2019 CITY OF TUCSON ON-BOARD SURVEY

Developed by:

ETC INSTITUTE

Prepared for:

The City of Tucson and Pima Association of Governments: for the Sun Tran, Sun Shuttle, and Sun Link Services

Table of Contents

Figures

Tables

Charts

Appendices

Acronyms and Abbreviations

APC	Automatic Passenger Counter
The City / COT	City of Tucson
FTA	Federal Transit Administration
Project	The City of Tucson onboard transit survey
QA/QC	Quality Assurance/Quality Control
RTD	Route, Time Period, and Direction
TRT	Transit Review Team
PAG	Pima Association of Governments
RTA	Regional Transportation Authority

1 Executive Summary

The City of Tucson conducted a transit on-board survey from January of 2019 to February of 2019. The purpose of this project was to gather and update travel behavior data from transit users that encompasses all streetcar and fixed bus route services in the City of Tucson. The data will be used for the following reasons:

- Compile statistically accurate information about transit customers and how they use the transit system.
- Generate reliable linked Origin-Destination data needed by the City of Tucson to support computerized travel demand modeling for purposes of complying with enhanced regional transit studies (e.g. Long-Range Regional Transit Plan).
- Assist in fulfilling the City of Tucson's commitment to update the Pima Association of Governments Regional Travel Model.
- Meet the Title VI Civil Right Requirements per the latest Federal Transit Administration (FTA) guidance.

The goal was to obtain at least 6,200 Origin-Destination (OD) completed surveys. Of those, 5,400 were to be completed with Sun Tran and Sun Shuttle passengers, and 700 were to be completed with Sun Link passengers. The actual number of completed OD surveys was 7,118. Of these, 6,096 were completed with Sun Tran and Sun Shuttle passengers, and 1,022 were completed with Sun Link passengers.

The objectives of the 2019 Origin-Destination Survey analysis were to examine the demographics, and to examine the travel behavior characteristics of Sun Tran, Sun Shuttle, and Sun Link transit service riders. The survey data used for this analysis was appropriately weighted and expanded to represent the linked trips made by Sun Tran, Sun Shuttle, and Sun Link transit service riders.

Some important findings from the analysis of all bus/streetcar riders are the following (includes findings from combined Sun Tran, Sun Shuttle, and Sun Link):

- Just over half (51.59%) of riders do not have a working vehicle in their household.
- Of those passengers that had at least one working vehicle in their household, sixty-one percent of riders (61.05%) could not have used a vehicle on their one-way trip.
- Seventy-three percent of riders (73.14%) indicated they are not a student.
- Sixty-two percent (62.37%) of riders are employed either full-time or part-time.
- Forty-nine percent (49.28%) of riders indicated that they do have a valid driver's license.
- The highest frequency riders were between the ages of 18-24 years old (22.88%), while 25-34 years old were the second highest age range (20.80%).
- The majority, at 67.17%, of riders make less than $35,000 per year for their overall household income.

- Fifty-eight percent (57.84%) of riders indicated they are male, while 42.16% indicated they are female.
- Eighty-nine percent (89.35%) of riders indicated they did not have any type of disability that limits their mobility.
- Seventy-one percent (69.84%) of riders specified their race/ethnicity is “White.”
- Seventy-five percent (75.48%) of riders only speak English at home.
- Most riders got from their Origin to the very first place they boarded the bus by walking (92.30%).
- Walking was the preferred method for riders to get from their alighting location to their destination (94.98%).
- Fifty-one percent (50.53%) of riders used no additional transfers for their one-way trip.
- Eighty-four percent (83.63%) of riders either began their trip, or ended their trip, at home.

Some important findings from the analysis of the Sun Tran riders are the following:

- Just over half (54.73%) of Sun Tran riders do not have a working vehicle in their household.
- Sixty-five percent of Sun Tran riders (65.19%), with at least one working vehicle in their household, could not have used a vehicle on their one-way trip.
- Eighty percent of riders (79.70%) indicated they are not a student.
- Approximately sixty-three percent (62.99%) of riders are employed either full-time or part-time.
- Forty-four percent (44.01%) of Sun Tran riders indicated that they do have a valid driver’s license.
- The highest frequency rider for the Sun Tran service were between the ages of 25-34 years old (22.06%), while 18-24 years old were the second highest age range (17.35%) followed very closely by 35-44 years old (16.68%).
- The majority, at 69.09%, of Sun Tran riders make less than $35,000 per year for their overall household income.
- Sixty percent (59.51%) of Sun Tran riders indicated they are male, while 40.49% indicated they are female.
- Eighty-eight percent (88.09%) of riders indicated they did not have any type of disability that limits their mobility.

- Seventy percent (70.35%) of Sun Tran riders specified their race/ethnicity is "White."
- Seventy-five percent (75.43%) of Sun Tran riders only speak English at home.
- Most Sun Tran riders got from their Origin to the very first place they boarded the bus by walking (92.69%).
- Walking was the preferred method for riders to get from their alighting location to their destination (95.64%).
- Forty-four percent (44.48%) of Sun Tran riders used no additional transfers for their one-way trip.
- Nearly ninety percent (85.45%) of Sun Tran riders either began their trip, or ended their trip, at home.

Some important findings from the analysis of the Sun Shuttle riders are the following:

- Forty-one percent (41.03%) of Sun Shuttle riders do not have a working vehicle in their household.
- Sixty-eight percent of Sun Shuttle riders (68.48%), with at least one working vehicle in their household, could not have used a vehicle on their one-way trip.
- Seventy-six percent of riders (75.64%) indicated they are not a student.
- Over fifty percent (56.41%) of riders are employed either full-time or part-time.
- Forty-one percent (41.03%) of Sun Shuttle riders indicated that they do have a valid driver's license.
- The highest frequency rider for the Sun Shuttle service were between the ages of 18-24 years old (20.51%), while 45-54 years old were the second highest age range (17.95%).
- Over half (52.56%) of Sun Shuttle riders make less than $25,000 per year for their overall household income.
- Fifty-nine percent (58.97%) of Sun Shuttle riders indicated they are male, while 41.03% indicated they are female.
- Eighty-nine percent (89.10%) of riders indicated they did not have any type of disability that limits their mobility.
- Sixty-two percent (62.18%) of Sun Shuttle riders specified their race/ethnicity is "White."
- Seventy-eight percent (78.21%) of Sun Shuttle riders only speak English at home.

- Most Sun Shuttle riders got from their Origin to the very first place they boarded the shuttle by walking (89.74%).
- Walking was the preferred method for riders to get from their alighting location to their destination (87.18%).
- Forty percent (40.38%) of Sun Shuttle riders used no additional transfers for their one-way trip.
- Nearly ninety-three percent (92.95%) of Sun Shuttle riders either began their trip, or ended their trip, at home.

Some important findings from the analysis of the Sun Link riders are the following:

- Thirty-five percent (35.05%) of Sun Link riders do not have a working vehicle in their household.
- Thirty percent of Sun Link riders (30.49%), with at least one working vehicle in their household, could not have used a vehicle on their one-way trip.
- Thirty-five percent of riders (34.85%) indicated they are not a student.
- Approximately sixty percent (59.71%) of riders are employed either full-time or part-time.
- Eighty-one percent (80.97%) of Sun Link riders indicated that they do have a valid driver's license.
- The highest frequency rider for the Sun Link service were between the ages of 18-24 years old (55.15%), while 25-34 years old were the second highest age range (14.27%).
- Over half (56.99%) of Sun Link riders make less than $35,000 per year for their overall household income.
- Forty-eight percent (48.06%) of Sun Link riders indicated they are male, while 51.94% indicated they are female.
- Ninety-seven percent (96.60%) of riders indicated they did not have any type of disability that limits their mobility.
- Seventy-nine percent (78.74%) of Sun Link riders specified their race/ethnicity is "White."
- Seventy-five percent (75.34%) of Sun Link riders only speak English at home.
- Most Sun Link riders got from their Origin to the very first place they boarded the streetcar by walking (90.49%).
- Walking was the preferred method for riders to get from their alighting location to their destination (92.33%).

- Eighty-seven percent (86.99%) of Sun Link riders used no additional transfers for their one-way trip.
- Seventy-eight percent (77.57%) of Sun Link riders either began their trip, or ended their trip, at home.

2 Survey Overview

The 2019 City of Tucson (the City) Onboard Transit Survey was conducted on the Sun Tran, Sun Shuttle, and Sun Link services during the months of January 2019 to February 2019. The OD Survey consisted of detailed surveys of riders conducted onboard streetcar and bus routes. Overall, the contracted goals were to complete over 7,100 OD surveys combined for Sun Tran, Sun Shuttle, and Sun Link. The following sections further describe the survey process.

2.1 Purpose and Objectives

The purpose of the project was to gather updated travel behavior data from transit users in the Tucson area. The data collected will be used to:

- Improve transit forecasts by updating the Pima Association of Governments (PAG) Regional Travel Model
- Gather updated travel behavior data from transit users in the regional service area to gain a better understanding of today's transit riders
- Support transit planning and operations activities based on observed ridership patterns and preferences
- Allow for updated Title VI and Environmental Justice reporting

2.2 Survey Development Process

The survey development process began by having representatives from Sun Tran and PAG in cooperation with ETC Institute review the data requirements for the Onboard Transit Survey. The primary objective for the project was to provide data for Title VI reporting for the City and improve the regional transit ridership forecasts produced by PAG's travel demand model. Most of the questions focused on collecting data that will support current and future Title VI analyses and transportation forecasting efforts.

After multiple iterations of input and review, the survey instrument was shared with representatives of the FTA to ensure all Federal requirements and expectations for the design of the survey were met. All the suggestions from the FTA staff were incorporated into the final version of the survey.

2.2.1 Required Data Collected

Required data involved questions for which a response from a respondent was required for the survey to be considered complete. *(Required data is listed below)*

- Route / Direction
- Time of Trip
- Transfers made
- Home address
- Origin address
- Destination address
- Origin place type
- Destination place type
- Access mode
- Egress mode
- Boarding location
- Alighting location

2.3 Survey Instrument

The survey instrument was designed to be administered as a face-to-face interview using tablet PCs and printed surveys. Tablet PCs were the preferred method and paper surveys (printed on heavy card stock for easy distribution and completion) were only used on Sun Shuttle Dial-A-Ride services in Green Valley/Sahuarita and Oro Valley (see Appendix A for a copy of the paper survey).

The tablet PCs were the preferred method as they have an on-screen mapping feature that allows for real-time geocoding of addresses and places from address, intersection, or place searches based on feedback from respondents. The respondents can then confirm the geocoded location based on the on-screen map that shows the searched address/location via a Google Map indicator icon. In addition to using the mapping feature to collect the major survey location geo coordinates (home address, origin address, destination address, boarding location, alighting location), the tablet PC also allows the surveyor to walk through each question with the respondent to answer any questions as well as to ensure the quality of the data collected. The respondent can also independently select the answers to the questions during the demographic section in order to allow for more privacy.

3 Findings from the Survey

This section highlights selected demographic and trip-related findings from the survey based on the individual services (Sun Tran, Sun Shuttle, and Sun Link), as well as overall. Three major categories are presented regarding the survey findings: (1) demographic characteristics, (2) travel characteristics, and (3) rider characteristics. The database used for the tables in this section was expanded based on the weight factors created during the data expansion process. Each table indicates whether it was based on the linked weight factor or unlinked weight factor. Linked weight factors are meant to estimate the average daily number of trips that occur in a system as opposed to the unlinked weight factors which represent the average daily number of boardings. Linked weight factors are generally used for demographics because they tend to reduce the chance of overestimating lower income populations who tend to make a higher number of transfers. When expanding the database using the linked weight factor, the total number of estimated average daily trips equals 37,433. When expanding the database using the unlinked weight factor, the total number of average daily boardings equals 51,976.

The subsequent charts exclude visitors to the area to better depict the average daily ridership and demographics of the typical rider.

3.1 Demographic Characteristics

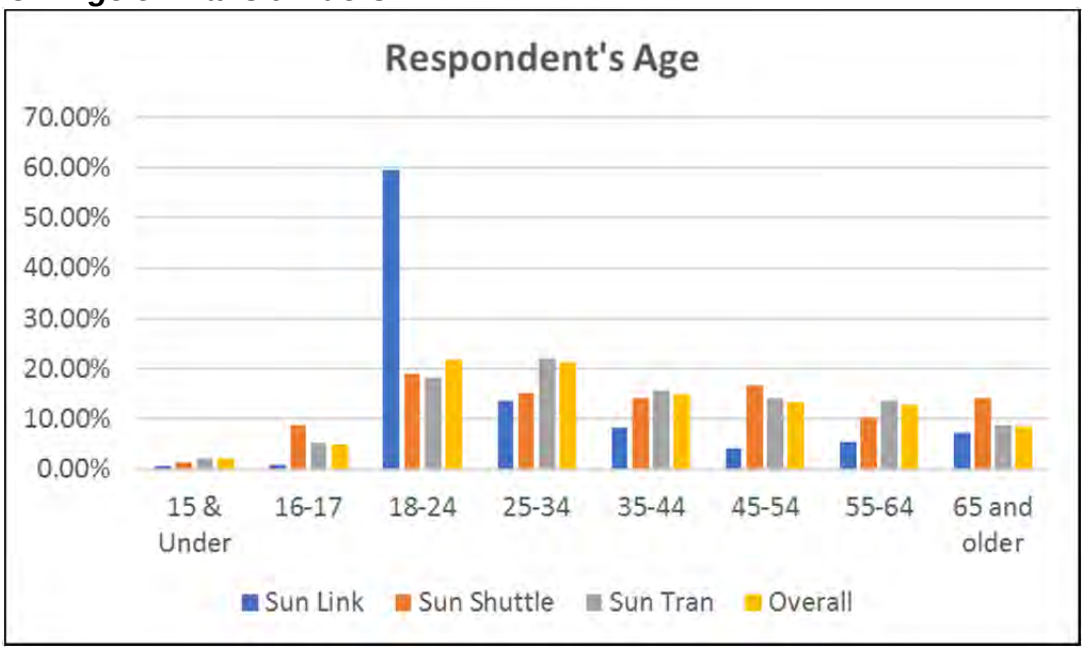
3.1.1 Age

Most of all transit riders indicated that they were between the ages of 18 and 54 (71.31%). Seven percent of riders (7.06%) were indicated to be under the age of 18 as shown in Table 1 below and in Chart 3-1 on the following page.

Table 1 Age of Transit Riders

Respondent's Age Based on Linked Weight Factor Excluding Visitors				
	Sun Link	Sun Shuttle	Sun Tran	Overall
15 & Under	0.65%	1.41%	2.28%	2.13%
16-17	1.01%	8.88%	5.27%	4.93%
18-24	59.59%	18.95%	18.14%	21.76%
25-34	13.61%	15.29%	21.97%	21.18%
35-44	8.22%	14.16%	15.68%	15.01%
45-54	4.14%	16.76%	14.21%	13.36%
55-64	5.59%	10.44%	13.72%	12.98%
65 and older	7.20%	14.11%	8.74%	8.65%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Chart 3-1 Age of Transit Riders



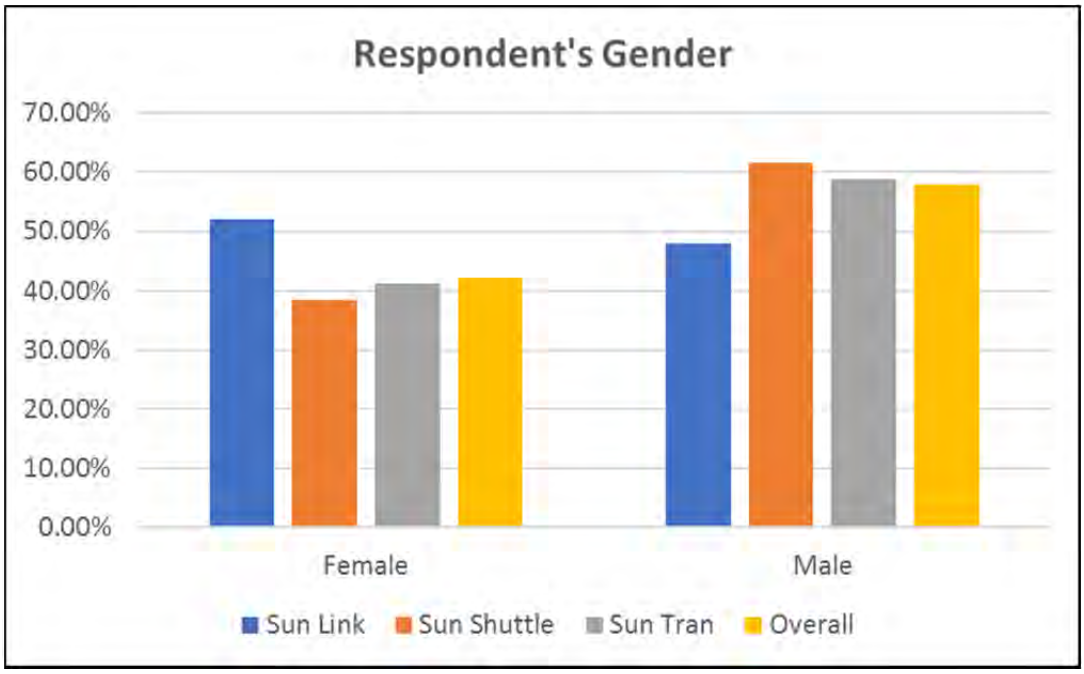
3.1.2 Gender

As indicated in Table 3-2 below and in Chart 2 on the following page, more female riders (52.12%) take the Sun Link than male riders (47.88%), while more male riders (58.76%) take the Sun Tran than female riders (41.24%).

Table 2 Gender of Transit Riders

Respondent's Gender Based on Linked Weight Factor Excluding Visitors				
	Sun Link	**Sun Shuttle**	**Sun Tran**	**Overall**
Female	52.12%	38.41%	41.24%	42.16%
Male	47.88%	61.59%	58.76%	57.84%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Chart 3-2 Gender of Transit Riders



3.1.3 Race/Ethnicity

Thirty-three percent (33.38%) of all transit riders (Sun Tran, Sun Shuttle, and Sun Link combined) identified themselves as having Hispanic, Latino, or Spanish origins as shown in Table 3 below.

Table 3 Race/Ethnicity (Hispanic Origin)

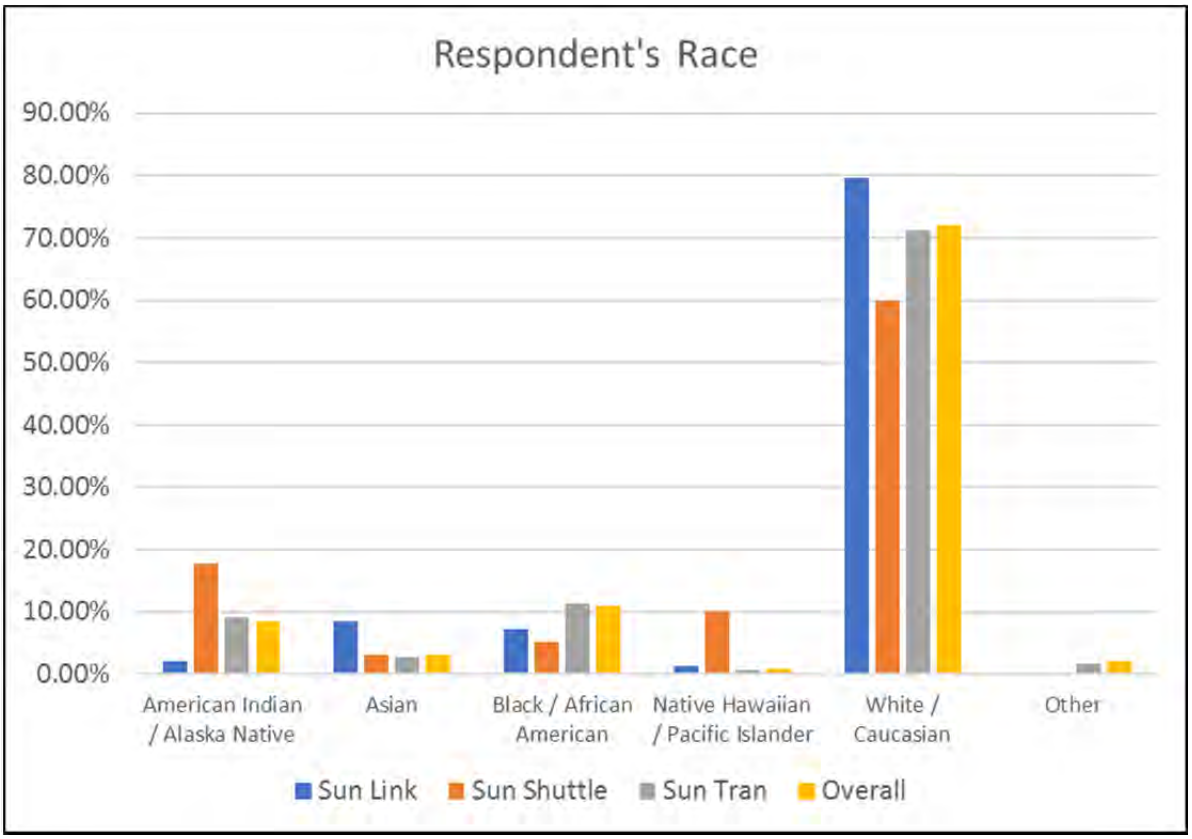
Whether Respondent is of Hispanic, Latino, or Spanish Origin				
Based on Linked Weight Factor Excluding Visitors				
	Sun Link	**Sun Shuttle**	**Sun Tran**	**Overall**
No	78.99%	66.07%	63.70%	65.05%
Yes	18.70%	29.51%	34.83%	33.38%
Choose not to answer	2.31%	4.43%	1.47%	1.57%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Most of all transit riders (Sun Tran, Sun Shuttle, and Sun Link combined) identified themselves as “White” (71.95%) as shown in Table 3-4 and in Chart 3-3 on the following page. Totals do not always equal 100% as respondents were encouraged to select all that applied.

Table 4 Race/Ethnicity

Based on Linked Weight Factor Excluding Visitors				
	Sun Link	**Sun Shuttle**	**Sun Tran**	**Overall**
American Indian / Alaska Native	2.09%	17.69%	9.12%	8.58%
Asian	8.55%	3.23%	2.66%	3.18%
Black / African American	7.23%	5.22%	11.44%	11.02%
Native Hawaiian / Pacific Islander	1.31%	10.08%	0.74%	0.87%
White / Caucasian	79.68%	59.82%	71.33%	71.95%
Other	0.35%	0.03%	1.80%	2.18%

Chart 3-3 Race/Ethnicity



3.1.4 Income

As shown in Table 5 and Chart 3-4 below, Sun Link riders indicate the lowest annual household income of Less than $10,000 per year (28.31%), while also indicating the highest annual household income of $100,000 or More per year of the three services (5.96%).

Table 5 Total Annual Household Income

Income				
Based on Linked Weight Factor Excluding Visitors				
	Sun Link	**Sun Shuttle**	**Sun Tran**	**Overall**
Less than $10,000	28.31%	21.47%	22.82%	23.28%
$10,000 - $14,999	12.37%	13.95%	15.47%	15.19%
$15,000 - $24,999	10.68%	16.81%	19.68%	18.87%
$25,000 - $34,999	7.04%	9.27%	11.57%	11.15%
$35,000 - $49,999	6.16%	10.61%	7.47%	7.38%
$50,000 - $74,999	9.68%	6.51%	4.88%	5.31%
$75,000 - $99,999	5.86%	3.45%	2.07%	2.41%
$100,000 or more	5.96%	2.82%	1.66%	2.04%
REFUSED	13.94%	15.10%	14.38%	14.35%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Chart 3-4 Total Annual Household Income

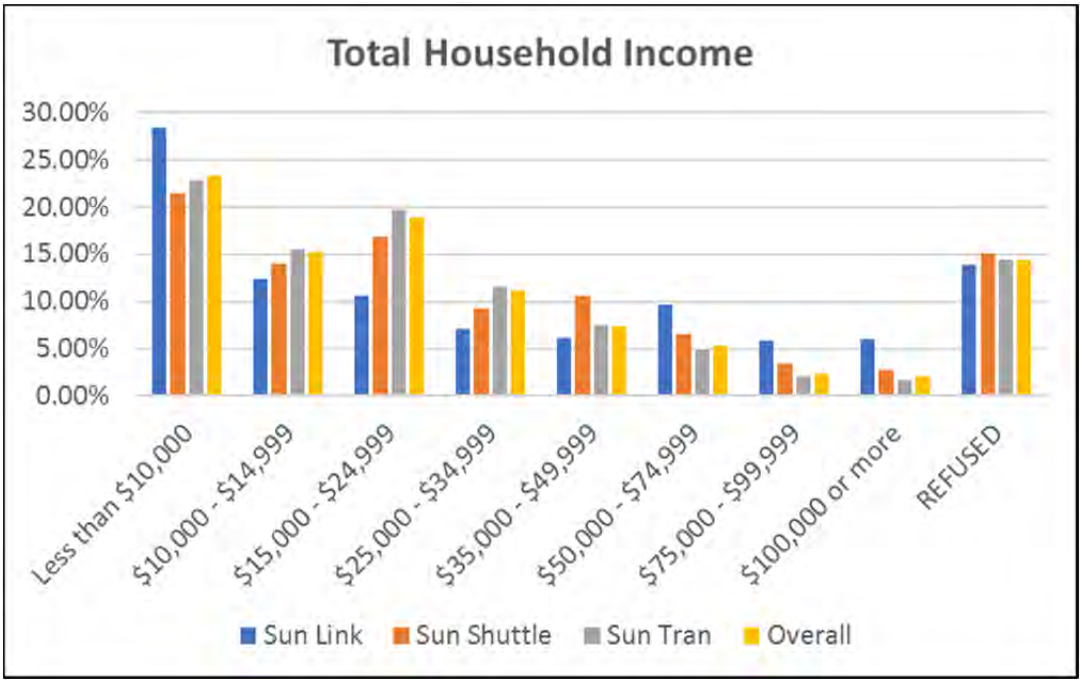


Table 6 Income by Number of Members in Household

Income by Number of Members in Household Based on Linked Weight Factor Excluding Visitors				
	Sun Link	Sun Shuttle	Sun Tran	Overall
One (1)	**25.19%**	**25.11%**	**30.69%**	**30.16%**
Less than $10,000	7.53%	7.57%	10.69%	10.39%
$10,000 - $14,999	3.95%	3.55%	5.56%	5.40%
$15,000 - $24,999	3.44%	4.88%	5.38%	5.21%
$25,000 - $34,999	1.84%	2.37%	2.61%	2.54%
$35,000 - $49,999	1.18%	1.26%	1.66%	1.61%
$50,000 - $74,999	2.71%	1.08%	0.52%	0.71%
$75,000 - $99,999	0.84%	0.00%	0.23%	0.28%
$100,000 or more	0.34%	0.75%	0.06%	0.09%
REFUSED	3.36%	3.64%	3.97%	3.91%
Two (2)	**30.70%**	**14.20%**	**25.07%**	**25.46%**
Less than $10,000	6.77%	2.68%	5.23%	5.34%
$10,000 - $14,999	3.05%	5.41%	3.84%	3.79%
$15,000 - $24,999	3.58%	0.85%	5.15%	4.97%
$25,000 - $34,999	1.63%	1.03%	3.29%	3.12%
$35,000 - $49,999	2.65%	2.13%	1.90%	1.97%
$50,000 - $74,999	2.67%	0.38%	1.60%	1.68%
$75,000 - $99,999	1.26%	0.00%	0.74%	0.78%
$100,000 or more	4.06%	0.42%	0.58%	0.88%
REFUSED	5.03%	1.31%	2.73%	2.92%
Three (3)	**17.72%**	**17.66%**	**17.26%**	**17.31%**
Less than $10,000	6.45%	3.61%	3.05%	3.35%
$10,000 - $14,999	1.50%	0.63%	2.36%	2.27%
$15,000 - $24,999	1.70%	1.74%	3.66%	3.47%
$25,000 - $34,999	1.58%	1.73%	2.21%	2.15%
$35,000 - $49,999	1.09%	1.96%	1.49%	1.46%
$50,000 - $74,999	1.36%	0.47%	1.18%	1.18%
$75,000 - $99,999	0.99%	1.87%	0.34%	0.41%
$100,000 or more	0.75%	0.47%	0.32%	0.36%
REFUSED	2.31%	5.19%	2.64%	2.64%
Four (4)	**21.29%**	**18.20%**	**12.70%**	**13.49%**
Less than $10,000	6.47%	1.31%	1.77%	2.17%
$10,000 - $14,999	3.12%	2.99%	1.84%	1.96%
$15,000 - $24,999	1.50%	2.27%	2.58%	2.48%
$25,000 - $34,999	1.43%	2.05%	1.35%	1.36%
$35,000 - $49,999	0.98%	1.81%	1.11%	1.11%
$50,000 - $74,999	2.40%	3.52%	0.78%	0.94%
$75,000 - $99,999	2.46%	0.93%	0.41%	0.60%
$100,000 or more	0.79%	0.75%	0.42%	0.45%
REFUSED	2.15%	2.57%	2.44%	2.42%
Five (5)	**3.90%**	**12.78%**	**7.20%**	**6.96%**
Less than $10,000	0.99%	1.45%	0.82%	0.84%
$10,000 - $14,999	0.56%	1.37%	1.03%	0.99%
$15,000 - $24,999	0.44%	3.84%	1.57%	1.49%
$25,000 - $34,999	0.44%	0.84%	1.17%	1.11%
$35,000 - $49,999	0.13%	1.96%	0.77%	0.73%
$50,000 - $74,999	0.40%	0.61%	0.36%	0.36%
$75,000 - $99,999	0.22%	0.65%	0.13%	0.14%
$100,000 or more	0.00%	0.42%	0.13%	0.12%
REFUSED	0.72%	1.64%	1.22%	1.18%

Income by Number of Members in Household Based on Linked Weight Factor Excluding Visitors				
	Sun Link	Sun Shuttle	Sun Tran	Overall
Six (6)	**0.80%**	**5.02%**	**3.21%**	**3.02%**
Less than $10,000	0.00%	2.35%	0.42%	0.40%
$10,000 - $14,999	0.19%	0.00%	0.40%	0.38%
$15,000 - $24,999	0.00%	1.17%	0.74%	0.68%
$25,000 - $34,999	0.09%	0.28%	0.56%	0.52%
$35,000 - $49,999	0.02%	0.47%	0.26%	0.24%
$50,000 - $74,999	0.13%	0.00%	0.25%	0.24%
$75,000 - $99,999	0.10%	0.00%	0.06%	0.06%
$100,000 or more	0.00%	0.00%	0.02%	0.02%
REFUSED	0.27%	0.75%	0.50%	0.48%
Seven (7)	**0.25%**	**1.43%**	**1.65%**	**1.53%**
Less than $10,000	0.08%	0.00%	0.23%	0.21%
$10,000 - $14,999	0.00%	0.00%	0.28%	0.25%
$15,000 - $24,999	0.00%	0.00%	0.31%	0.28%
$25,000 - $34,999	0.02%	0.97%	0.18%	0.17%
$35,000 - $49,999	0.12%	0.00%	0.25%	0.24%
$50,000 - $74,999	0.00%	0.46%	0.03%	0.03%
$75,000 - $99,999	0.01%	0.00%	0.02%	0.02%
$100,000 or more	0.02%	0.00%	0.04%	0.03%
REFUSED	0.01%	0.00%	0.33%	0.30%
Eight (8)	**0.00%**	**2.05%**	**0.79%**	**0.73%**
Less than $10,000	0.00%	0.00%	0.07%	0.06%
$10,000 - $14,999	0.00%	0.00%	0.06%	0.05%
$15,000 - $24,999	0.00%	2.05%	0.13%	0.14%
$25,000 - $34,999	0.00%	0.00%	0.08%	0.07%
$35,000 - $49,999	0.00%	0.00%	0.02%	0.02%
$50,000 - $74,999	0.00%	0.00%	0.11%	0.10%
$75,000 - $99,999	0.00%	0.00%	0.04%	0.04%
$100,000 or more	0.00%	0.00%	0.01%	0.01%
REFUSED	0.00%	0.00%	0.25%	0.23%
Nine (9)	**0.00%**	**1.49%**	**0.22%**	**0.21%**
Less than $10,000	0.00%	1.49%	0.09%	0.10%
$10,000 - $14,999	0.00%	0.00%	0.01%	0.01%
$15,000 - $24,999	0.00%	0.00%	0.07%	0.06%
$25,000 - $34,999	0.00%	0.00%	0.02%	0.02%
$100,000 or more	0.00%	0.00%	0.02%	0.02%
REFUSED	0.00%	0.00%	0.01%	0.01%
Ten or More (10+)	**0.14%**	**2.05%**	**1.23%**	**1.14%**
Less than $10,000	0.03%	1.03%	0.44%	0.41%
$10,000 - $14,999	0.00%	0.00%	0.08%	0.07%
$15,000 - $24,999	0.02%	0.00%	0.10%	0.09%
$25,000 - $34,999	0.00%	0.00%	0.10%	0.09%
$35,000 - $49,999	0.00%	1.03%	0.00%	0.01%
$50,000 - $74,999	0.00%	0.00%	0.05%	0.05%
$75,000 - $99,999	0.00%	0.00%	0.11%	0.10%
$100,000 or more	0.00%	0.00%	0.05%	0.05%
REFUSED	0.09%	0.00%	0.29%	0.27%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

3.1.5 Employed Status of Transit Rider

Sun Link (27.70%) and Sun Shuttle (23.69%) had the highest ridership for not having any household members employed, either part-time or full-time as shown in Table 7 below. Most overall riders (65.22%) had one or two household members employed either part-time or full-time.

Employed in household was asked based on number of members living in the household over the age of 15 who were employed either part- or full-time. If there was only one member in the household, the response would be either 0 or 1 for employed in household based on their employment status.

Table 7 Employment Status of Respondent

Employed in Household				
Based on Linked Weight Factor Excluding Visitors				
	Sun Link	**Sun Shuttle**	**Sun Tran**	**Overall**
None (0)	27.70%	23.69%	22.47%	22.94%
One (1)	34.57%	32.15%	38.25%	37.88%
Two (2)	27.01%	27.28%	27.37%	27.34%
Three (3)	7.12%	11.94%	8.23%	8.17%
Four (4)	2.78%	2.39%	2.13%	2.19%
Five (5)	0.77%	1.11%	0.70%	0.71%
Six (6)	0.00%	0.98%	0.22%	0.21%
Seven (7)	0.00%	0.46%	0.17%	0.15%
Eight (8)	0.01%	0.00%	0.12%	0.11%
Nine (9)	0.00%	0.00%	0.02%	0.01%
Ten or More (10+)	0.03%	0.00%	0.32%	0.29%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

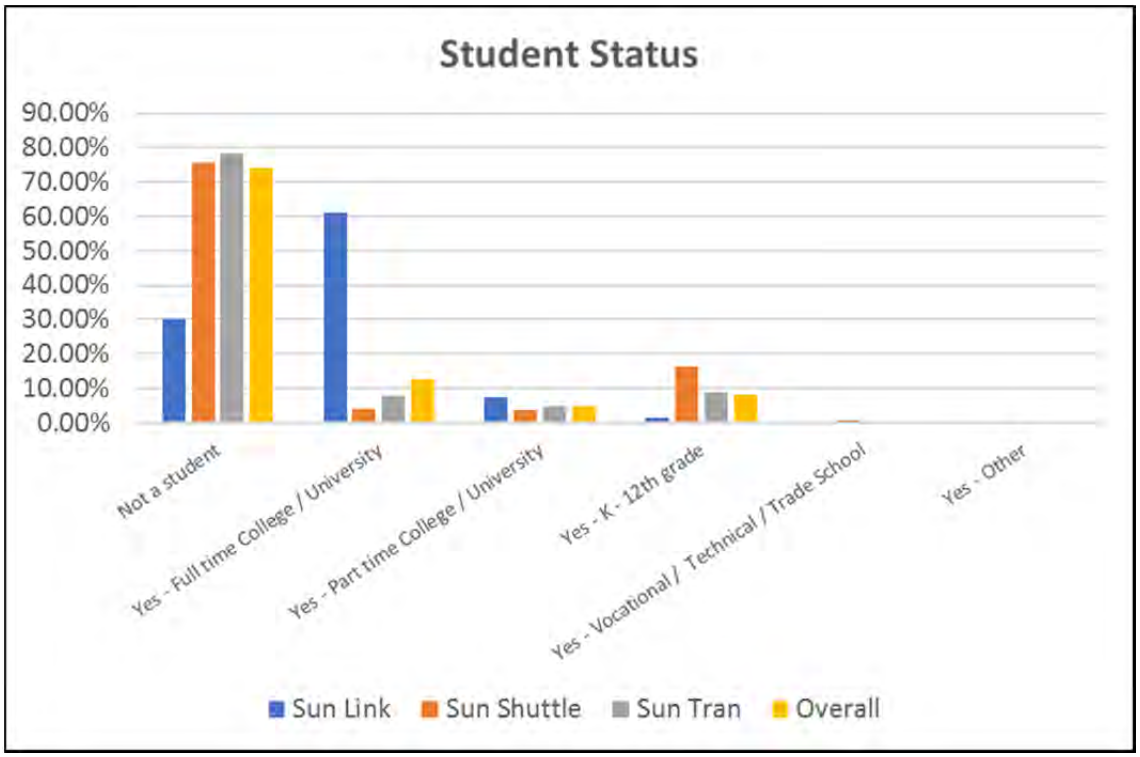
3.1.6 Student Status

Most of the Sun Tran (78.40%) and Sun Shuttle (75.54%) riders indicated they were not a student of any kind. The majority of Sun Link (61.05%) indicated they were a full-time college/university student as shown in Table 3-7 below and in Chart 8 on the following page.

Table 8 Student Status

Student Status				
Based on Linked Weight Factor Excluding Visitors				
	Sun Link	**Sun Shuttle**	**Sun Tran**	**Overall**
Not a student	30.12%	75.54%	78.40%	74.18%
Yes - Full time College / University	61.05%	3.88%	7.87%	12.46%
Yes - Part time College / University	7.32%	3.70%	4.64%	4.86%
Yes - K - 12th grade	1.50%	16.41%	8.73%	8.17%
Yes - Vocational / Technical / Trade School	0.00%	0.47%	0.18%	0.16%
Yes - Other	0.02%	0.00%	0.19%	0.17%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Chart 3-5 Student Status



3.1.7 Transit Riders that Speak another Language besides English at Home

Sun Tran (24.27%) and Sun Link (22.66%) have the highest percentage of the services of riders who do speak another language other than English at home as shown in Table 9 below.

There were a total of 66 languages chosen for those respondents that indicated they spoke another language other than English at home.

Table 9 Transit Riders that Speak another Language besides English at Home

Speak Another Language Other than English at Home Based on Linked Weight Factor Excluding Visitors				
	Sun Link	**Sun Shuttle**	**Sun Tran**	**Overall**
No	77.34%	78.76%	75.73%	75.90%
Yes	22.66%	21.24%	24.27%	24.10%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Of those riders who indicated they did speak another language other than English at home, most of all riders speak English either “Very well” or “Well” (95.92%) as shown in Table 10 below.

For transit riders that speak a language other than English at home, 81.24% indicated speaking Spanish followed by 2.17% who speak French and 15.04% who speak a different language at home.

Table 10 English Ability: Transit Riders that Speak another Language besides English at Home

English Ability Based on Linked Weight Factor Excluding Visitors				
	Sun Link	Sun Shuttle	Sun Tran	Overall
Very well	87.36%	66.32%	84.53%	84.61%
Well	11.55%	17.14%	11.24%	11.31%
Less than well	1.08%	7.89%	2.72%	2.63%
Not at all	0.00%	0.00%	1.04%	0.95%
Unknown	0.00%	8.65%	0.47%	0.50%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

3.1.8 Transit Riders with Disabilities

Eighty-nine percent (88.70%) of all riders (Sun Tran, Sun Shuttle, and Sun Link combined) indicated that they did not have a disability that hindered their mobility as shown in Table 11 below.

Table 11 Transit Riders with Disabilities

Disability Based on Linked Weight Factor Excluding Visitors				
	Sun Link	Sun Shuttle	Sun Tran	Overall
No	96.79%	87.60%	87.94%	88.70%
Yes	3.21%	12.40%	12.06%	11.30%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

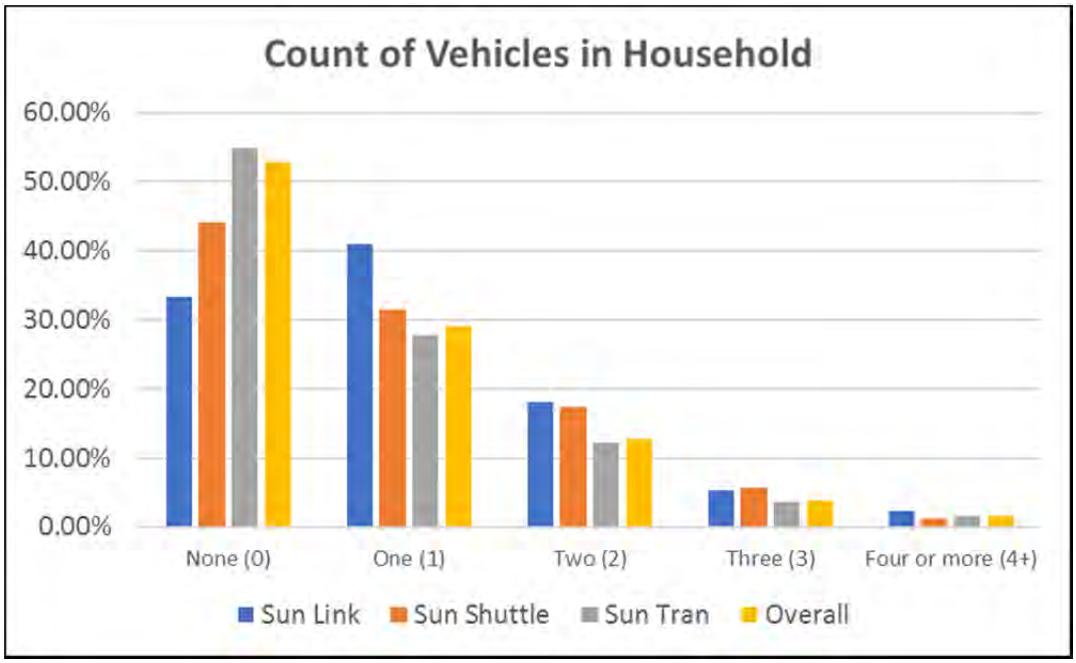
3.1.9 Vehicle Availability

Fifty-three percent (52.91%) of overall riders do not have a working vehicle available to their household. Sun Link riders had the highest percentage of riders (66.71 %) that had at least one or more working vehicles in their household as shown in Table 12 and Chart 3-6 below.

Table 12 Number of Working Vehicles in Household (by percentage of transit riders surveyed, excluding visitors)

Count of Vehicles in Household Based on Linked Weight Factor Excluding Visitors				
	Sun Link	**Sun Shuttle**	**Sun Tran**	**Overall**
None (0)	33.29%	44.06%	54.88%	52.91%
One (1)	40.94%	31.58%	27.84%	29.01%
Two (2)	18.14%	17.35%	12.14%	12.70%
Three (3)	5.28%	5.73%	3.61%	3.77%
Four or more (4+)	2.34%	1.27%	1.54%	1.61%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Chart 3-6 Number of Working Vehicles in Household (by percentage of transit riders surveyed, excluding visitors)



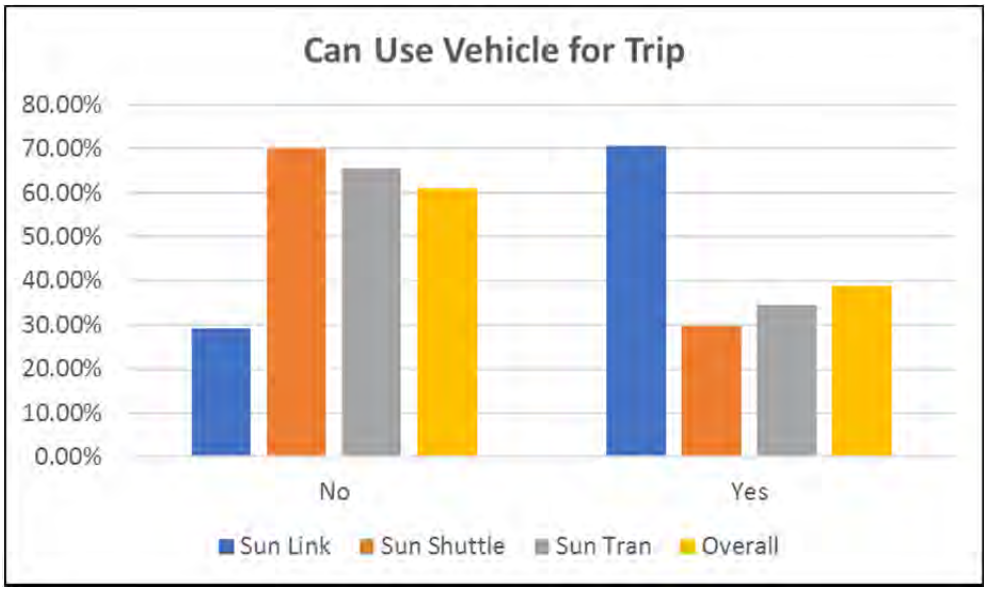
3.1.10 Could transit rider use household vehicle to make trip

Of those passengers that had at least one working vehicle in their household, seventy-one percent (70.66%) of Sun Link riders indicated that they could have used a household vehicle to make their trip, a marked difference compared to Sun Tran riders (34.56%) and Sun Shuttle riders (29.87%) as shown in Table 13 and in Chart 3-7 below.

Table 13 Could transit rider use household vehicle to make trip (by percentage of transit riders surveyed who had at least one working vehicle available to their household, excluding visitors)

Can Use Vehicle for Trip Based on Linked Weight Factor Excluding Visitors				
	Sun Link	Sun Shuttle	Sun Tran	Overall
No	29.34%	70.13%	65.44%	61.05%
Yes	70.66%	29.87%	34.56%	38.95%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Chart 3-7 Could transit rider use household vehicle to make trip (by percentage of transit riders surveyed who had at least one working vehicle available to their household, excluding visitors)



3.1.11 Driver's License

Sun Link riders indicated having a higher percentage of riders who have a valid driver's license (80.88%) compared to Sun Tran riders (44.11%) and Sun Shuttle riders (39.31%) as shown in Table 14 on the following page.

Table 14 Valid Driver's License

Driver's License Based on Linked Weight Factor Excluding Visitors				
	Sun Link	Sun Shuttle	Sun Tran	Overall
No	19.12%	60.69%	55.89%	52.74%
Yes	80.88%	39.31%	44.11%	47.26%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

3.2 Travel Characteristics

3.2.1 How Passengers Access Public Transit

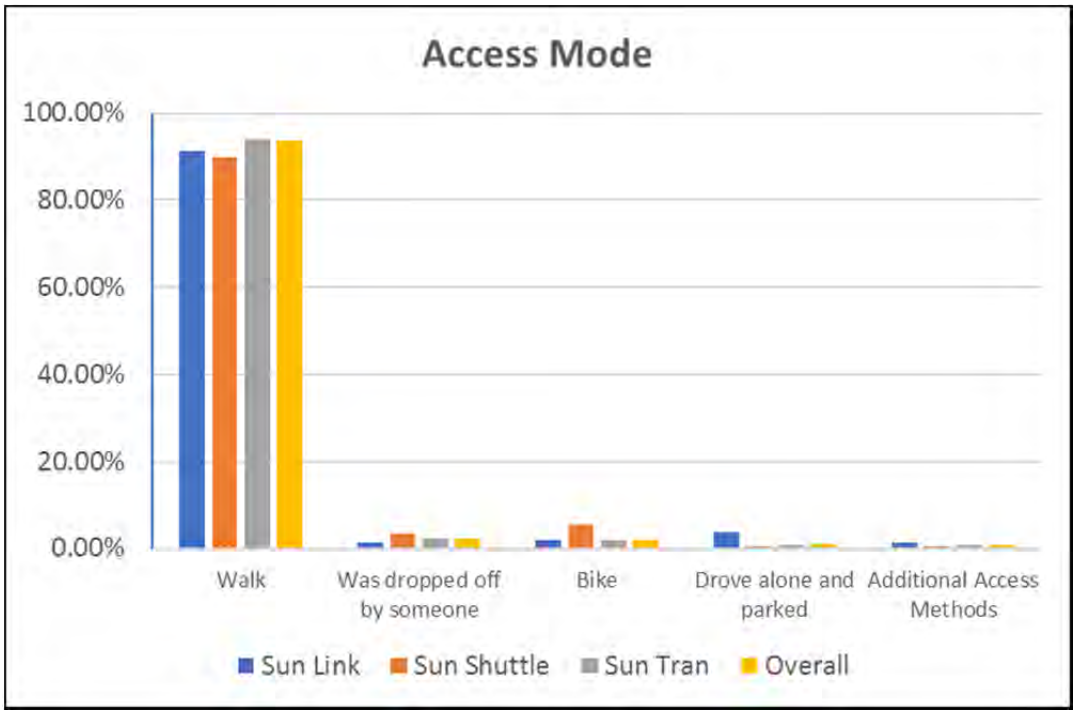
Most of all transit riders (Sun Tran, Sun Shuttle, and Sun Link combined) indicated that they accessed public transit by walking (93.81%). Sun Shuttle had the highest percentage of riders who indicated they took a bike to access public transit (5.37%) as shown in Table 15 below and in Chart 3-8 on the following page.

The additional methods of transportation were less than 1% of the overall and include “Wheelchair”, “Drove or rode with others and parked”, “Cat Tran Shuttle”, “Uber, Lyft, etc.”, “Skateboard”, “Taxi”, and “Scooter”.

Table 15 Mode to Access Public Transit

Access Mode Based on Unlinked Weight Factor Excluding Visitors				
	Sun Link	Sun Shuttle	Sun Tran	Overall
Walk	91.44%	89.96%	94.02%	93.81%
Was dropped off by someone	1.26%	3.58%	2.24%	2.19%
Bike	2.04%	5.37%	2.03%	2.07%
Drove alone and parked	3.89%	0.60%	0.92%	1.12%
Additional Access Methods	1.37%	0.49%	0.78%	0.81%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Chart 3-8 Mode to Access Public Transit



3.2.2 How Passengers Traveled from Transit to Their Final Destination

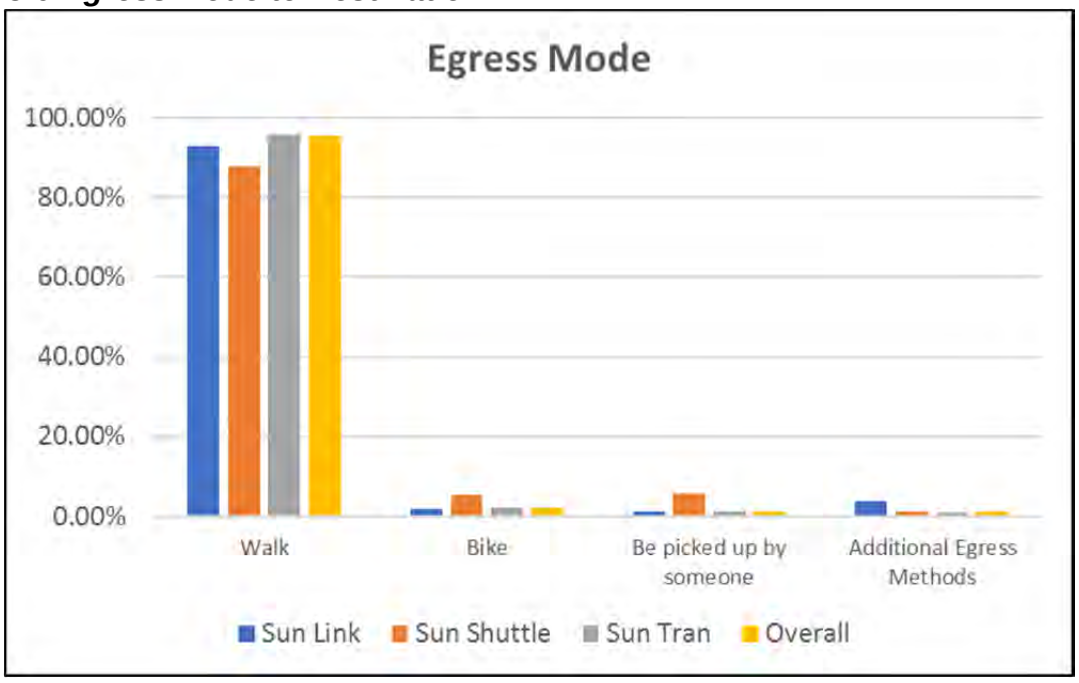
Most of all transit riders (Sun Tran, Sun Shuttle, and Sun Link combined) indicated that they traveled from public transit to their destination by walking (95.50%). Sun Shuttle (6.88%) riders were more likely to use a vehicle of some sort, compared to Sun Link (4.67%) and Sun Tran riders (1.58%), as shown in Table 16 below and in Chart 3-9 on the following page.

The additional methods of transportation were less than 1% of the overall and include “Wheelchair”, “Get in a parked vehicle & drive alone”, “Uber, Lyft, etc.”, “Skateboard”, “Get in a parked vehicle & drive/ride w/others”, “Cat Tran Shuttle”, “School Bus”, “Scooter”, and “Taxi”.

Table 16 Egress Mode to Destination

Egress Mode				
Based on Unlinked Weight Factor Excluding Visitors				
	Sun Link	**Sun Shuttle**	**Sun Tran**	**Overall**
Walk	93.00%	87.70%	95.76%	95.50%
Bike	1.87%	5.43%	2.08%	2.10%
Be picked up by someone	1.24%	5.62%	1.13%	1.19%
Additional Egress Methods	3.89%	1.25%	1.02%	1.22%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Chart 3-9 Egress Mode to Destination



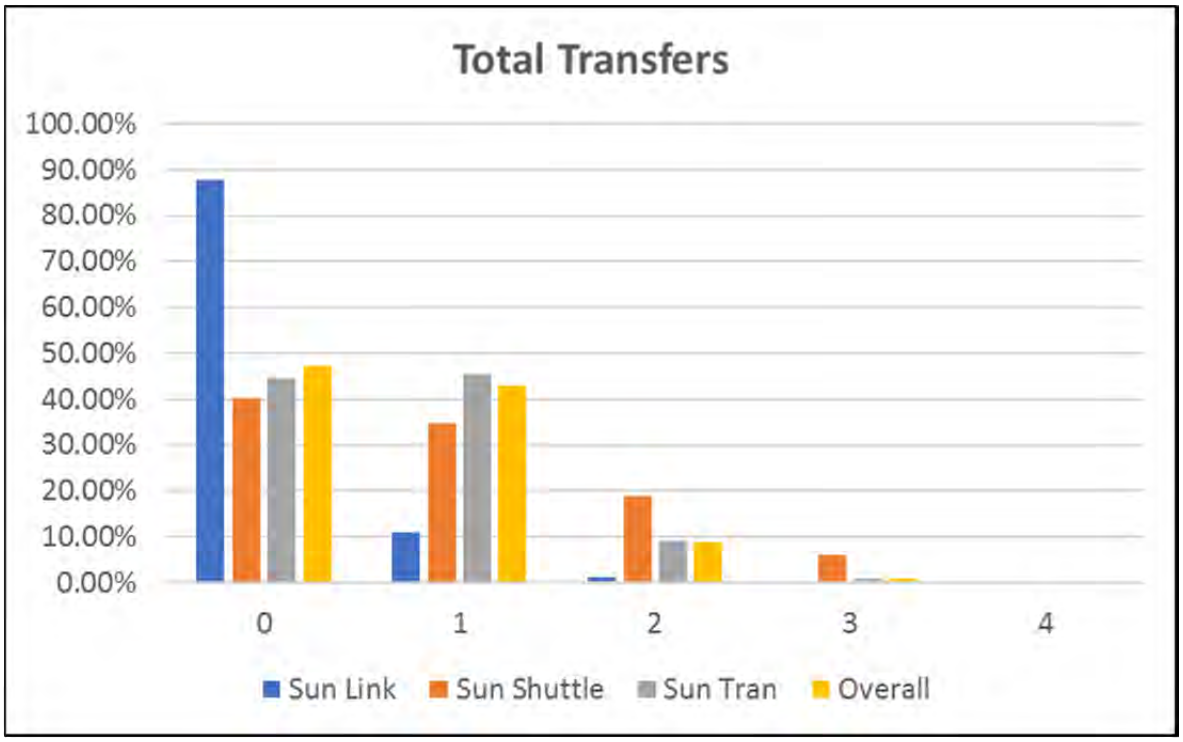
3.2.3 Transfers

Almost half (47.35%) of all riders were able to complete their one-way trip on a single vehicle and did not require a transfer. Nearly ninety percent (89.99%) of Sun Tran riders take one or fewer transfers as shown in Table 17 below and in Chart 3-10 on the following page.

Table 17 Total Number of Transfers

Total Transfers				
Based on Unlinked Weight Factor Excluding Visitors				
	Sun Link	**Sun Shuttle**	**Sun Tran**	**Overall**
0	87.85%	40.28%	44.50%	47.35%
1	10.91%	34.75%	45.49%	43.08%
2	1.24%	18.77%	9.18%	8.75%
3	0.00%	6.21%	0.80%	0.80%
4	0.00%	0.00%	0.02%	0.02%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Chart 3-10 Total Number of Transfers



3.3 Most Common Types of Place Riders are Coming from and Going to

Table 18 below and Table on the following page show the most common types of places that riders were coming from and going to during their one-way trips. This does not include trips that were made in the opposite direction.

The most common type of place a rider was coming from was their Home (48.21%), followed by their usual Workplace (13.79%) and then personal business (bank, post office) as the third most common place (7.69%). As Table 18 below shows, Sun Link riders are the most likely to be coming from College/University (28.44%).

Table 18 Most Common Types of Places Riders are Coming From

Origin Place Type Based on Linked Weight Factor Excluding Visitors				
	Sun Link	**Sun Shuttle**	**Sun Tran**	**Overall**
Your HOME	41.19%	54.66%	48.82%	48.21%
Your usual WORKPLACE	10.70%	17.09%	14.06%	13.79%
Personal business (bank, post office)	4.01%	3.13%	8.09%	7.69%
Shopping	2.56%	7.55%	6.86%	6.50%
College / University (students only)	28.44%	2.50%	4.13%	6.23%
Social visit (friends, relatives)	1.10%	3.96%	5.39%	5.00%
Medical appointment / doctor visit	0.67%	1.29%	3.77%	3.48%
School K-12 (students only)	0.81%	7.33%	3.27%	3.09%
Dining out	6.54%	0.35%	1.48%	1.91%
Recreation / Sightseeing	1.52%	1.87%	1.67%	1.66%
Other business-related (e.g. meeting, delivery)	0.26%	0.28%	1.57%	1.44%
Pick up / Drop off someone (daycare, school)	0.06%	0.00%	0.45%	0.42%
Your Hotel	2.16%	0.00%	0.16%	0.33%
Escorting / accompanying someone	0.00%	0.00%	0.17%	0.15%
Airport (airline passenger only)	0.00%	0.00%	0.11%	0.10%
Major Sporting Event, Concert, or Conference	0.00%	0.00%	0.00%	0.00%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

The most common type of place a rider was going to was their Home (35.44%), followed by their usual Workplace (19.35%) and then personal business (bank, post office) as the third most common place (10.18%). As Table 19 below shows, Sun Link riders are the most likely to be going to College/University (30.29%).

Table 19 Most Common Types of Places Riders are Going To

Destination Place Type				
Based on Linked Weight Factor Excluding Visitors				
	Sun Link	**Sun Shuttle**	**Sun Tran**	**Overall**
Your HOME	36.91%	38.88%	35.27%	35.44%
Your usual WORKPLACE	9.89%	14.01%	20.31%	19.35%
Personal business (bank, post office)	5.20%	5.26%	10.70%	10.18%
Shopping	1.93%	13.44%	7.22%	6.81%
College / University (students only)	30.29%	3.24%	4.42%	6.66%
Social visit (friends, relatives)	2.48%	5.43%	6.80%	6.41%
Medical appointment / doctor visit	1.17%	7.65%	4.56%	4.30%
School K-12 (students only)	0.46%	7.86%	4.13%	3.85%
Recreation / Sightseeing	3.18%	0.00%	1.93%	2.03%
Dining out	4.67%	0.00%	1.77%	2.01%
Other business-related (e.g. meeting, delivery)	1.60%	3.67%	1.74%	1.75%
Pick up / Drop off someone (daycare, school)	0.15%	0.00%	0.67%	0.61%
Your Hotel	1.28%	0.56%	0.28%	0.37%
Major Sporting Event, Concert, or Conference	0.77%	0.00%	0.07%	0.13%
Escorting / accompanying someone	0.03%	0.00%	0.06%	0.06%
Airport (airline passenger only)	0.00%	0.00%	0.06%	0.05%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

4 Sampling Procedures

This chapter describes the procedures used for carrying out the sampling of bus and streetcar riders. Three major areas are addressed by these procedures: (1) sampling goals, (2) methods for selecting survey participants, and (3) other techniques used to manage the sampling process.

4.1 Sampling Goals

In order to ensure that the distribution of completed surveys mirrored the actual distribution of riders, ETC Institute developed a sampling plan that would ensure the completion of the On-to-Off Counts with at least 560 of Sun Link service riders, and at least 4,600 Origin-Destination surveys for all services.

4.1.1 Sampling Goals for the OD Survey

Table 20 shows the original OD Survey goals and the actual number of completed surveys that were obtained for the Sun Link service by station, time period and direction. Table 21 shows the original OD Survey goals and the actual number of completed surveys that were obtained for the Sun Tran and Sun Shuttle routes by Time Period and Direction (RTD). In addition to the goal of approximately 6,200 completed surveys, there was also a goal of being within 10 surveys or within 10% of the established goal based on the overall estimated ridership by route with additional goals of being within 10 surveys or within 10% of the established goal based on the estimated ridership by time period and direction for each route. Based on the previous mentioned goals, all goals were achieved for all services. The time periods for this project were as follows: "Early" time period (Before 6:30am), "AM Peak" time period (6:30am-8:30am), "Midday" time period (8:30am-4pm), "PM Peak" time period (4pm-6pm), and "Evening" time period (After 6pm). Initially, total estimated weekday ridership data by route was provided for goal-setting purposes, but was later updated during the data expansion process.

Table 20 Sampling Goals for Sun Link by Station, Time Period, and Direction

Station	Sampling Goals					COMPLETED				
	AM Peak (6:30-8:30am)	Midday (8:30am-4:00pm)	PM Peak (4:00-6:00pm)	Evening (6:00pm-10:00pm)	Night (10:00pm - 3:00am	AM Peak (6:30-8:30am)	Midday (8:30am-4:00pm)	PM Peak (4:00-6:00pm)	Evening (6:00pm-10:00pm)	Night (10:00pm - 3:00am
Eastbound	38	225	45	42	7	67	355	81	89	9
Av del Convento	9	22	4	3	1	16	41	10	14	2
Cushing/Frontage Rd	1	1	0	0	0	2	5	0	1	0
Granada/Cushing	1	2	0	0	0	1	5	0	0	0
Congress/Granada Av	1	4	1	1	0	5	14	5	5	0
Broadway/Church	1	2	1	1	0	4	7	2	2	0
Broadway/Stone	1	6	1	1	0	3	13	5	3	0
Broadway/6th Av	3	13	2	3	0	6	35	7	18	0
Congress/Toole	7	31	3	2	1	8	47	5	3	3
4th Av/9th St	4	20	3	3	1	5	22	9	6	0
4th Av/7th St	1	10	2	2	1	1	16	2	3	2
4th Av/5th St	6	45	4	3	1	6	61	7	7	1
University/3rd Av	2	11	1	1	0	6	17	4	2	0
University/Tyndall	1	8	2	2	0	3	18	9	7	1
2nd St/Olive Av	1	42	19	17	2	1	45	13	13	0
2nd St/Highland Av	0	8	2	2	0	0	9	3	5	0
2nd St/Cherry Av	0	2	0	0	0	0	0	0	0	0
Helen/Warren	0	0	0	0	0	0	0	0	0	0
Westbound	8	126	43	34	4	22	245	74	89	3
Av del Convento	0	0	0	0	0	0	0	0	0	0
Cushing/Av del Convento	0	1	0	0	0	0	0	0	0	0
Cushing/Frontage Rd	0	0	0	0	0	0	1	0	0	0
Granada/Cushing	0	0	0	0	0	0	0	0	0	0
Congress/Granada Av	0	0	1	0	0	0	2	2	0	0
Congress/Church	0	1	2	0	0	1	3	3	0	0
Congress/Stone	0	3	1	1	0	0	4	2	2	0
Congress/6th Av	1	7	2	2	0	3	10	5	3	0
4th Av/9th St	1	7	1	3	0	2	6	0	2	0
4th Av/7th St	0	7	2	2	0	0	12	3	2	0
4th Av/5th St	0	2	1	1	0	1	7	1	1	0
University/3rd Av	0	3	1	1	0	0	7	0	2	0
University/Tyndall	0	4	1	1	0	2	28	9	16	0
2nd St/Olive Av	0	26	10	6	0	2	72	11	11	0
2nd St/Highland Av	0	31	12	9	1	2	38	16	21	1
2nd St/Cherry Av	0	7	2	2	0	1	11	2	11	1
Helen/Warren	5	26	7	5	1	8	44	20	18	1

Table 21 Sampling Goals for Sun Tran and Sun Shuttle OD Surveys by Route, Time Period and Direction

				Sampling Goals							COMPLETED						
Route #	Route Name	Direction	Service	Early AM (Before 6:30am)	AM Peak (6:30-8:30am)	Midday (8:30am-4:00pm)	PM Peak (4:00-6:00pm)	Evening (6:00pm-10:00pm)	Total	Total Surveys	Early AM (Before 6:30am)	AM Peak (6:30-8:30am)	Midday (8:30am-4:00pm)	PM Peak (4:00-6:00pm)	Evening (6:00pm-10:00pm)	Total	Total Surveys
1	Glenn/Swan	EASTBOUND	Sun Tran	3	11	35	11	6	66	172	7	17	54	12	8	98	178
		WESTBOUND	Sun Tran	3	14	32	9	5	64		4	14	46	12	4	80	
2	Pueblo Gardens	NORTHBOUND	Sun Tran	5	5	14	4	2	30	87	8	10	21	8	4	51	112
		SOUTHBOUND	Sun Tran	2	4	19	6	5	35		2	9	29	9	12	61	
3	6Th St. / Wilmot	EASTBOUND	Sun Tran	10	28	51	12	10	112	295	12	27	95	16	11	161	330
		WESTBOUND	Sun Tran	7	20	52	17	12	109		11	31	99	15	13	169	
4	Speedway	EASTBOUND	Sun Tran	6	16	74	28	28	153	397	12	29	100	28	39	208	409
		WESTBOUND	Sun Tran	14	26	72	18	16	145		16	36	81	25	43	201	
5	Pima / W. Speedway	EASTBOUND	Sun Tran	1	6	19	7	2	35	99	1	14	28	11	10	64	122
		WESTBOUND	Sun Tran	1	10	21	6	1	39		4	12	30	10	2	58	
6	Euclid / N. 1st Ave.	NORTHBOUND	Sun Tran	5	10	44	15	12	86	214	5	15	63	21	13	117	226
		SOUTHBOUND	Sun Tran	6	14	36	10	9	75		6	20	47	15	21	109	
7	22nd St.	EASTBOUND	Sun Tran	6	25	53	18	13	116	271	7	27	75	18	24	151	297
		WESTBOUND	Sun Tran	9	21	37	12	9	87		11	23	73	17	22	146	
8	Broadway	EASTBOUND	Sun Tran	10	21	82	24	20	157	422	19	36	109	31	35	230	447
		WESTBOUND	Sun Tran	14	25	79	22	19	159		16	38	98	34	31	217	
9	Grant	EASTBOUND	Sun Tran	5	11	43	15	11	85	225	5	16	47	19	34	121	252
		WESTBOUND	Sun Tran	7	14	41	11	11	83		7	14	65	14	31	131	
10	Flowing Wells	NORTHBOUND	Sun Tran	2	6	18	7	7	39	109	3	12	35	10	8	68	133
		SOUTHBOUND	Sun Tran	3	8	22	5	5	43		5	12	28	8	12	65	
11	Alvernon	NORTHBOUND	Sun Tran	10	16	64	21	18	130	368	15	34	101	25	25	200	392
		SOUTHBOUND	Sun Tran	12	24	70	20	19	146		13	32	91	20	36	192	
12	10th / 12th Avenue	NORTHBOUND	Sun Tran	6	9	26	7	5	54	148	8	12	47	8	16	91	175
		SOUTHBOUND	Sun Tran	3	6	29	11	9	57		3	16	40	14	11	84	
15	Campbell	NORTHBOUND	Sun Tran	2	7	26	10	8	53	147	2	10	29	12	14	67	158
		SOUTHBOUND	Sun Tran	3	10	30	8	6	57		3	13	45	15	15	91	
16	Oracle / Ina	NORTHBOUND	Sun Tran	10	21	85	23	19	158	397	19	21	111	21	38	210	424
		SOUTHBOUND	Sun Tran	10	18	71	19	21	139		10	22	119	20	43	214	
17	Country Club / 29th St.	NORTHWEST	Sun Tran	11	19	46	15	14	105	273	14	27	73	17	16	147	293
		SOUTHEAST	Sun Tran	9	14	47	17	13	100		12	30	69	20	15	146	
18	S. 6th Avenue	NORTHBOUND	Sun Tran	10	20	74	16	13	133	353	11	33	100	23	28	195	375
		SOUTHBOUND	Sun Tran	6	15	75	20	16	132		16	26	97	20	21	180	
19	Stone	NORTHBOUND	Sun Tran	1	4	17	8	9	39	96	1	6	25	10	10	52	115
		SOUTHBOUND	Sun Tran	2	5	17	5	5	32		2	8	29	8	16	63	
21	W. Congress / Silverbell	NORTHBOUND	Sun Tran	1	3	12	4	3	23	53	2	5	14	7	13	41	67
		SOUTHBOUND	Sun Tran	0	4	9	2	2	17		0	3	14	7	2	26	
22	Grande	NORTHBOUND	Sun Tran	1	3	12	4	2	22	53	1	5	20	4	7	37	65
		SOUTHBOUND	Sun Tran	1	4	10	2	2	18		1	5	14	6	2	28	
23	Mission	NORTHBOUND	Sun Tran	4	7	19	6	5	42	119	4	20	39	7	16	86	171
		SOUTHBOUND	Sun Tran	2	6	25	7	7	47		5	15	41	10	14	85	
24	12th Avenue	NORTHBOUND	Sun Tran	3	3	9	3	3	21	59	3	4	14	7	7	35	78
		SOUTHBOUND	Sun Tran	2	3	12	4	3	23		4	3	21	6	9	43	
25	S. Park Avenue	NORTHBOUND	Sun Tran	9	12	29	7	6	64	163	9	10	42	12	18	91	178
		SOUTHBOUND	Sun Tran	4	7	27	11	10	58		6	8	46	13	14	87	
26	Benson Highway	EASTBOUND	Sun Tran	2	4	16	6	6	33	76	4	3	21	8	11	47	89
		WESTBOUND	Sun Tran	2	5	12	3	2	24		3	8	18	7	6	42	
27	Midvale Park	NORTHBOUND	Sun Tran	3	7	16	5	3	35	91	2	11	29	5	10	57	117
		SOUTHBOUND	Sun Tran	1	6	16	5	5	34		2	10	34	6	8	60	
29	Valencia	EASTBOUND	Sun Tran	4	6	18	5	4	38	120	5	11	28	7	9	60	127
		WESTBOUND	Sun Tran	2	6	26	9	9	52		4	9	29	10	15	67	

Table 22 Sampling Goals for Sun Tran and Sun Shuttle OD Surveys by Route, Time Period and Direction (CONTINUED)

				Sampling Goals							COMPLETED						
Route #	Route Name	Direction	Service	Early AM (Before 6:30am)	AM Peak (6:30-8:30am)	Midday (8:30am-4:00pm)	PM Peak (4:00-6:00pm)	Evening (6:00pm-10:00pm)	Total	Total Surveys	Early AM (Before 6:30am)	AM Peak (6:30-8:30am)	Midday (8:30am-4:00pm)	PM Peak (4:00-6:00pm)	Evening (6:00pm-10:00pm)	Total	Total Surveys
34	Craycroft / Ft. Lowell	NORTHBOUND	Sun Tran	9	19	50	11	11	101	271	6	18	62	20	40	146	280
		SOUTHBOUND	Sun Tran	6	13	51	18	14	102		7	23	55	18	31	134	
37	Pantano	NORTHBOUND	Sun Tran	3	6	12	5	1	27	68	3	5	13	9	3	33	71
		SOUTHBOUND	Sun Tran	2	4	13	4	1	24		3	8	18	6	3	38	
50	Ajo Way	EASTBOUND	Sun Tran	1	3	5	2	1	11	30	1	3	9	3	1	17	35
		WESTBOUND	Sun Tran	0	1	6	2	1	11		1	1	8	7	1	18	
61	La Chola	NORTHBOUND	Sun Tran	2	3	13	3	2	23	53	2	4	18	8	5	37	69
		SOUTHBOUND	Sun Tran	1	3	8	4	1	16		2	3	15	5	7	32	
101X	Golf Links-Downtown Express	EASTBOUND	Sun Tran	0	0	0	0	0	0	14	0	0	0	0	0	0	15
		WESTBOUND	Sun Tran	0	14	0	0	0	14		1	14	0	0	0	15	
102X	Northwest-UA Express	NORTHBOUND	Sun Tran	0	0	0	0	0	0	16	0	0	0	0	0	0	19
		SOUTHBOUND	Sun Tran	0	16	0	0	0	16		4	15	0	0	0	19	
103X	Northwest-Downtown Express	NORTHBOUND	Sun Tran	0	0	0	0	0	0	5	0	0	0	1	0	1	8
		SOUTHBOUND	Sun Tran	0	5	0	0	0	5		2	5	0	0	0	7	
104X	Marana-Downtown Express	NORTHBOUND	Sun Tran	0	0	0	0	0	0	8	0	0	0	0	0	0	8
		SOUTHBOUND	Sun Tran	0	8	0	0	0	8		0	8	0	0	0	8	
105X	Foothills-Downtown Express	NORTHBOUND	Sun Tran	0	0	0	0	0	0	14	0	0	0	0	0	0	15
		SOUTHBOUND	Sun Tran	0	14	0	0	0	14		3	12	0	0	0	15	
107X	Oro Valley-Downtown Express	NORTHBOUND	Sun Tran	0	5	0	0	0	5	14	3	3	0	0	0	6	16
		SOUTHBOUND	Sun Tran	0	8	0	0	0	8		7	2	0	1	0	10	
108X	Broadway-Downtown Express	EASTBOUND	Sun Tran	0	0	0	0	0	0	10	0	0	0	0	0	0	14
		WESTBOUND	Sun Tran	0	10	0	0	0	10		0	14	0	0	0	14	
109X	Catalina Hwy-Downtown Express	EASTBOUND	Sun Tran	0	0	0	0	0	0	7	0	0	0	0	0	0	9
		WESTBOUND	Sun Tran	0	7	0	0	0	7		4	5	0	0	0	9	
110X	Rita Ranch-Downtown Express	NORTHBOUND	Sun Tran	0	7	0	0	0	7	16	0	10	0	0	0	10	17
		SOUTHBOUND	Sun Tran	0	7	0	0	0	7		0	7	0	0	0	7	
201X	Eastside-Aero Park Express	EASTBOUND	Sun Tran	0	0	0	0	0	0	8	0	0	0	0	0	0	11
		WESTBOUND	Sun Tran	0	8	0	0	0	8		11	0	0	0	0	11	
203X	Oro Valley-Aero Park Express	NORTHBOUND	Sun Tran	0	0	0	0	0	0	17	0	0	0	0	0	0	21
		SOUTHBOUND	Sun Tran	0	17	0	0	0	17		16	5	0	0	0	21	
204X	Northwest-Aero Park Express	NORTHBOUND	Sun Tran	0	0	0	0	0	0	7	0	0	0	0	0	0	9
		SOUTHBOUND	Sun Tran	0	7	0	0	0	7		0	9	0	0	0	9	
401	N. Oracle/Catalina	NORTHBOUND	Sun Shuttle	0	1	1	0	0	3	10	0	2	2	1	0	5	9
		SOUTHBOUND	Sun Shuttle	0	1	1	1	0	2		0	2	1	1	0	4	
410	Anway/Trico	EASTBOUND	Sun Shuttle	0	0	0	0	0	1	6	1	3	1	0	0	5	6
		WESTBOUND	Sun Shuttle	0	0	1	0	0	2		0	0	1	0	0	1	
412	Thornydale/River	NORTHBOUND	Sun Shuttle	0	1	2	1	0	4	15	2	2	9	1	0	14	28
		SOUTHBOUND	Sun Shuttle	0	1	2	1	0	4		0	4	6	4	0	14	
413	Marana/I-10	NORTHBOUND	Sun Shuttle	0	1	1	0	0	3	12	0	1	3	3	0	7	15
		SOUTHBOUND	Sun Shuttle	0	1	2	0	0	3		0	1	6	1	0	8	
421	Green Valley/Sahuarita Connector	NORTHBOUND	Sun Shuttle	0	2	1	0	0	4	15	0	1	3	2	3	9	25
		SOUTHBOUND	Sun Shuttle	0	1	2	1	0	4		0	1	8	7	0	16	
430	Tucson Estates	EASTBOUND	Sun Shuttle	0	1	1	0	0	2	10	0	1	2	2	0	5	19
		WESTBOUND	Sun Shuttle	0	1	1	1	0	3		0	2	6	3	3	14	
440	San Xavier	NORTHBOUND	Sun Shuttle	0	2	2	1	1	6	24	0	3	10	4	1	18	28
		SOUTHBOUND	Sun Shuttle	0	1	3	1	1	6		0	2	5	1	2	10	
450	Southeast Tucson/Rita Ranch	NORTHBOUND	Sun Shuttle	0	1	1	1	0	3	8	0	3	4	2	0	9	13
		SOUTHBOUND	Sun Shuttle	0	0	1	1	0	2		1	0	2	1	0	4	
486	Ajo/Tucson	EASTBOUND	Sun Shuttle	0	0	0	0	0	0	5	0	0	0	0	0	0	0
		WESTBOUND	Sun Shuttle	0	0	0	0	0	0		0	0	0	0	0	0	
OTHER	Green Valley/Sahuarita	DAR	Sun Shuttle	0	0	0	0	0	0	6	0	4	2	0	0	6	6
OTHER	Oro Valley/NW	DAR	Sun Shuttle	0	0	0	0	0	0	18	2	5	0	0	0	7	5

The sampling target for each route involved completed surveys that were within 10% of the goal or within 10 surveys of the goal. For example, the goal for Sun Tran Route 16 based on the ridership during the "Midday" time period heading "Northbound" was 85 completed surveys. With 111 completed surveys for Route 16 during the 2019 onboard survey, the sample target was achieved. In the case of Sun Tran Route 1 during the "Evening" time period heading "Southbound", the goal was 5 completed surveys. Since the number of completed surveys (4) for this route was within 10 of the goal, the target was achieved.

A survey was considered "complete" if all the required information was collected, as described in Section 2.2.1. A survey was considered "useable" if it met 100 percent of the quality assurance and quality control tests that were applied to each record. Overall, the total number of "complete and useable surveys" exceeded the contractual requirements by more than 2,400 surveys. More information on the QA/QC process can be found in Section 7.2.

4.2 Methods for Selecting Survey Participants

4.2.1 Methods for Selecting OD Survey Participants

On bus routes, a random number generator was used to determine which passengers were asked to participate in the survey after boarding a bus at a stop. If four people boarded the bus, the tablet PC randomly generated a number from 1 to 4. If the answer was 2, the second person who boarded the bus was asked to participate in the survey. If the answer was 1, the first person was asked to participate in the survey, and so forth. The selection was limited to the first six people who boarded a bus at any given stop to ensure the interviewer could keep track of the passengers as they boarded. For example, if 20 people boarded a bus, the tablet PC program would randomly pick one of the first six people for the survey. The process was very similar for Sun Link, except for the placement of the surveyors. For example, if there were 3 trains with 3 cars each for a particular rail line, then 1 surveyor would be placed in the first car of the first train, another surveyor would be placed in the second car of the second train, and a third surveyor would be placed in the third car of the third train. For the purpose of the City of Tucson, there being only one streetcar on which to place a surveyor, only one interviewer was placed on the streetcar for each direction. The surveyor then would focus on the door of the car they were currently occupying and use the random number generator previously described to determine which boarding passenger to survey.

4.3 Other Techniques Used to Manage the Sampling Process

Some of the other techniques that were used to manage the sampling of bus and rail riders are described below:

Daily Reviews of Interviewer Performance—During each day, the research team evaluated the performance of each interviewer. This included a review of the characteristics of the passengers who were interviewed about age, gender, race, the number of reported transfers, the number of required data fields that were completed, the number of desired data fields that were completed, and the average length of each interview. These reviews are completed while the surveyor is on the bus or streetcar and the findings are discussed with that surveyor when they check in. This allowed the research team to provide immediate feedback to interviewers to improve their overall performance. It also allowed the research team to quickly identify and remove interviewers who were not conducting the survey properly.

Management of the Sample by Time of Day—In addition to managing the total number of surveys that were completed for each route/station, ETC Institute also managed the number of surveys that were completed during each of the following five time periods: "Early" time period (Before 6:30am), "AM Peak" time period (6:30am-8:30am), "Midday" time period (8:30am-4pm), "PM Peak" time period (4pm-6pm), and "Evening" time period (6pm-10pm). This was done to ensure that the number of completed surveys for each time period would adequately support data expansion requirements for travel demand forecasting. The data expansion process is further described in Chapter 8 of this report.

Figure 4-1 below shows the system wide estimated ridership by time period and Figure 4-2 on the following page shows the number of system wide OD Surveys that were collected by time period.
(Note: Sun Link does not operate in the "Early" time period).

Figure 4-1 Estimated Ridership by Time Period

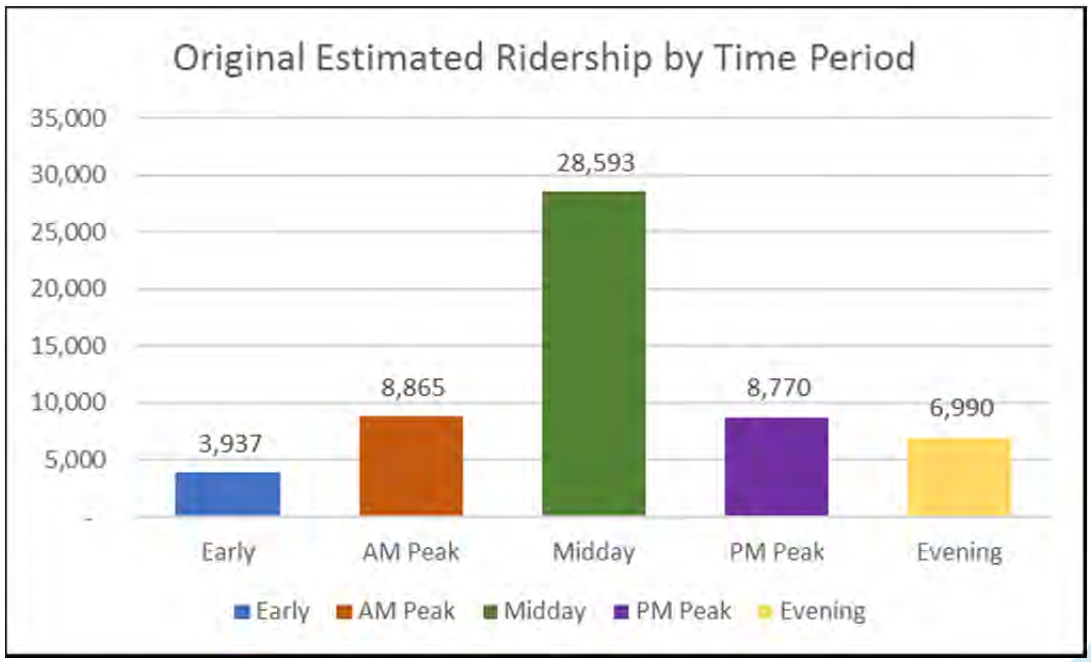
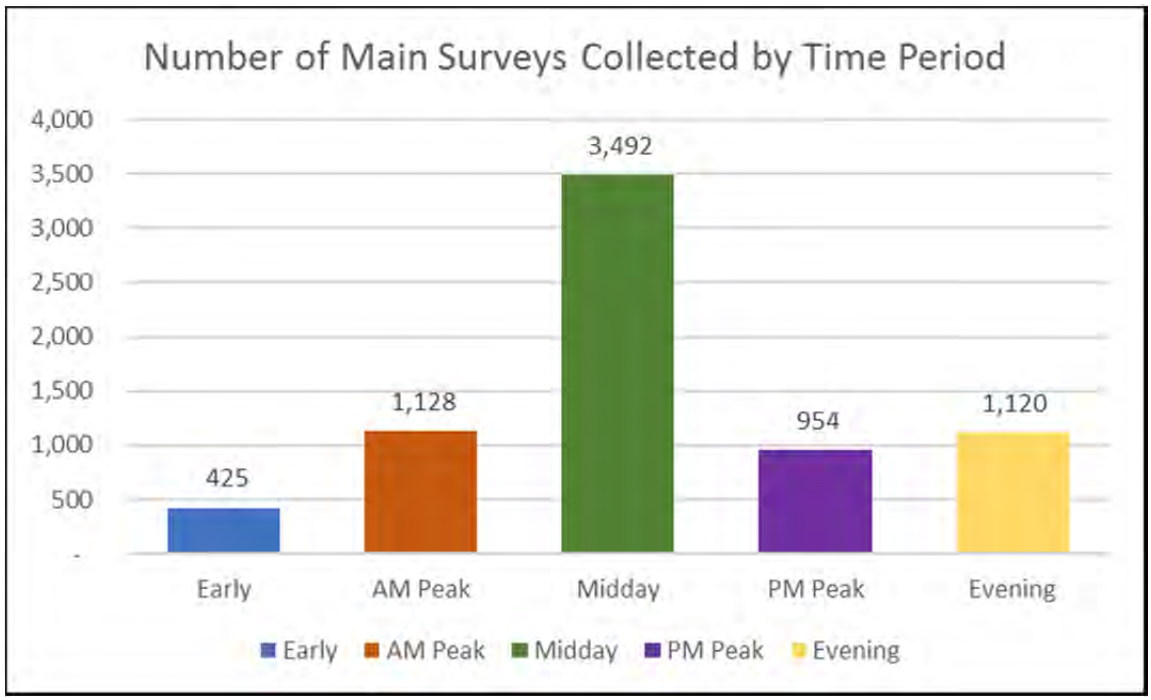


Figure 4-2 Number of OD Surveys Collected by Time Period



5 OD Survey Administration Methodology

The following sections describe the methodology used for the OD Survey. This methodology includes recruiting and training of interviewers, procedures used for the survey, and organization of the survey teams.

5.1 Recruiting and Training Interviewers

Assembling a team of high-quality interviewers was one of the most important steps in the OD Survey administration process. For this project, ETC Institute also used local temporary interviewers who were recruited by a staffing agency to complement ETC Institute's experienced supervisors.

Interviewers recruited by the agency were required to have a familiarity with the bus service areas. They were also required to document a solid work history, show a professional attitude and appearance, prove to supervisors the ability to interact with the public, display an ability to work a Tablet PC, and show proficiency with ETC Institute's surveying program.

Each interviewer was required to attend ETC Institute's training session. During this training session, interviewers were presented with the following:

- An overview of the onboard survey objectives
- How to operate the tablet PC and surveying software
- How to approach riders and sampling procedures
- Survey etiquette
- How to deal with various situations that could be encountered during a survey
- Role-playing and one-on-one tutoring with an ETC Institute supervisor
- Overview of rules and procedures and a code of conduct to be followed while representing Sun Tran, Sun Link, and Sun Shuttle

Once all training was completed, and each interviewer was approved by an ETC Institute supervisor, interviewers spent several days under the supervision of a supervisor who assessed each interviewer's ability to properly conduct surveys. Those who did not demonstrate proficiency in all the required tasks for the OD Survey were released.

5.2 Prior to the Administration of the Survey

In order to encourage participation in the survey, signs were posted on buses and streetcars that explained the importance of the survey. The sign also pictured an interviewer for recognition.

5.3 OD Survey Administration Procedure

All routes, except for the Sun Shuttle dial-a-ride routes, were surveyed using the tablet PCs, as described in Section 2.3. Interviewers selected people for the survey in accordance with the sampling procedures described in Section 4 of this report.

Once an interviewer had selected a person for the survey, the interviewer:

- Approached the selected person and asked him/her to participate in the survey.
- If the person agreed to participate, the interviewer asked the respondent if he/she had at least 5 minutes to complete the survey.
- If the person did not have at least 5 minutes, the interviewer asked the person to provide his/her home/hotel/local address, boarding location, alighting location, name, and phone number. A phone interviewer from ETC Institute's call center contacted the respondent and asked him/her to provide the information by phone. This methodology ensured that people who completed "short-trips" on public transit were well represented. A nominal amount of surveys were collected this way as the vast majority of completed surveys were able to be completed within the time frame needed.
- If the person had at least 5 minutes, the interviewer began administering the survey to the respondent as a face-to-face interview using a tablet PC. After all the required questions had been answered, the interviewer asked the respondent if he/she had 2 to 3 more minutes to complete the remaining questions. If the respondent agreed, the interviewer then asked the remaining questions on the survey.
    - If the respondent did not have an addition 2 to 3 minutes to complete the surveys, the interviewer selected the Call Back option on the bottom of the screen, where they were then able to capture the respondent's name and phone number where a phone interviewer from ETC Institute's Call Center could then contact the person at a more convenient time for the respondent to complete the survey.

5.3.1 After the Administration of the Survey

Field Supervisor Quality Checks

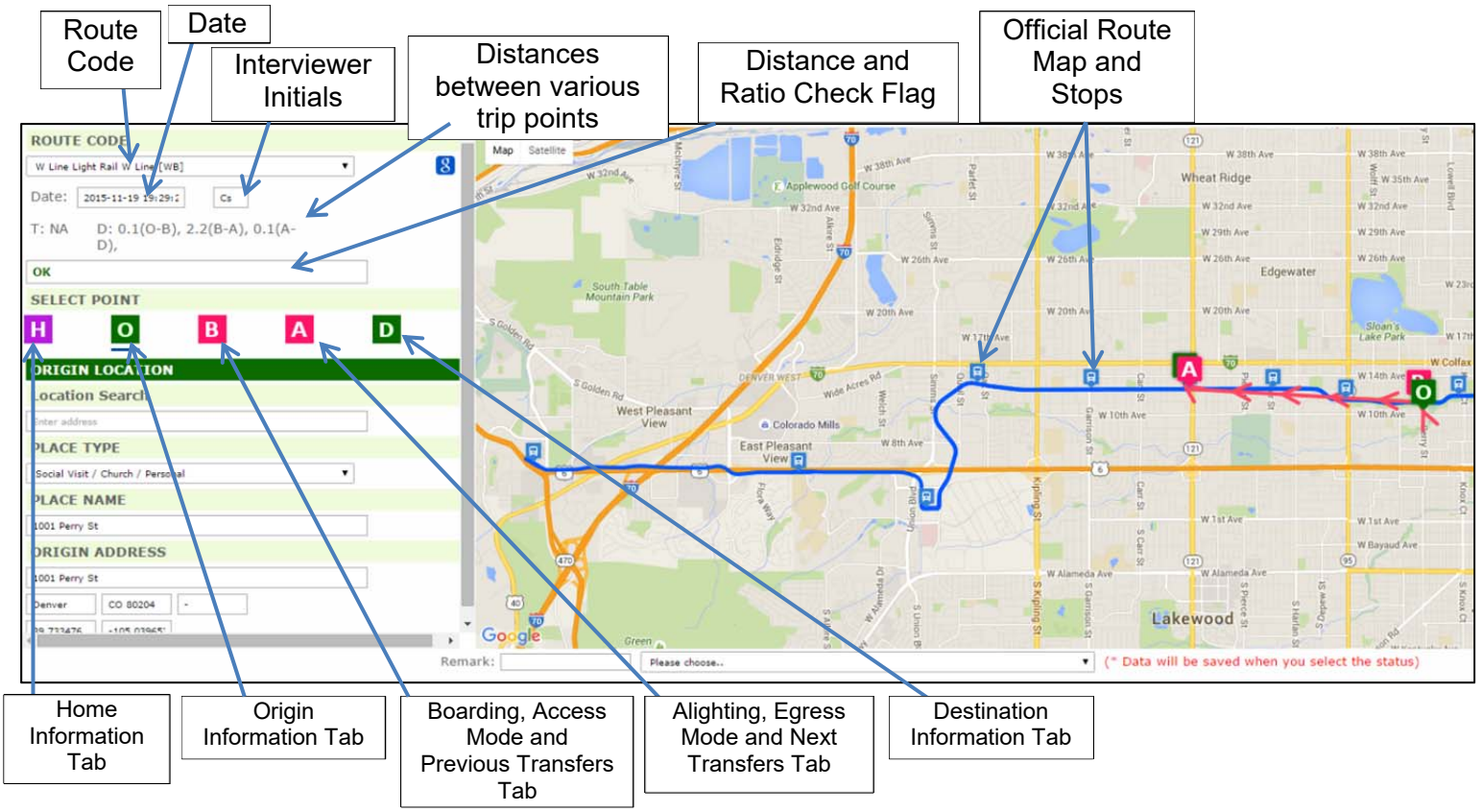
ETC Institute employs Field Supervisors (FS) who are responsible for: training, scheduling, and managing transit data collection efforts. ETC Institute continually adds steps to improve the FS' ability to effectively manage field staff. One tool is the use of an online dashboard created for each project. The online survey database that stores all the data collected in the field allows for connection to multiple Business Intelligence (BI) dashboards. This allows ETC Institute to create dashboards that allows the FS to instantly see the data collected in a variety of formats.

Sampling goals by route, direction, and time of day can instantly be viewed to support effective management of sampling goals. The dashboard also displayed a breakdown of the overall trip information and demographics collected, both overall and by individual interviewer. Individual interviewer data reviews were conducted throughout the day to ensure sampling procedures were followed and the findings were discussed with that interviewer when they checked in with the FS.

Field Supervisor Online Review Tool

In addition to being able to review various breakdowns of data, the FS was also able to review each individual record using a visual review tool. This was done in the field to ensure that trip data was being collected accurately for each interviewer. The FS was also able to look up individual records by interviewer in database/spreadsheet form which allowed them to call respondents to check on the accuracy of the data collected, as well as the job performance of the interviewer. An example screenshot of the FS' version of this online tool is shown in Figure 6-1 on the following page.

Figure 5-1 Online Visual Review Tool (Read-Only Version)



5.4 Timing of the OD Survey Administration

The OD Survey was administered at the time of day that coincided with the hours that each route was operational. This was to ensure that the administration of the survey began prior to peak ridership levels in the morning and continued after peak ridership levels in the evening. Although the administration of the OD Survey began as early as 5:30 am and continued to as late as 8:30 pm on some routes, most of the surveys were administered between the hours of 6 am and 8 pm.

The OD Survey was administered during weekdays (Monday through Thursday) with the exceptions of holidays and college/school breaks from January 2019 – February 2019.

6 Data Review Process

Many of the processes described in Sections 2 and 4-6 of this report were essential elements of the overall quality assurance/quality control (QA/QC) process that was implemented throughout the survey administration process. The establishment of specific sampling goals and procedures for managing the goals ensured that a representative sample was obtained from each bus route. Training of interviewers and the high levels of oversight provided by team leaders and the project manager ensured that the survey was administered properly. Also, the use of the latest geocoding tools contributed to the high quality of geocoding accuracy that was achieved.

The following sections describe the QA/QC processes that were implemented after the data was collected.

6.1.1 Process for Identifying Complete Records

To classify a survey as being completed, the record must have contained all elements of the one-way trip. ETC Institute has classified required trip data as containing the complete answers to the following:

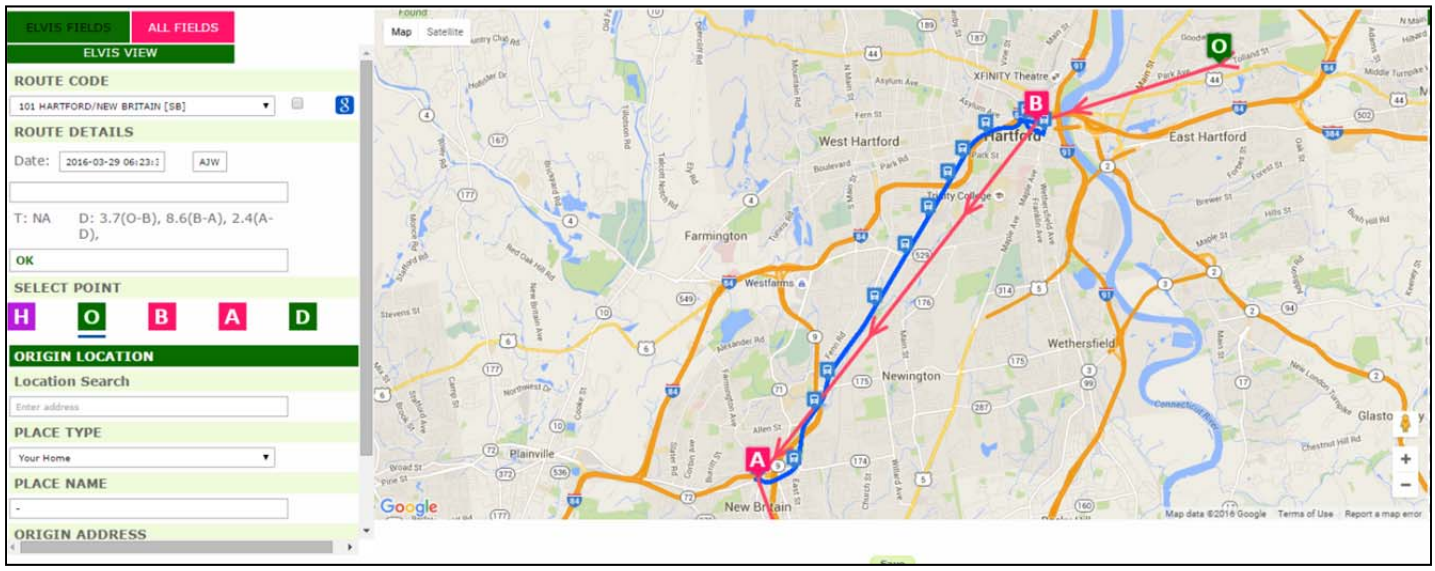
- Route / Direction
- Time of trip
- Transfers made
- Home address
- Origin address
- Destination address
- Origin place type
- Destination place type
- Access mode
- Egress mode
- Boarding location
- Alighting location

In addition to the required trip data questions, a survey must be marked as complete by the online survey program which occurs only if the interviewer has navigated through every required question on the online survey instrument including demographic questions.

Online Visual Review Tool

ETC Institute has created an online visual review tool that allows for the review of all completed records within the database. This tool shows all components of each individual trip as well as a series of preprogrammed distance and ratio checks as described on subsequent pages. After directions were finalized, the next step was to run each record through the Speed/Distance/Time checks. Figure 7-1 on the following page shows an example of the online visual review tool. It is very similar to the online visual review tool used by FS described previously, with the additional functionality of being able to review all aspects of the survey as well as being able to make edits when appropriate.

Figure 6-1 Online Visual Review Tool (Editable Version)



6.2 Pre-Processing Distance Checks

A series of distance and ratio checks are preprogrammed into the online visual review tool in order to allow for ETC Institute's Transit Review Team (TRT) to take a more systematic approach in reviewing completed records. The TRT process for editing surveys is described in a later section. (Note: The distance and ratio checks described were meant to alert the reviewer that closer evaluation was needed. It did not necessarily indicate that the record was inaccurate or unusable).

The distances used for the checks were created using the great-circle distance formula which is based on a straight line from point A to point B that considers the curvature of the earth.

Access/Egress Mode Distance Check

Table 23 on the following page shows the distance checks for access (Origin to Boarding) and egress modes (Alighting to Destination).

Table 24 Origin to Boarding and Alighting to Destination Checks

Distance Check Name	Check	Condition 1	Condition 2	Flag?
Origin to Boarding	Origin to Boarding distance is greater than 1.75 miles	Access Mode - **ANY USE OF A VEHICLE** (ie, dropped off, rode with others, drove, taxi...)		No
		Access Mode - Walk/Wheelchair/Skateboard	There is at least one transfer from origin to boarding	No
		Access Mode - Walk/Wheelchair/Skateboard	There are no transfers from origin to boarding	Yes
	Origin to Boarding distance is less than .2 miles	Access Mode - **ANY USE OF A VEHICLE** (ie, dropped off, rode with others, drove, taxi...)		Yes
		Access Mode - Every mode	There is at least one transfer from origin to boarding	Yes
		Access Mode - Walk/Wheelchair/Skateboard	There are no transfers from origin to boarding	No
Alighting to Destination	Alighting to Destination distance is greater than 1.75 miles	Egress Mode - ANY USE OF A VEHICLE (ie, will get picked up, ride with others, drive, taxi...)		No
		Egress Mode - Walk/Wheelchair/Skateboard	There is at least one transfer from alighting to destination	No
		Egress Mode - Walk/Wheelchair/Skateboard	There are no transfers from alighting to destination	Yes
	Alighting to Destination distance is less than .2 miles	Egress Mode - **ANY USE OF A VEHICLE** (ie, will get picked up, ride with others, drive, taxi...)		Yes
		Egress Mode - Every mode	There is at least one transfer from alighting to destination	Yes
		Egress Mode - Walk/Wheelchair/Skateboard	There are no transfers from alighting to destination	No

Origin to Destination Distance Check

Table 24 below shows the distance checks based on the origin and destination locations.

Table 25 Origin to Destination Distance Checks

Distance Check Name	Check	Flag Record
Origin to Destination	Origin equals the Destination	Yes
	Origin to Destination is greater than 50 miles	Yes
	Origin to Destination is less than .25 miles	Yes

Boarding and Alighting Distance Check

Table 25 below shows the distance checks based on the boarding and alighting locations.

Table 26 Boarding to Alighting Distance Checks

Distance Check Name	Check	Flag Record
Boarding to Alighting	Boarding equals the Alighting	Yes
	Boarding to Alighting is less than .25 miles	Yes

6.3 Pre-Processing Ratio Checks

After all transfer checks were completed, the next step in this process involved the application of a series of QA/QC Ratio Checks.

Three ratio checks were conducted for each record. First, the distance between boarding and alighting was divided by the distance between origin and destination. If the rider had a high ratio, then the rider was on the bus for an extensive time compared to the origin to destination distance. If the check created an extremely low ratio, the use of transit seemed unnecessary.

Second, the distance between origin and boarding was divided by the distance between origin and destination. If the rider had a high ratio, the origin to boarding distance was excessive compared to the origin to destination.

Third, the distance between alighting and destination was divided by the distance between origin and destination. If the rider had a high ratio, this indicated that the alighting to destination distance was excessive compared to the origin to destination.

Table 26 on the following page describes in more detail the ratio checks used, and the conditions in which a record would be flagged for review.

Table 27 Ratio Checks

Ratio Checks	Check	Result of Formula	Condition 1	Condition 2	Flag?
Boarding to Alighting distance divided by Origin to Destination distance	Boarding to Alighting Distance/Origin to Destination Distance	the result of this formula is 1.5 or greater			Yes
	Boarding to Alighting Distance/Origin to Destination Distance	the result of this formula is less than .3	Access and Egress modes are both Walk/Wheelchair/Skateboard	There are NO transfers involved in the trip	Yes
	Boarding to Alighting Distance/Origin to Destination Distance	the result of this formula is less than .3	Access or Egress mode - **ANY USE OF A VEHICLE**		No
	Boarding to Alighting Distance/Origin to Destination Distance	the result of this formula is less than .3	There is at least one transfer involved in the trip		No
Origin to Boarding distance divided by Origin to Destination distance	Origin to Boarding Distance/Origin to Destination Distance	the result of this formula is 1 or greater	there is at least one transfer from origin to boarding		No
	Origin to Boarding Distance/Origin to Destination Distance	the result of this formula is 1 or greater	Access Mode - **ANY USE OF A VEHICLE** (ie, dropped off, rode with others, drove, taxi...)		No
	Origin to Boarding Distance/Origin to Destination Distance	the result of this formula is 1 or greater	Access Mode - Walk/Wheelchair/Skateboard	There are no transfers from origin to boarding	Yes
Alighting to Destination divided by Origin to Destination	Alighting to Destination Distance/Origin to Destination Distance	the result of this formula is 1 or greater	there is at least one transfer from alighting to destination		No
	Alighting to Destination Distance/Origin to Destination Distance	the result of this formula is 1 or greater	Egress Mode - **ANY USE OF A VEHICLE** (ie, will get picked up, ride with others, drive, taxi...)		No
	Alighting to Destination Distance/Origin to Destination Distance	the result of this formula is 1 or greater	Egress Mode - Walk/Wheelchair/Skateboard	There are no transfers from alighting to destination	Yes

6.3.1 Transit Review Team (TRT)

ETC Institute has a dedicated team whose priority is reviewing and editing completed records using an online visual review tool. One of their other key responsibilities is the process of calling and completing "Callback" surveys. Callback surveys are surveys that were unable to be completed in the field. The "Callback" surveys were conducted within a week of when the initial survey began so that the information of the trip could be more easily recalled by the respondent.

The TRT reviewed all complete records collected for the survey, paying special attention to records that were automatically flagged by the online visual review tool. Prior to making edits to any survey, they first attempted to contact the respondent to clarify any questionable answer choices regarding the trip. If no contact was made, or if contact was not possible, the following actions were taken.

Pre-Processing General Issues and Actions

Table 27 below describes the general issues that could occur within a trip where changes may have been appropriate.

Table 28 General Issues

Issue	Description of Issue	Action
Origin/Destination Issue - 1	Origin/Destination appears incorrect because the wrong location of a multiple-location organization was selected	If for example, an Origin/Destination appears illogical based on the college campus that was selected, but an appropriate campus of the same college does appear logical given the other points and answer choices of the trip, then the appropriate campus will be selected.
Origin/Destination Issue - 2	Origin/Destination appears to have been geocoded to the incorrect city/state	If for example, an Origin/Destination appears illogical based on the city/state that was geocoded, but the address/intersection is logical within the trip if the city/state are changed. This occurs occasionally because the surveyor selects the wrong choice from the list of possible address choices that appear in the online survey instrument, then the appropriate address information will be inserted.
Access/Egress Mode	Access/Egress Mode seems illogical based on trip	If the access/egress mode involves the use of a vehicle and the distance from either origin to boarding or alighting to destination is less than .2 miles then the access/egress mode is recoded to walk/walked and that change will be reflected in the database. Unless the terrain of the area makes walking unlikely.
Directionality of Record	Boarding and alighting locations indicate that the trip is going in the opposite direction of what was selected by the surveyor.	Change Direction of Route Selected and if necessary update boarding and alighting locations based on appropriate direction.

Transfer Issues and Actions

Table 28 below describes the transfer issues that could occur within a trip where changes may have been appropriate.

Table 29 Transfer Issues

Issue #	Description of Issue	Action
Transfer Issue - 1	The transfer(s) seems illogical based on either the origin to boarding or alighting to destination	If the transfer appears to have been selected incorrectly based on surveyor misselection/passenger error then an appropriate transfer(s) will be inserted based on the geocoded points of the trip, the time of day of the trip and the direction of travel. If no appropriate transfers can be found, then the record will be removed from the database.
Transfer Issue - 2	The transfer(s) seems unnessary based on either the origin to boarding or alighting to destination	If the transfer(s) appears to be unnecessary because the distance from the origin to boarding or alighting to destination is less than 0.2 miles then the trip will be reviewed in further detail to determine if the transfer(s) are inappropriate. Aspects that wil determine appropriateness are: the terrain (0.1 miles for example is a very short distance but a river inbetween the origin and boarding location could require an individual to use a transfer as opposed to being able to walk), disability, age, and alternate access/egress modes (IE if someone indicates walking 1 mile from origin to boarding but then indicates taking 2 transfers from alighting to destination to travel a total of 0.1 miles they have likely indicated transfers for a future trip later in the day). *NOTE: The 0.2 distance is only used as guideline to create a flag for closer review. Typically only extreme distances have transfers removed.*
Transfer Issue - 3	The passenger indicated that they did not use a transfer but based on their access/egress mode and the distance between either the origin to boarding or alighting to destination suggests that a transfer was likely used.	If the access/egress mode is "walked/walk" and no transfer is indicated, and the distance between either origin to boarding or alighting to destination is greater than 2 miles, then an appropriate transfer(s) will be inserted based on the geocoded points of the trip, the time of day of the trip and the direction of travel. If no appropriate transfers can be found, then the record will be removed from the database.
Transfer Issue - 4	Duplicate Transfers in the Route Path	If duplicate transfers exist in the route path, the path is reviewed to determine which route(s) were incorrectly entered. If a review of the record suggests that the transfer route(s) is/are unneccesary then they will be removed. If the transfers suggest that trip is a round trip and not a one-way trip then the record will be removed from the database.

6.4 Post-Processing Additional Checks

After all records were reviewed by the TRT, the next step in this process involved the application of a series of QA/QC "non-trip" Checks. Non-trip checks are described as anything not pertaining to the respondent's actual trip, i.e. demographic information. Non-trip related checks included:

- Ensuring the respondents who indicated that they were employed also reported that at least one member of their household was employed.
- Ensuring the time of day a survey was completed was reasonable given the published operating schedule for the route.
- Ensuring that the appropriate fare type was used in response to the age of respondent.
- Checking that there is a representative demographic distribution based on age, gender, and income status.
- Removing any personal contact information used for quality control purposes during the data collection portion of the project in order to protect the anonymity of the respondents.

Once all records had gone through the pre-processing and post-processing QA/QC checks, those that were deemed complete and usable were then used to update the completion report used by the FS to ensure that all contractual goals had been met. After the final high-level review was completed, metadata (a codebook) was created in order to suitably explain the data in the database.

7 Data Expansion Process

While the "goals" described in section 4.1 of this report were based upon the most current ridership levels provided at the time of the surveying effort, revised ridership figures were used to expand the data. The revised estimated ridership was based on more comprehensive and up-to-date ridership information that was available during the time of the data expansion process.

7.1 Sources of Ridership Data

7.1.1 Ridership Data Sources

The source of the updated weekday ridership figures for the Sun Tran buses and Sun Link streetcar were based on APC weekday data from January - February 2019.

7.1.2 System Totals of Weight Factors

Table 29 below shows the estimate number of boardings (unlinked weight factors) and estimated trips (linked weight factors) that the OD records were expanded to for Sun Tran, Sun Link, and Sun Shuttle. The process for procuring those numbers are listed out in the rest of section 7 below.

Table 30 Sum of Weight Factors

Sum of Weight Factors		
	Sun Link	**Sun Shuttle**
Sun Tran	47,977	33,839
Sun Link	3,486	3,268
Sun Shuttle	513	336
Total	**51,976**	**37,443**

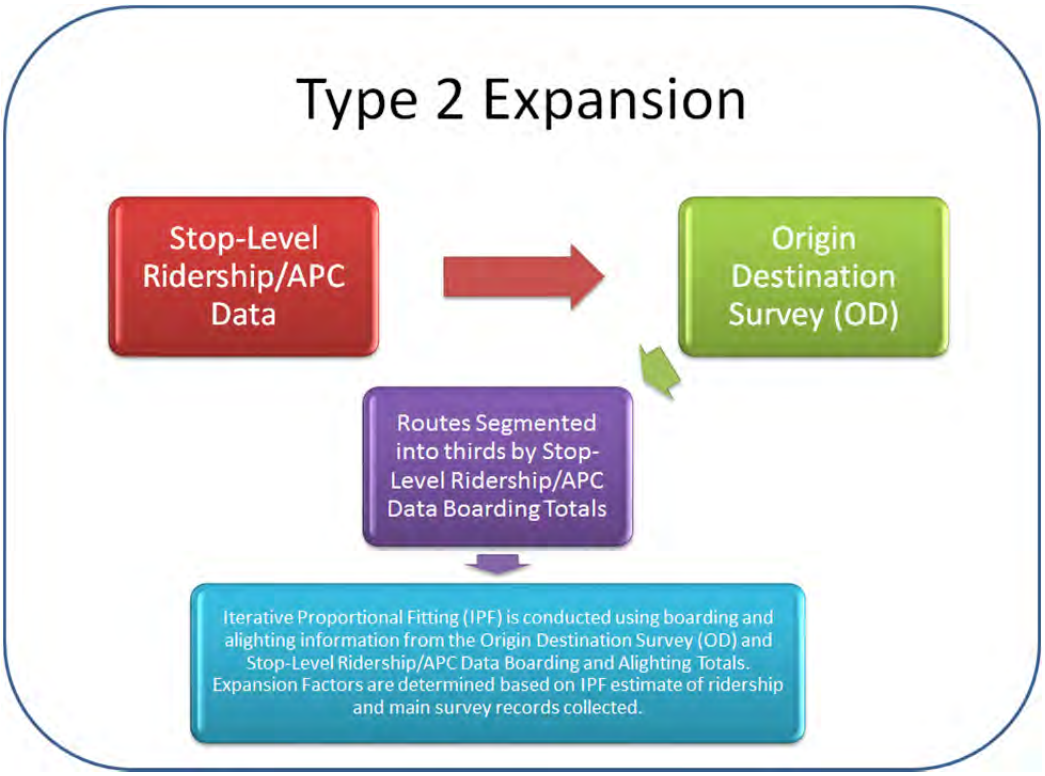
7.2 Data Expansion Overview

When survey goals are created, they are typically based off a percentage of the average weekday ridership for the routes in the system. That is further broken down by time periods and directions. The time periods that are created (6:30am to 8:30am for example) are based off the specific needs of the client, generally aligning with the travel demand model. Once a sample percentage is agreed upon, the goals for the survey collection are based on ridership for each route by time period and direction and then multiplied by the sampling percentage.

The purpose of developing survey goals is to collect an appropriate number of survey records that will be "expanded" to represent the total average weekday ridership of each route by time period and direction. To further increase the specificity of the expansion process, segments were created for each route. Stops were grouped into segments along that route so that boarding segments could be paired with alighting segments when creating the expansion factor. Segmentation occurs on bus routes because it is unrealistic to expand bus survey data at the stop level. Stop, or station, level expansion is generally reserved for rail lines.

7.2.1 Sun Link Data Expansion

On-to-Off counts are not always collected, but with rail expansion stop-level ridership/APC data is available. In this case, Type 2 Expansion, as described in Figure 7-1, is used. This expansion method is similar to Type 1 expansion, the only difference being that the distribution of OD records was substituted for the On-to-Off counts data. The methodology for Type 2 expansion is as follows:



With rail expansion, similar to Type 2 Expansion above, the routes are not segmented into thirds but are left unsegmented for station-to-station expansion. The following describes the rail expansion process used to expand the Sun Link data.

Table 30 shows the distribution of the data as a percentage of all boardings for the Sun Link for that time period and direction. For example, 3.1% of all trips during the AM peak board at Av del Convento/Congress St and end at Broadway/Stone.

Table 31 Sun Link Data Expansion Table Distribution of On-to-Off Survey

AM PEAK - EASTBOUND	PERCENTAGE DISTRIBUTION OF RIDERSHIP COUNTS FROM THE ON/OFF SURVEY						
Station Name	Total	Av del Convento/ Congress St	Cushing/ Frontage Rd	Granada/Cushing	Congress/ Granada Av	Broadway/Church	Broadway/Stone
Av del Convento/Congress St	24.7%	0.0%	0.0%	1.0%	1.0%	3.1%	3.1%
Cushing/Frontage Rd	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Granada/Cushing	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Congress/Granada Av	5.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Broadway/Church	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Broadway/Stone	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

To develop an initial estimate of the ridership flow based on the Station-on to the Station-off, the Sun Link total ridership for this time period and direction was applied to the distribution shown in Table 30. Table 31 shows the initial estimate of ridership from Station-on to Station-off. Based on this estimate, 4 trips during the AM peak begin at Av del Convento/Congress St and end at Broadway/Stone.

Table 32 Sun Link Data Expansion Table Initial Estimate of Ridership Flows Between Stations

AM PEAK - EASTBOUND	PROJECTED RIDERSHIP BASED ON THE ON-TO-OFF SURVEY						
STATION	Total	Av del Convento/ Congress St	Cushing/ Frontage Rd	Granada/Cushing	Congress/ Granada Av	Broadway/Church	Broadway/Stone
Av del Convento/Congress St	36	0	0	1	1	4	4
Cushing/Frontage Rd	1	0	0	0	0	0	0
Granada/Cushing	1	0	0	0	0	0	0
Congress/Granada Av	7	0	0	0	0	0	0
Broadway/Church	3	0	0	0	0	0	0
Broadway/Stone	1	0	0	0	0	0	0

The top portion of Table 32 below shows the boarding and alighting counts for each major station on the route. The bottom portion of the table shows the difference between the projected boardings and alightings at each station (from Table 31) and the average calculated counts.

Table 33 Sun Link Data Expansion Table Actual Boardings and Alightings by Station

AM PEAK - EASTBOUND							
Average Weekday Ridership	Total	Av del Convento/ Congress St	Cushing/ Frontage Rd	Granada/Cushing	Congress/ Granada Av	Broadway/Church	Broadway/Stone
BOARDINGS	145	27	1	3	5	2	1
ALIGHTINGS	145	0	0	0	1	2	2
DIFFERENCE FROM PROJECTED							
BOARDINGS	0	-9	0	2	-3	-1	0
ALIGHTINGS	0	0	0	-1	0	-2	-2

In order to develop a more accurate estimate of the ridership flows between major stations on each route, ETC Institute developed an Iterative Proportional Fitting Algorithm to balance the differences between the ridership projected from the On-to-Off Survey (OD Survey for this project) and the average calculated counts at each station (shown in Table 32).

The key steps to the iterative process are described below.

Step 1: Correction for the Boardings. The estimated ridership from the On-to-Off data (OD Data for this project) was multiplied by the ratio of the calculated boardings from the APC data for each stop by the estimated boardings for each stop. For example, if the calculated boardings for Station A were 120 and the estimated boardings were 100, each cell associated with Station A would have been multiplied by 1.2 (120 / 100) to adjust the estimated boardings to calculated boardings.

Step 2: Correction for the Alightings. Once the correction in Step 1 (described above) was applied, the estimated boardings would have equaled the calculated boardings. However, the adjustment to the boardings total may have changed the alighting estimates. In order to correct the alighting estimate, the new values calculated in Step 1 were adjusted by multiplying the ratio of the calculated alightings for each stop by the estimated alightings for each stop from Step 1. For example, if the calculated alightings for Station B were 220 and the estimated alightings from Step 1 were 200, each cell associated with Station B would have been multiplied by 1.1 (220 / 200) to adjust the estimated alightings from Step 1 to calculated alightings.

The processes described in Steps 1 and Steps 2 were repeated sequentially until the difference between the calculated and estimated boardings and alightings was zero.

The final estimate for ridership flows is shown in Table 33. To calculate the expansion factors, the final estimate of ridership between major stations shown in Table 33 was divided by the actual number of main surveys that were completed by station shown in Table 34 on the following page.

Table 34 Final Estimate of Ridership Flows between Stations (Sun Link)

AM PEAK - EASTBOUND								
Station Name	Total	DIFFERENCE FROM ACTUAL BOARDINGS	Av del Convento/ Congress St	Cushing/ Frontage Rd	Granada/Cushing	Congress/ Granada Av	Broadway/Church	Broadway/Stone
Av del Convento/Congress St	27	0	0	0	0	1	3	2
Cushing/Frontage Rd	1	0	0	0	0	0	0	0
Granada/Cushing	3	0	0	0	0	0	0	0
Congress/Granada Av	5	0	0	0	0	0	0	0
Broadway/Church	2	0	0	0	0	0	0	0
Broadway/Stone	1	0	0	0	0	0	0	0

Table 35 Number of Completed Surveys (Sun Link)

AM PEAK - EASTBOUND							
STATION	Total	Av del Convento/ Congress St	Cushing/ Frontage Rd	Granada/Cushing	Congress/ Granada Av	Broadway/Church	Broadway/Stone
Av del Convento/Congress St	19	0	0	0	0	1	3
Cushing/Frontage Rd	1	0	0	0	0	0	1
Granada/Cushing	1	0	0	0	0	0	0
Congress/Granada Av	1	0	0	0	0	0	0
Broadway/Church	3	0	0	0	0	0	0
Broadway/Stone	4	0	0	0	0	0	0

The next step after creating the weighting factors was to give each Sun Link record in the Main Survey database a weight factor name based on time period, boarding station, and alighting station. For example, the weight factor name of "700_E_2_1_5" indicates that the record is from Sun Link (700 is the code for Sun Link), "E" for Eastbound, "2", AM PEAK is Time Period 2, the rider boarded at the "Av del Convento/Congress St" Station (1), the rider alighted at the "Broadway/Stone" Station (5).

Since there is so much daily variation of ridership between the 17 eastbound Sun Link stations, there are areas where there are completed surveys that have no estimated ridership and vice versa. In order to address the daily variations that take place, the remaining surveys were given a weight factor based on the ridership data that was unaccounted for and divided by those unaccounted for completed surveys.

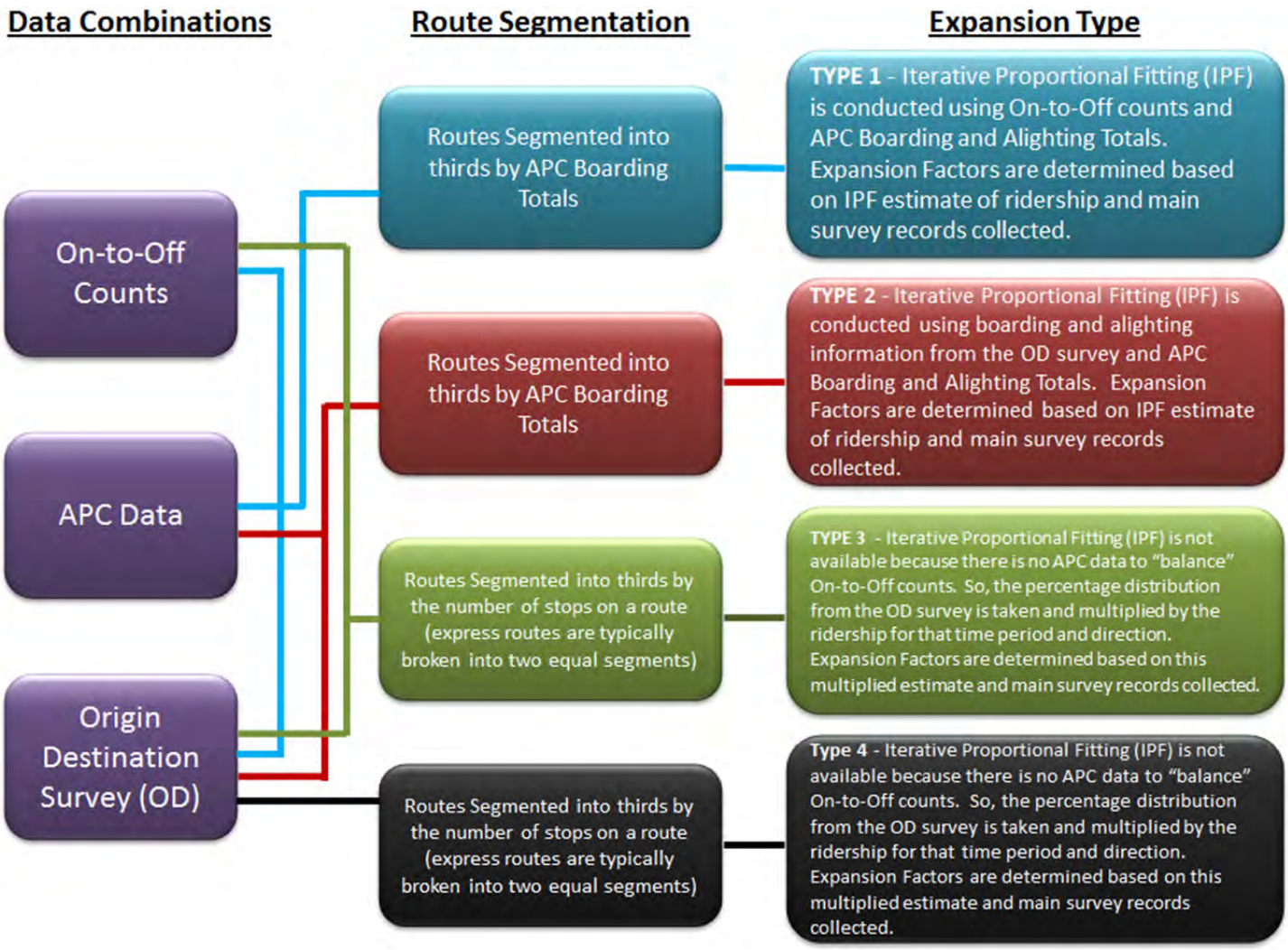
Validating the Expansion for Sun Link

After all the Sun Link expansion factors were added into the Main Survey database, the weighting factors were summed by time period and direction. Those summed weighting factors by time period and direction were then compared to the revised overall ridership numbers for the appropriate time period and direction in order to make sure they were the same.

7.3 Types of Bus Data Expansion

The type of bus data expansion conducted depended on the data available for the specific bus route. The two types of data that created the combinations that guided the type of expansion used were: APC data (from Client) and Origin-Destination (OD) Survey Data (collected by ETC Institute). Figure 7-1 below shows the data combinations, the corresponding route segmentation, and type of expansion used.

Figure 7-1 Type of Bus Data Expansion



7.3.1 Sun Tran Data Expansion

There are two ways ETC Institute creates segments for bus routes: 1) boarding percentages of the route from APC data, and 2) based on the number of stops for the route. When possible, segmenting routes using APC data is the preferred way to segment routes as opposed to segmenting routes based on the number of stops. Routes with usable APC data were separated based on direction, then divided into two segments based on the total boardings for the entire day. After approximately half of the route's total APC ridership had boarded, the second segment began. Table 35 below shows an example of how a route with APC data might have been segmented.
(Note: Iterative Proportional Fitting (IPF) is used in multiple types of expansion discussed in this document. For IPF to work properly, the boarding totals must match the alighting totals. For this reason, APC alightings are adjusted using a multiplying factor in order to make sure their totals match the boarding totals.)

Table 36 Route Segmenting: APC Provided Routes

Segmentation with APC Example					
Direction: Eastbound	APC Data		Segmentation		
Stops	Boardings	Alightings	Running Total of Boardings	Running Percentage of Total Boardings	Segment
Stop 1	30	0	30	25%	1
Stop 2	5	5	35	29%	1
Stop 3	10	8	45	38%	1
Stop 4	5	13	50	42%	1
Stop 5	5	5	55	46%	1
Stop 6	10	6	65	54%	2
Stop 7	5	8	70	58%	2
Stop 8	20	10	90	75%	2
Stop 9	15	20	105	88%	2
Stop 10	13	10	118	98%	2
Stop 11	2	15	120	100%	2
Stop 12	0	20	120	100%	2
	120	120			

After the segmentation process, the segments were then appended to the full APC dataset. The next step was to determine how much ridership belonged into each paired boarding to alighting segment for every route, direction, and time period. Table 36 shows an example of what the segments look like after being appended to the APC data for the appropriate route, direction, and time period.

Table 37 Example of Segments by Route, Direction, and Time Period

Route X Eastbound during the AM Peak			
Stops	**Boardings**	**Alightings**	**Segment**
Stop 1	15	0	1
Stop 2	3	3	1
Stop 3	5	4	1
Stop 4	3	7	1
Stop 5	3	3	1
Stop 6	4	3	2
Stop 7	3	4	2
Stop 8	10	5	2
Stop 9	8	10	2
Stop 10	7	5	2
Stop 11	1	8	2
Stop 12	0	10	2
	62	**62**	

We can see the boardings and alightings for each stop along with the segments.

With two segments you have three possible boarding to alighting pair options: a) boarding segment 1 to alighting segment 1, b) boarding segment 1 to alighting segment 2 and c) boarding segment 2 to alighting segment 2. Boarding segment 2 to alighting segment 1 is not an option as that means the rider would be going in the opposite direction. In the case of this example, the rider would be heading westbound if they boarded segment 2 and alighted on segment 1. In order to determine the ridership for the possible boarding to alighting pairs in this example we start with boarding segment 1 to alighting segment 1. This is simple to determine as you simply add up the alightings for those stops associated with segment 1 which equals 17. Since these 17 people alighted in segment 1 that means they must have boarded on stops within segment 1, so boarding to alighting pair (1 to 1) for this route, time period and direction has 17 boardings and 17 alightings. For boarding to alighting pair (2 to 2) instead of looking at the alightings we instead look at the boardings. Adding up the boardings for segment 2 in the example on the previous page shows 33 total boardings. If those riders boarded within segment 2, then they must have alighted within segment 2 as well which means boarding to alighting pair (2 to 2) for this route, time period and direction has 33 boardings and 33 alightings. This only leaves boarding to alighting segment pair 1 to 2. This can be determined two different ways. Adding up all the boardings for segment 1 gives us a total of 29 boardings. We have already determined that 17 of those segment 1 boardings alighted within segment 1, which means the remaining segment 1 boardings must have alighted within segment 2, which gives us 12 boardings and 12 alightings for segment pair 1 to 2 (29-17). Likewise, you can sum up the total number of alightings for segment 2 which equals 45 alightings. We have already determined that 33 of those segment 2 alightings boarded within segment 2, which means the

remaining segment 2 alightings must have boarded within segment 1, which also gives us 12 boardings and 12 alightings for segment pair 1 to 2 (45-33).

The final step in the process is simply to append the appropriate boarding and alighting segments to each record in the OD dataset based on route, direction, time period, boarding location and alighting location. Then divide the appropriate segment to segment pair ridership by the corresponding number of records that match the same route, direction, time period and boarding segment to alighting segment. For example, in the previously described scenario for Route X heading eastbound in the "AM Peak" time period we had 12 riders boarding on segment 1 and alighting on segment 2. If we had 4 OD surveys that were also Route X heading eastbound during the "AM Peak" time period that boarded within segment 1 and alighted within segment 2, we would just divide 12 riders by 4 surveys to come up with an unlinked weight factor of 3 for each of the 4 OD surveys. These unlinked weight factors are then appended to the OD dataset, summed by route, direction, and time period to ensure that the total summed unlinked weight factors match the provided APC boardings by route, direction and time period.

General Rule for Expansion Factors

While there are no specific guidelines for the expansion factor values, ETC Institute uses a guideline of keeping expansion factors below 3 times the average expansion factor based on the sampling percentage. This is done in order to keep any one record from representing a markedly high number of riders in the system. The formula for determining this guideline is:

1/(Sampling %) x 3 = Guideline Weight Factor

If the expansion factor for a boarding segment to alighting segment pair is greater than 3 times the average expansion factor, then it is aggregated into the adjacent boarding to alighting segment where it will have the least impact on the previously existing expansion factors. This guideline is standard for all the various expansion types.

7.3.2 Sun Shuttle Data Expansion

For routes that only have OD Survey data and ridership information by time period and direction like the Sun Shuttle routes, Type 4 expansion (described in Figure 7-1) is utilized. Type 4 expansion represents the classic version of bus expansion, which takes the ridership for a given route, time period and direction and divides that ridership by the appropriate number of collected surveys.

For the Sun Shuttle expansion, APC data was not available, so expansion was performed at the route level utilizing manual counts provided by the operator. This was done by summing the boardings from the provided data from the months of January 2019 and February 2019 and dividing them by the number of working service days from both months. These average daily figures were then divided by the number of collected OD surveys.

7.3.3 Summary of Unlinked Weight Factors

After all the factors are appended to the OD survey database (regardless of type of expansion) the factors are summed by route, time period, and direction. If expansion was done properly, the summed factors will equal the boarding ridership provided in the APC data by route, time period, and direction. All routes had their unlinked weight factors summed by time period and direction and that ridership was matched to the ridership APC totals to ensure they were the same.

Linked Trip Expansion Factors for All Records

The linked trip expansion factor helps to account for the number of transfers that were made by each passenger, so the linked expansion factors can better represent the overall system. Linked expansion factors are generated after the unlinked expansion factors are created.

The equation that is used to calculate the linked trip multiplying factor is shown below:

Linked Trip Multiplying Factor = [1 / (1 + # of transfers)]

If a passenger did not make a transfer, the linked trip multiplying factor would be 1.0 because the person would have only boarded one vehicle. If a person made two transfers, the linked trip expansion factor would be 0.33 because the person would have boarded three transit vehicles during his/her one-way trip. An example of how the linked trip expansion factors were calculated is provided in Table 37 below.

Table 38 Sample Calculations of Linked Trip Multiplying Factors

Number of Transfers	Calculation [1/(1+Number of Transfers)]	Linked Trip Multiplying Factor
0	[1/(1+0)]	1
1	[1/(1+1)]	0.5
2	[1/(1+2)]	0.33
3	[1/(1+3)]	0.25

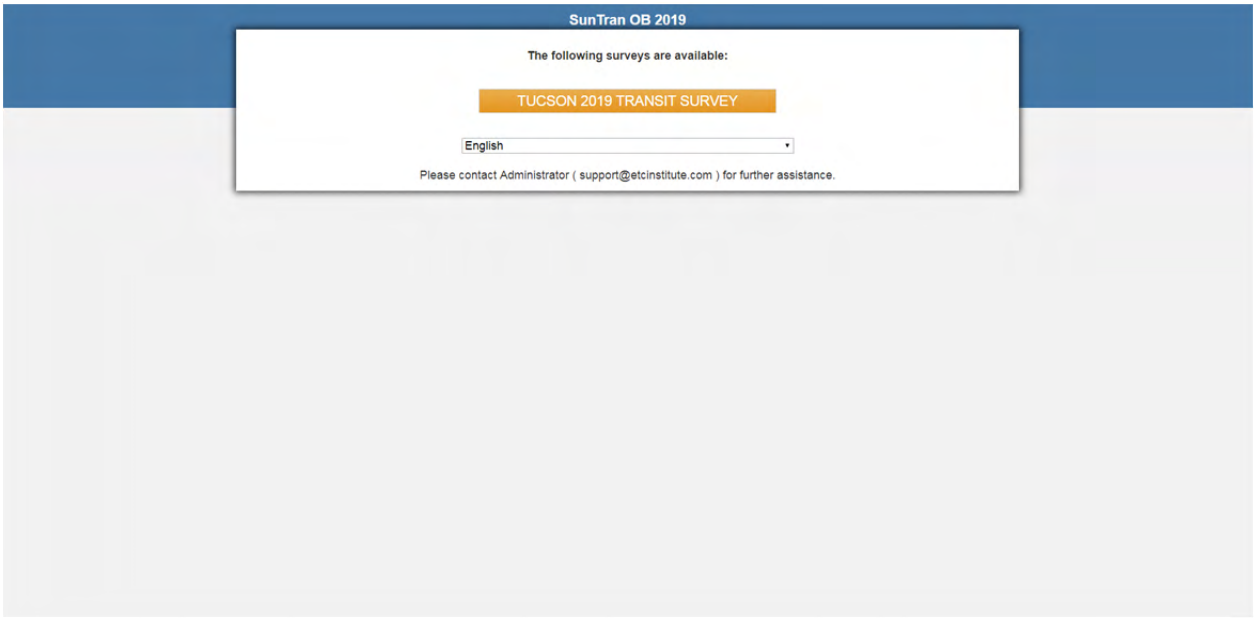
Once the linked trip multiplier is created it is multiplied by the unlinked expansion factor to create the linked expansion factor.

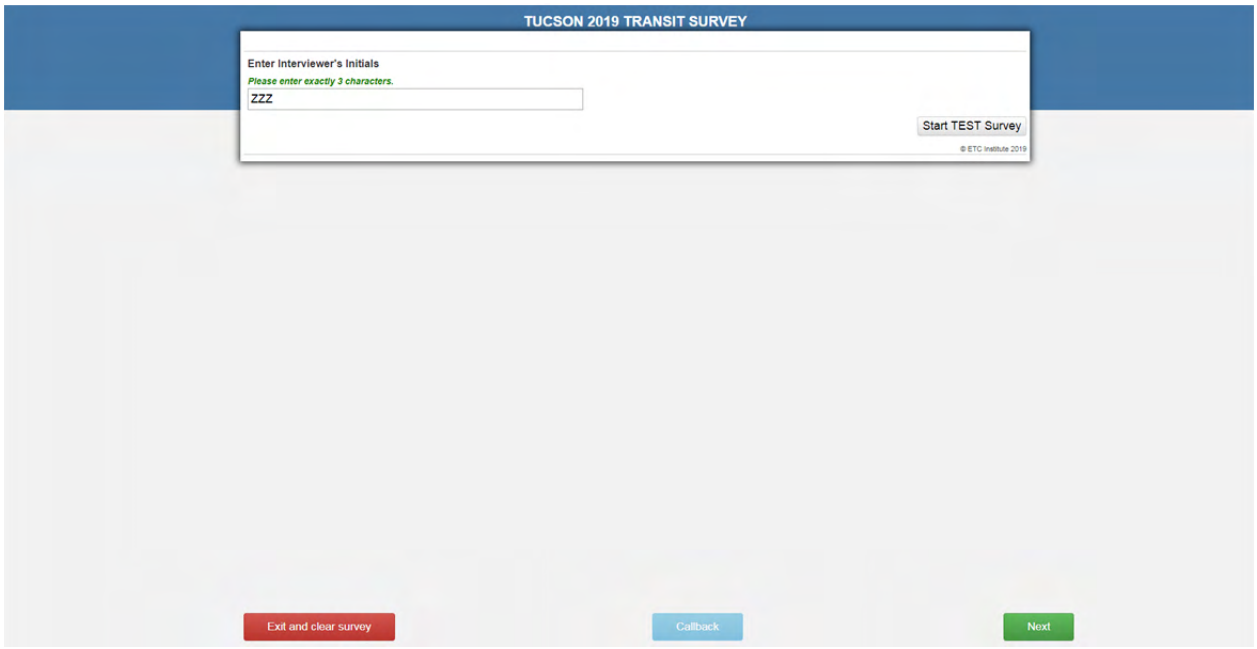
Assessment of Expansion Factor Values

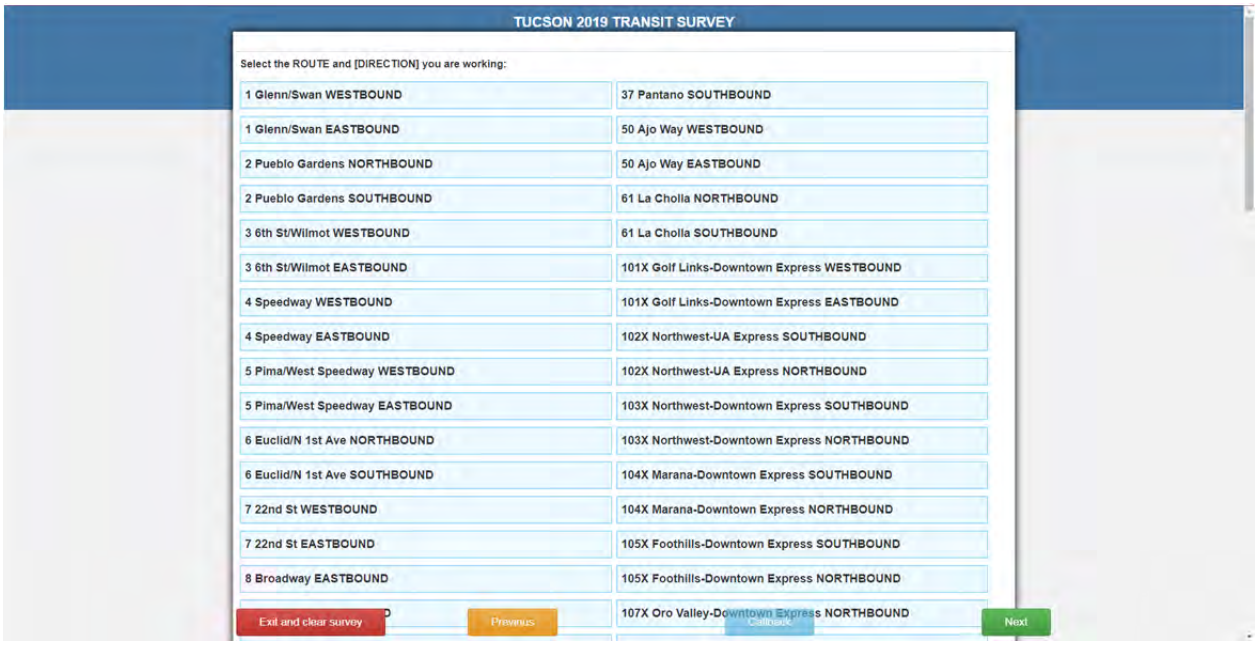
The average value of all unlinked expansion factors in the database is 7.28. Of the 7,118 records in the database, 6,689 (94% of the sample) have an expansion factor of 15 or less and 7,019 (99% of the sample) have a value less than 20. Only 7 records in the database have an expansion factor of 30 or greater.

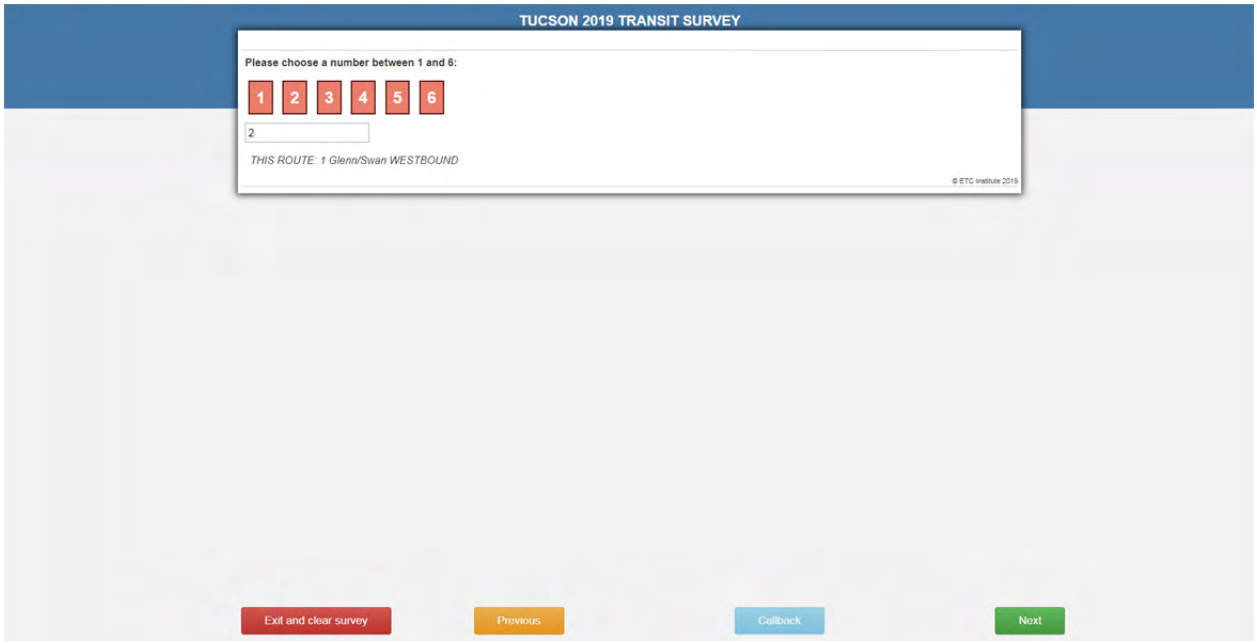
Tablet Survey

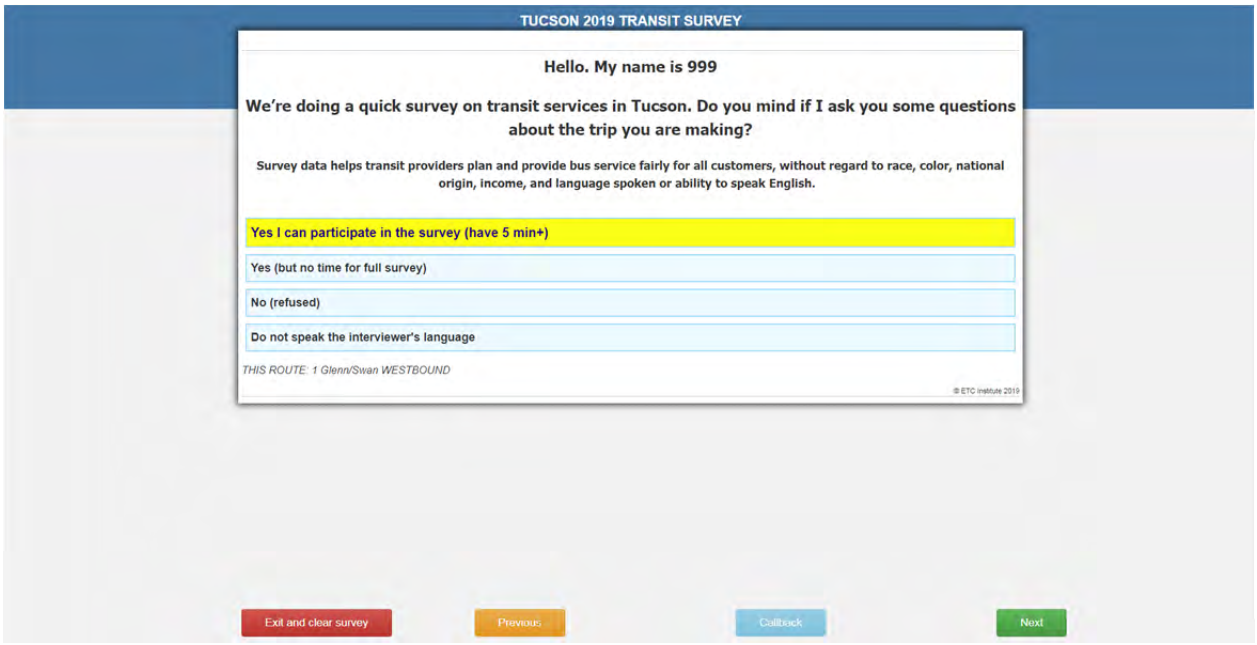
Screenshots of the tablet survey are shown on the following pages. *(Note: Not all "paths" are shown in the screenshots. For example, during the demographic portion of the survey, if a respondent indicated that they spoke another language other than English at home, a secondary question for what type of language would be asked).*

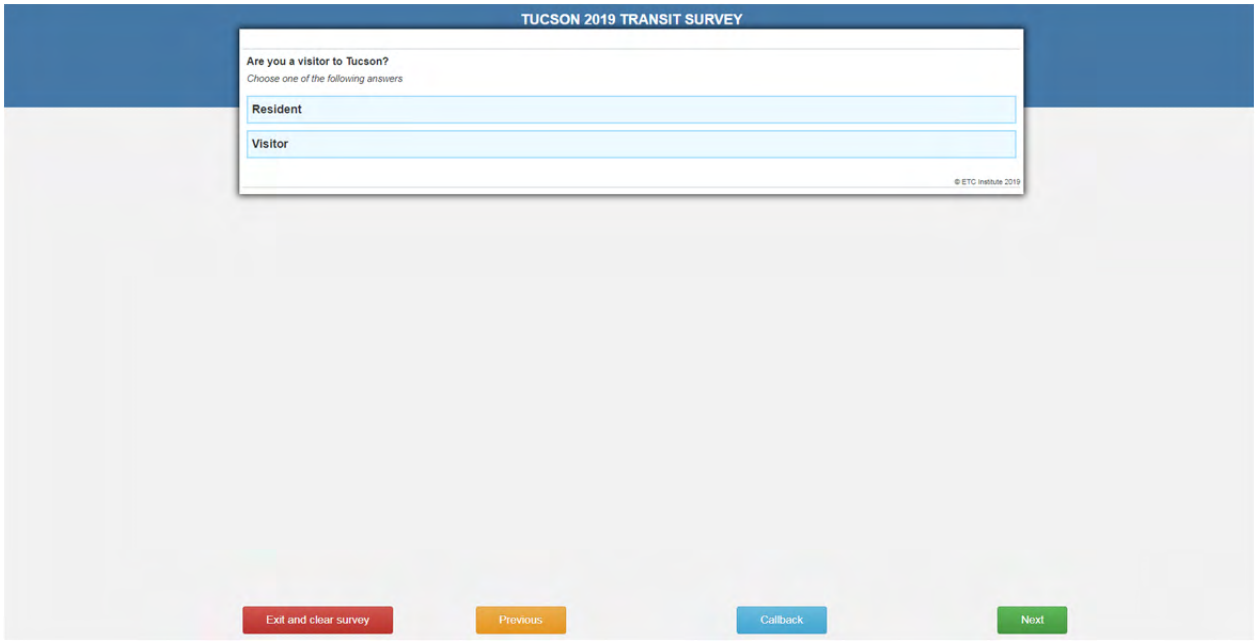


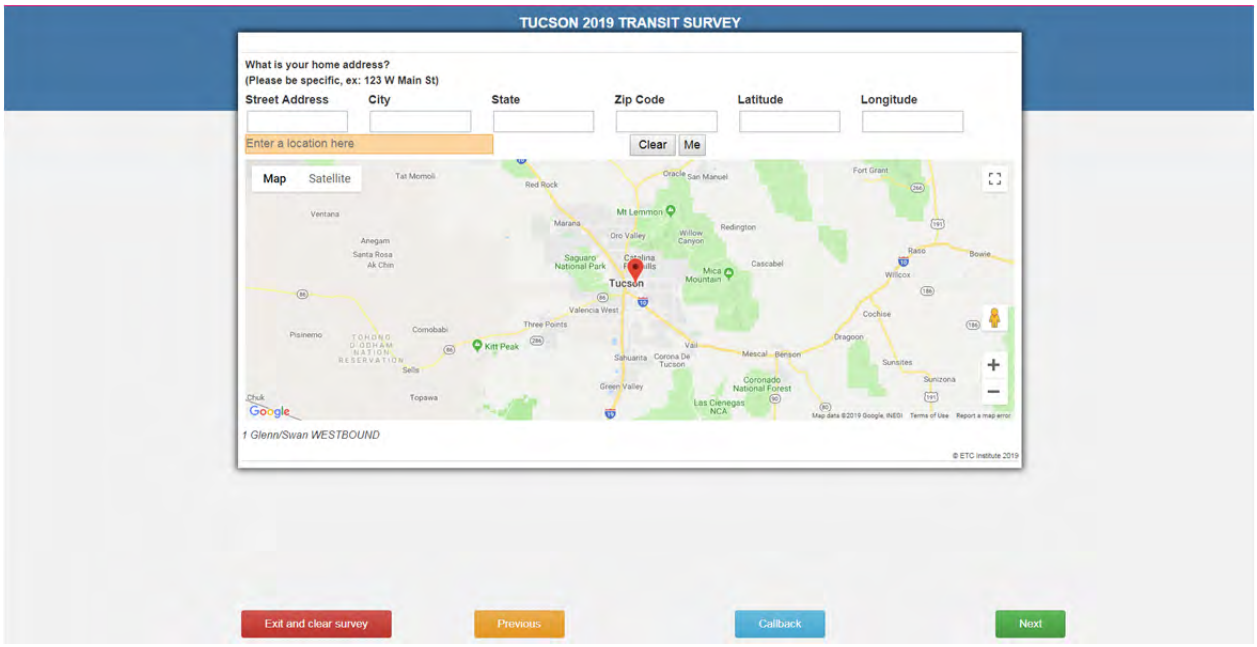

TUCSON 2019 TRANSIT SURVEY
Enter Interviewer's Initials
Please enter exactly 3 characters.
ZZZ
Start TEST Survey
© ETC Institute 2019
Exit and clear survey
Callback
Next

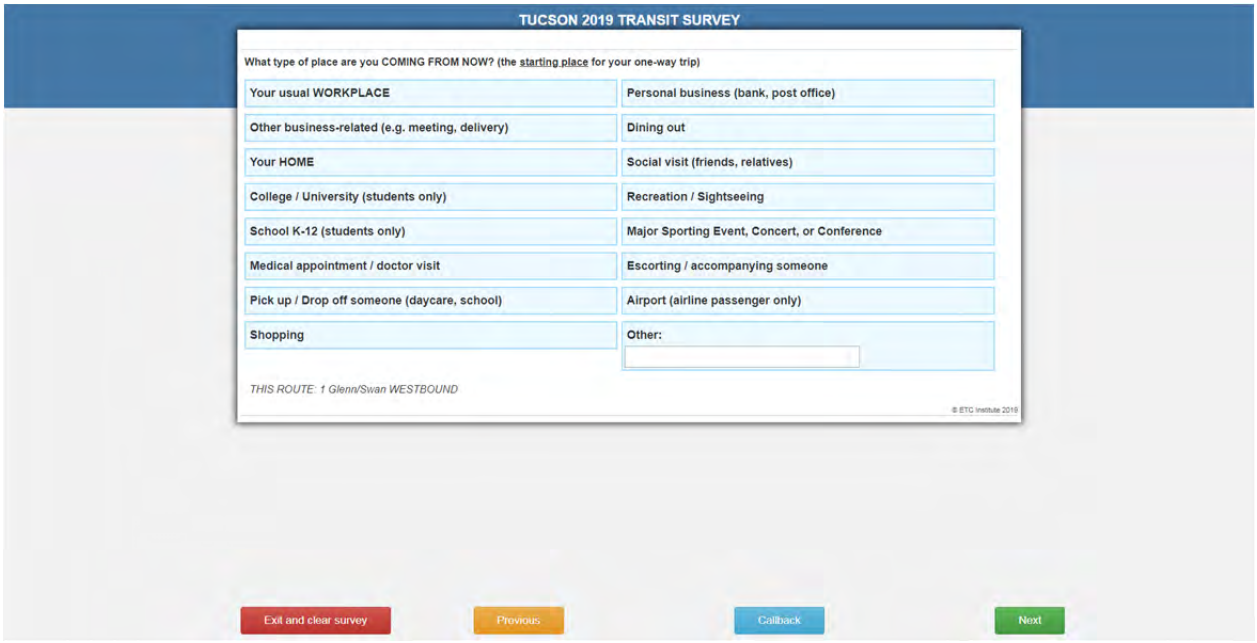

TUCSON 2019 TRANSIT SURVEY
Select the ROUTE and [DIRECTION] you are working:
1 Glenn/Swan WESTBOUND
1 Glenn/Swan EASTBOUND
2 Pueblo Gardens NORTHBOUND
2 Pueblo Gardens SOUTHBOUND
3 6th St/Wilmot WESTBOUND
3 6th St/Wilmot EASTBOUND
4 Speedway WESTBOUND
4 Speedway EASTBOUND
5 Pima/West Speedway WESTBOUND
5 Pima/West Speedway EASTBOUND
6 Euclid/N 1st Ave NORTHBOUND
6 Euclid/N 1st Ave SOUTHBOUND
7 22nd St WESTBOUND
7 22nd St EASTBOUND
8 Broadway EASTBOUND
37 Pantano SOUTHBOUND
50 Ajo Way WESTBOUND
50 Ajo Way EASTBOUND
61 La Cholla NORTHBOUND
61 La Cholla SOUTHBOUND
101X Golf Links-Downtown Express WESTBOUND
101X Golf Links-Downtown Express EASTBOUND
102X Northwest-UA Express SOUTHBOUND
102X Northwest-UA Express NORTHBOUND
103X Northwest-Downtown Express SOUTHBOUND
103X Northwest-Downtown Express NORTHBOUND
104X Marana-Downtown Express SOUTHBOUND
104X Marana-Downtown Express NORTHBOUND
105X Foothills-Downtown Express SOUTHBOUND
105X Foothills-Downtown Express NORTHBOUND
107X Oro Valley-Downtown Express NORTHBOUND
Exit and clear survey
Previous
Callback
Next

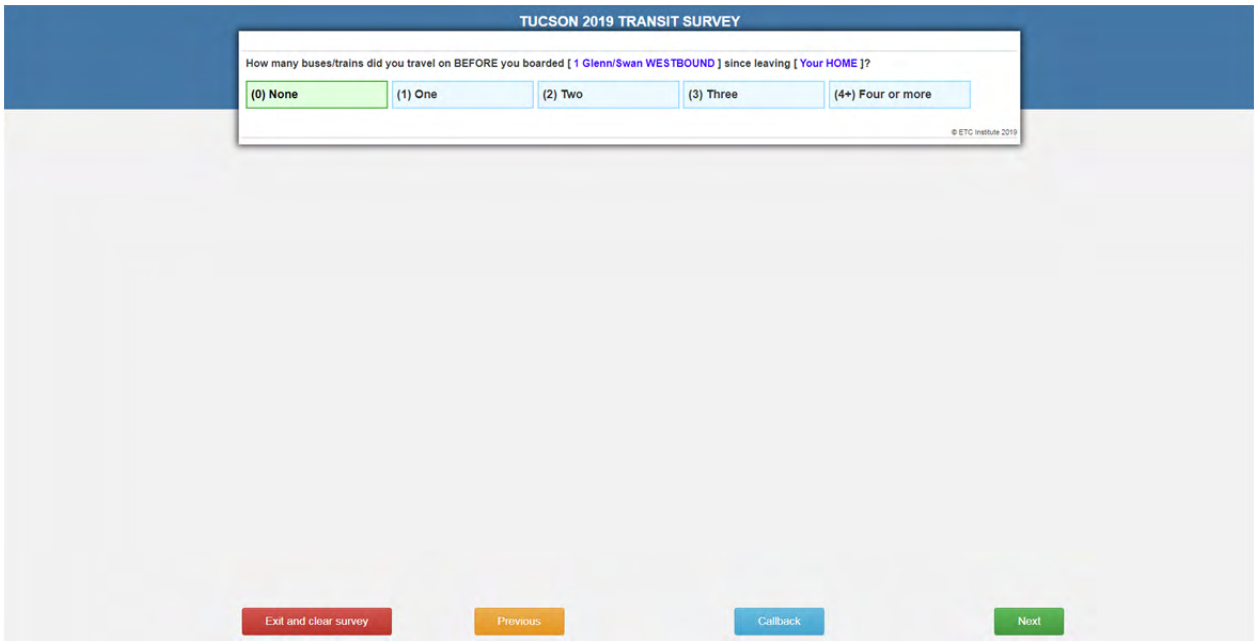

TUCSON 2019 TRANSIT SURVEY
Please choose a number between 1 and 6:
1 2 3 4 5 6
2
THIS ROUTE: 1 Glenn/Swan WESTBOUND
© ETC Institute 2019
Exit and clear survey
Previous
Callback
Next

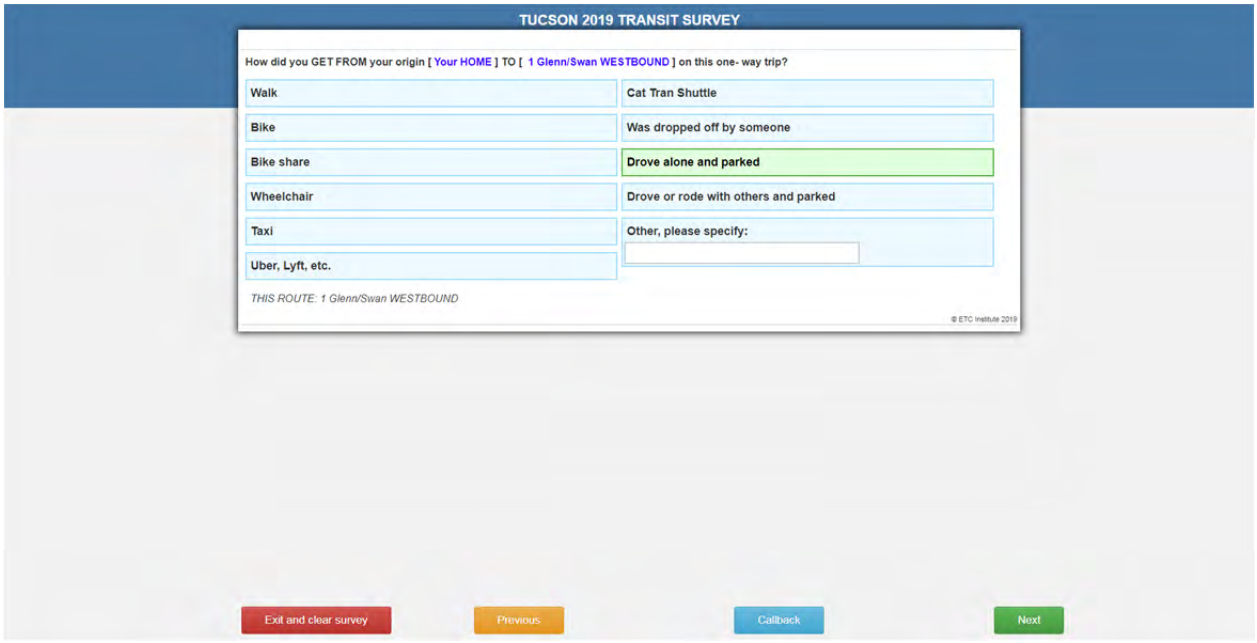

TUCSON 2019 TRANSIT SURVEY
Hello. My name is 999
We're doing a quick survey on transit services in Tucson. Do you mind if I ask you some questions about the trip you are making?
Survey data helps transit providers plan and provide bus service fairly for all customers, without regard to race, color, national origin, income, and language spoken or ability to speak English.
Yes I can participate in the survey (have 5 min+)
Yes (but no time for full survey)
No (refused)
Do not speak the interviewer's language
THIS ROUTE: 1 Glenn/Swan WESTBOUND
© ETC Institute 2019
Exit and clear survey
Previous
Callback
Next

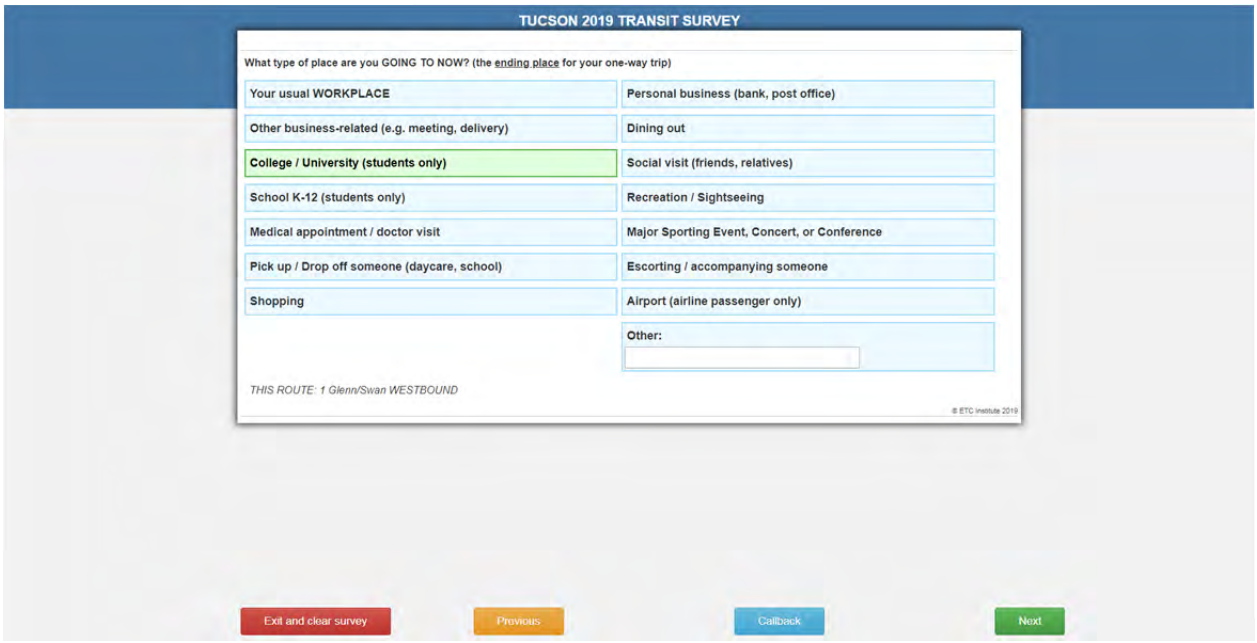

TUCSON 2019 TRANSIT SURVEY
Are you a visitor to Tucson?
Choose one of the following answers
Resident
Visitor
© ETC Institute 2019
Exit and clear survey
Previous
Callback
Next

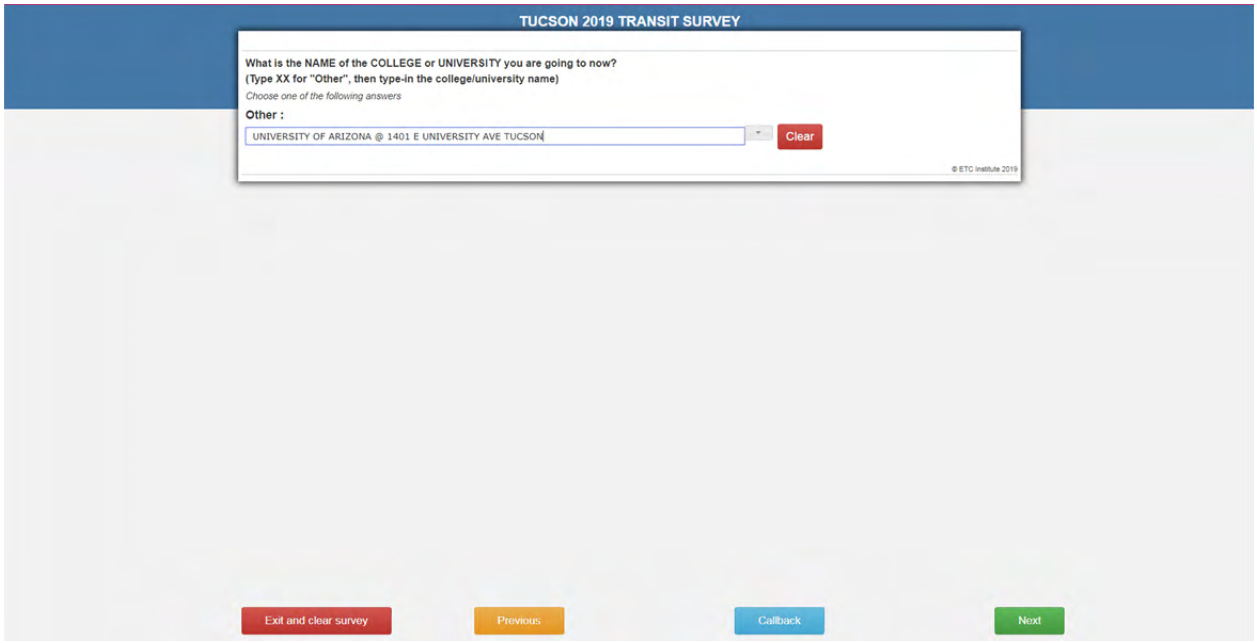

TUCSON 2019 TRANSIT SURVEY
What is your home address?
(Please be specific, ex: 123 W Main St)
Street Address
City
State
Zip Code
Latitude
Longitude
Enter a location here
Clear
Me
Map
Satellite
Tucson
1 Glenn/Swan WESTBOUND
© ETC Institute 2019
Exit and clear survey
Previous
Callback
Next

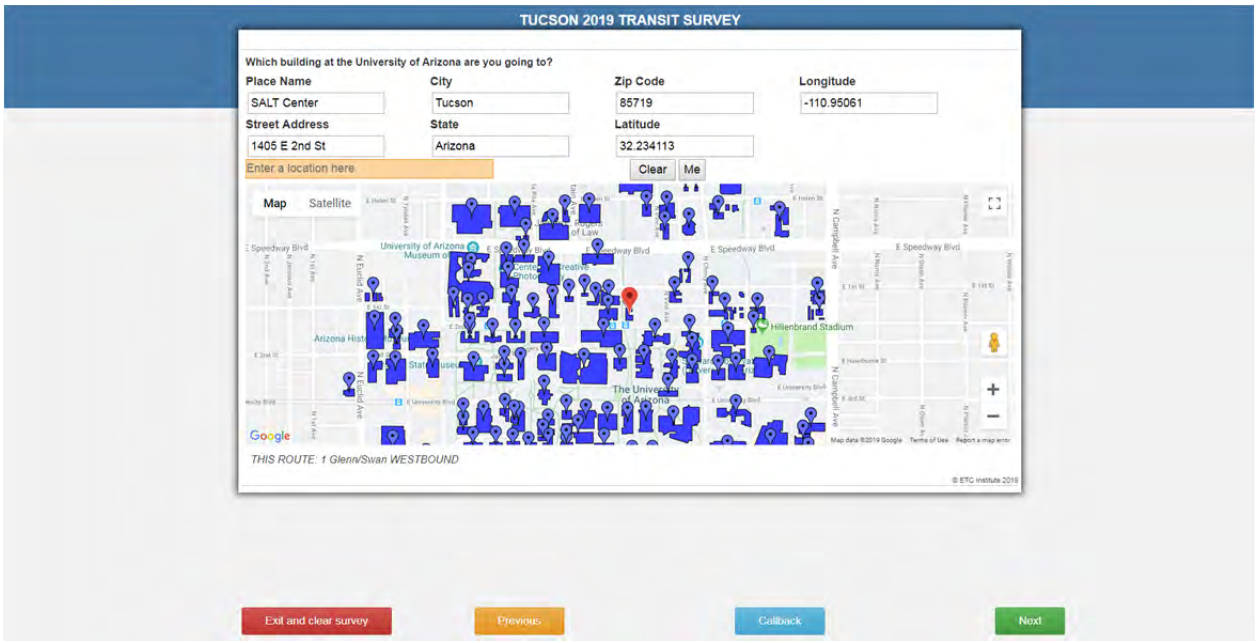

TUCSON 2019 TRANSIT SURVEY
What type of place are you COMING FROM NOW? (the starting place for your one-way trip)
Your usual WORKPLACE
Other business-related (e.g. meeting, delivery)
Your HOME
College / University (students only)
School K-12 (students only)
Medical appointment / doctor visit
Pick up / Drop off someone (daycare, school)
Shopping
Personal business (bank, post office)
Dining out
Social visit (friends, relatives)
Recreation / Sightseeing
Major Sporting Event, Concert, or Conference
Escorting / accompanying someone
Airport (airline passenger only)
Other:
THIS ROUTE: 1 Glenn/Swan WESTBOUND
© ETC Institute 2019
Exit and clear survey
Previous
Callback
Next

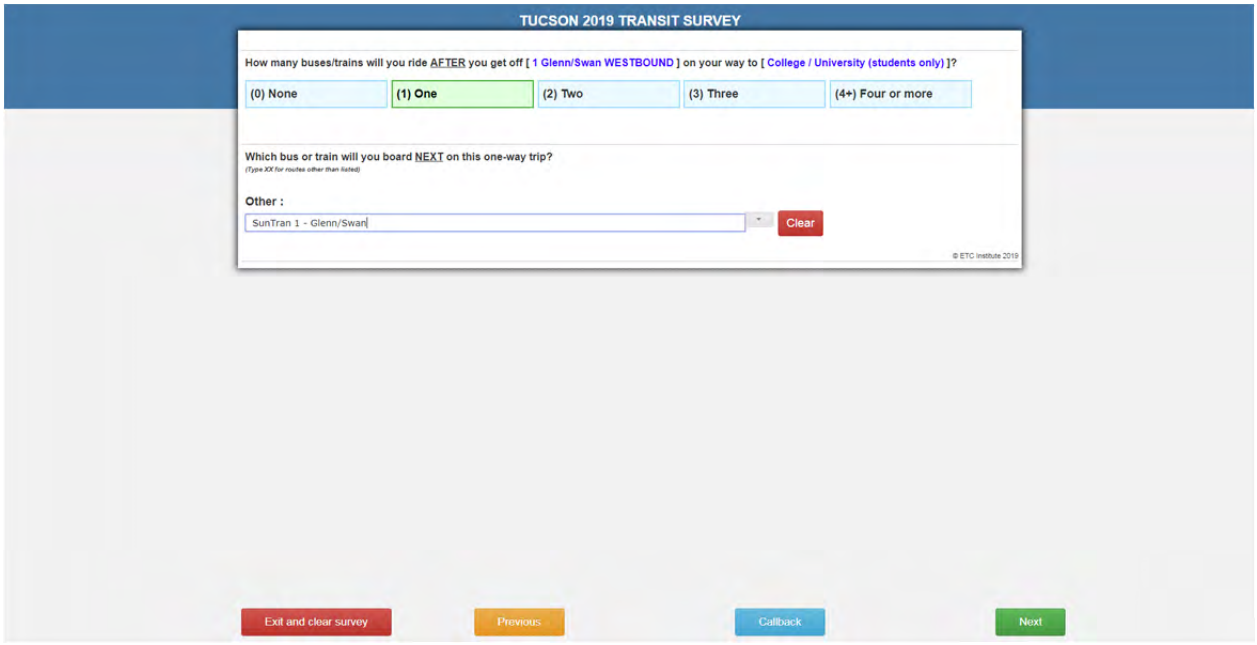

TUCSON 2019 TRANSIT SURVEY
How many buses/trains did you travel on BEFORE you boarded [1 Glenn/Swan WESTBOUND] since leaving [Your HOME]?
(0) None
(1) One
(2) Two
(3) Three
(4+) Four or more
© ETC Institute 2019
Exit and clear survey
Previous
Callback
Next

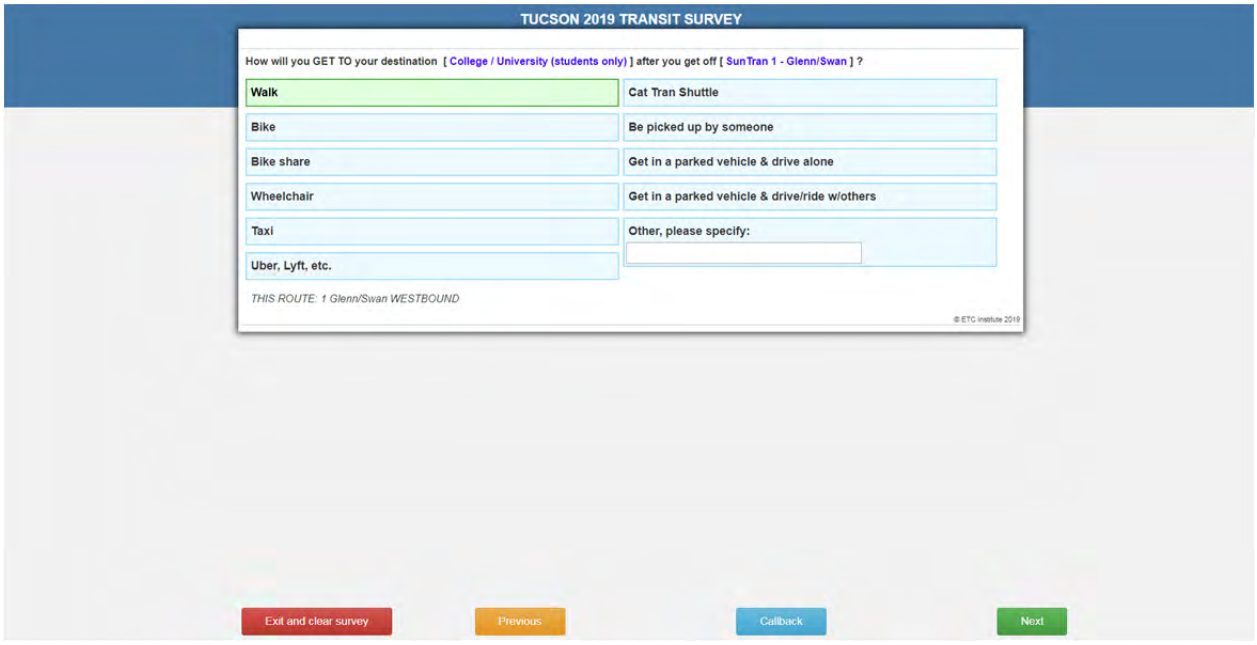

TUCSON 2019 TRANSIT SURVEY
How did you GET FROM your origin [Your HOME] TO [1 Glenn/Swan WESTBOUND] on this one- way trip?
Walk
Bike
Bike share
Wheelchair
Taxi
Uber, Lyft, etc.
Cat Tran Shuttle
Was dropped off by someone
Drove alone and parked
Drove or rode with others and parked
Other, please specify:
THIS ROUTE: 1 Glenn/Swan WESTBOUND
© ETC Institute 2019
Exit and clear survey
Previous
Callback
Next

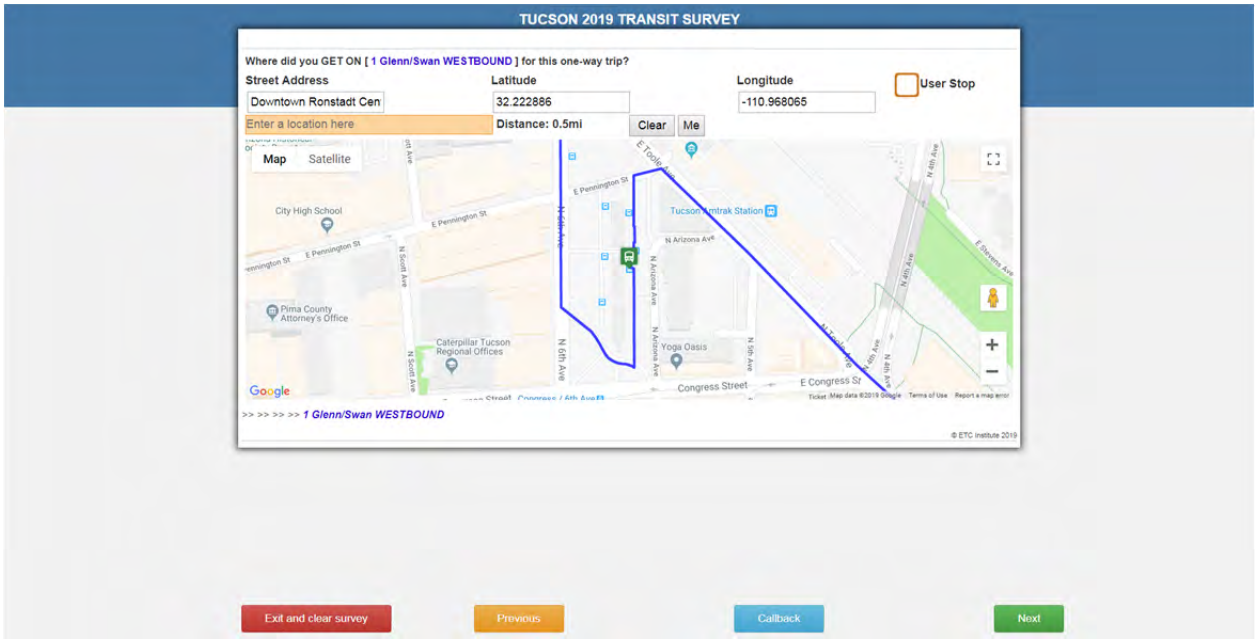

TUCSON 2019 TRANSIT SURVEY
What type of place are you GOING TO NOW? (the ending place for your one-way trip)
Your usual WORKPLACE
Other business-related (e.g. meeting, delivery)
College / University (students only)
School K-12 (students only)
Medical appointment / doctor visit
Pick up / Drop off someone (daycare, school)
Shopping
Personal business (bank, post office)
Dining out
Social visit (friends, relatives)
Recreation / Sightseeing
Major Sporting Event, Concert, or Conference
Escorting / accompanying someone
Airport (airline passenger only)
Other:
THIS ROUTE: 1 Glenn/Swan WESTBOUND
© ETC Institute 2019
Exit and clear survey
Previous
Callback
Next

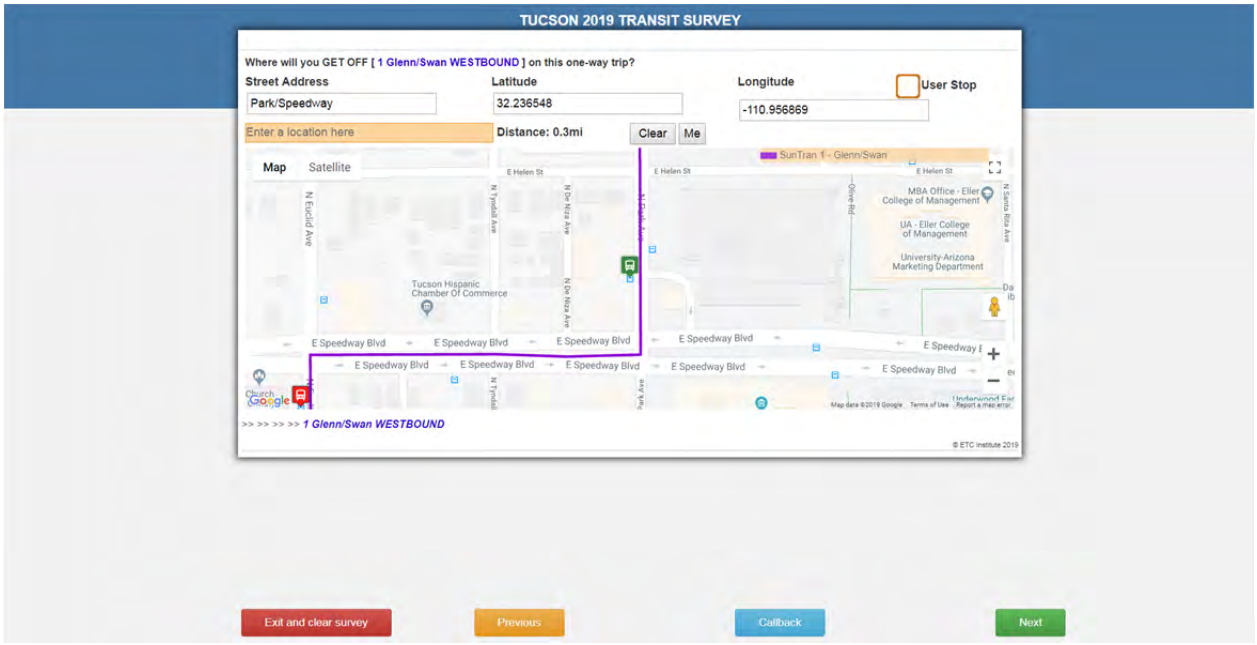

TUCSON 2019 TRANSIT SURVEY
What is the NAME of the COLLEGE or UNIVERSITY you are going to now?
(Type XX for "Other", then type-in the college/university name)
Choose one of the following answers
Other :
UNIVERSITY OF ARIZONA @ 1401 E UNIVERSITY AVE TUCSON
Clear
© ETC Institute 2019
Exit and clear survey
Previous
Callback
Next

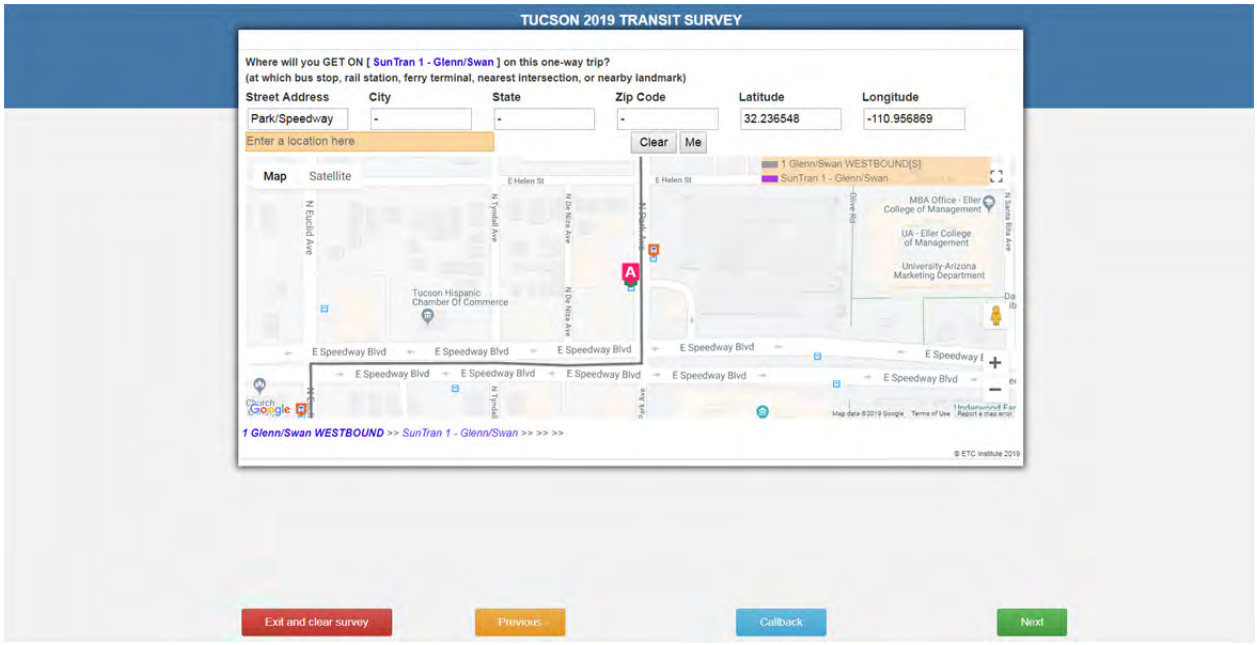

TUCSON 2019 TRANSIT SURVEY
Which building at the University of Arizona are you going to?
Place Name
SALT Center
City
Tucson
Zip Code
85719
Longitude
-110.95061
Street Address
1405 E 2nd St
State
Arizona
Latitude
32.234113
Enter a location here
Clear
Me
Map
Satellite
E Speedway Blvd
Hillenbrand Stadium
Google
THIS ROUTE: 1 Glenn/Swan WESTBOUND
© ETC Institute 2019
Exit and clear survey
Previous
Callback
Next

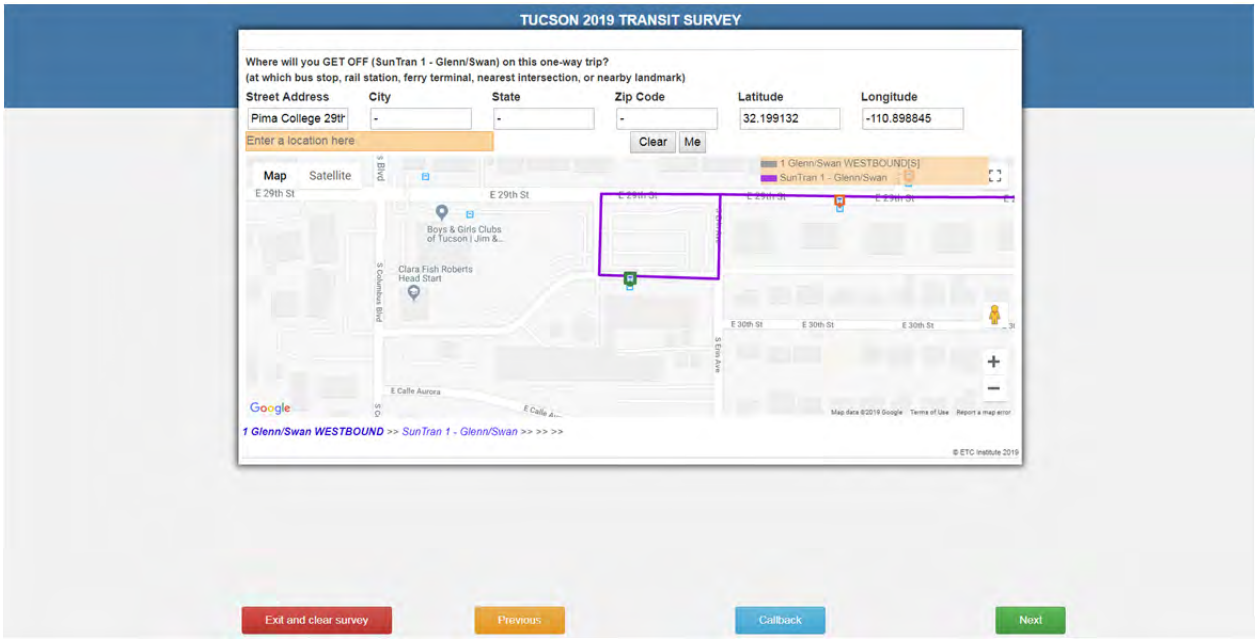

TUCSON 2019 TRANSIT SURVEY
How many buses/trains will you ride AFTER you get off [1 Glenn/Swan WESTBOUND] on your way to [College / University (students only)]?
(0) None
(1) One
(2) Two
(3) Three
(4+) Four or more
Which bus or train will you board NEXT on this one-way trip?
(Type XX for routes other than listed)
Other :
SunTran 1 - Glenn/Swan
Clear
© ETC Institute 2019
Exit and clear survey
Previous
Callback
Next

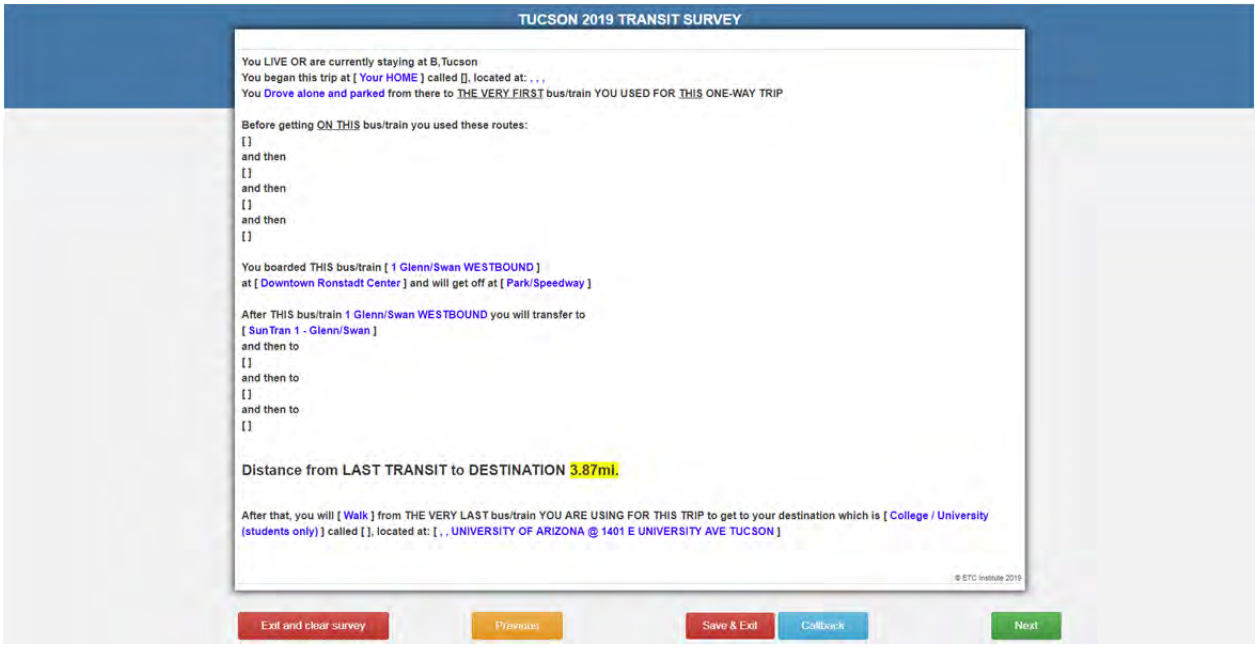

TUCSON 2019 TRANSIT SURVEY
How will you GET TO your destination [College / University (students only)] after you get off [SunTran 1 - Glenn/Swan] ?
Walk
Bike
Bike share
Wheelchair
Taxi
Uber, Lyft, etc.
Cat Tran Shuttle
Be picked up by someone
Get in a parked vehicle & drive alone
Get in a parked vehicle & drive/ride w/others
Other, please specify:
THIS ROUTE: 1 Glenn/Swan WESTBOUND
© ETC Institute 2019
Exit and clear survey
Previous
Callback
Next

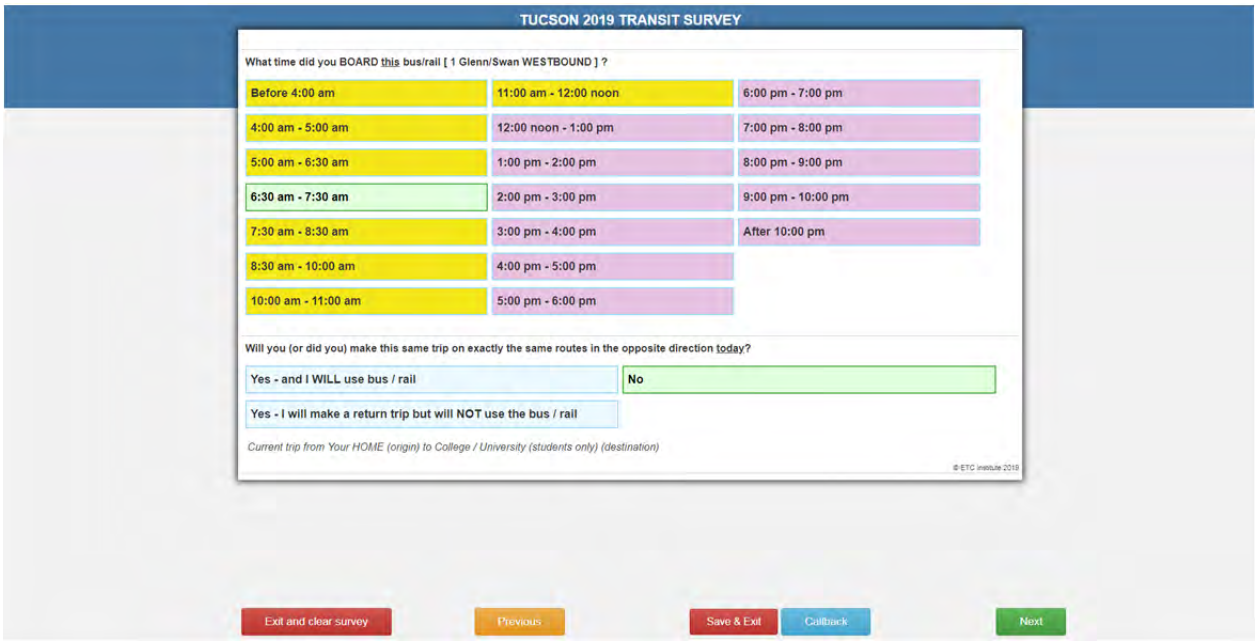

TUCSON 2019 TRANSIT SURVEY
Where did you GET ON [1 Glenn/Swan WESTBOUND] for this one-way trip?
Street Address
Downtown Ronstadt Cen
Latitude
32.222886
Longitude
-110.968065
User Stop
Enter a location here
Distance: 0.5mi
Clear
Me
Map
Satellite
City High School
E Pennington St
N Scott Ave
Pima County Attorney's Office
Caterpillar Tucson Regional Offices
N 6th Ave
E Toole Ave
Tucson Amtrak Station
N Arizona Ave
Yoga Oasis
Congress Street
E Congress St
N 4th Ave
Google
>> >> >> >> 1 Glenn/Swan WESTBOUND
© ETC Institute 2019
Exit and clear survey
Previous
Callback
Next

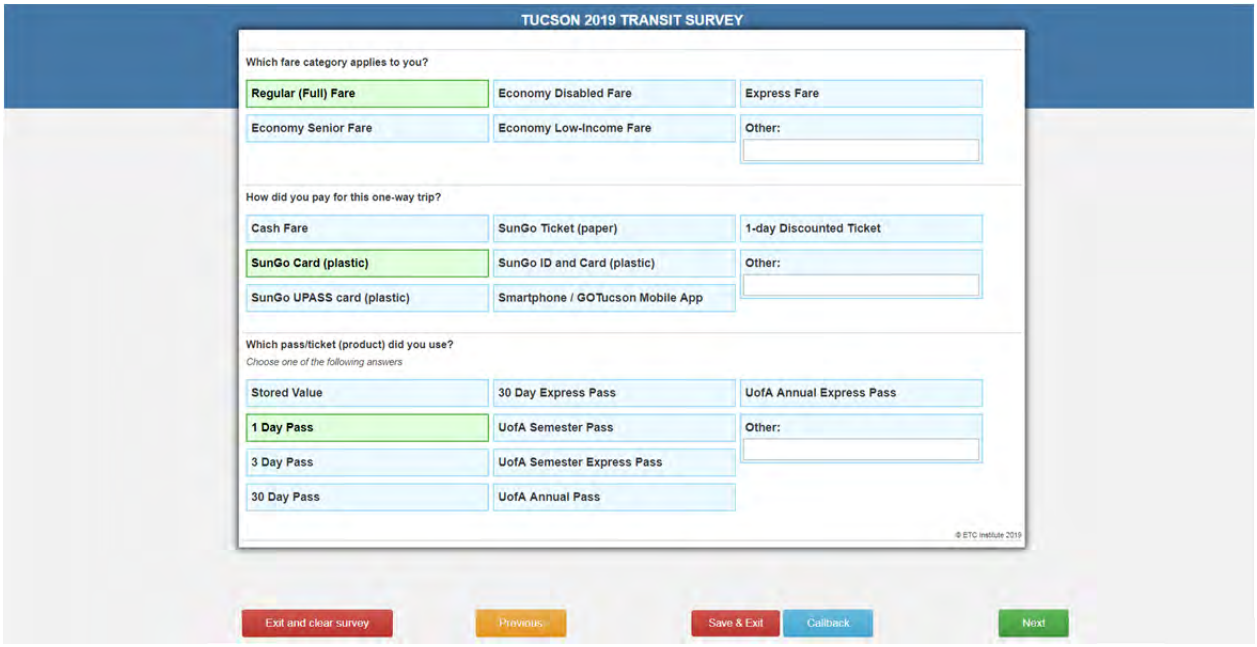

TUCSON 2019 TRANSIT SURVEY
Where will you GET OFF [1 Glenn/Swan WESTBOUND] on this one-way trip?
Street Address
Park/Speedway
Latitude
32.236548
Longitude
-110.956869
User Stop
Enter a location here
Distance: 0.3mi
Clear
Me
Map
Satellite
SunTran 1 - Glenn/Swan
E Helen St
N Euclid Ave
N Tyndall Ave
N De Anza Ave
Tucson Hispanic Chamber Of Commerce
MBA Office - Eller College of Management
UA - Eller College of Management
University Arizona Marketing Department
N Santa Rita Ave
E Speedway Blvd
Google
>> >> >> >> 1 Glenn/Swan WESTBOUND
© ETC Institute 2019
Exit and clear survey
Previous
Callback
Next

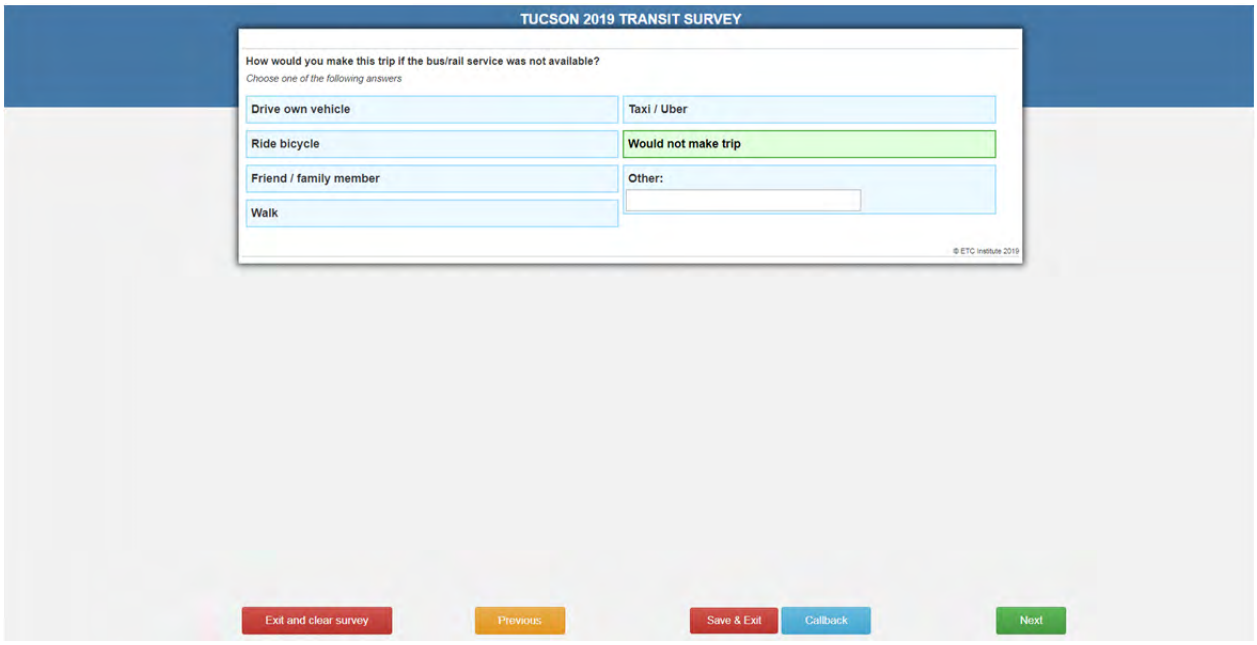

TUCSON 2019 TRANSIT SURVEY
Where will you GET ON [SunTran 1 - Glenn/Swan] on this one-way trip?
(at which bus stop, rail station, ferry terminal, nearest intersection, or nearby landmark)
Street Address
City
State
Zip Code
Latitude
Longitude
Park/Speedway
-
-
-
32.236548
-110.956869
Enter a location here
Clear
Me
Map
Satellite
1 Glenn/Swan WESTBOUND[S]
SunTran 1 - Glenn/Swan
E Speedway Blvd
Tucson Hispanic Chamber Of Commerce
MBA Office - Eller College of Management
UA - Eller College of Management
University-Arizona Marketing Department
1 Glenn/Swan WESTBOUND >> SunTran 1 - Glenn/Swan >> >> >>
© ETC Institute 2019
Exit and clear survey
Previous
Callback
Next

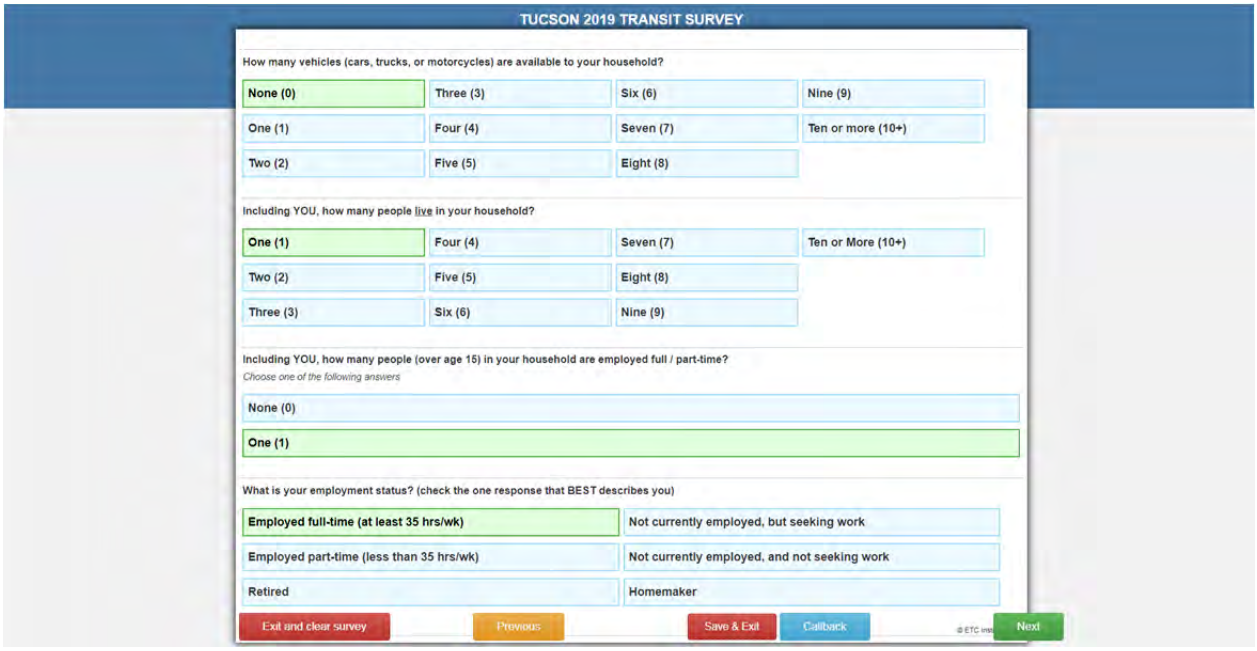

TUCSON 2019 TRANSIT SURVEY
Where will you GET OFF (SunTran 1 - Glenn/Swan) on this one-way trip?
(at which bus stop, rail station, ferry terminal, nearest intersection, or nearby landmark)
Street Address
City
State
Zip Code
Latitude
Longitude
Pima College 29th
-
-
-
32.199132
-110.898845
Enter a location here
Clear
Me
Map
Satellite
1 Glenn/Swan WESTBOUND[S]
SunTran 1 - Glenn/Swan
E 29th St
Boys & Girls Clubs of Tucson | Jim &...
Clara Fish Roberts Head Start
E Calle Aurora
E 30th St
1 Glenn/Swan WESTBOUND >> SunTran 1 - Glenn/Swan >> >> >>
© ETC Institute 2019
Exit and clear survey
Previous
Callback
Next

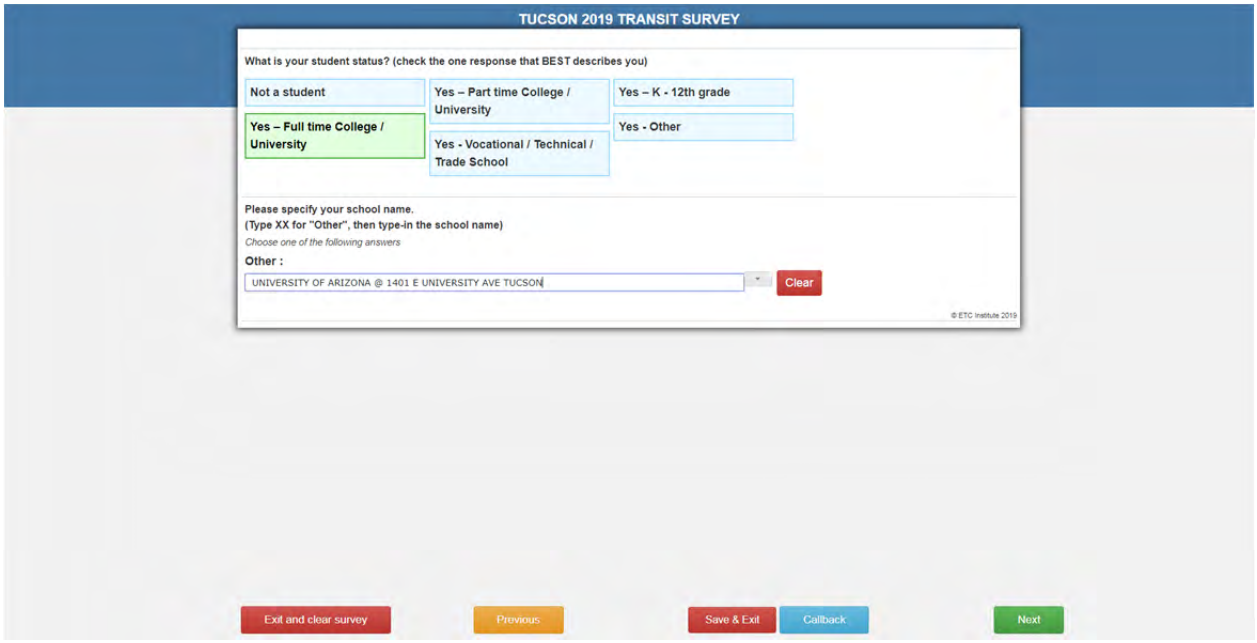

TUCSON 2019 TRANSIT SURVEY
You LIVE OR are currently staying at B,Tucson
You began this trip at [Your HOME] called [], located at: , , ,
You Drove alone and parked from there to THE VERY FIRST bus/train YOU USED FOR THIS ONE-WAY TRIP
Before getting ON THIS bus/train you used these routes:
[ ]
and then
[ ]
and then
[ ]
and then
[ ]
You boarded THIS bus/train [1 Glenn/Swan WESTBOUND]
at [Downtown Ronstadt Center] and will get off at [Park/Speedway]
After THIS bus/train 1 Glenn/Swan WESTBOUND you will transfer to
[SunTran 1 - Glenn/Swan]
and then to
[ ]
and then to
[ ]
and then to
[ ]
Distance from LAST TRANSIT to DESTINATION 3.87mi.
After that, you will [Walk] from THE VERY LAST bus/train YOU ARE USING FOR THIS TRIP to get to your destination which is [College / University (students only)] called [ ], located at: [, , UNIVERSITY OF ARIZONA @ 1401 E UNIVERSITY AVE TUCSON]
© ETC Institute 2019
Exit and clear survey
Previous
Save & Exit
Callback
Next

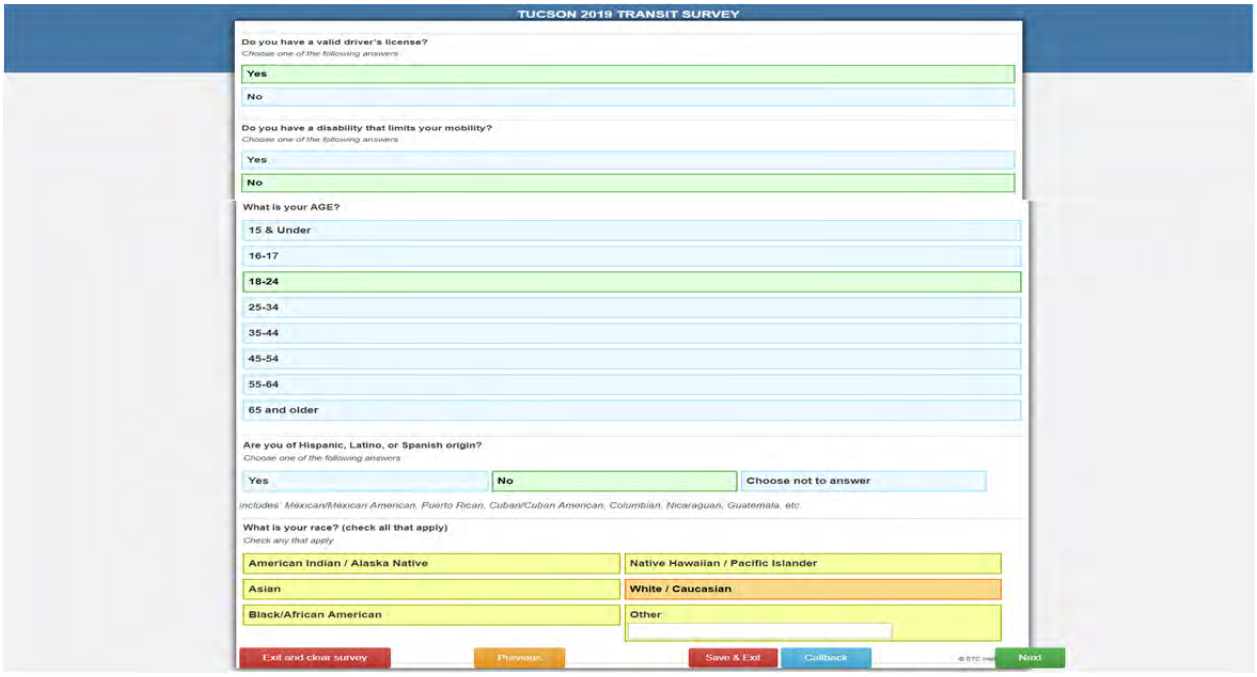

TUCSON 2019 TRANSIT SURVEY
What time did you BOARD this bus/rail [1 Glenn/Swan WESTBOUND] ?
Before 4:00 am
4:00 am - 5:00 am
5:00 am - 6:30 am
6:30 am - 7:30 am
7:30 am - 8:30 am
8:30 am - 10:00 am
10:00 am - 11:00 am
11:00 am - 12:00 noon
12:00 noon - 1:00 pm
1:00 pm - 2:00 pm
2:00 pm - 3:00 pm
3:00 pm - 4:00 pm
4:00 pm - 5:00 pm
5:00 pm - 6:00 pm
6:00 pm - 7:00 pm
7:00 pm - 8:00 pm
8:00 pm - 9:00 pm
9:00 pm - 10:00 pm
After 10:00 pm
Will you (or did you) make this same trip on exactly the same routes in the opposite direction today?
Yes - and I WILL use bus / rail
No
Yes - I will make a return trip but will NOT use the bus / rail
Current trip from Your HOME (origin) to College / University (students only) (destination)
© ETC Institute 2019
Exit and clear survey
Previous
Save & Exit
Callback
Next

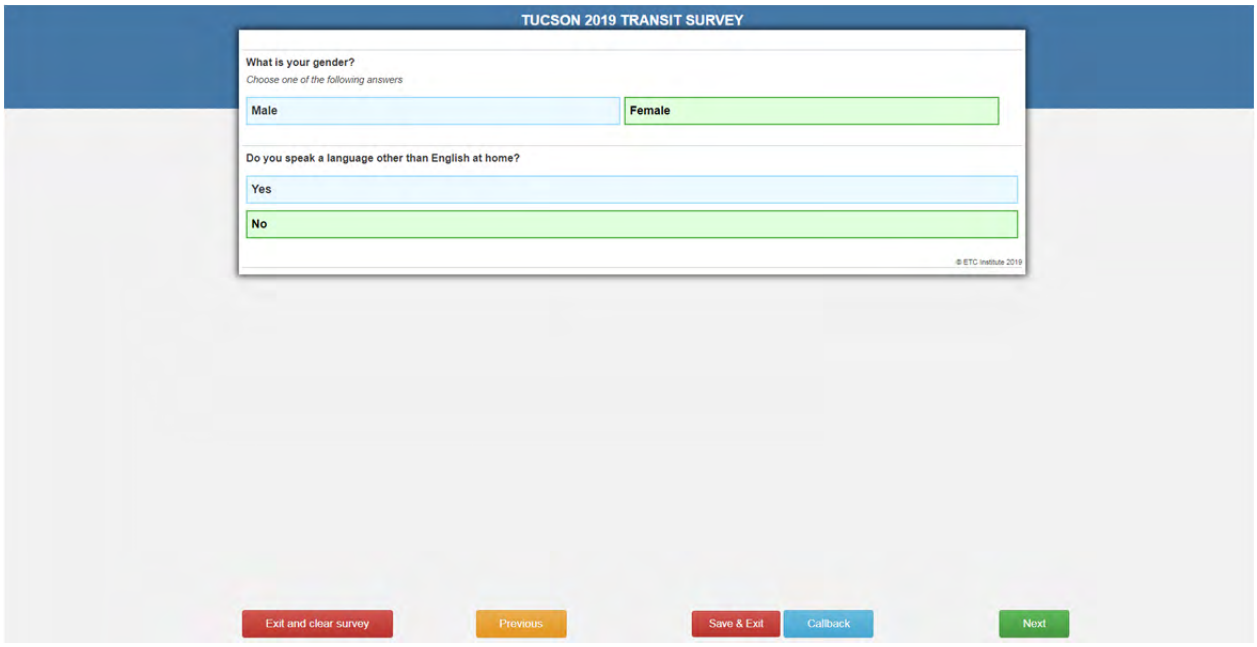

TUCSON 2019 TRANSIT SURVEY
Which fare category applies to you?
Regular (Full) Fare
Economy Disabled Fare
Express Fare
Economy Senior Fare
Economy Low-Income Fare
Other:
How did you pay for this one-way trip?
Cash Fare
SunGo Ticket (paper)
1-day Discounted Ticket
SunGo Card (plastic)
SunGo ID and Card (plastic)
Other:
SunGo UPASS card (plastic)
Smartphone / GOTucson Mobile App
Which pass/ticket (product) did you use?
Choose one of the following answers
Stored Value
30 Day Express Pass
UofA Annual Express Pass
1 Day Pass
UofA Semester Pass
Other:
3 Day Pass
UofA Semester Express Pass
30 Day Pass
UofA Annual Pass
© ETC Institute 2019
Exit and clear survey
Previous
Save & Exit
Callback
Next

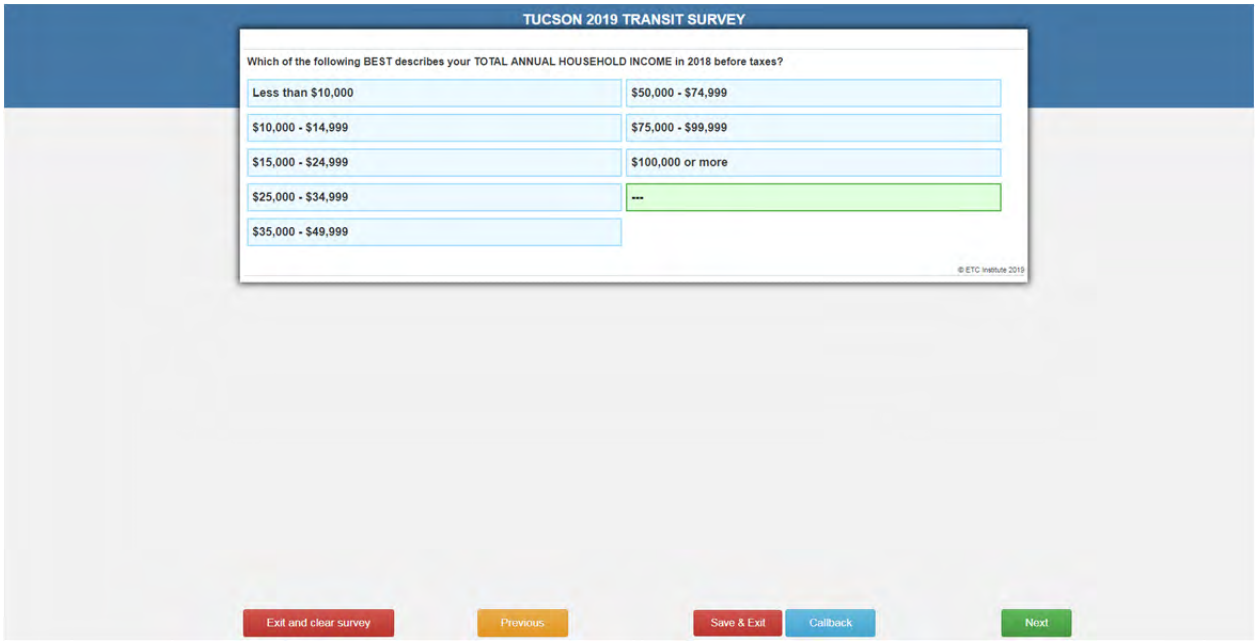

TUCSON 2019 TRANSIT SURVEY
How would you make this trip if the bus/rail service was not available?
Choose one of the following answers
Drive own vehicle
Taxi / Uber
Ride bicycle
Would not make trip
Friend / family member
Other:
Walk
© ETC Institute 2019
Exit and clear survey
Previous
Save & Exit
Callback
Next


TUCSON 2019 TRANSIT SURVEY
How many vehicles (cars, trucks, or motorcycles) are available to your household?
None (0)
One (1)
Two (2)
Three (3)
Four (4)
Five (5)
Six (6)
Seven (7)
Eight (8)
Nine (9)
Ten or more (10+)
Including YOU, how many people live in your household?
One (1)
Two (2)
Three (3)
Four (4)
Five (5)
Six (6)
Seven (7)
Eight (8)
Nine (9)
Ten or More (10+)
Including YOU, how many people (over age 15) in your household are employed full / part-time?
Choose one of the following answers
None (0)
One (1)
What is your employment status? (check the one response that BEST describes you)
Employed full-time (at least 35 hrs/wk)
Employed part-time (less than 35 hrs/wk)
Retired
Not currently employed, but seeking work
Not currently employed, and not seeking work
Homemaker
Exit and clear survey
Previous
Save & Exit
Callback
Next

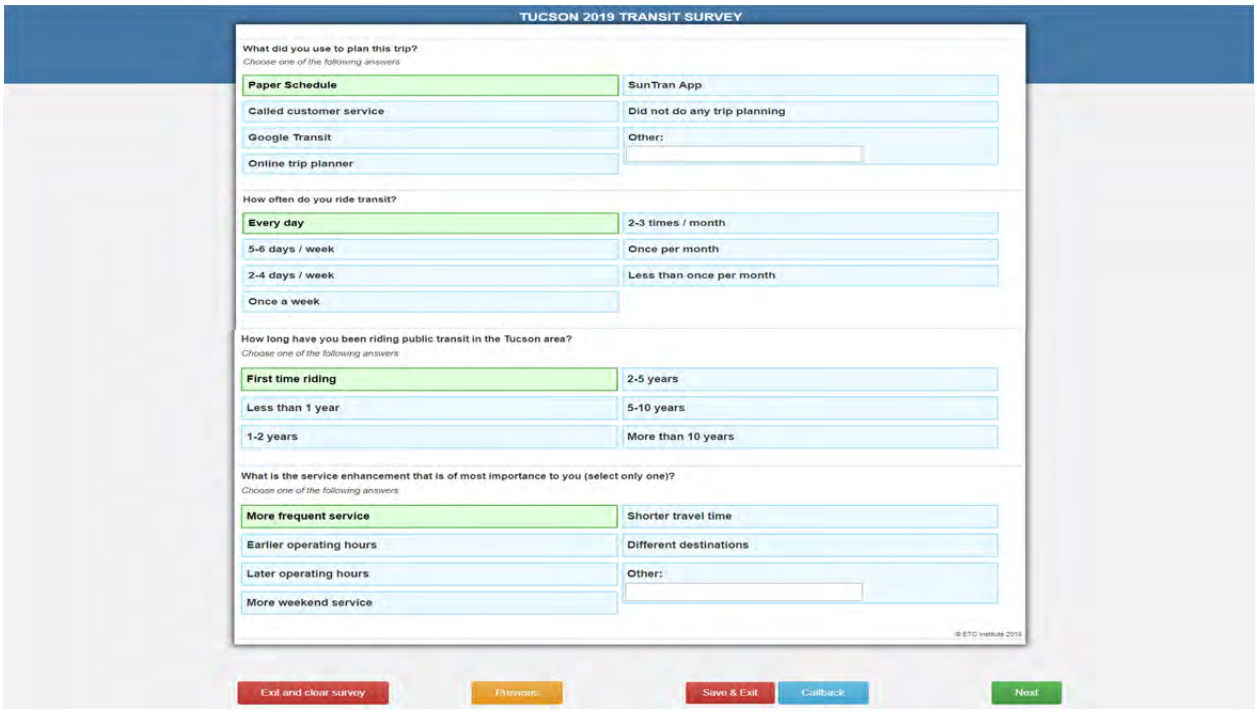

TUCSON 2019 TRANSIT SURVEY
What is your student status? (check the one response that BEST describes you)
Not a student
Yes – Full time College / University
Yes – Part time College / University
Yes - Vocational / Technical / Trade School
Yes – K - 12th grade
Yes - Other
Please specify your school name.
(Type XX for "Other", then type-in the school name)
Choose one of the following answers
Other :
UNIVERSITY OF ARIZONA @ 1401 E UNIVERSITY AVE TUCSON
Clear
Exit and clear survey
Previous
Save & Exit
Callback
Next

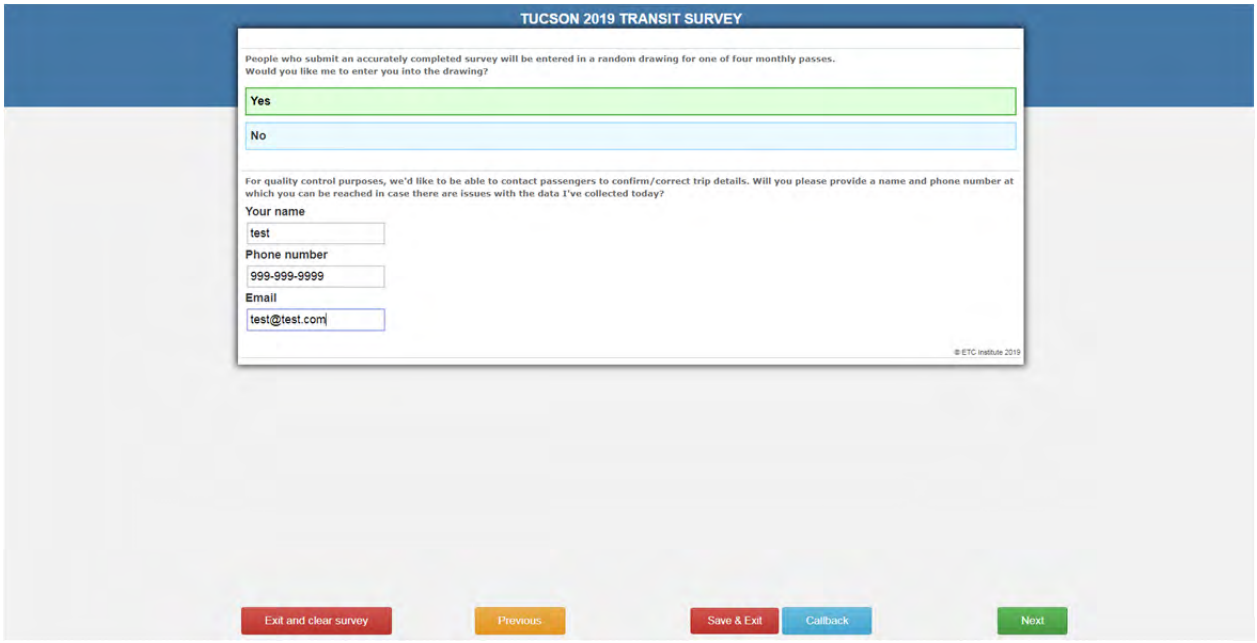

TUCSON 2019 TRANSIT SURVEY
Do you have a valid driver's license?
Choose one of the following answers
Yes
No
Do you have a disability that limits your mobility?
Choose one of the following answers
Yes
No
What is your AGE?
15 & Under
16-17
18-24
25-34
35-44
45-54
55-64
65 and older
Are you of Hispanic, Latino, or Spanish origin?
Choose one of the following answers
Yes
No
Choose not to answer
Includes: Mexican/Mexican American, Puerto Rican, Cuban/Cuban American, Columbian, Nicaraguan, Guatemala, etc.
What is your race? (check all that apply)
Check any that apply
American Indian / Alaska Native
Native Hawaiian / Pacific Islander
Asian
White / Caucasian
Black/African American
Other
Exit and clear survey
Previous
Save & Exit
Callback
Next

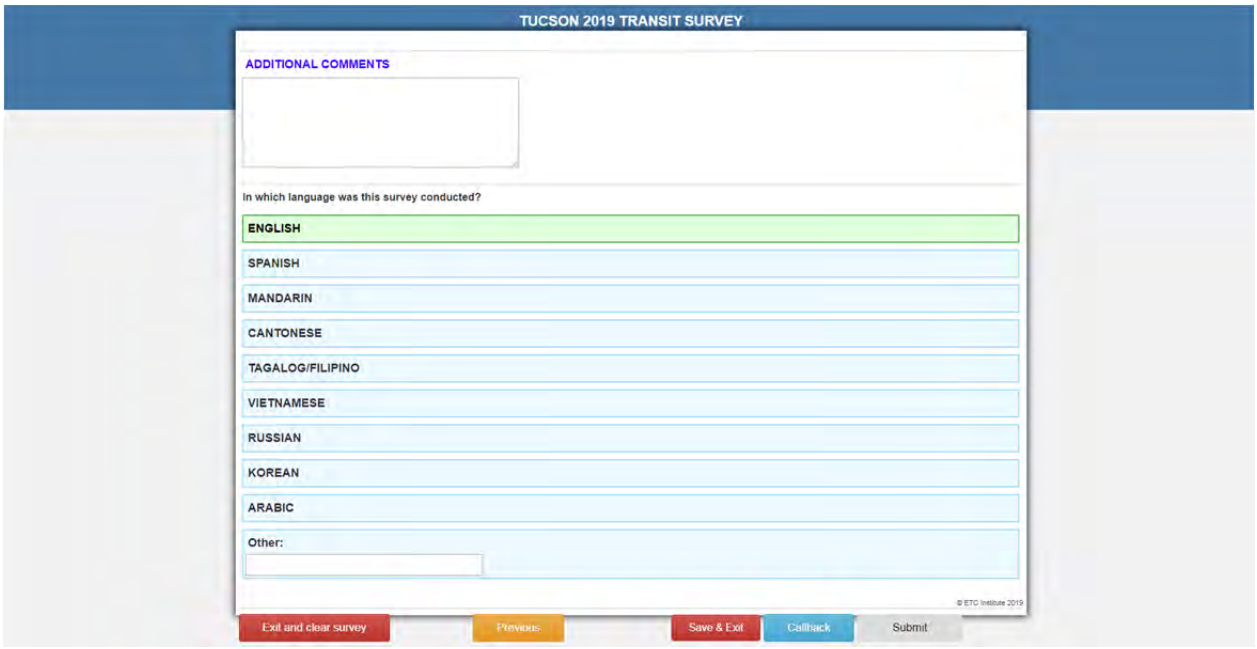

TUCSON 2019 TRANSIT SURVEY
What is your gender?
Choose one of the following answers
Male
Female
Do you speak a language other than English at home?
Yes
No
© ETC Institute 2019
Exit and clear survey
Previous
Save & Exit
Callback
Next


TUCSON 2019 TRANSIT SURVEY
Which of the following BEST describes your TOTAL ANNUAL HOUSEHOLD INCOME in 2018 before taxes?
Less than $10,000
$10,000 - $14,999
$15,000 - $24,999
$25,000 - $34,999
$35,000 - $49,999
$50,000 - $74,999
$75,000 - $99,999
$100,000 or more

© ETC Institute 2019
Exit and clear survey
Previous
Save & Exit
Callback
Next


TUCSON 2019 TRANSIT SURVEY
What did you use to plan this trip?
Choose one of the following answers
Paper Schedule
Called customer service
Google Transit
Online trip planner
SunTran App
Did not do any trip planning
Other:
How often do you ride transit?
Every day
5-6 days / week
2-4 days / week
Once a week
2-3 times / month
Once per month
Less than once per month
How long have you been riding public transit in the Tucson area?
Choose one of the following answers
First time riding
Less than 1 year
1-2 years
2-5 years
5-10 years
More than 10 years
What is the service enhancement that is of most importance to you (select only one)?
Choose one of the following answers
More frequent service
Earlier operating hours
Later operating hours
More weekend service
Shorter travel time
Different destinations
Other:
© ETC Institute 2019
Exit and clear survey
Previous
Save & Exit
Callback
Next


TUCSON 2019 TRANSIT SURVEY
People who submit an accurately completed survey will be entered in a random drawing for one of four monthly passes.
Would you like me to enter you into the drawing?
Yes
No
For quality control purposes, we'd like to be able to contact passengers to confirm/correct trip details. Will you please provide a name and phone number at which you can be reached in case there are issues with the data I've collected today?
Your name
test
Phone number
999-999-9999
Email
test@test.com
© ETC Institute 2019
Exit and clear survey
Previous
Save & Exit
Callback
Next


TUCSON 2019 TRANSIT SURVEY
ADDITIONAL COMMENTS
In which language was this survey conducted?
ENGLISH
SPANISH
MANDARIN
CANTONESE
TAGALOG/FILIPINO
VIETNAMESE
RUSSIAN
KOREAN
ARABIC
Other:
© ETC Institute 2019
Exit and clear survey
Previous
Save & Exit
Callback
Submit

The paper survey, used only on the Sun Shuttle Dial-a-Ride, is shown below and on the following page.

City of Tucson On-Board Transit Survey

(for office use only) Route Code: ____ Dir: **N S E W** Time: ____ am / pm Interviewer: ____ Serial #: ____

Please take a few moments to help plan for your transit needs by filling out this survey.

All personal information will be kept strictly confidential and WILL NOT be shared or sold.

What is your HOME ADDRESS? (please be specific, ex: 123 W. Main St):
(*If you are visiting the Tucson area, please list the **hotel name** or address where you are staying*)

Street Address _____ **City** _____ **State** _____ **ZIP Code** _____

COMING FROM?

1. What type of place are you COMING FROM NOW? *(the starting place for your one-way trip)*

- O Your usual Workplace
- O Other business related (e.g., meeting, delivery)
- O College / University (students only)
- O School K-12 (students only)
- O Medical appointment / doctor visit
- O Pick up / drop off someone (daycare, school)
- O Shopping
- O Personal business (bank, post office)
- O Dining out
- O Social visit (friends, relatives)
- O Recreation / Sightseeing
- O Major Sporting Event, Concert, or Conference
- O Escorting / accompanying someone
- O Airport (passengers only)
- O Your hotel/motel/lodging → *Go to Question #4*
- O Your **HOME** → *Go to Question #4*
- O Other: _____

2. What is the NAME of the place you are coming from now?

_____

3. What is the EXACT STREET ADDRESS of this place? (OR **Intersection if you do not know)**

_____

City: _____ **State:** _____ **ZIP:** _____

4. How did you get from the place in Question #1 to the very first bus or streetcar you used for this one-way trip?

- O Walk
- O Bike
- O Wheelchair
- O Was dropped off by someone (answer 4a)
- O Drove alone and parked (answer 4a)
- O Drove or rode with others and parked (answer 4a)
- O Taxi, Uber, etc. (answer 4a)
- O Other Specify_____

4a. Where did you park/get dropped off before the FIRST bus / streetcar you used for this one-way trip (Nearest intersection / Park & Ride lot / Landmark below):

_____

GOING TO?

5. What type of place are you GOING TO NOW? *(the ending place for your one-way trip)*

- O Your usual Workplace
- O Other business related (e.g., meeting, delivery)
- O College / University (students only)
- O School K-12 (students only)
- O Medical appointment / doctor visit
- O Pick up / drop off someone (daycare, school)
- O Shopping
- O Personal business (bank, post office)
- O Dining out
- O Social visit (friends, relatives)
- O Recreation / Sightseeing
- O Major Sporting Event, Concert, or Conference
- O Escorting / accompanying someone
- O Airport (passengers only)
- O Your hotel/motel/lodging → *Go to Question #8*
- O Your **HOME** → *Go to Question #8*
- O Other: _____

6. What is the NAME of the place you are going to now?

_____

7. What is the EXACT STREET ADDRESS of this place? (OR **Intersection if you do not know)**

_____

City: _____ **State:** _____ **ZIP:** _____

8. For this one-way trip, how will you get to your destination listed in Question #5 once you get off the last bus or streetcar?

- O Walk
- O Bike
- O Wheelchair
- O Be picked up by someone (answer 8a)
- O Get in a parked vehicle & drive alone (answer 8a)
- O Get in a parked vehicle & drive/ride w/others (answer 8a)
- O Taxi, Uber, etc. (answer 8a)
- O Other Specify_____

8a. Where will you get your car/get picked up after the LAST bus/ streetcar you are using for this one-way trip (nearest intersection / Park & Ride lot / landmark below):

_____

9 Did you transfer FROM another bus / streetcar BEFORE getting on this bus / streetcar? O Yes O No

10. Where did you GET ON THIS bus / streetcar? *Please provide the nearest intersection / station name / Park & Ride lot:*

_____

11. Where will you GET OFF THIS bus / streetcar? *Please provide the nearest intersection / station name / Park & Ride lot:*

_____

12. Will you transfer TO another bus / streetcar AFTER getting off this bus / streetcar? O Yes O No

13. Please list the BUS ROUTE NUNMBERS or STREETCAR in the exact order you use them for this one-way trip.

START → ____ → ____ → ____ → ____ → END

14. What time did you GET ON this bus / streetcar? _____ : _____ a.m. / p.m. (circle one)

15. Will you make a RETURN TRIP today to get you back to the place where you started this one-way trip? O No
O Yes, I will make a return trip in exactly the opposite direction today (or this is my return trip) at what time _____:_____ am/pm (circle one)
O Yes, I will make a return trip but will not use the bus/streetcar. How will you return?
O Guarantee Ride Home-PAG Rideshare O Pick up/carpool/drop off O Other

16. How did you pay for this one-way trip?
O Cash Fare (Single Trip) O Value on SunGo card O Value on SunGo ID & Card
O 1 Day Pass O 1-day non-profit agency ticket O 30-day full fare pass
O 30-day full fare ticket O 30-day economy fare pass O 30-day economy fare ticket
O 30-day express pass O GoTucson Mobile app / Smart Phone O University annual pass
O University annual express pass O University semester pass O University semester express pass

17. Which fare category applies to you? O Regular (Full) Fare O Economy Senior fare (SunGO ID & Card holder)
O Express Fare O Economy Disabled fare (SunGO ID & Card holder) O Economy Low Income fare (SunGO ID & Card holder)

18. If you used a monthly or annual pass to pay for this trip; did your employer or another organization pay all or a portion of the fare for your trip today? O Yes O No

18a. If yes to #18: Approximately what amount or percentage of the fare did your employer or another organization pay? Amount $ _____ or Percentage _____%

ABOUT YOU AND YOUR HOUSEHOLD

19. Are you visitor to the Tucson area? O Yes O No

20. How many vehicles (cars, trucks, or motorcycles) are available to your household? _____ vehicles

20a. [If #20 is ONE OR MORE] Could you have used one of these vehicles to complete this trip? O Yes O No

21. Including YOU, how many people live in your household? _____ people

22. Including YOU, how many people (over age 15) in your household are employed full/part-time? _____ people

23. What is your employment status? ***(check the one response that BEST describes you)***
O Employed full-time (at least 35 hrs/wk) O Employed part-time (less than 35 hrs/wk) O Retired
O Not currently employed, but seeking work O Not currently employed, and not seeking work O Homemaker

24. What is your student status? ***(check the one response that BEST describes you)***
O Not a student O Yes – Full-time college/university O Yes – Part-time college/university
O Yes – Vocational/technical/trade school O Yes – K-12th grade O Yes - Other
Please specify your school name <drop down list>_____

25. Do you have a valid driver's license? O Yes O No

26. Do you have a disability that limits your mobility? O Yes O No

27. What is your Age? O Under 15 O 16-17 O 18-24 O 25-34 O 35-44 O 45-54 O 55-64 O 65 and older

28. Are you Hispanic, Latino, or Spanish origin? O Yes O No
(includes: Mexican/Mexican American, Puerto Rican, Cuban/Cuban American, Columbian, Nicaraguan, Guatemala, etc.)

29. What is your Race? ***(check all that apply)***
O American Indian / Alaska Native O Asian O Black/African American
O Native Hawaiian / Pacific Islander O White / Caucasian O Other: _____

30. What is your gender? O Male O Female

31. Do you speak a language other than English at home? O No O Yes - **Which language? _____**

31a. [If #31 = Yes] How well do you speak English? O Very well O Well O Less than well O Not at all

32. Which of the following BEST describes your TOTAL ANNUAL HOUSEHOLD INCOME in 2014 before taxes?
O Less than $10,000 O $15,000 - $24,999 O $35,000 - $49,999 O $75,000 - $99,999
O $10,000 - $15,999 O $25,000 - $34,999 O $50,000 - $74,999 O $100,000 or more

33. What did you use to plan this trip? O Paper schedule O Called customer service O Google Transit
O Online trip planner O Sun Tran App O Did not do any trip planning O Other_____

34. How would you have made this trip if Sun Tran, Sun Link, or Sun Shuttle were not available?
O Drive own vehicle O Ride bicycle O Friend/family member O Walk
O Taxi/Uber O Would not make trip O Other_____

35. How often do you ride transit (Sun Tran, Sun Link, Sun Shuttle)? O Everyday O 5 days/week
O 2-4 days/week O Once/week O 2-3 times/month O Once per month O Less than once per month

36. What is the service enhancement that is of most importance to you (select only one)?
O More frequent service O Earlier operating hours O Later operating hours
O More weekend service O Shorter travel time O Different destinations
O Other

Appendix B Decomposition Analysis

Decomposition analysis measures the overall representativeness of the survey records relative to linked and unlinked trips on an individual route basis. Self-enumeration surveys have historically suffered from substantial errors in route level boarding levels when linked trips were determined by simply dividing the boarding factor by one plus the number of transfers. For example, in systems with both local bus and urban rail routes, the survey typically displayed significant differences in how many local bus riders indicated that they had transferred to/from urban rail compared to the same statistic measured from those who were interviewed on an urban rail route. Difficult decisions had to be made regarding what was the actual value of such transfers.

The advent of the personal interview, coupled with tablet technology, and more effective management of surveyors has eliminated this problem. The decomposition analysis examines each record and the recorded sequence of routes and tabulates boardings for each route using this information. After all records have been examined, total boardings by route are summarized and compared with the observed level of boardings. The result of this analysis will help to determine the level of correlation between observed and estimated boardings by route.

The decomposition analysis below and on the following page shows the summed link factors for the routes for which the survey was conducted along with the summed linked weight factors for those same routes that was captured in transfer information for both previous transfers and transfers that would occur after the rider alighted the route they were being surveyed on. The table below and on the following page shows that the overall results for the onboard survey do a very good job of representing the system. The services that deviate the farthest from the summed linked factors compared to the APC/Farebox data counts are the services that are expected to deviate the most as they contain low volume ridership routes (Sun Shuttle and Sun Tran Express Buses (XB). The higher volume Sun Link and Sun Tran Local Buses (LB) once summed are extremely close to the overall ridership as seen in the table below:

System

System	Ridership	Total Summed Linked	Total Difference	Percentage Difference
Sun Link	3,486.17	3,438.30	(47.87)	-1.4%
Sun Shuttle	512.81	597.75	84.94	16.6%
Sun Tran	47,977.19	47,946.70	(30.50)	-0.1%
Total	51,976.18	51,982.75	6.6	0.0%

This is an excellent outcome for this type of analysis. The table showing the decomposition analysis for each route is on the following page.

ALL ROUTES

Route [Code]	Route Description	Sum of Linked Trips: Route Surveyed	Previous Transfers	Next Transfers	Total Summed Linked	Ridership	Total Diff	Percent Diff
SUN_1_4	SunTran 4 - Speedway	3,166.58	409.42	396.92	3,972.92	4,090.14	117.22	2.9%
SUN_1_8	SunTran 8 - Broadway	2,807.18	497.67	614.42	3,919.28	4,013.59	94.31	2.3%
SUN_1_11	SunTran 11 - Alvernon Way	2,623.84	414.54	452.28	3,490.65	3,851.03	360.38	9.4%
SNL_1_700	SUNLINK	3,268.34	112.59	57.38	3,438.30	3,486.17	47.87	1.4%
SUN_1_18	SunTran 18 - S 6th Ave	1,884.19	452.01	534.21	2,870.41	3,295.11	424.70	12.9%
SUN_1_16	SunTran 16 - Oracle/Ina	1,871.67	551.67	568.54	2,991.87	2,723.64	(268.23)	-9.8%
SUN_1_3	SunTran 3 - 6th St/Wilmot	2,072.46	364.24	407.62	2,844.31	2,644.29	(200.02)	-7.6%
SUN_1_17	SunTran 17 - Country Club/29th St	2,097.19	343.49	300.27	2,740.95	2,632.75	(108.20)	-4.1%
SUN_1_7	SunTran 7 - 22nd St	1,727.65	344.93	313.55	2,386.14	2,411.98	25.84	1.1%
SUN_1_9	SunTran 9 - Grant Road	1,656.14	251.58	308.27	2,215.98	2,229.97	13.99	0.6%
SUN_1_34	SunTran 34 - Craycroft/Ft Lowell	1,556.04	302.51	286.91	2,145.45	2,179.46	34.01	1.6%
SUN_1_6	SunTran 6 - Euclid/N 1st Ave	1,272.06	240.65	269.63	1,782.34	1,790.98	8.64	0.5%
SUN_1_25	SunTran 25 - S Park Ave	1,035.39	259.60	234.35	1,529.34	1,595.32	65.98	4.1%
SUN_1_1	SunTran 1 - Glenn/Swan	1,125.42	199.81	156.42	1,481.65	1,427.78	(53.87)	-3.8%
SUN_1_12	SunTran 12 - 10th/12th Ave	738.94	313.31	244.79	1,297.04	1,318.77	21.73	1.6%
SUN_1_29	SunTran 29 - Valencia	871.98	201.02	215.93	1,288.93	1,278.44	(10.49)	-0.8%
SUN_1_23	SunTran 23 - Mission Road	873.95	186.53	198.44	1,258.92	1,227.79	(31.13)	-2.5%
SUN_1_10	SunTran 10 - Flowing Wells	704.17	197.71	196.73	1,098.61	1,041.45	(57.16)	-5.5%
SUN_1_19	SunTran 19 - Stone Ave	675.20	150.31	151.94	977.45	952.89	(24.56)	-2.6%
SUN_1_2	SunTran 2 - Pueblo Gardens	616.04	164.75	148.47	929.26	946.65	17.39	1.8%
SUN_1_27	SunTran 27 - Midvale Park	547.75	159.86	149.36	856.98	880.26	23.28	2.6%
SUN_1_5	SunTran 5 - Pima/West Speedway	678.56	88.09	112.06	878.71	826.85	(51.86)	-6.3%
SUN_1_15	SunTran 15 - Campbell Ave	615.03	191.08	148.61	954.71	826.63	(128.08)	-15.5%
SUN_1_26	SunTran 26 - Benson Highway	442.51	168.64	158.85	769.99	705.51	(64.48)	-9.1%
SUN_1_37	SunTran 37 - Pantano	429.63	90.11	120.22	639.96	584.77	(55.19)	-9.4%
SUN_1_22	SunTran 22 - Grande	303.34	59.02	91.74	454.09	449.04	(5.05)	-1.1%
SUN_1_24	SunTran 24 - S 12th Ave	251.84	99.92	137.63	489.40	439.03	(50.37)	-11.5%
SUN_1_61	SunTran 61 - La Cholla	249.60	80.33	73.94	403.87	407.87	4.00	1.0%
SUN_1_50	SunTran 50 - Ajo Way	198.40	43.19	36.31	277.90	315.81	37.91	12.0%
SUN_1_21	SunTran 21 - Congress/Silverbell	184.58	71.28	92.13	348.00	290.11	(57.89)	-20.0%
SNT_1_440	SunShuttle 440 - San Xavier	69.42	24.15	19.35	112.92	96.38	(16.54)	-17.2%
SNT_1_421	SunShuttle 421 - Green Valley/Sahuarita Connector	55.62	26.56	15.81	97.99	78.33	(19.65)	-25.1%
SUN_1_203X	SunTran 203X - Oro Valley-Aero Park Express	77.98	1.54	6.12	85.64	77.98	(7.66)	-9.8%
SUN_1_101X	SunTran 101X - Golf Links-Downtown Express	67.14	6.88	6.95	80.98	71.94	(9.04)	-12.6%
SNT_1_412	SunShuttle 412 - Thornydale/Dove Mountain	45.34	17.60	9.91	72.85	70.86	(1.99)	-2.8%
SUN_1_110X	SunTran 110X - Rita Ranch-Downtown Express	45.59	3.66	11.27	60.53	57.82	(2.71)	-4.7%
SUN_1_102X	SunTran 102X - Northwest-UA Express	55.86	5.42	3.85	65.13	55.86	(9.27)	-16.6%
SUN_1_107X	SunTran 107X - Oro Valley-Downtown Express	49.35	5.92	0.92	56.19	55.83	(0.36)	-0.6%
SNT_1_430	SunShuttle 430 - Tucson Estates	33.89	22.84	14.23	70.96	53.67	(17.29)	-32.2%
SUN_1_108X	SunTran 108X - Broadway-Downtown Express	49.41	-	-	49.41	53.21	3.80	7.1%
SNT_1_413	SunShuttle 413 - Marana/I-10	26.18	3.25	14.78	44.21	52.36	8.15	15.6%
SUN_1_204X	SunTran 204X - Northwest- Aero Park Express	50.12	-	-	50.12	50.12	-	0.0%
SNT_1_401	SunShuttle 401 - N Oracle/Catalina	23.71	9.89	12.63	46.23	48.31	2.08	4.3%
SUN_1_105X	SunTran 105X - Foothills-Downtown Express	42.04	15.97	5.67	63.67	45.04	(18.64)	-41.4%
SNT_1_450	SunShuttle 450 - Southeast Tucson/Rita Ranch	21.54	26.90	22.01	70.45	40.00	(30.45)	-76.1%
SUN_1_201X	SunTran 201X - Eastside-Aero Park Express	37.38	-	-	37.38	37.38	-	0.0%
SUN_1_109X	SunTran 109X - Catalina Hwy-Downtown Express	33.93	7.35	3.39	44.68	35.93	(8.75)	-24.3%
SUN_1_104X	SunTran 104X - Marana-Downtown Express	30.18	2.29	2.83	35.30	30.18	(5.12)	-17.0%
SUN_1_103X	SunTran 103X - Northwest-Downtown Express	22.59	-	-	22.59	28.00	5.42	19.3%
SNT_1_410	SunShuttle 410 - Anway/Trico	15.32	3.83	3.78	22.93	26.26	3.33	12.7%
SNT_1_GREEN	Green Valley/Sahuarita Dial-a-Ride	21.67	-	-	21.67	23.64	1.97	8.3%
SNT_1_486	SunShuttle 486 - Ajo	23.00	11.70	2.84	37.54	23.00	(14.54)	-63.2%
		37,442.90	7,205.61	7,334.24	51,982.75	51,976.18	(6.57)	-0.01%