0.2%		0.2%	0.1%	1.8%				
Commuter coordination/education	0.9%	0.2%	0.5%	0.4%	1.2%				0.3%
None of the above	10.2%	15.0%	17.5%	10.8%	8.5%	10.0%	7.9%	14.6%	5.4%
<b>Total</b>	<b>124.5%</b>	<b>121.2%</b>	<b>125.6%</b>	<b>134.1%</b>	<b>146.0%</b>	<b>109.8%</b>	<b>129.2%</b>	<b>125.7%</b>	<b>122.8%</b>
<b>Unweighted Total</b>	<b>1,218.00</b>	<b>408.00</b>	<b>1,698.00</b>	<b>835.00</b>	<b>1,983.00</b>	<b>145.00</b>	<b>135.00</b>	<b>62.00</b>	<b>205.00</b>
<b>Weighted Total</b>	<b>482,785.00</b>	<b>233,031.00</b>	<b>332,776.00</b>	<b>371,103.00</b>	<b>1,057,857.00</b>	<b>90,417.00</b>	<b>162,895.00</b>	<b>29,018.00</b>	<b>110,561.00</b>

**TABLE 49. COMPARISON OF COMMUTE FREQUENCY BEFORE AND AFTER COVID**

		COMMUTE FREQUENCY POST-COVID								
DAYS PER WEEK		6-7 DAYS A WEEK	5 DAYS A WEEK	4 DAYS A WEEK	3 DAYS A WEEK	2 DAYS A WEEK	1 DAY A WEEK	1-3 DAYS A MONTH	LESS THAN MONTHLY	NEVER
COMMUTE FREQUENCY PRE-COVID	6-7 DAYS A WEEK	59.5%	14.6%	8.1%	9.7%	2.6%	1.6%	1.9%	1.2%	0.7%
	5 DAYS A WEEK	1.4%	50.6%	9.6%	16.7%	8.7%	4.5%	4.7%	2.6%	1.2%
	4 DAYS A WEEK	1.5%	11.3%	36.0%	19.3%	13.7%	11.2%	4.7%	1.8%	0.3%
	3 DAYS A WEEK	0.3%	7.4%	9.6%	45.0%	20.8%	6.1%	8.9%	0.9%	1.0%
	2 DAYS A WEEK	0.2%	15.5%	6.8%	14.5%	26.9%	14.0%	11.6%	4.0%	6.5%
	1 DAY A WEEK	0.1%	8.5%	10.6%	22.2%	6.0%	25.6%	13.7%	2.7%	10.7%
	1-3 DAYS A MONTH	6.6%	6.5%	10.7%	6.6%	8.2%	0.8%	41.1%	11.3%	8.2%
	LESS THAN MONTHLY		18.8%	4.1%	8.9%	11.3%	7.4%	5.0%	42.5%	2.0%
	NEVER	4.5%	32.7%	9.9%	19.6%	8.5%	8.8%	1.3%	2.9%	11.9%
<b>Total</b>		74.2%	165.9%	105.4%	162.7%	106.7%	79.9%	92.9%	69.9%	42.5%

## Travel Day Analysis

Table 50 provides the categories respondents reported for no travel on a travel day. Note that these sum to more than 100% because more than one option was able to be selected. The majority of respondents who did not travel reported “hanging around home”, taking a day off, working from home, or being out sick on the travel day. Table 51 provides estimates for deliveries received on a typical travel day, with the pattern being similar regardless of the home county. Note that the results in these tables sum to more than 100% because respondents were able to select more than one option.

**TABLE 50. REASONS FOR NOT TRAVELING ON TRAVEL DAY BY HOME COUNTY**

NO TRAVEL REASON	ALAMEDA COUNTY	CONTRA COSTA COUNTY	SAN FRANCISCO COUNTY	SAN MATEO COUNTY	SANTA CLARA COUNTY	SOLANO COUNTY	SONOMA COUNTY	MARIN AND NAPA COUNTIES
I did make trips today	2.1%	1.2%	3.2%	4.2%	3.2%	1.6%	2.6%	2.3%
Not scheduled to work/took day off	9.5%	10.7%	10.2%	4.9%	10.2%	12.4%	10.5%	4.3%
Worked at home for pay (e.g., telework)	24.1%	18.1%	30.8%	20.4%	22.8%	14.6%	17.3%	18.1%
Hung out around home	52.8%	48.1%	45.7%	37.7%	47.5%	58.3%	64.3%	45.6%
Scheduled school closure (e.g., holiday)	0.3%	0.5%	0.0%		1.3%		0.0%	0.0%
No available transportation (e.g., no car, no bus)	1.2%	4.5%	0.4%	0.2%	3.2%	2.2%	1.5%	
Sick or quarantining (self or others)	7.8%	15.8%	11.2%	10.8%	12.5%	5.3%	4.4%	16.9%
Waited for visitor/delivery (e.g., plumber)	0.7%	1.8%	3.0%	2.1%	2.4%	0.9%	6.3%	5.1%
Kids did online/remote/home school	0.3%	1.4%	0.1%	1.4%	0.1%	0.2%	3.3%	
Weather conditions (e.g., snowstorm)	3.2%	1.7%	5.0%	4.6%	1.6%	1.4%	0.1%	5.1%
Person may have made trips, but I don't know when or where	1.3%	0.3%	3.0%	3.0%	2.0%	8.0%	0.2%	2.7%
Other reason	8.9%	13.2%	4.1%	19.9%	6.3%	5.9%	7.4%	5.6%
<b>Total</b>	<b>112.3%</b>	<b>117.5%</b>	<b>116.8%</b>	<b>109.3%</b>	<b>113.2%</b>	<b>110.8%</b>	<b>117.8%</b>	<b>105.6%</b>
<b>Unweighted Total</b>	<b>4,068.00</b>	<b>2,104.00</b>	<b>4,508.00</b>	<b>848.00</b>	<b>2,838.00</b>	<b>1,011.00</b>	<b>683.00</b>	<b>553.00</b>
<b>Weighted Total</b>	<b>349,040.00</b>	<b>275,206.00</b>	<b>169,494.00</b>	<b>123,821.00</b>	<b>358,075.00</b>	<b>88,195.00</b>	<b>88,594.00</b>	<b>69,496.00</b>

**TABLE 51. DELIVERIES RECEIVED ON TRAVEL DAY BY HOME COUNTY**

DELIVERY	ALAMEDA COUNTY	CONTRA COSTA COUNTY	SAN FRANCISCO COUNTY	SAN MATEO COUNTY	SANTA CLARA COUNTY	SOLANO COUNTY	SONOMA COUNTY	MARIN AND NAPA COUNTIES
Take-out/prepared food delivered to home	5.1%	5.8%	6.6%	4.4%	6.0%	3.7%	2.9%	0.1%
Someone came to do work at home (e.g., babysitter, housecleaning, lawn)	3.0%	5.6%	2.9%	4.8%	2.9%	1.7%	6.6%	6.8%
Groceries delivered to home	2.0%	0.8%	2.5%	1.4%	2.2%	2.0%	0.4%	0.2%
Received packages at home (e.g., USPS, FedEx, UPS)	37.1%	40.4%	34.4%	38.6%	34.7%	39.6%	31.8%	40.8%
Received personal packages at work	0.4%	0.9%	0.9%	1.4%	1.6%	0.8%	0.1%	0.0%
Received packages at another location (e.g., Amazon Locker, package pick-up point)	2.6%	2.0%	2.5%	2.1%	1.6%	4.4%	1.6%	1.7%
Other items delivered to home (e.g., appliance)	0.4%	0.8%	0.5%	2.0%	0.2%	0.6%	1.5%	0.0%
Other items delivered to work	0.6%	0.4%	0.8%	0.6%	0.8%	0.7%	1.5%	0.4%
None of the above	54.4%	52.7%	56.5%	53.2%	57.0%	53.9%	61.5%	53.4%
<b>Total</b>	<b>105.6%</b>	<b>109.5%</b>	<b>107.6%</b>	<b>108.6%</b>	<b>107.1%</b>	<b>107.3%</b>	<b>107.8%</b>	<b>103.4%</b>
<b>Unweighted Total</b>	<b>18,614.00</b>	<b>9,145.00</b>	<b>23,399.00</b>	<b>4,150.00</b>	<b>13,312.00</b>	<b>4,527.00</b>	<b>2,977.00</b>	<b>2,738.00</b>
<b>Unweighted Total</b>	<b>1,167,541.00</b>	<b>806,619.00</b>	<b>662,377.00</b>	<b>547,784.00</b>	<b>1,356,090.00</b>	<b>315,463.00</b>	<b>364,341.00</b>	<b>269,442.00</b>

## 9.0 CONCLUSION

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### 9.1 LESSONS LEARNED AND FUTURE RESEARCH

While the 2023 BATS data collection was successful, there are a number of elements that serve as useful learning opportunities. The following lessons are based on reflections by the team on the 2023 Bay Area Travel Study (BATS) and can serve as guides for the upcoming 2025/2026 cycle of the survey. These lessons are crucial for shaping the approach to conducting the next survey.

One of the key lessons learned is the importance of collecting data from full households, including non-family households, to ensure consistency with Census definitions and improve survey weighting and expansion. This will require changes to the recruitment approach and survey instrument. In 2023, the team implemented an approach which only collected data from the household respondent. In future rounds, the protocol will be to treat households comprised of unrelated members as if they are a family household and collect surveys from each person.

Another significant lesson is the need to address data quality issues in web-based surveys. The 2023 cycle revealed that non-rMove households had a lower completion rate and were more likely to report no-travel days. Evaluating the feasibility of implementing a smartphone-only survey is proposed as a solution.

There were challenges maintaining a five-day completion standard for rMove households, especially for large households and those with complex trip patterns. While the five-day standard aligns with the priorities of analyzing travel behavior across a week, there is openness to considering a graduated compensation scheme to reflect the value of the data collected.

Data completeness is another critical issue. Many records with incomplete socio-demographic data were deemed unusable, and enhancing the user experience of the app is seen as a way to improve data quality. That said, RSG maintains that there are no easy fixes to apply to solve problems that are common among these apps. These problems include battery drain, unintuitive trip editing, and other user interface challenges that stem from asking untrained members of the public to complete complex surveys. Implementing real-time QA/QC processes and setting clear data completion standards in the new contract are proposed solutions. RSG will work with MTC to determine feasibility for the implementation of real-time QA/QC.

The reasonableness of some trip attributes from 2023 have also been examined with thoughts for how to address trip records with unreasonable values. Implementing real-time QA/QC to prompt users to verify and re-enter data when necessary is suggested. This may be a much larger effort than would be supported by a typical survey design, so RSG will engage with MTC and partners to identify priorities for improving such attributes in the collection phase.

In 2023, uncertainty in response rates and the higher-than-anticipated share of smartphone households participating in the survey led to budgetary issues. Allocating a contingency budget and analyzing incentive and response rate data to improve budgeting for the next cycle will be leveraged. In addition, how hard-to-survey populations are defined will require further scrutiny in future survey rounds. The 2023 data collection period was compressed due to a number of factors some of which were not within control of the survey team. However, designing the survey in future rounds to allow for longer data collection periods will help the survey team to better observe and react to data collection trends during the data collection period.

## 10.0 APPENDICES

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### 10.1 LINKS TO MEMORANDA AND DOCUMENTATION

Through the course of the 2023 BATS, several milestone deliverables were presented to the project team. This section summarizes those deliverables and provides links to the final versions of each.

#### **Task 1. Survey Bench Test**

MTC conducted a side-by-side comparison of three smartphone applications and used the results in combination with scoring on other metrics to select the vendor whose app performed most effectively in the testing.

#### **Task 2. Kick-off and Work Plan**

The selected firm provided a kick-off meetings and developed a work plan with MTC staff input: <https://mtcdrive.box.com/s/9z1uso76ls6tnkqlrdpz04frgkhrhjv>

#### **Task 3. Survey Design and Materials**

The survey logo and invitation materials were designed for the Spring 2023 methodological test and were updated for the fall 2023 main survey collection window: <https://mtcdrive.box.com/s/cw0cssiuisjr7w5s0tl3p3tl93czdyyg>

#### **Task 4. Staff Pretest and Fee Schedule**

MTC staff participated in a pretest, with a results memo provided, summarizing the issues and steps taken to address them. MTC also requested a memorandum to use for pricing additional surveys for the purpose of inviting partner agencies in the region to participate in the survey: <https://mtcdrive.box.com/s/ygofmjr6uwfmyl7irhfovlooieo0wd0>

#### **Task 5. Sample Plan**

Two sample plans were prepared, one for the initial test in spring of 2023, and another with the plan for collecting the full sample with all add-ons in the fall: <https://mtcdrive.box.com/s/k5xb2ghxhbx5tejl8x8gqhkf36aqqadn>

#### **Task 6. Public Outreach Review and CBO Plan**

Task 6 involved assessing the public outreach approach and developing a plan for future outreach efforts: <https://mtcdrive.box.com/s/q0yxroxn8hl45cjl0hp9gkgt5w1gc9qq>

## **Task 7. Survey Administration**

Task 7 had no milestone deliverables but a summary of the test results from Spring was provided: <https://mtcdrive.box.com/s/d2ts24qnmo8hmvccwlgy2m0zc8wavcwj>

## **Task 8. Quality Assurance and Quality Control Plan**

Draft and final data processing memoranda were delivered, outlining the plans for quality control and assurance: <https://mtcdrive.box.com/s/c7a84zeiwpykutml6x3on0oovv2dfybn>

## **Task 9. Weighting and Expansion Methodology**

Several deliverables were provided under task 9, including an initial description of the weighting methods, a step-by-step overview of the weighting scripts, a summary of how RSG handled non-related household members, and a validation report on the interim and final weighted data: <https://mtcdrive.box.com/s/faufujryxija8trdg5ir5bevm8qz7an2>

## **Task 10. Weighting and Expansion Data Files**

Task 10 involved posting the results of the weighting procedure with the required data tables and documentation: <https://mtcdrive.box.com/s/rnbuk6qdp017wz7f4tjbc80v4qq7698p>

## 10.2 INVITATION MATERIALS

FIGURE 7. FALL INVITATION ENVELOPE



**FIGURE 8. FALL INVITATION LETTER**



METROPOLITAN TRANSPORTATION COMMISSION (MTC)  
 BAY AREA METRO CENTER  
 375 BEALE STREET  
 SAN FRANCISCO, CA 94105

<First and last name/City name resident>  
 <Street Address 1>  
 <Street Address 2>  
 <City, ST <#####>

March 00, 2023

Thank you in advance for your participation in this important regional study. Your input will help us better understand local travel needs and plan future transportation improvements in the Bay Area. As technologies and travel behaviors change quickly over the next few years, we need your help now to plan for the future. The Metropolitan Transportation Commission, the San Francisco County Transportation Authority, and the Santa Clara Valley Transportation Authority strongly value your participation. Your voice can change your community, and we encourage you to begin today.

To get started today, follow the instructions below. Together, we can improve transportation in our region.

  
**Alfredo Pedroza**  
 Chair, MTC

  
**Tilly Chang**  
 Executive Director, SFCTA

  
**Carolyn Ganot**  
 CEO and General Manager, VTA

## GET STARTED TODAY

**OPTION 1**  Download the smartphone app, rMove™, and sign up  Receive **\$XX** per adult after all adults complete the 7-day study.

**OR**

**OPTION 2**  Sign up at [bayareatravelstudy.mtc.ca.gov](http://bayareatravelstudy.mtc.ca.gov) or call 1-888-730-2504  Receive **\$XX** per household after completing the 1-day study.



INVITATION ACCESS CODE **XXXXXXXXXX**

You can participate in English, Spanish, Chinese, and Vietnamese through the survey smartphone app, the online survey, or by calling toll-free.

**SPANISH** Lo invitamos a participar en una encuesta sobre sus viajes. Su participación nos ayuda a mejorar las opciones de transporte en su comunidad. Cuando haya completado la encuesta, le enviaremos una de tarjeta regalo como agradecimiento. Para inscribirse, visite: [bayareatravelstudy.mtc.ca.gov](http://bayareatravelstudy.mtc.ca.gov) o llame al 1-888-730-2504.

**VIETNAMESE** Chúng tôi mời bạn làm khảo sát về các chuyến đi của bạn. Khi tham gia khảo sát, bạn giúp chúng tôi cải thiện các lựa chọn giao thông trong cộng đồng của bạn. Sau khi bạn hoàn thành khảo sát, chúng tôi sẽ gửi cho bạn một thẻ quà tặng để cảm ơn. Để đăng ký, hãy truy cập [bayareatravelstudy.mtc.ca.gov](http://bayareatravelstudy.mtc.ca.gov) hoặc gọi 1-888-730-2504.

**TRADITIONAL CHINESE** 繁體中文 我們誠邀您參與一項有關您出行情況的調查，以幫助我們改善您所在社區的交通計劃。在完成調查之後，我們會向您贈送一張禮品卡作為答謝。如果您想參與調查，請訪問：[bayareatravelstudy.mtc.ca.gov](http://bayareatravelstudy.mtc.ca.gov) 或致電：1-888-730-2504 進行報名。

Learn more at [bayareatravelstudy.mtc.ca.gov](http://bayareatravelstudy.mtc.ca.gov) or by calling 1-888-730-2504

**FIGURE 9. BAY AREA TRAVEL STUDY – FREQUENTLY ASKED QUESTIONS**



## FREQUENTLY ASKED QUESTIONS

### **What do I get for participating?**

You will receive a gift card once all members of your household have reported their travel and completed their surveys. If your household participates using the smartphone app, rMove, each participating adult will receive a gift card (e.g., a household with two adults receives two gift cards). Households that report their travel online or by calling in will receive a single gift card.

### **What is this study all about?**

We want to learn how, when, where, and why people travel in and around the Bay Area. We're asking you to log your travel to help us understand regional transportation patterns. By participating, you can help us plan for future transportation improvements in your community.

### **Why should I participate?**

Your participation ensures that households like yours are represented in our regional transportation plans. Your input has a big impact, because only a limited number of households are invited to participate in the study.

### **What if I don't travel much?**

Any amount of travel (even if you don't make any trips) will help us improve regional transportation planning. Don't forget that short trips, such as walking the dog, count too. Deliveries to you, such as take-out or groceries, are also important.

### **What if my transportation habits during the study aren't my "typical" habits?**

That's no problem—we still encourage you to participate. We'll also ask about your typical travel habits, how your travel has changed over the past year, and how you think you'll travel in the future.

### **How was I selected to participate?**

Invited households were selected at random from the Bay Area region. You must live within the study region in order to qualify for an incentive.

### **I was invited to use the study smartphone app, rMove. How does it work?**

After you download rMove and sign up, rMove will log your trips for one week while you go about your daily life. Each day, you'll be asked to complete a short daily survey about your travel habits, as well as a trip survey about each trip you make.

### **How much time does it take to participate?**

It takes about 10 minutes to sign up for the study. Once you sign-up, we'll give you instructions for logging your travel and completing the study. Households that log their travel for seven days in the smartphone app, rMove, will spend about 5-10 minutes each day reporting their travel. Households that log their travel online or over the phone will spend about 10 minutes per household member reporting their travel for one day.

### **Who should sign up?**

Please have only one household member complete the initial sign up survey for the study. Once your household is signed up, all household members need to participate in the study to be eligible for gift cards. If using the app, please have all household members download the app and use the participation code that was emailed. If doing the one-day study, please answer for your entire household.

### **How is my personal privacy protected?**

We are committed to protecting the confidentiality, integrity, and security of your personal information. We take this responsibility seriously. Our Privacy Policy is intended to help you understand how we collect and safeguard your information. To read the study's full privacy documentation, visit [bayareatrustudy.mtc.ca.gov](http://bayareatrustudy.mtc.ca.gov).

### **Who is sponsoring this study?**


This study is sponsored by The Metropolitan Transportation Commission, the San Francisco County Transportation Authority, and the Santa Clara Valley Transportation Authority.

Learn more at [bayareatrustudy.mtc.ca.gov](http://bayareatrustudy.mtc.ca.gov) or by calling 1-888-730-2504

FIGURE 10. REMINDER POSTCARD FRONT




FIGURE 11. REMINDER POSTCARD BACK




**METROPOLITAN TRANSPORTATION COMMISSION (MTC)**  
 BAY AREA METRO CENTER  
 375 BEALE STREET  
 SAN FRANCISCO, CA 94105


**SIGN UP TODAY!** Complete a study about how you travel and receive a gift card as thanks.



**Go online:**  
[bayareatravelstudy.mtc.ca.gov](http://bayareatravelstudy.mtc.ca.gov)



or



**Call toll-free:**  
 1-888-730-2504

INVITATION ACCESS CODE: XXXXXXXXXX

**SPANISH:** Ayúdenos a mejorar las opciones de transporte en su comunidad. Complete la encuesta y le enviaremos una tarjeta de regalo como agradecimiento. Para completar la encuesta, registre en línea o llame al teléfono gratuito.

**TRADITIONAL CHINESE:** 繁體中文 請幫助我們改善您所在社區的交通狀況。在完成調查之後，我們會向您贈送一張禮品卡作為答謝。如果您想參與調查，請上網或撥打免費熱線電話進行報名。

**VIETNAMESE:** Giúp chúng tôi cải thiện giao thông trong cộng đồng của bạn. Hoàn thành khảo sát và chúng tôi sẽ gửi một thẻ quà tặng để cảm ơn. Để hoàn thành khảo sát, hãy đăng ký trực tuyến hoặc gọi đến số điện thoại miễn cước.

<City name resident>  
 <Street Address 1>  
 <Street Address 2>  
 <City, CA <#####>

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