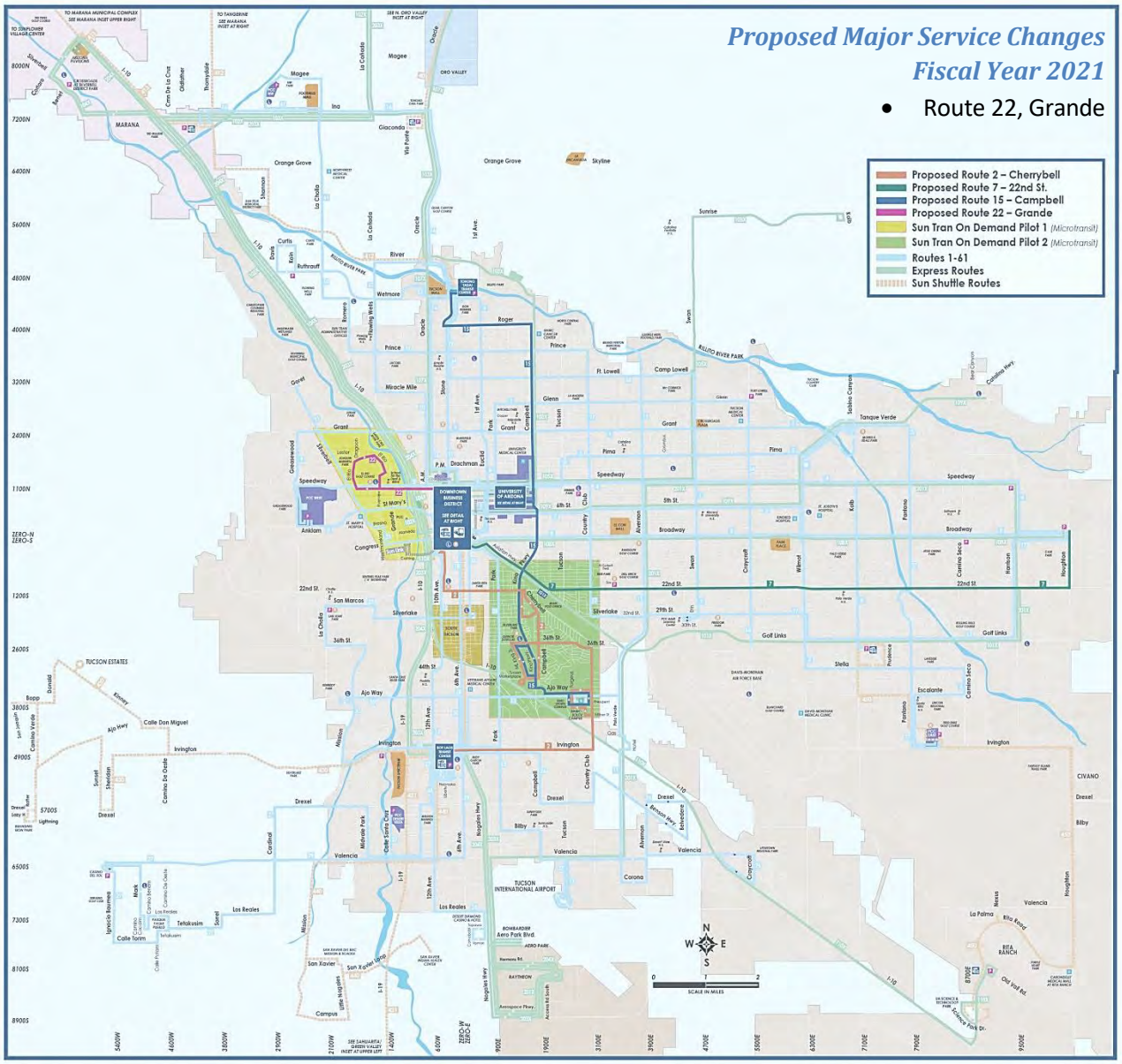
# Title VI –
# Major Service Change Equity Analysis

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Scheduling and Service Development Department

**On behalf of:** City of Tucson, Department of Transportation & Mobility,
Transit Services Division

**Updated:** August 24, 2020

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# Executive Summary and Purpose:

The City of Tucson's Policy and Procedure Fare Changes and Major Service Changes on Public Transportation (Appendix A) establishes a definition of "Major Service Change." The proposed service changes to Route 22, Grande, meet the definition of "Major Service Changes" and therefore require a Title VI service equity analysis. Staff conducted the equity analysis in August 2020.

The analysis uses information collected from individuals on the bus as part of the 2019 On-Board Transit Survey, completed by ETC Institute from January 2019 thru February 2019 (Appendix B), before the current COVID-19 pandemic. Comparisons via a system-wide analysis, across the Sun Tran service area, show neither a disparate impact nor a disproportionate burden in any of the proposed service changes. A majority of the individuals using the existing route have other fixed-route choices within ¼ to ½ mile. In addition, a proposed microtransit on-demand pilot project (Sun Van On-Demand) will be available to individuals whose trip is within the Ward 1 on-demand service zone.

The analysis concludes that the Major Service Changes for Route 22 do not have a disparate impact on minorities nor a disproportionate burden for low-income individuals.

## *Background:*

Sun Tran has received comments from the community over the years about removing or realigning bus routes to no longer travel on residential streets. In many cases, local streets have on-street parking on both sides of the street, children playing near or in the street, and traffic calming, all of which slow the bus and present safety hazards.

Sun Tran has been engaged in an effort to improve transit service by:

- Evaluating route performance
- Seeking system efficiencies
- Developing innovative opportunities to better meet community needs
- Supporting the Slow Streets initiative

Route 22 was evaluated during a recent review of several routes for improvement. Route 22 has been a traditionally low ridership route and operates on a number of local streets. The route also operates in the close proximity to several other routes leading to route redundancy. As a result, Sun Tran recommended changes to streamline the Route 22 and introduce Sun Van On-Demand, a form of microtransit.

The recommended changes eliminate service in low ridership areas and remove buses from local streets in the neighborhoods. In addition, the existence of local routes provides alternatives for existing riders.

The City of Tucson Department of Transportation & Mobility (DTM) was reviewing local streets to implement a "Slow Streets Project." "Slow Streets" is a citywide initiative from DTM to reimagine how we use our residential streets. Its purpose is to use our neighborhood residential streets to enhance physical activities of walking, cycling, and jogging. Slow Streets limits traffic to give neighbors a safe zone to use the street as a social, neighborly connection. Bus routes often are not consistent with the concept of Slow Streets, so when possible, it is recommended to de-emphasize the bus in those areas. Several streets

reviewed were neighborhood residential streets that Route 22, Grande, traveled on, which limited areas that the Slow Streets initiative could be implemented in Ward 1.

Sun Tran has been reviewing best practices of microtransit projects and evaluating opportunities to implement a pilot project in the Sun Tran system area. Traditionally microtransit has been implemented in more suburban areas to resolve first- and last-mile transit connections. Sun Tran staff believe that a microtransit project would also provide benefits in the urban core where residents have high levels of transit dependency associated with low-income, aging in place, and other high-stress demographic factors.

To implement the proposed service changes, per the Major Service Change Policy, the City of Tucson must hold public input meetings and a public hearing to approve the proposed changes. While the COVID-19 pandemic has limited the ability to hold in-person open house meetings, staff was able to hold four virtual public input meetings. In addition, staff conducted socially distanced bus stop intercept meetings with bus riders, spoke with a charter school and apartment complexes management, and left flyers and posters for display along the route. Staff also connected with business and community partners, assuring them that the proposed changes were available to all segments of the community. The public input, outreach, and intercept meetings were conducted from July 21, 2020, through August 12, 2020. Outreach meetings continued through August 14, 2020, with community stakeholders. The public hearing is scheduled on September 22, 2020, during the Regular Session of the Mayor and Council Meeting.

## Title VI and Environmental Justice Considerations:

The FTA Title VI Circular 4702.1B, Chapter IV requires that transit providers that operate 50 or more fixed route vehicles in peak service and located in an urbanized area (UZA) of 200,000 or more in population conduct a Title VI equity analysis whenever planning a major service change. The City of Tucson Resolution 23077 adopted September 4, 2019, for the Title VI Program, also includes the City's Policy and Procedure for Fare Changes and Major Service Changes on Public Transportation (Appendix A). This policy and procedure states the requirement for an equity analysis when planning major services changes and consideration of the adverse effects that may occur. These effects are defined as disparate impact (e.g., non-discrimination of race, color, or national origin) and disproportionate burden (e.g., low-income) policies.

A major service change is defined by the criteria below: major service change (thresholds) is defined as any change in service from the previous fiscal year that would add or eliminate more than:

1. When the route revenue miles on any individual route or combination of routes, increases or decreases by 25% or more when compared to the previous fiscal year.
2. When the route revenue hours on any individual route or combination of routes increases or decreases by 25% or more when compared to the previous fiscal year.

Per FTA Title VI Circular 4702.1B, if a proposed service change meets the definition of a Major Service Change both the possibility of adverse effects and disparate impacts are to be evaluated. The *Fare Change & Major Service Change Policy* defines thresholds for determining whether potential fare and major

service changes will have an adverse effect based on a disparate impact or disproportionate burden for and proposed service changes, which are to be evaluated:

- Disparate impact(s) is determined by an analysis of race, color, or national origin (minority) within the service area. The Disparate Impact Policy states that a proposed fare or major service changes should not have an adverse effect borne by twenty percent (20%) or more of a minority population than an adverse effect borne by the non-minority population.

- Disproportionate burden(s) is determined by an analysis of low-income populations within the service area. The Disproportionate Burden Policy states that a proposed fare or major service change should not have an adverse effect borne by twenty percent (20%) or more of a low-income population than an adverse effect borne by the non-low-income population.

If the equity analysis indicates that a disparate impact and/or disproportionate burden exist, alternatives to mitigate, provide opportunities to minimize, or avoid the effect should be identified and reanalyzed. The agency may implement the service change if there is substantial legitimate justification for the change and the agency can show there are no practical alternatives that would have less of an impact on the minority and/or low-income populations and would still accomplish the agency's legitimate program goals.

### *Public Engagement Process for setting the major service change, disparate impact, and disproportionate burden policies*

The following outreach activities were conducted prior to Mayor and Council's adoption of Resolution 23077 for the Title VI program, including the *Policy and Procedure for Fare Changes and Major Service Changes on Public Transportation*

- The policies and solicitation for comments was posted at www.suntran.com in English and Spanish, as well as on Facebook
- Eight (8) Open houses and two (2) pop-up meetings one each at the Downtown Ronstadt Transit Center and Laos Transit Center were conducted between May 1 to May 21, 2019
- Strip cards in English and Spanish were placed on all buses and distributed to customers advising of the open houses and providing comments.
- Sun Tran's customer service representatives were provided talking points regarding the policies and were prepared for telephone inquiries and/or comments.
- Sun Tran's customer service department monitored emails at suntraninfo@tucsonaz.gov for any emailed comments.
- The draft policies were distributed to members of the Transit Task Force
- Public hearing notices were published.
- Interior bus advertising was placed in all buses advising of the Public Hearing and opportunity for public comment.

A total of twenty-five (25) people attended the public meetings or were contacted at the transit centers. Spanish-speaking staff attended each meeting to provide verbal and written translation, if necessary.

Comments were tracked by meeting location, source (social media, comment cards, email, U.S. mail, website, or telephone), and preferred language.

- One comment was received pertaining to the Proposed Title VI Policies.
- One comment was received at the University of Arizona that requested clarification about the outreach process for major service changes. The request was recognized and a statement was added to the Public Notice Requirements that "A public hearing will be held prior to final action by the governing body" into the Major Service Change Policy.
- There were no additional comments received during the public meetings or transit center visits.
- Staff received two emails regarding the policies and provided materials in response with requests for comment.

### *Goals and objectives of the Sun Tran System that influenced this analysis were:*

- Provide safe reliable service to the community within the fiscal constraints determined by the City of Tucson via the City Manager's Office, Department of Transportation & Mobility - Transit Services Division with guidance from the City of Tucson Department of Finance
- Maintain current coverage of the Sun Tran Service Area
- Maintain and improve when possible minimum frequencies
  - Weekdays:
    - 30-minutes or better between the hours of 6:00 am through 6:00 pm on all routes
    - 15-minutes or better on selected routes identified in the emerging FTN
  - Weekends (Saturday and Sunday):
    - 60-minutes or better between the hours of 6:00 am through 6:00 pm on all routes
    - 30-minutes or better on selected routes identified in the emerging FTN

### *Minority and Low-Income Fare Demographic Information*

FTA circular 4702.1B defines minority persons to include American Indian and Alaska Native, Asian, Black or African American, Native Hawaiian or other Pacific Islander, and Hispanic or Latino, which includes persons of Cuban, Mexican, Puerto Rican, South, or Central American, or other Spanish culture regardless of race.

Individuals who responded to the 2019 On-Board Transit Survey, completed by ETC Institute from January 2019 thru February 2019 on behalf of the City of Tucson and PAG (Appendix B), answered questions that identified their racial and ethnic categories. Based on the survey responses from Sun Tran system riders average percentages were determined for each race and/or ethnicity: 36 percent (36.12%) Hispanic, 12 percent (11.60%) Black or African American, 10 percent (9.76%) American Indian, two (2) percent (2.39%) were Asian, with 45 percent (45.48%) identified as White/Caucasian with no other ethnicity or race included.

Additionally, survey respondents answered questions relating to household income. All survey respondents that identified their household incomes as $25,000 or less determined the low-income passengers (population). Low-income households earning $25,000 or less, is 54 percent (54.1%) of the median household income (in 2014 dollars), 2010-2014 ACS 5-year estimates data, of $45,233 per the U.S. Census Quick Facts for Pima County, Arizona (8/16/2016). Sun Tran Special Services Office qualifies economy fare low-income users based on information from the Arizona Department of Economic Security, Social Security, or the U.S. Department of Labor Lower Living Standard Income Level (LLLSIL) table. A family

of two, yearly lower income standard level, is allowed a maximum household income of $24,219. Economy fare low-income qualified users may have a household income greater than this threshold based on household size.

The percentage of respondents that identified themselves as minority was 55 percent (54.52%) and the number of respondents who identified their households as meeting the low-income thresholds were 68 percent (67.96%) for the overall Sun Tran system. Separating the Express Route system from the local/core routes, 31 percent (30.69%) of respondents identified themselves as minority and seven percent (7.30%) of respondents identified their households as meeting the low-income threshold.

Service equity analysis requires the route level be compared to the system as a whole, individual route changes may affect how other areas of the system operate. The maps following illustrate the Sun Tran Service area, with minority and low-income populations highlighted. Route 22, as discussed in this equity analysis, before or after any changes proposed, has an opportunity for a minority or low-income person to be affected by the possible changes. Though the service changes to the route affect minority persons in a notable manner, the analysis below does not indicate a disparate impact. Nor does the analysis indicate a disproportionate burden for persons of low-income.

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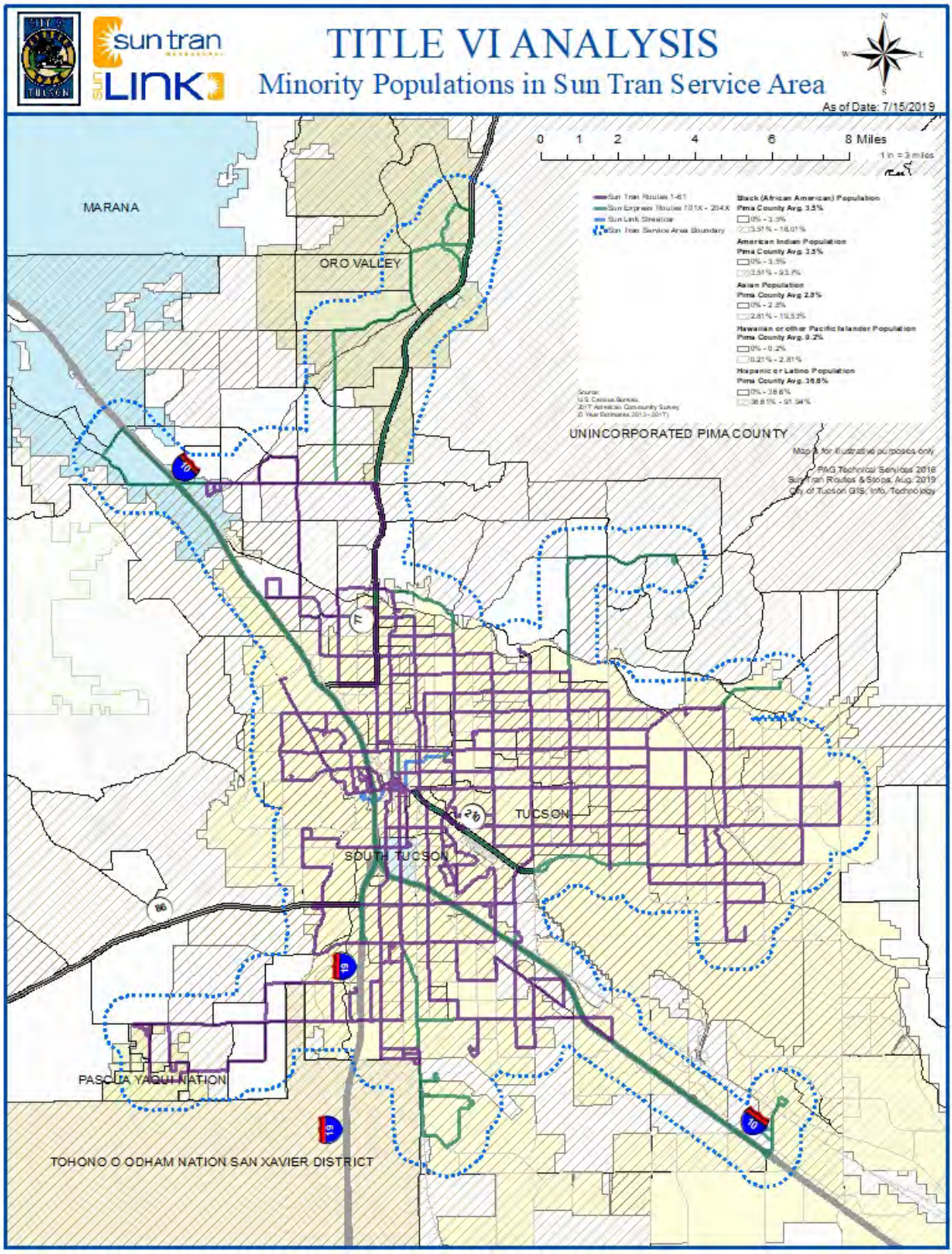
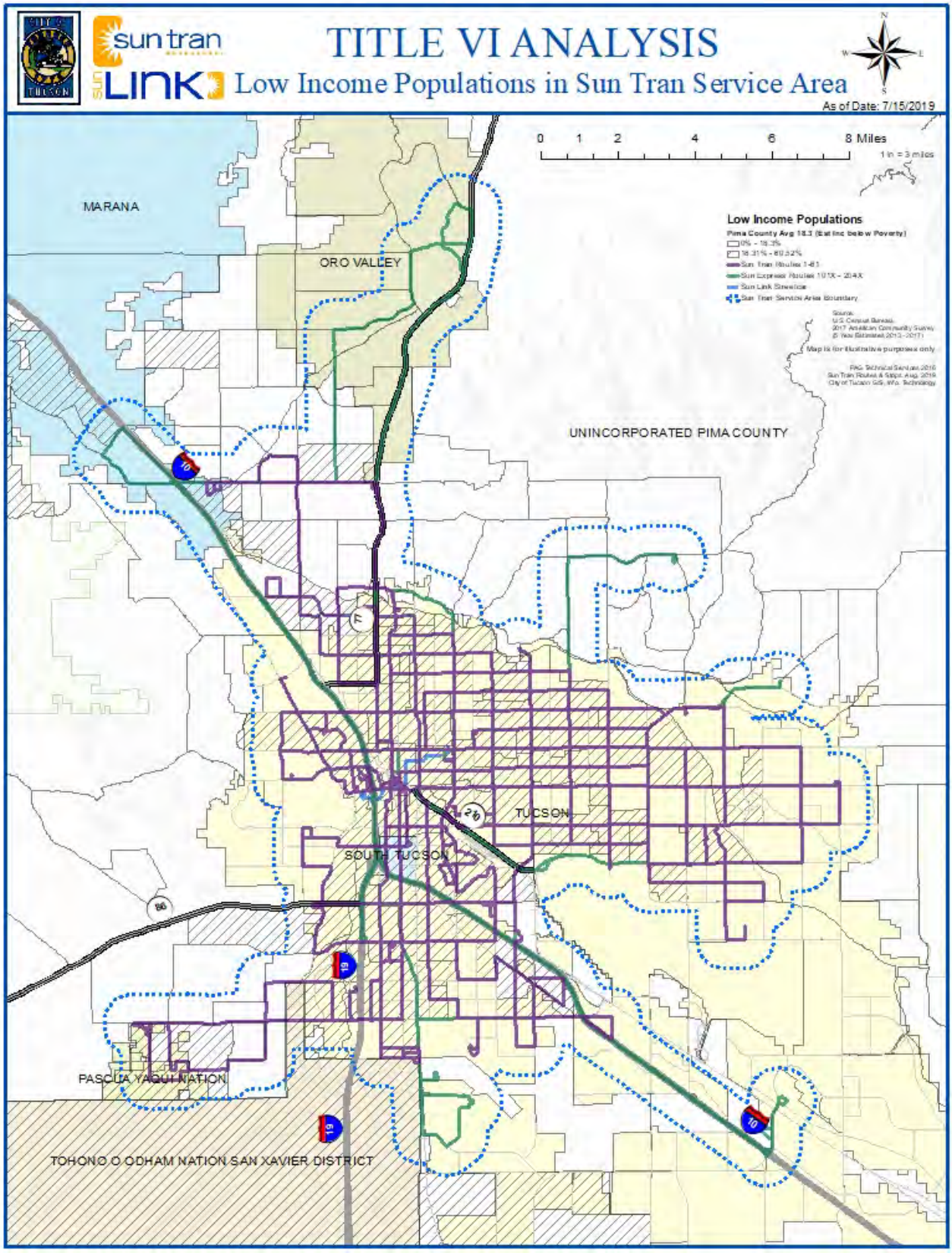

TITLE VI ANALYSIS
Minority Populations in Sun Tran Service Area
As of Date: 7/15/2019
sun tran
sun LINK
0 1 2 4 6 8 Miles
1 in = 3 miles
MARANA
ORO VALLEY
UNINCORPORATED PIMA COUNTY
TUCSON
SOUTH TUCSON
PASCUA YAQUI NATION
TOHONO O ODHAM NATION SAN XAVIER DISTRICT
Black (African American) Population
Pima County Avg. 3.5%
American Indian Population
Pima County Avg. 3.5%
Asian Population
Pima County Avg. 2.8%
Hawaiian or other Pacific Islander Population
Pima County Avg. 0.2%
Hispanic or Latino Population
Pima County Avg. 36.8%
Map is for illustrative purposes only
PAG Technical Services 2018
Sun Tran Routes & Stops, Aug. 2019
City of Tucson GIS, Info. Technology


TITLE VI ANALYSIS
sun tran
sun LINK
Low Income Populations in Sun Tran Service Area
As of Date: 7/15/2019
0 1 2 4 6 8 Miles
1 in = 3 miles
MARANA
ORO VALLEY
UNINCORPORATED PIMA COUNTY
TUCSON
SOUTH TUCSON
PASCUA YAQUI NATION
TOHONO O ODHAM NATION SAN XAVIER DISTRICT
Low Income Populations
Pima County Avg 18.3 (Est Inc below Poverty)
0% - 18.3%
18.31% - 60.32%
Sun Tran Routes 1-61
Sun Express Routes 101X - 204X
Sun Link Streetcar
Sun Tran Service Area Boundary
Source:
U.S. Census Bureau,
2017 American Community Survey
(5 Year Estimates 2013 - 2017)
Map is for illustrative purposes only
PAG Technical Services 2018
Sun Tran Routes & Maps, Aug. 2019
City of Tucson GIS, IMD, Technology

## Current Route Service & Proposed Changes:

Route 22 operates primarily on neighborhood streets. There is an interest at the City to minimize non-local traffic (such as buses) on neighborhood streets as part of the "slow streets" initiative. The route intersects other routes providing alternative route choices to riders.

### Route 22, Grande

**Current Service:** Route 22 operates on the west side of the city serving neighborhoods located between Congress and Grant. Service operates every 30 minutes on weekdays and 60 minute service on weekends. Route 22 operates primarily on neighborhood streets. The current weekday frequency, as scheduled effective February 16, 2020, is 30 minutes from 5:25 a.m. to 11:29 p.m. Saturday and Sunday frequency is hourly, starting Saturday from 6:30 am to 9:30 pm and Sunday from 7:01 am to 8:48 pm.

**Proposed Change:** Realign the Route 22, Grande, to operate on Speedway to El Rio Drive and Riverview back to Speedway, and returning to downtown via Stone Avenue, reducing travel on residential streets. The route intersects other routes providing alternative route choices to riders, and eliminates current route duplication. The route is recommended to continue operating every 30 minutes on weekday with hourly service on weekends.

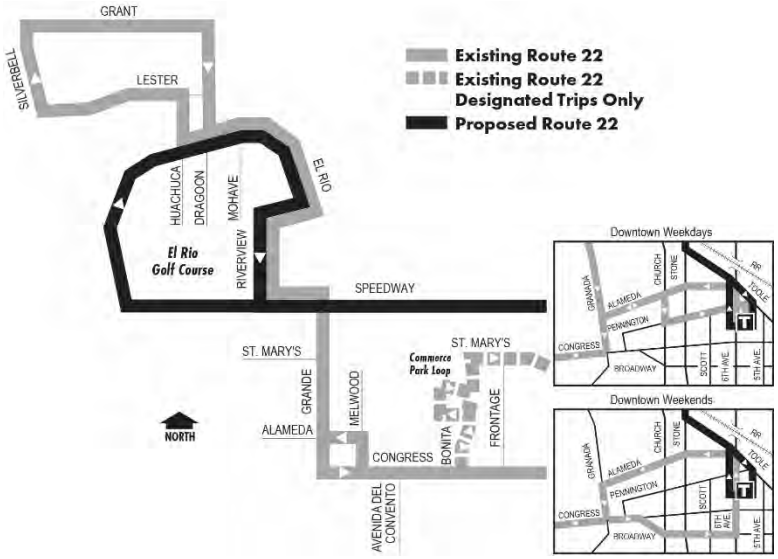



**Figure1: Proposed and Existing Route 22. Route 22 (current) has weekday only trips on Bonita Ave and Commerce Loop**

The route change will accomplish the following goals:

- Reduce the neighborhood streets with buses by more than 50%.
- Alternative routes may have an increase in ridership (Routes 3, 5, 9, 21, and Sun Link)
- El Rio Neighborhood Center, Subsidized Housing and an elementary school in the El Rio Neighborhood will continue to have direct service to Ronstadt Transit Center, Downtown.
- The Grande/St. Mary's intersection is also serviced by Route 3, 6th St. /Wilmot, maintaining transit service for nearby apartment complexes.
- Reduce running time and operating costs.
- Operating savings to be reallocated to for On-Demand Pilot Project (microtransit), serving the areas east and west between Silverbell and Interstate 10 (I-10) and the areas north and south between Grant Road and Mission Lane.

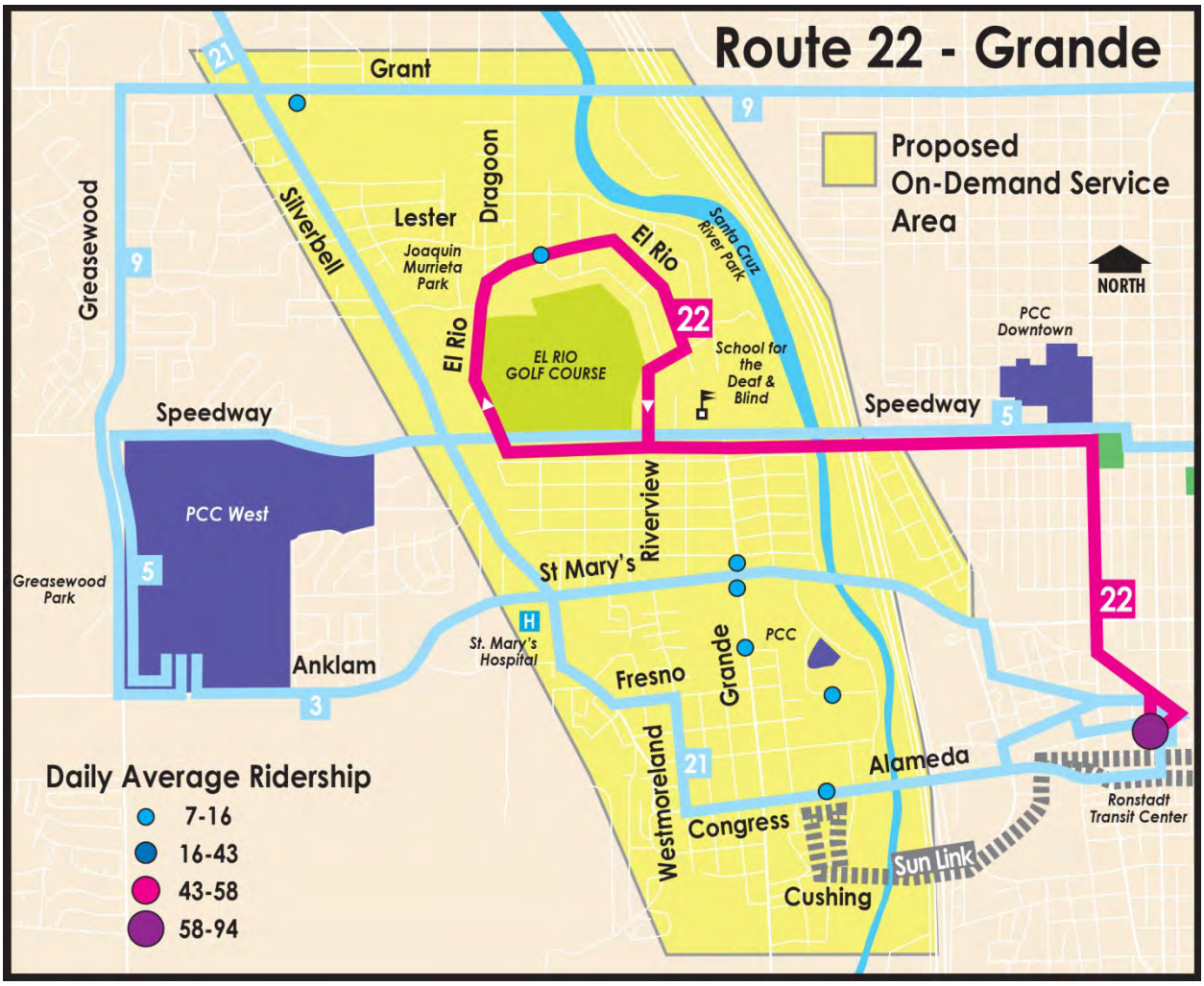



**Figure 2: Proposed Route 22 and the Proposed On-Demand Service. Bus Stop ridership information is for the existing Route 22. All stops except one are covered within 1/4 mile of another route. The additional stop is within 1/2 mile of three routes.**

## *Route 22, Grande - Analysis of Proposed Change in Routing*

This route has been recommended for a route change after discussions with DTM at the request of the Ward 1 council office. Many factors were considered including access to other routes on the Sun Tran bus system, the larger 40' buses, and the ridership on the route both the pre-COVID19 and post-COVID19 public health pandemic. The transit hours will be from 6:00 am to 11:00 pm with a 30 minute frequency weekdays from 6:00 am to 7:00 pm and hourly frequency until 11:00 pm. Saturday and Sunday frequency is hourly; Saturday is from 6:08 am to 9:23 pm and Sunday from 7:01 am to 8:31 pm.

**Change in Revenue Miles and Hours:** The proposed change in Route 22 routing meets the threshold of a major service change based upon revenue service hours and miles. It is expected that current ridership would redistribute across the proposed service hours and five other routes that are adjacent or intersect the Route 22. The other routes nearby include Route 3 (6th St. /Wilmot), Route 5 (Pima/W. Speedway), Route 9 (Grant), Route 21 (W. Congress/Silverbell), and the Sun Link streetcar. In addition, the proposed On-Demand Pilot project may provide service needed for shorter trips and the current ridership would have additional transit options and may not be redistributed to other near routes. The overall decrease in ridership is expected due to the route changes; however the anticipated passenger per hour

measurement is projected to be similar at 9 passengers per hour pending use of the On-Demand Pilot. The following tables depict the total miles, hours, and percentage of change represented by Route 22 proposal in revenue service hours and revenue service miles from February 2020.

| | Revenue Miles | | | | | Revenue Hours | | | |
|---|---|---|---|---|---|---|---|---|---|
| Route | Current Miles | Proposed Miles | Change | Percent difference | | Current Hours | Proposed Hours | Change | Percent difference |
| 22 | 151.14 | 105.16 | 45.98 | -30.4% | | 15.37 | 8.7 | 6.67 | -43.4% |

**Table 1: Revenue Miles and Revenue Hours percent difference is greater than 25% indicating a Major Service Change**

The analytical methodology used in determining the percentages of change and impact to the revenue hours, revenue miles, (shown in the table above) is consistently applied to determine a percent change for the analyses. Each step Sun Tran verified the values calculated. The percent of the change used the "current" and "proposed" as an "initial" and "final" value. Percentage change equals the change in value divided by the absolute value of the original value, multiplied by 100. A positive change is expressed as an increase amount of the percentage value while a negative change is expressed as a decrease amount of the absolute value of the percentage value.
Percentage change = (ΔV / |V1|) * 100 = ((V2 - V1) / |V1|) * 100 whereas V = value (http://www.calculatorsoup.com/calculators/algebra/percent-change-calculator.php).

**Impact to Minority and Low-Income**: The demographics of the route were evaluated to determine if a disparate impact upon minorities or a disproportionate burden upon persons with low incomes results from the proposed change. Minority and low-income populations specifically for Route 22 compared to the system ridership are shown in the table below. Sun Tran analyzed the impacts of the service change on minority populations and low-income populations in comparison to the overall service area. The changes in frequency appears to affect minority populations and low-income populations greater than non-minority or non-low-income populations as a whole; however, the thresholds for 20 percent (20%) in comparison to the route and system do not reflect a disparate impact for minority population or a disproportionate burden for low-income populations.

| Major Service Changes - Comparison to Fixed Route System (based on the 2019 On-Board Survey) | | | | |
|---|---|---|---|---|
| ROUTE | Percent (%) MINORITY | % NON-MINORITY | SUN TRAN % MINORITY | DIFFERENCE (Route Minority – Sun Tran System Minority) |
| 22 | 73.50% | 26.50% | 54.52% | 18.98% |

**Table 2: Difference between Route 22 Minority vs. the Sun Tran System is less than 20% - No Disparate Impact**

| Major Service Changes - Comparison to Fixed Route System (based on the 2019 On-Board Survey) | | | | |
|---|---|---|---|---|
| ROUTE | % LOW INCOME | % NON-LOW INCOME | SUN TRAN % LOW INCOME | DIFFERENCE (Route Low-Income – Sun Tran System Low-Income) |
| 22 | 63.21% | 36.79% | 67.96% | -4.75% |

**Table3: Difference between Route 22 Low Income vs. the Sun Tran System is less than 20% - No Disproportionate Burden**

### *Route 22, Grande - Findings:*

The impact of the service changes were evaluated on the system-wide basis. The service equity analysis shows that the proposed change does not meet the 20 percent (20%) threshold for either a disparate impact or disproportionate burden. It is therefore determined that there is no resulting disparate impact upon minorities, or disproportionate burden to persons with low income.

### *Route 22, Grande and On-Demand (microtransit) Pilot Project - Mitigations:*

The impact of the service changes were evaluated on the system-wide basis. The service equity analysis indicates that there is no disparate impact upon minorities or disproportionate burden to persons with low income; however, it is recognized that the major service change to the Route 22 is significant and may cause some individuals to be inconvenienced. Sun Tran proposed to implement an On-Demand (microtransit) Pilot program in Ward 1 to assist with short trips and alleviate any inconvenience resulting from the route change. As illustrated in Figure 2 above, the proposed On-Demand service area covers all areas where the Route 22 is currently and proposed to serve. The on-demand service would use smaller Sun Van vehicles to provide feeder and circulator service in the prescribed area. Persons living and/or working within the area can call a central number and reserve a trip either to the nearest bus route or to any other destination within the service area. Trips may be scheduled up to seven (7) days in advance or requested the same day based on availability. Group trips may be organized by social service, neighborhoods, or other entity to organize neighborhood shopping, medical appointments, and/or other purposes. The proposed pilot will augment the fixed route bus service, providing enhanced service for short trips.

## Conclusions:

**No disparate impact for minority passengers or disproportionate burden for low-income passengers was found for major service changes on Route 22, Grande**.

Sun Tran reviewed Route 22 to determine the Major Service Change impact to ridership, comparing the route and across the Sun Tran system. In addition, the proposed On-Demand service and access to other nearby routes offer significant mitigation to an adverse impact to individuals caused by the proposed changes. The route changes planned for November 2020 include the major service changes for Route 22 (Grande) as described above and the implementation of an On-Demand Pilot project within Ward 1, providing microtransit services where the route is affected. There is no disparate impact or disproportionate burden created by this change.

## Appendix A: City of Tucson, Resolution Number 23077, for the Title VI Program September 4, 2019, which includes approval of the City of Tucson Policy and Procedure Fare Changes and Major Service Changes on Public Transportation

# Fare Change & Major Service Change Policy, Disparate Impact, and Disproportionate Burden Policy

## City of Tucson Policy and Procedure Fare Changes and Major Service Changes on Public Transportation

### I. Purpose of the Policy:

The Federal Transit Administration (FTA) Circular 4702.1 B, *"Title VI Requirements and Guidelines for Federal Transit Administration Recipients"* effective October 1, 2012) requires that all FTA recipients who operate 50 or more fixed route vehicles in peak service and serve a population of 200,000 or greater, evaluate any fare change or any major service change, during the planning and programming stages.

When planning fare changes or major services changes, the City of Tucson shall consider if any adverse effect would occur as a result of the fare change or major service change. The City of Tucson shall consider the degree of adverse effects (if any), analyze those effects, and discuss any necessary minimization and/or mitigation that need to be considered as a result of the proposed fare change or major service change.

The Fare Change and Major Service Change Policy defines thresholds for determining whether potential fare and major service changes will have an adverse effect based on possible:

**Disparate impact(s)** (as determined by an analysis of race, color, or national origin within the service area); or

**Disproportionate burden(s)** (as determined by an analysis of low-income populations within the service area).

### II. Policy Statement:

It is the policy of the City of Tucson to solicit and consider public comment from private transportation providers, private citizens, and appropriate boards, committees, and commissions before implementing fare changes and/or major service changes pursuant to the City of Tucson's public transportation system. To this end, the Mayor and Council have adopted the following citizen participation related public hearing policies and procedures.

### Ill. Requirements:

**a) Fare Changes:**

A public hearing must be held if there is any fare change to any of the public transportation modes (Sun Tran, Sun Van, or Sun Link). For changes to existing transit fares, the FTA requires all City of Tucson transit providers (Sun Tran, Sun Van, and Sun Link) to conduct a Fare Equity Analysis for all proposed fare changes.

**b) Major Service Changes:**

A public hearing must be held if there is any major service change to any of the public transportation modes (Sun Tran, Sun Van, or Sun Link).

For all major service changes, the FTA requires all City of Tucson transit providers (e.g., Sun Tran, Sun Van, and Sun Link) to develop guidelines and thresholds for what it considers a "major" service change. For major service changes, the FTA requires the City of Tucson to conduct a Service Equity Analysis, which includes an analysis of adverse effects relating to possible disparate impacts and disproportionate burden. It is the City of Tucson's policy to conduct a Service Equity Analysis for any proposed major service changes.

The following is considered a major service change (unless otherwise noted under "Exemptions") and will be evaluated in accordance with the regulatory requirements set forth in FTA Circular 4702.1B:

An equity analysis is required for any major service change. A major service change is defined by the criteria below: major service change (thresholds) is defined as any change in service from the previous fiscal year that would add or eliminate more than:

1. When the route revenue miles on any individual route or combination of routes, increases or decreases by 25% or more when compared to the previous fiscal year.

2. When the route revenue hours on any individual route or combination of routes increases or decreases by 25% or more when compared to the previous fiscal year.

**Exemptions:**

The major service change thresholds exclude any changes to service that are caused by the following:

- Initiation/Discontinuance of Temporary or Demonstration Services - The initiation or discontinuance of a temporary transit service or demonstration service that will be or has been in effect for less than one year.
- Initiation/Discontinuance of any Promotional Fares that will be or have been in effect for a maximum of six months.
- Natural or Catastrophic Disasters - Forces of nature such as earthquakes, wildfires, or other natural disasters or human-caused catastrophic disasters that may force the suspension of transit service for public safety or technical events.
- Temporary Route Detours – A short-term change to a route caused by road construction, routine road maintenance, road closures, emergency road conditions, fiscal crisis, civil demonstrations, or any uncontrollable circumstance.
- When a segment of one route is moved to another route but the route miles or hours do not change by 25%.

**c) <u>Public Notice Requirements:</u>**

Prior to the implementation of any fare change or major service change that falls within the levels established above, notices of public hearing will be published at least fourteen (14) days prior to the hearing and will comply with the City of Tucson guidelines for notice of Mayor and Council meetings. The notices will contain the description of the contemplated fare change or major service change, as appropriate, and the time and place of the hearing. Any interested citizen may address the governing body related to the proposed fare change or major service change.

**d) Applicability to Third-Party Contract Recipients:**

Any agency, firm, or governmental jurisdiction, which operates public transit service within the Tucson urbanized area utilizing FTA funds provided through the City of Tucson, shall follow the above process to solicit and consider public comment prior to any fare change or major service change.

## IV. Definitions:

**Adverse Effects** - The City of Tucson shall define and analyze adverse effects related to major changes in transit service. Adverse effects are measured by the change between the existing and proposed service levels that would be deemed significant. Changes in service that have an adverse effect and that may result in a disparate impact include reductions in service (elimination of route, short lining a route, rerouting an existing route, increase in headways). Elimination of a route will generally have a greater adverse impact than a change in headways. Additions to service may also result in disparate impacts, especially if they come at the expense of reductions in service on other routes.

**Disparate Impact** – Refers to a facially neutral policy or practice that disproportionately affects members of a group identified by race, color, or national origin, where City of Tucson's policy or practice lacks a substantial legitimate justification and where there exists one or more alternatives that would serve the same legitimate objectives but with less disproportionate effect on the basis of race, color, or national origin.

**Disproportionate Burden** – Refers to a neutral policy or practice that disproportionately affects low-income populations' more than non-low-income populations. A finding of disproportionate burden requires the City of Tucson to evaluate alternatives and mitigate burdens where practicable.

**Low-Income Person** - Means a person whose median household income is at or below the U.S. Department of Health and Human Services (HHS) poverty guidelines.

**Major Service Change** – Is any service change from the previous fiscal year that would increase or decrease more than twenty-five percent (25%) of the revenue route miles or revenue route hours on any individual route or combination of routes.

**Minority Population** – Means any readily identifiable group of minority persons who live in geographic proximity and, if circumstances warrant, geographically dispersed/transient populations (such as migrant workers or Native Americans) who will be similarly affected by a proposed DOT program, policy, or activity.

**Predominantly Minority Area** - Means a geographic area, such as a neighborhood, Census tract, block or block group, or traffic analysis zone, where the proportion of minority persons residing in that area exceeds the average proportion of minority persons in the recipient's service area.

## V. Policies:

**a) Fare Change Policy**

For changes to existing transit fares, the FTA requires all City of Tucson (Sun Tran, Sun Van, and Sun Link) transit providers to conduct a fare equity analysis for all potential transit fare adjustments. It is the City of Tucson's policy to conduct a Fare Equity Analysis for all proposed fare changes.

**b) Major Service Change Policy**

For all major service changes, the FTA requires all City of Tucson transit providers (Sun Tran, Sun Van, and Sun Link) to develop guidelines and thresholds for what it considers a "major" service change to be. For major service changes, the FTA requires the City of Tucson to conduct a Service Equity Analysis, which includes an analysis of adverse effects relating to possible disparate impacts and disproportionate burden. It is the City of Tucson's policy to conduct a Service Equity Analysis for any proposed major service changes.

**b) Disparate Impact Policy**

The purpose of the Disparate Impact Policy is to establish a threshold, which identifies when adverse effects of any fare change or major service change that is borne disproportionately by minority populations.

For the purpose of this policy, minority population means any readily identifiable group of minority persons who live in geographic proximity and in residential land use areas within Census tracts where the percentage of minority persons is higher than the Sun Tran service area average.

A disparate impact occurs if a proposed fare or major service change requires a minority population to bear adverse effects by twenty percent (20%) or more than the adverse effects borne by the non-minority population.

If the City of Tucson finds a potential disparate impact, the transit agency will take steps to avoid, minimize or mitigate impacts then re-analyze the modified service plan to determine whether the impacts were avoided, minimized or mitigated. If the City of Tucson, chooses not to alter the proposed changes, the transit agency may implement the fare or service change if there is substantial legitimate justification for the change and the transit agency can show that there are no alternatives that would have less of an impact on the minority population and would still accomplish the agency's legitimate program goals.

**d) Disproportionate Burden Policy**

The purpose of this policy is to establish a threshold, which identifies when adverse effects of any fare or major service change are borne disproportionately by low-income populations.

A disproportionate burden occurs if a proposed fare or major service change requires a low income population to bear adverse effects by twenty percent (20%) or more than the adverse effects borne by the non- low income population.

If the City of Tucson finds a potential disproportionate burden, the transit agency will take steps to avoid, minimize or mitigate impacts then reanalyze the modified service plan to determine whether the impacts were avoided, minimized or mitigated. If the City of Tucson chooses not to alter the proposed changes, the agency may implement the service or fare change if there is substantial legitimate justification for the change and the agency can show that there are no practical alternatives that would have less of an impact on the low-income population and would still accomplish the agency's legitimate program goals.

# MAYOR & COUNCIL COMMUNICATION

September 4, 2019

**Subject: City of Tucson Transit Services Title VI Program (City Wide and Outside City)** **Page: 1 of 2**

Issue – Per Federal Transit Administration (FTA) requirements, the Title VI Program has been prepared for submission to FTA.

City Manager's Office Recommendation – It is recommended that Mayor and Council approve the attached resolution approving the City of Tucson Transit Services Title VI Program for submission to FTA.

Background – Title VI was enacted as part of the landmark Civil Rights Act of 1964. It prohibits discrimination on the basis of race, color, and national origin in programs and activities receiving federal financial assistance. As a primary recipient of FTA funds, the City of Tucson is required to comply with Title VI regulations issued by the U.S. Department of Transportation. Every three years, FTA requires the City of Tucson to submit a new Title VI program as a condition of receiving ongoing federal funds.

Present Consideration(s) – FTA *Circular 4702.1B – Title VI Requirements and Guidelines for Federal Transit Administration Recipients* requires that transit providers brief and obtain approval from the transit providers' governing board regarding their Title VI Program and Policies, including the following:

1. Major Service Change Policy – a threshold for when the City of Tucson will conduct a comprehensive analysis of potential adverse effects and disparate impacts of service changes on minority and low-income populations.

2. Disparate Impact Policy and Disproportionate Burden Policy – the measures and thresholds for finding whether a fare change or major service change will result in a disparate impact (disproportionately affects members of a group identified by race, color, or national origin) or a disproportionate burden (disproportionately affects low-income populations).

3. System-wide Service Standards and System-wide Service Policies – used to determine whether service is provided and amenities are distributed equitably to minority and non-minority populations. The Title VI Program needs to include the results from monitoring these service standards and policies as well as documentation to verify the Board's consideration, awareness and approval of the monitoring results.

4. Public Engagement Process

    a. As part of the public engagement process for fare and bus services changes in Fiscal Year 2019, the "City of Tucson Policy and Procedure for Solicitation and Consideration of Public Comment on Fare Changes and Major Service Changes on Public Transportation" was included as a subject for the public to review and comment on at public meetings from May 1 through May 21, 2016.

b. Staff captured verbal comments, and attendees were provided with comment forms to record feedback. Sun Tran also encouraged customers to call customer service with comments or submit by e-mail, mail, or through social media. A total of two comments were received on this subject. Those comments are included in the Title VI Public Input Report (Attachment A).

c. To promote the open house events and public hearing, staff posted information in each transit vehicle, which includes Sun Tran, Sun Shuttle, Sun Van, and Sun Link. All information was posted at transit centers, on the regional transit websites, online, on social media, and was distributed to local media outlets for additional outreach to the community at large.

Plan Tucson Consideration(s) – This item relates to the Element of Land Use, Transportation, & Urban Design and is supported by the following policy:

- LT22 – Participate in efforts to develop a coordinated regional, multi-modal transportation system that improves the efficiency, safety, and reliability of transporting people and goods within the region and to destinations outside of the region.

This item also relates to Chapter Four, Plan Implementation & Administration, and the City's ability to implement Plan Tucson by having the right foundational elements in place, such as resources, partnerships, procedures, agreements, and other administrative elements.

Financial Considerations – None at this time.

Legal Considerations – Per FTA Circular 4702.1B, the FTA requires that, "…the Title VI program must be approved by the recipient's board of directors or appropriate governing entity or official(s) responsible for policy decisions prior to submission to FTA." The City's Title VI Program is due to FTA by October 1, 2019.

Respectfully submitted,

Albert Elias
Assistant City Manager

AE/DA/SC/cb
Transportation

Attachments: A – Public Input Report for City of Tucson Title VI Program (2019)
Resolution

SEP04-19-279

ADOPTED BY THE
MAYOR AND COUNCIL

September 4, 2019

RESOLUTION NO. 23077

RELATING TO TRANSPORTATION AND PUBLIC TRANSIT: APPROVING THE CITY OF TUCSON TRANSIT SERVICES TITLE VI PROGRAM FOR SUBMISSION TO THE FEDERAL TRANSIT AUTHORITY (FTA); AND DECLARING AN EMERGENCY.

WHEREAS, in accordance with FTA requirements, the City of Tucson Transit Services Title VI Program has been prepared for submission to the FTA; and

WHEREAS, in accordance with FTA requirements, the City of Tucson's governing legislative body is required to approve and direct staff to submit the Transit Services Title VI Program to the FTA on or before October 1, 2019;

NOW THEREFORE, BE IT RESOLVED BY THE MAYOR AND COUNCIL OF THE CITY OF TUCSON, ARIZONA, AS FOLLOWS:

SECTION 1. The Mayor and Council hereby approve the Title VI Program, attached hereto as Exhibit 1.

SECTION 2. The City Manager, and the various other City officers and employees are hereby authorized and directed to perform all acts necessary or

desirable to give effect to this Resolution, and staff is directed to submit the Program to the FTA on or before October 1, 2019.

SECTION 3. WHEREAS, it is necessary for the preservation of the peace, health and safety of the City of Tucson that this Resolution become effective, an emergency is declared to exist and this Resolution shall be effective immediately upon its passage and adoption.

PASSED, ADOPTED AND APPROVED by the Mayor and Council of the City of Tucson, Arizona, September 4, 2019.

MAYOR

ATTEST:

CITY CLERK

APPROVED AS TO FORM:

CITY ATTORNEY

REVIEWED BY:

CITY MANAGER

DF:tl
8/13/19

# Appendix B: 2019 City of Tucson On-Board Survey

# 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*



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## *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

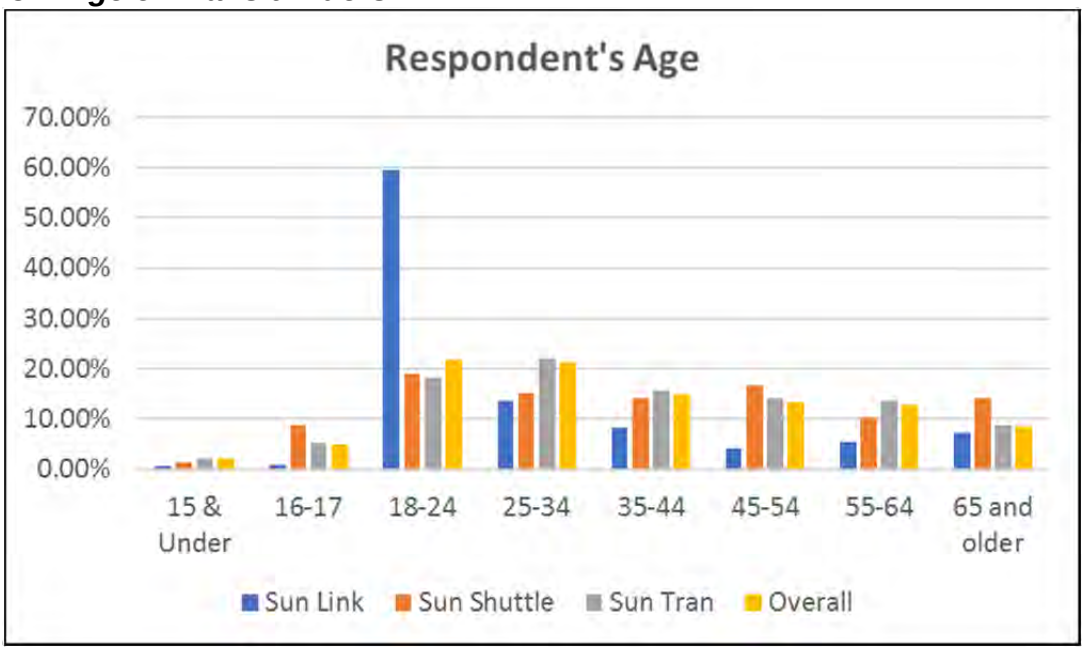
### *3.1.1 Age*

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<br>Based on Linked Weight Factor<br>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***



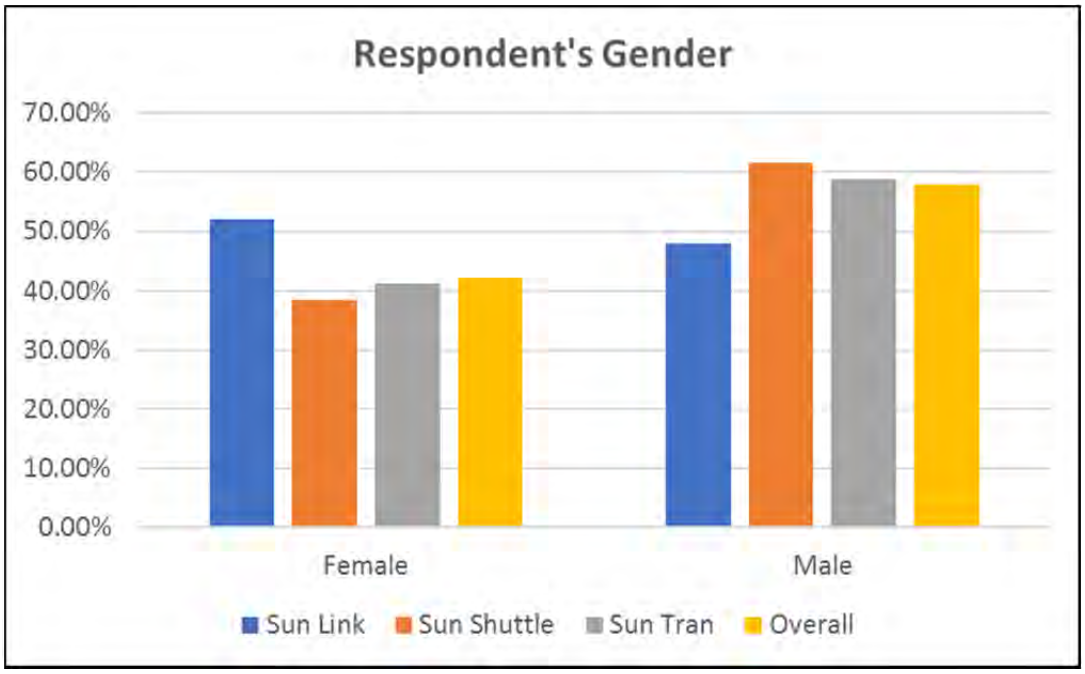

### *3.1.2 Gender*

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<br>Based on Linked Weight Factor<br>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)***

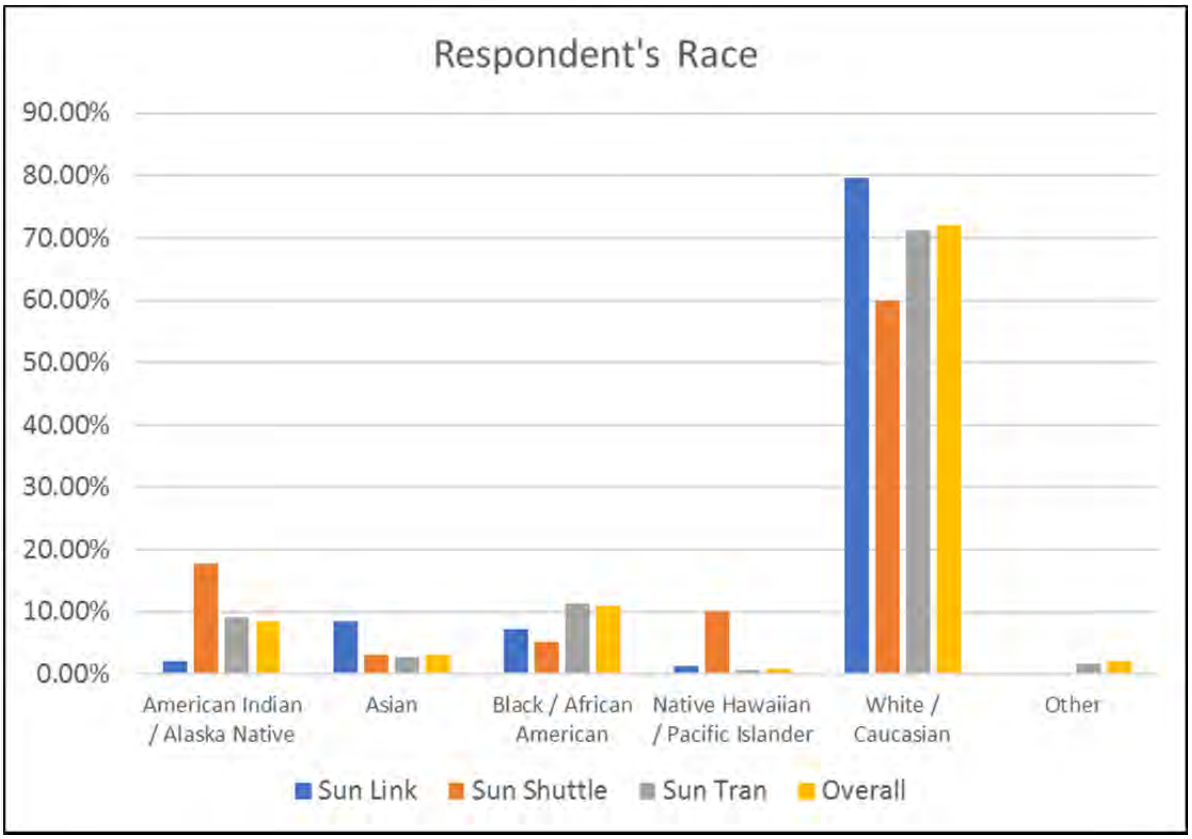
| Whether Respondent is of Hispanic, Latino, or Spanish Origin | | | | |
|---|---|---|---|---|
| **Based on Linked Weight Factor Excluding Visitors** | | | | |
| | **Sun Link** | **Sun Shuttle** | **Sun Tran** | **Overall** |
| No | 78.99% | 66.07% | 63.70% | 65.05% |
| Yes | 18.70% | 29.51% | 34.83% | 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***



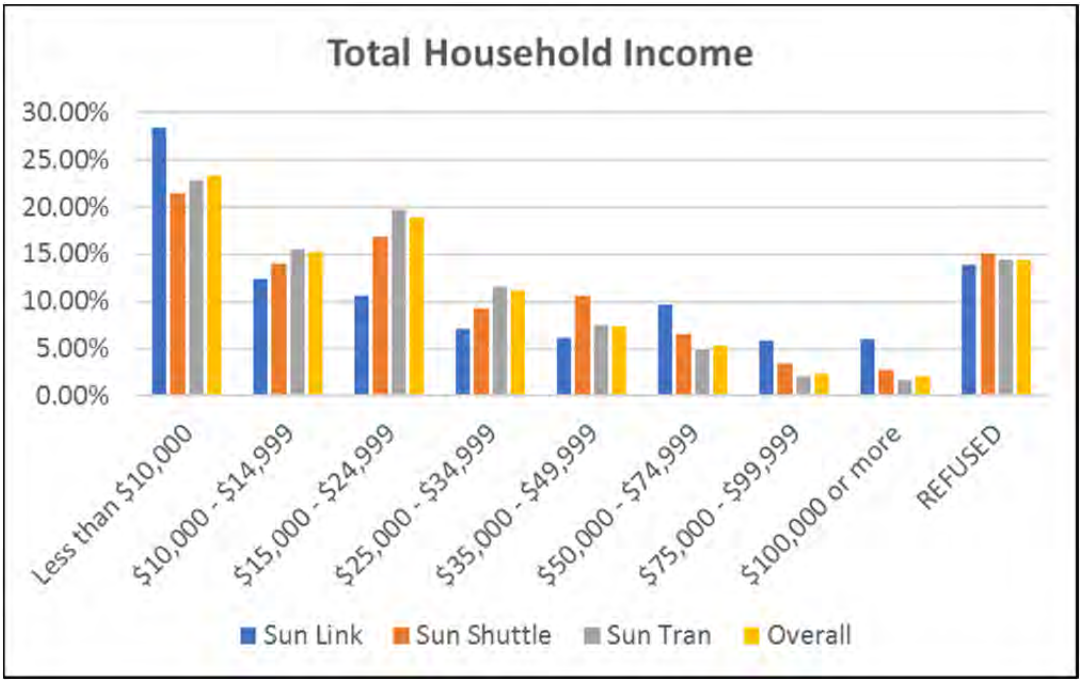
### *3.1.4 Income*

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<br>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<br>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%** |

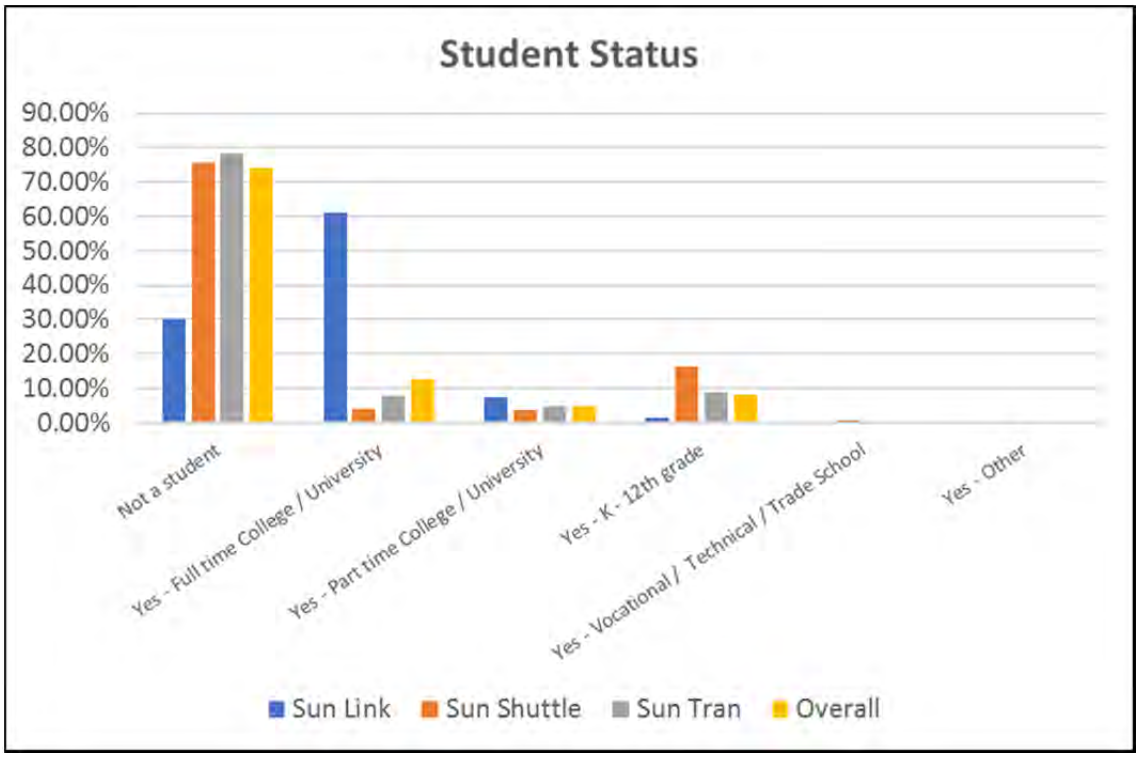
### 3.1.6 Student Status

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<br>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<br>Based on Linked Weight Factor<br>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<br>Based on Linked Weight Factor<br>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%** |

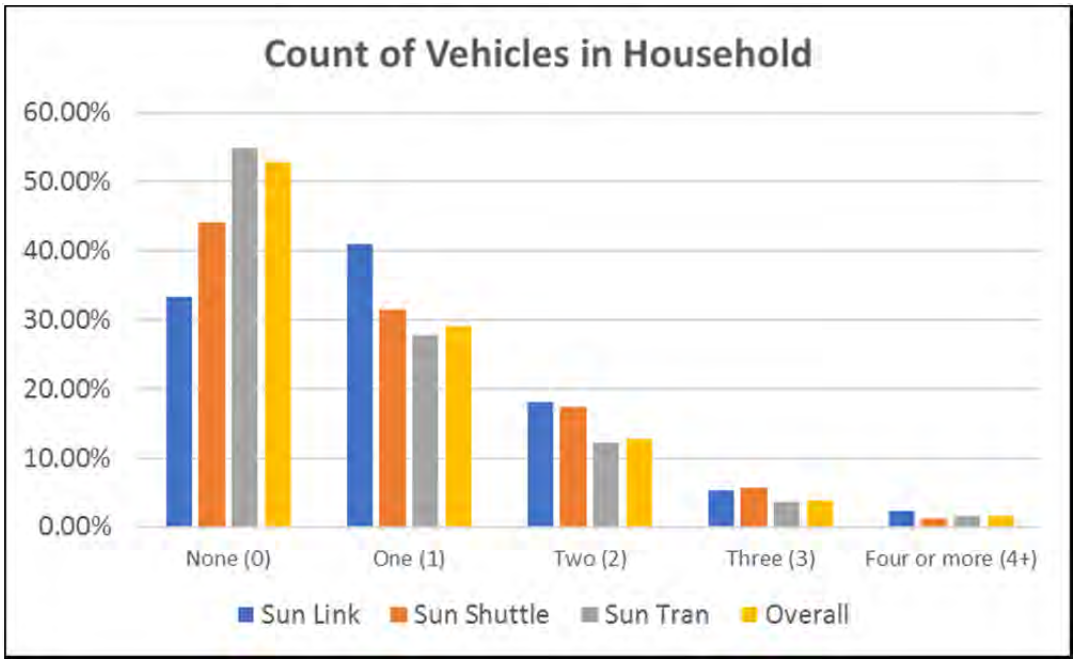
### *3.1.9 Vehicle Availability*

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<br>Based on Linked Weight Factor<br>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)***



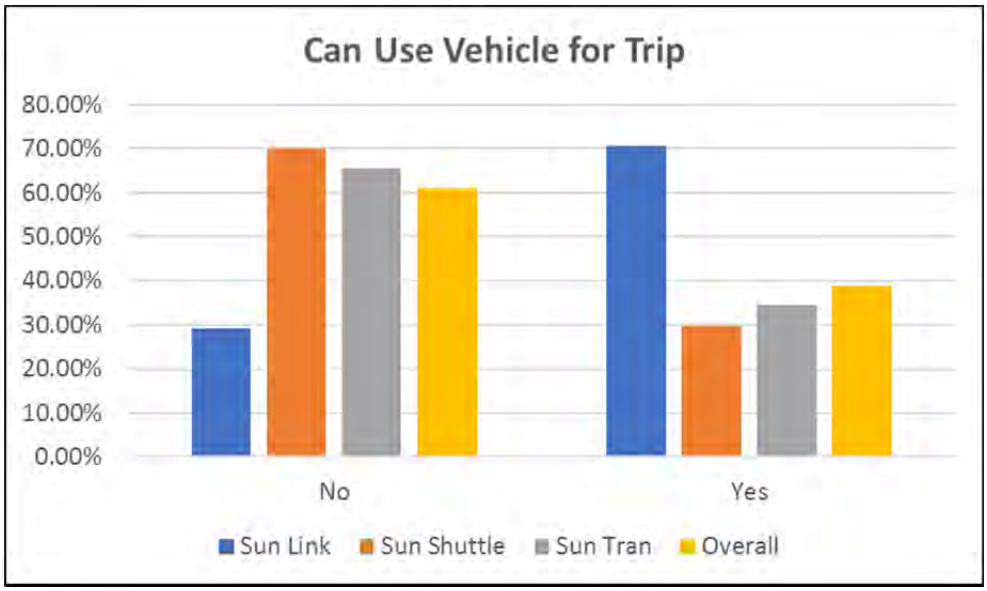
### 3.1.10 Could transit rider use household vehicle to make trip

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<br>Based on Linked Weight Factor<br>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<br>Based on Linked Weight Factor<br>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*

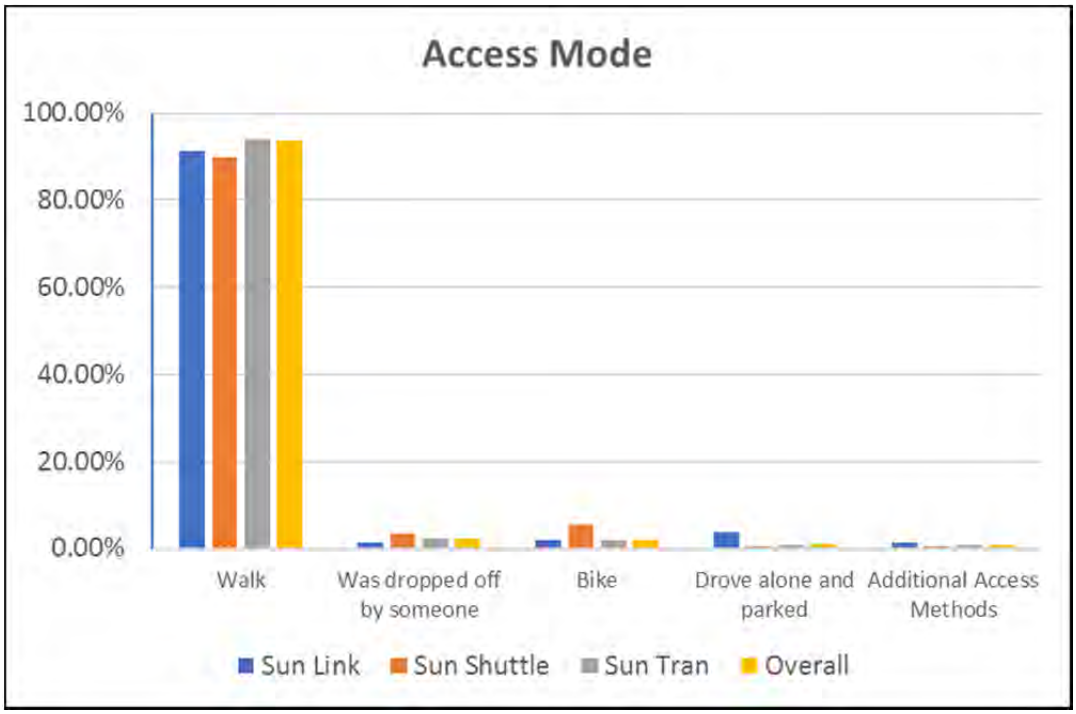
Most of all transit riders (Sun Tran, Sun Shuttle, and Sun Link combined) indicated that they accessed public transit by walking (93.81%). Sun Shuttle had the highest percentage of riders who indicated they took a bike to access public transit (5.37%) as shown in Table 15 below and in Chart 3-8 on the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

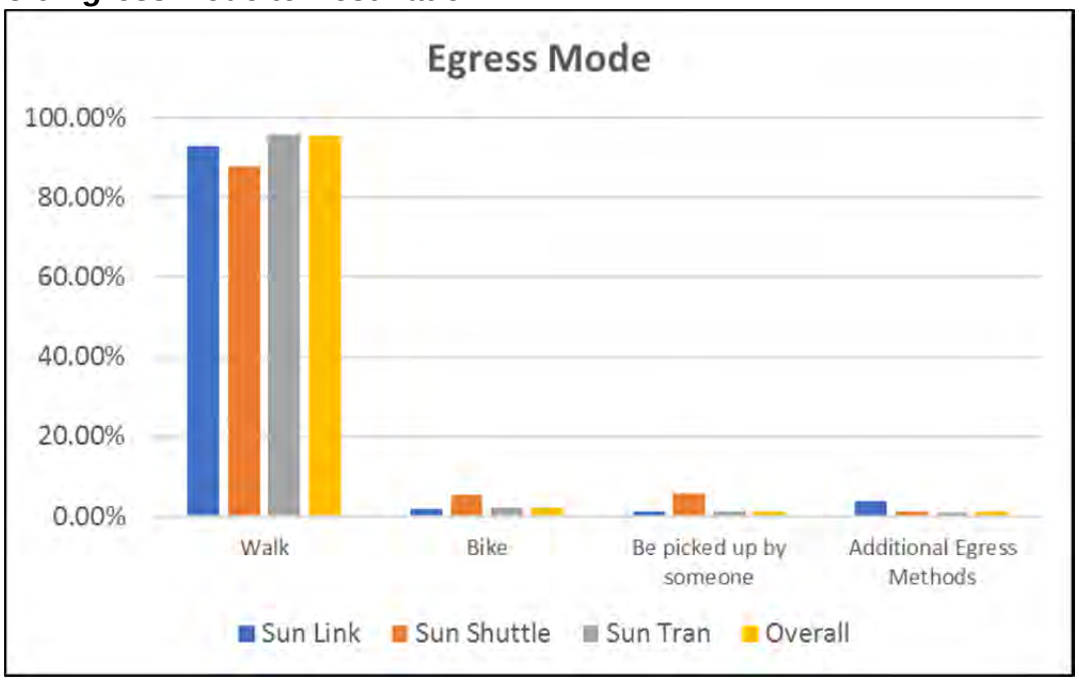
Most of all transit riders (Sun Tran, Sun Shuttle, and Sun Link combined) indicated that they traveled from public transit to their destination by walking (95.50%). Sun Shuttle (6.88%) riders were more likely to use a vehicle of some sort, compared to Sun Link (4.67%) and Sun Tran riders (1.58%), as 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***



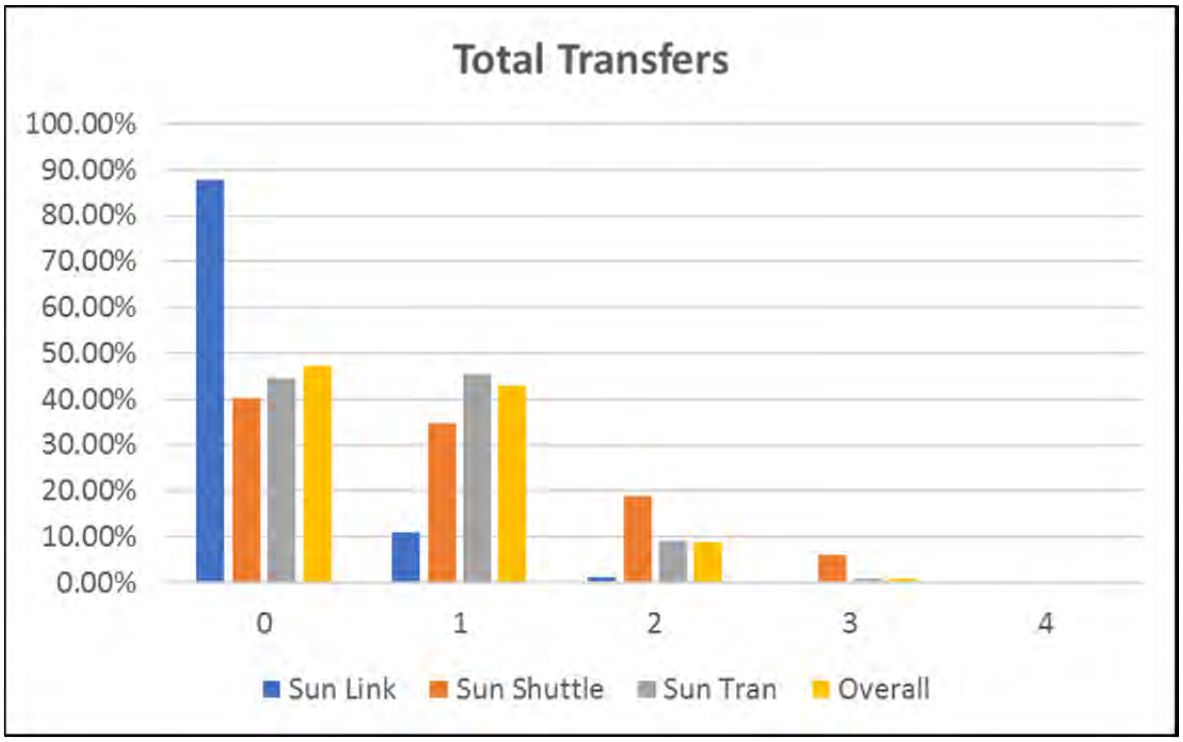

### *3.2.3 Transfers*

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***

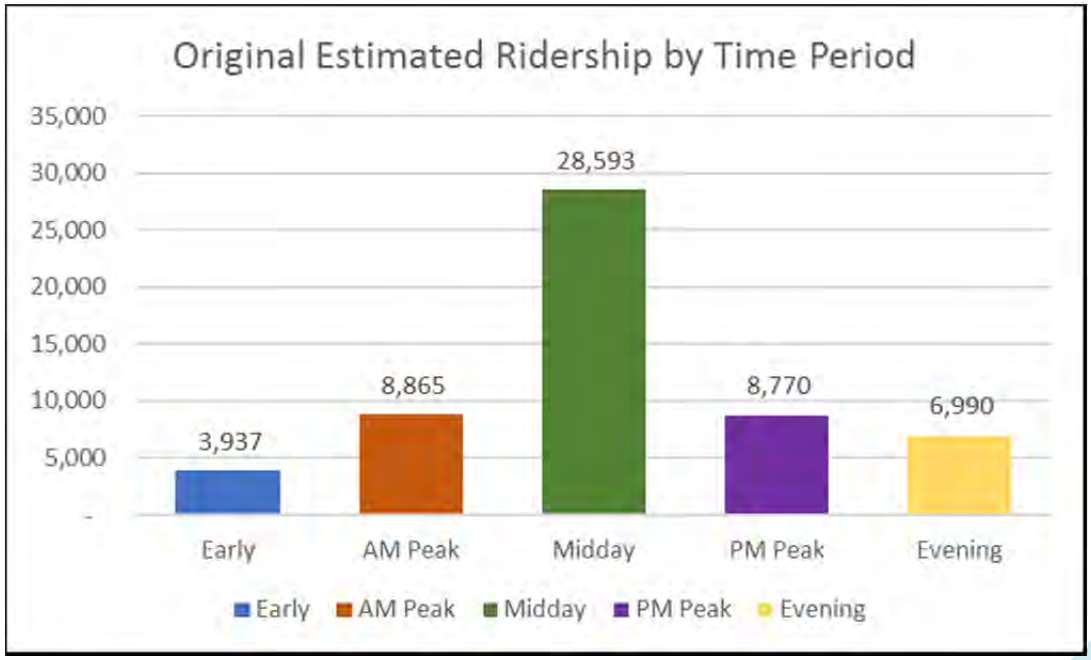
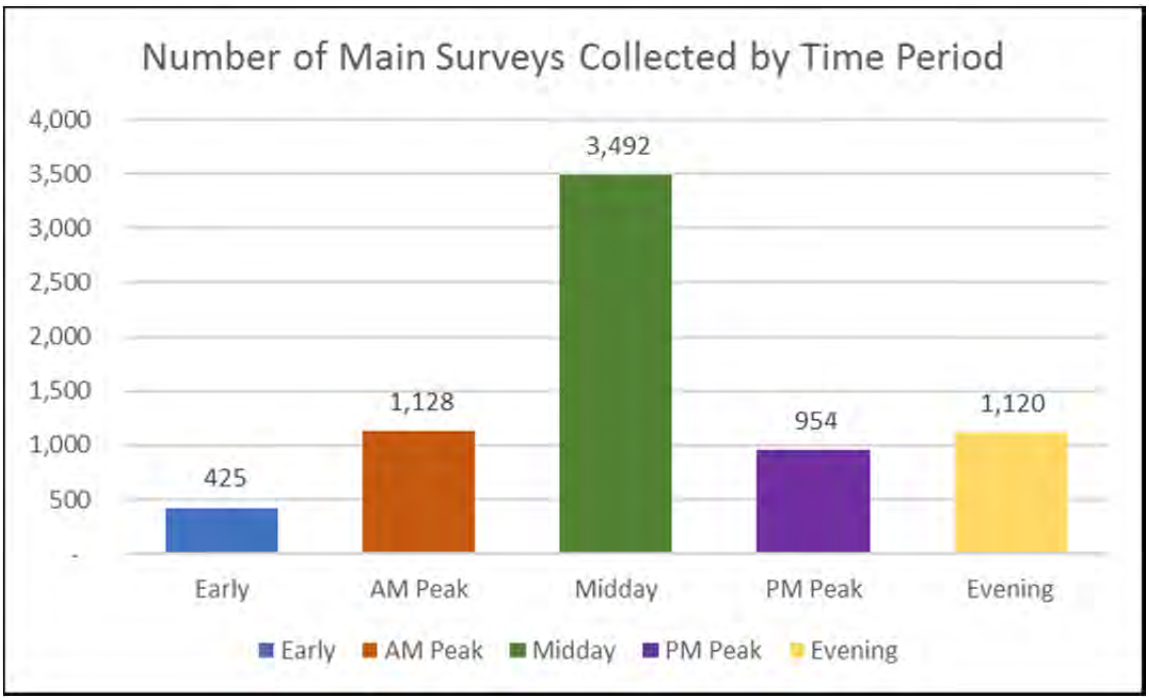


***Figure 4-2 Number of OD Surveys Collected by Time Period***



# 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**

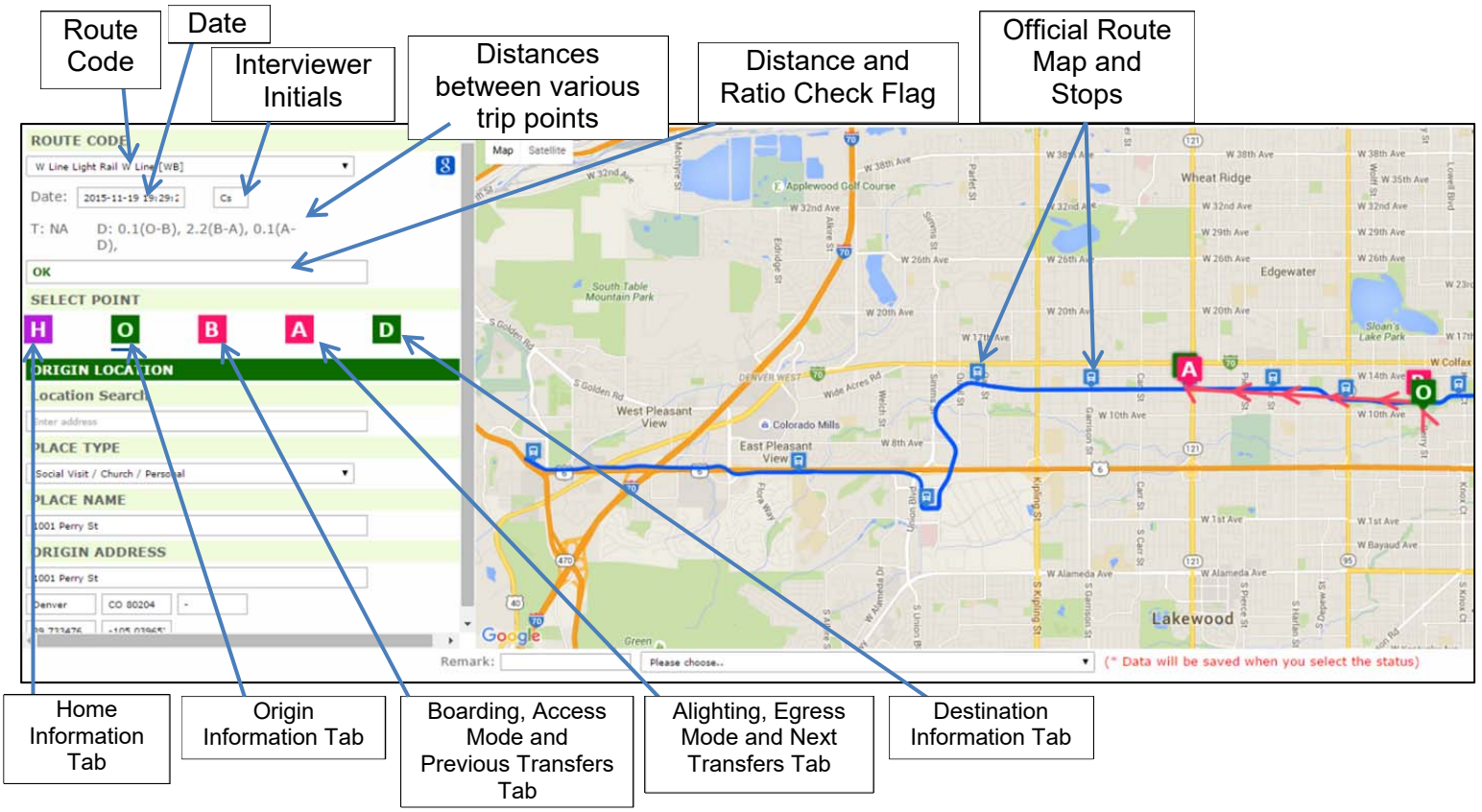
ETC Institute employs Field Supervisors (FS) who are responsible for: training, scheduling, and managing transit data collection efforts. ETC Institute continually adds steps to improve the FS' ability to effectively manage field staff. One tool is the use of an online dashboard created for each project. 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:

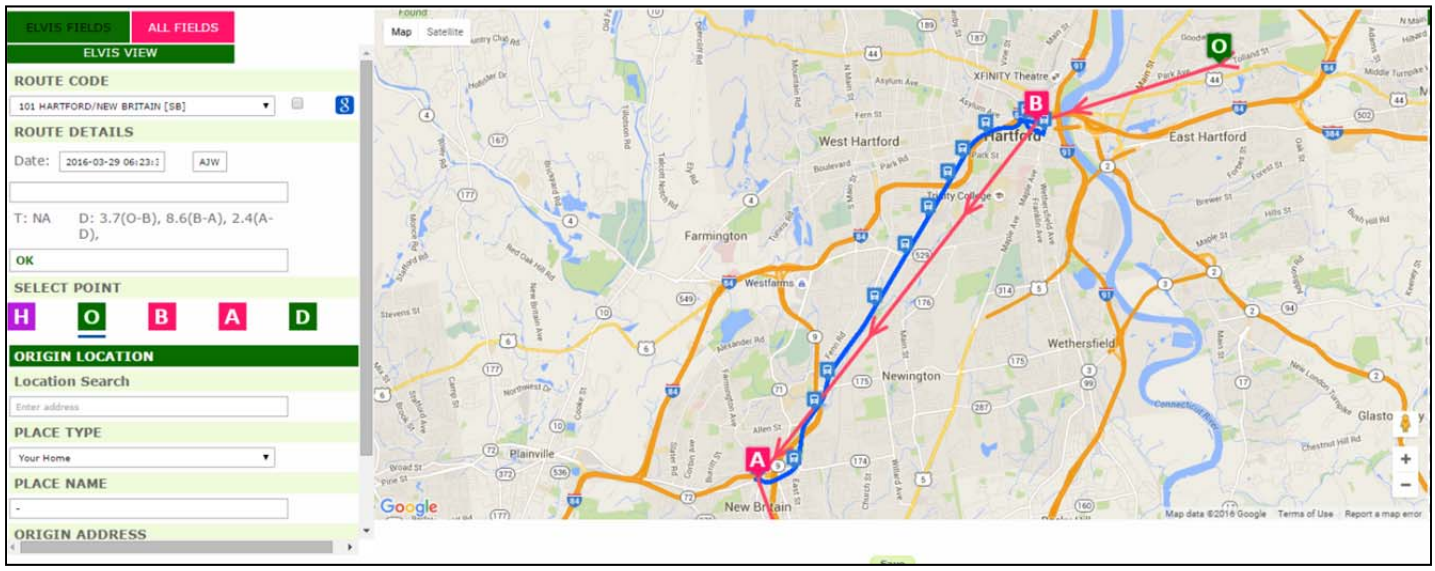
- Route / Direction
- Time of trip
- Transfers made
- Home address
- Origin address
- Destination address
- Origin place type
- Destination place type
- Access mode
- Egress mode
- Boarding location
- Alighting location

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** |

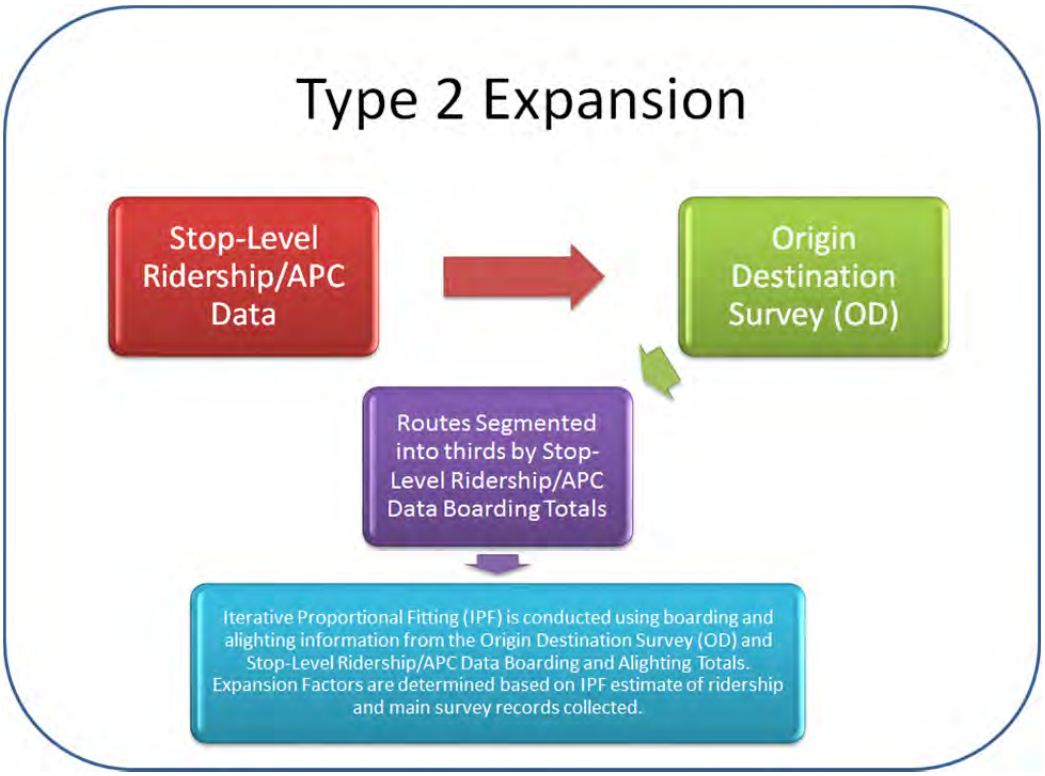
## 7.2 Data Expansion Overview

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.

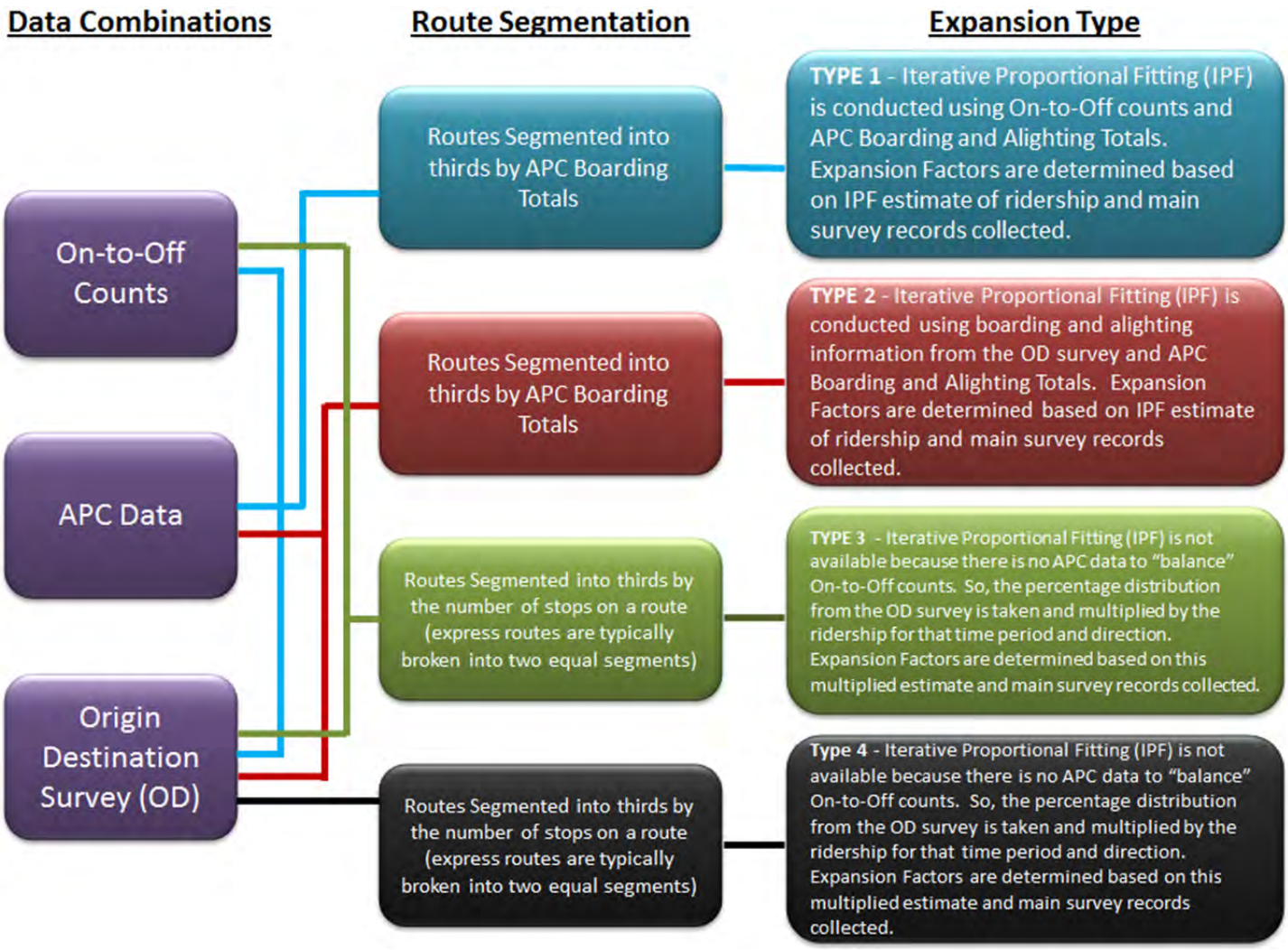
**Validating the Expansion for Sun Link**

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 |

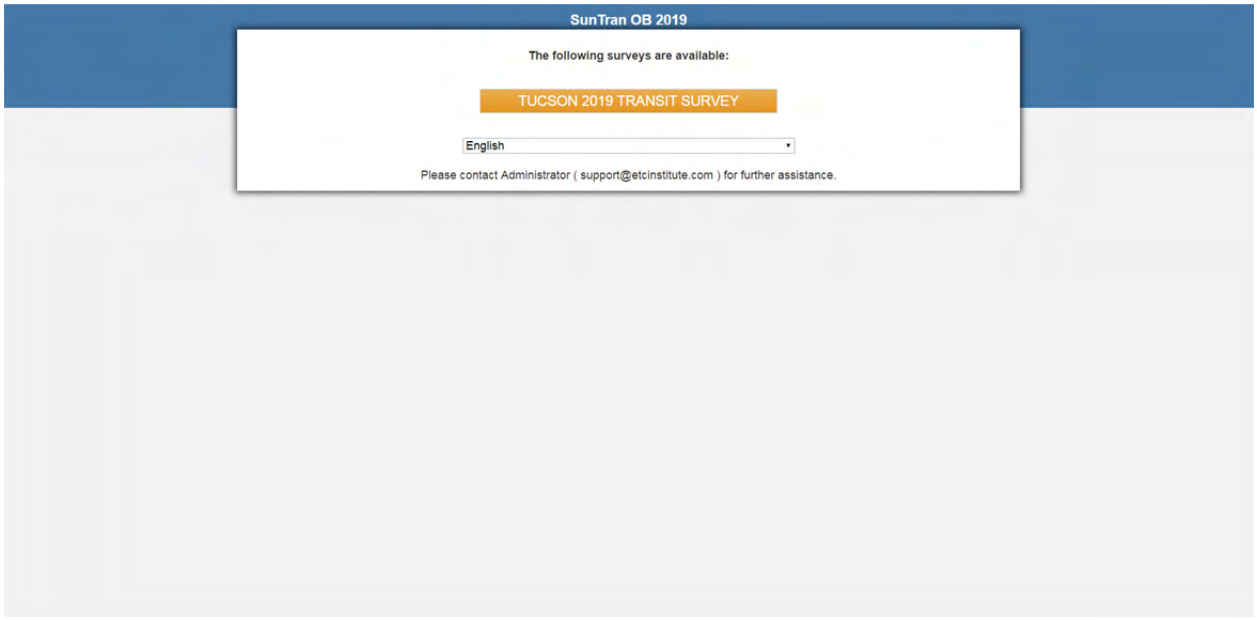
Once the linked trip multiplier is created it is multiplied by the unlinked expansion factor to create the linked expansion factor.

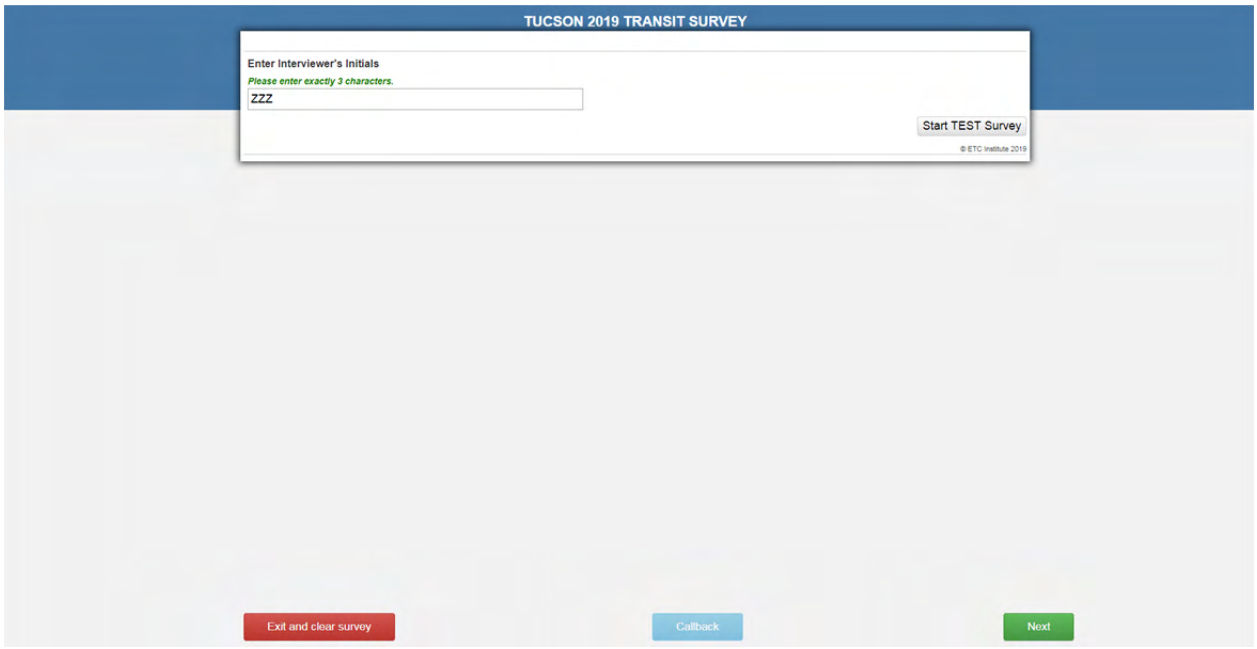
**Assessment of Expansion Factor Values**

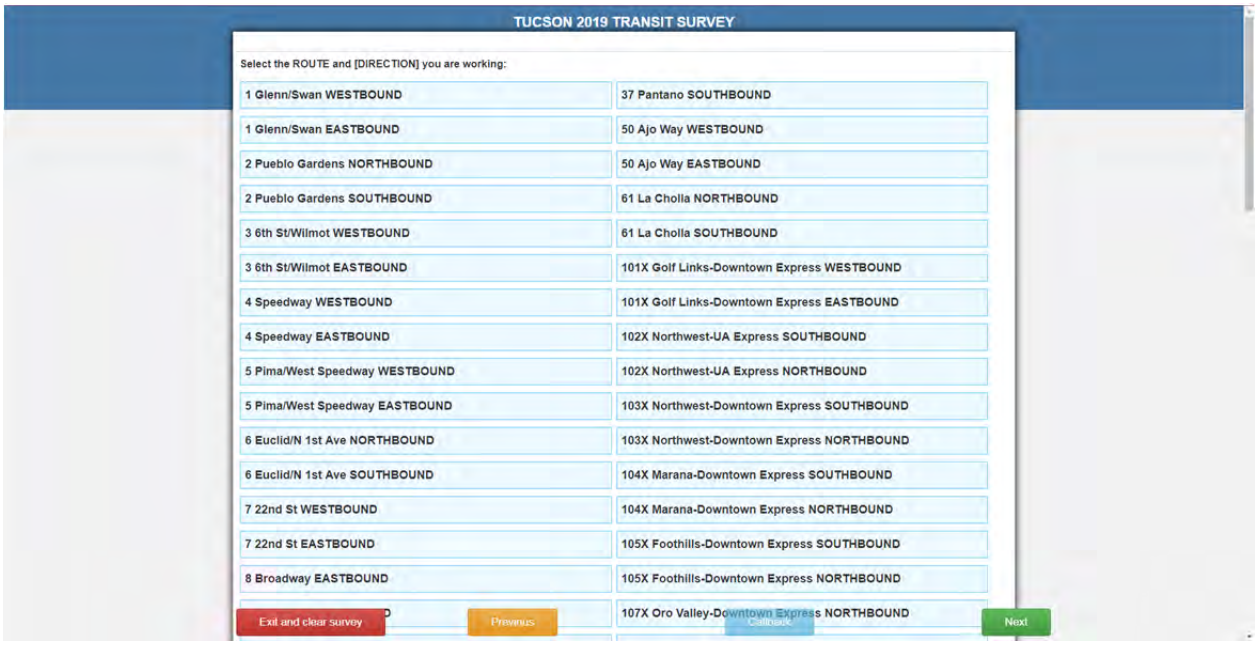
The average value of all unlinked expansion factors in the database is 7.28. Of the 7,118 records in the database, 6,689 (94% of the sample) have an expansion factor of 15 or less and 7,019 (99% of the sample) have a value less than 20. Only 7 records in the database have an expansion factor of 30 or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

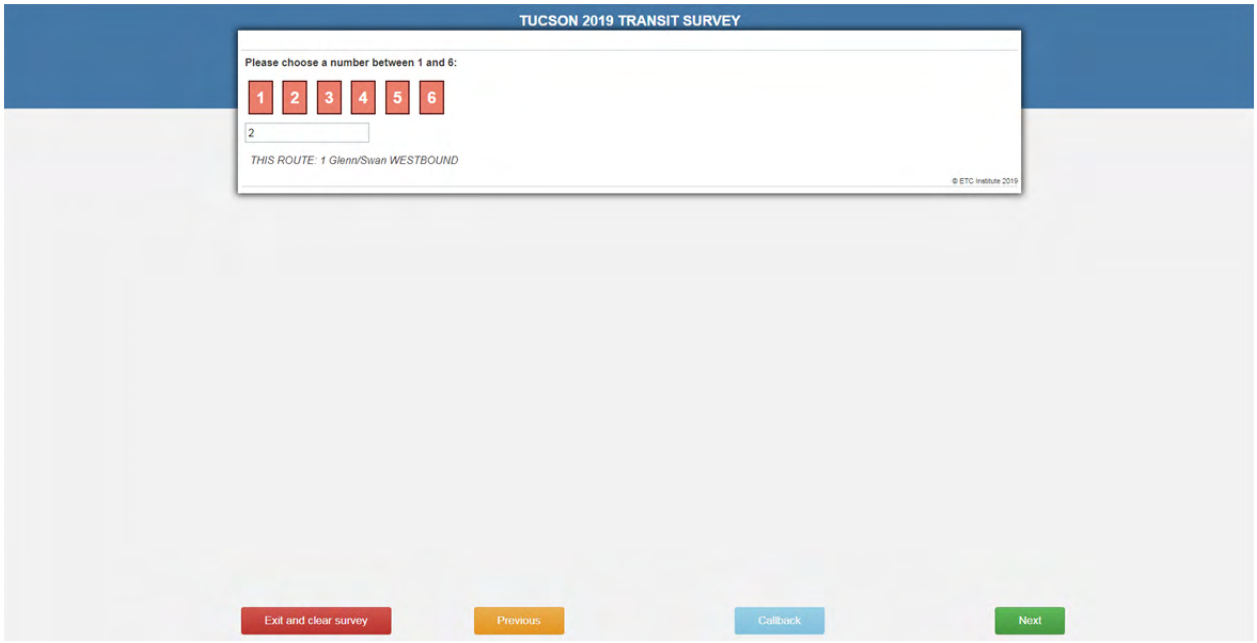
*Tablet Survey*

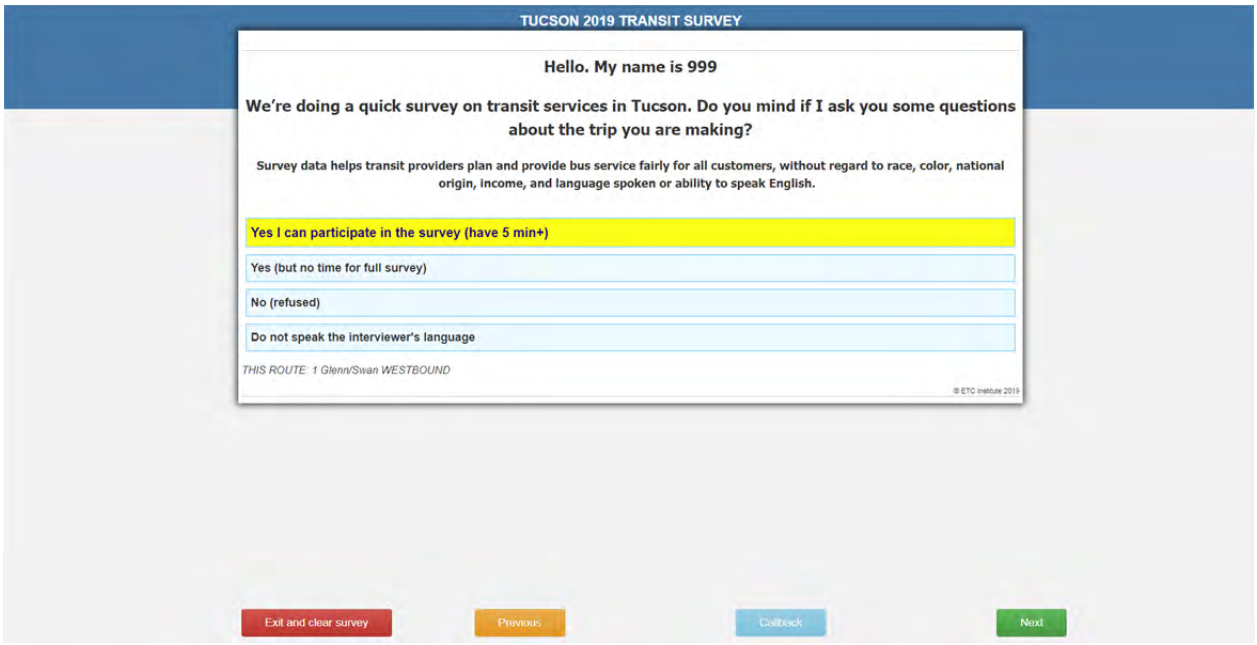
Screenshots of the tablet survey are shown on the following pages. *(Note: Not all "paths" are shown in the screenshots. For example, during the demographic portion of the survey, if a respondent indicated that they spoke another language other than English at home, a secondary question for what type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

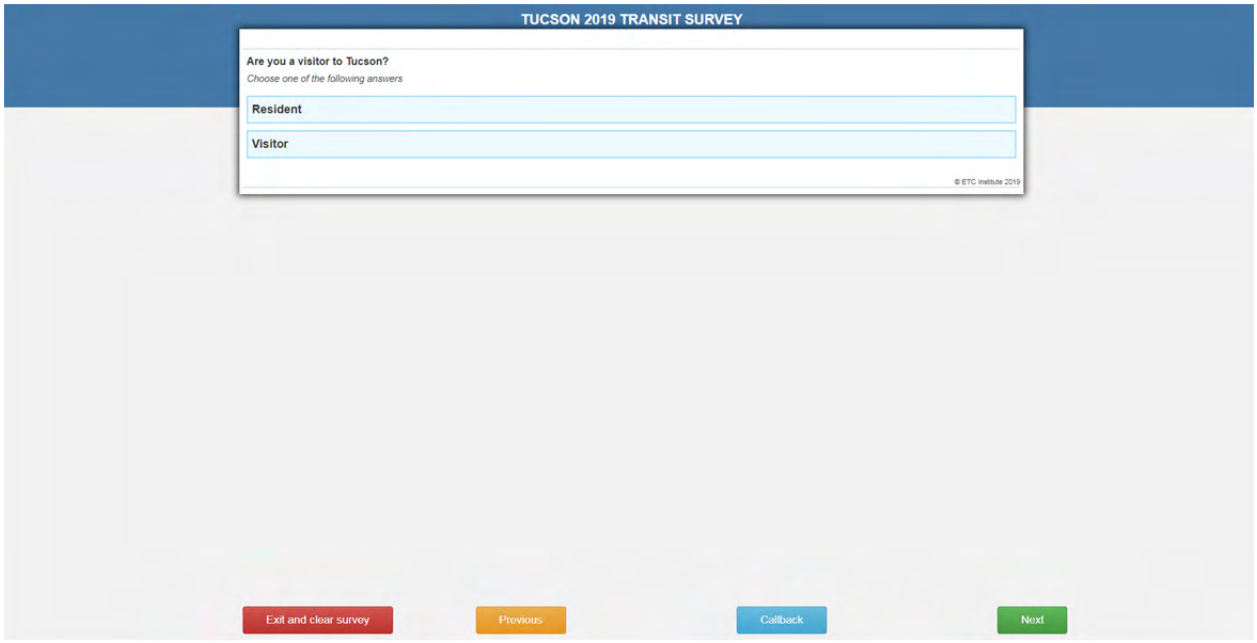


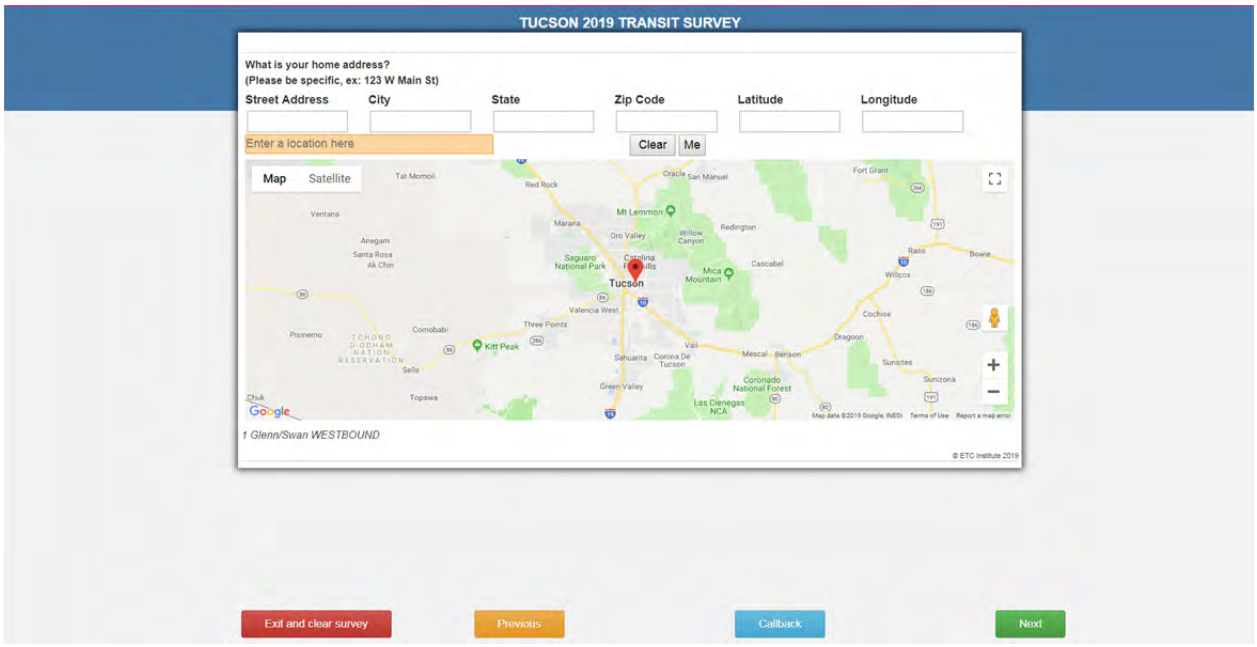

TUCSON 2019 TRANSIT SURVEY
Enter Interviewer's Initials
Please enter exactly 3 characters.
ZZZ
Start TEST Survey
© ETC Institute 2019
Exit and clear survey
Callback
Next

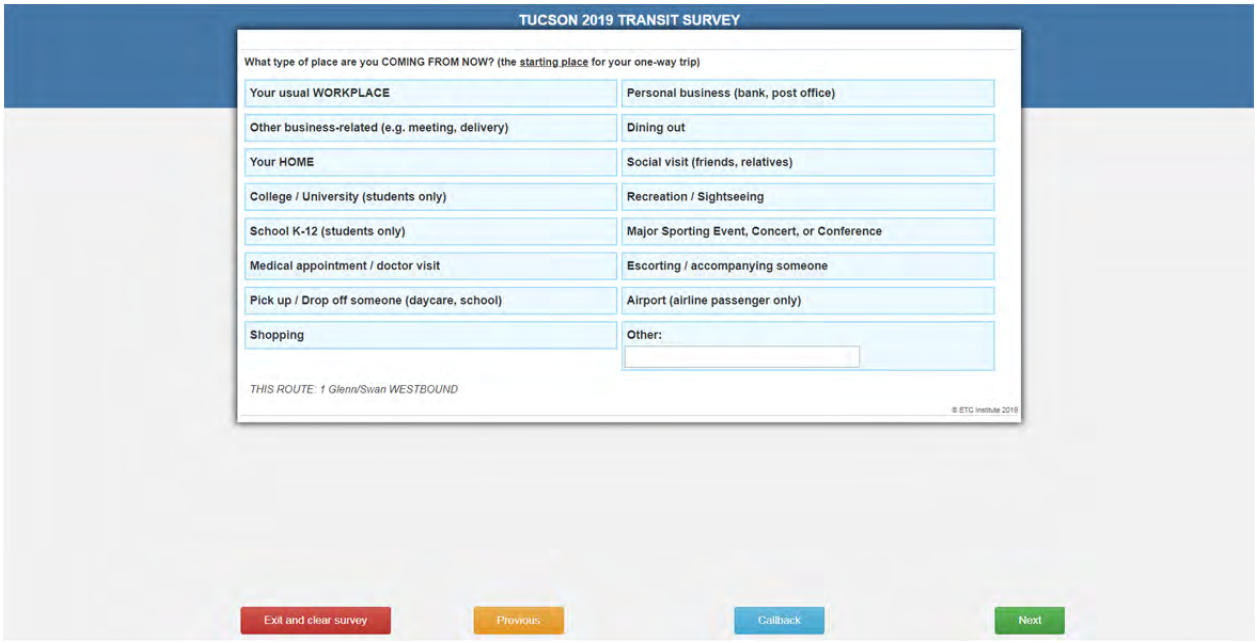

TUCSON 2019 TRANSIT SURVEY
Select the ROUTE and [DIRECTION] you are working:
1 Glenn/Swan WESTBOUND
1 Glenn/Swan EASTBOUND
2 Pueblo Gardens NORTHBOUND
2 Pueblo Gardens SOUTHBOUND
3 6th St/Wilmot WESTBOUND
3 6th St/Wilmot EASTBOUND
4 Speedway WESTBOUND
4 Speedway EASTBOUND
5 Pima/West Speedway WESTBOUND
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

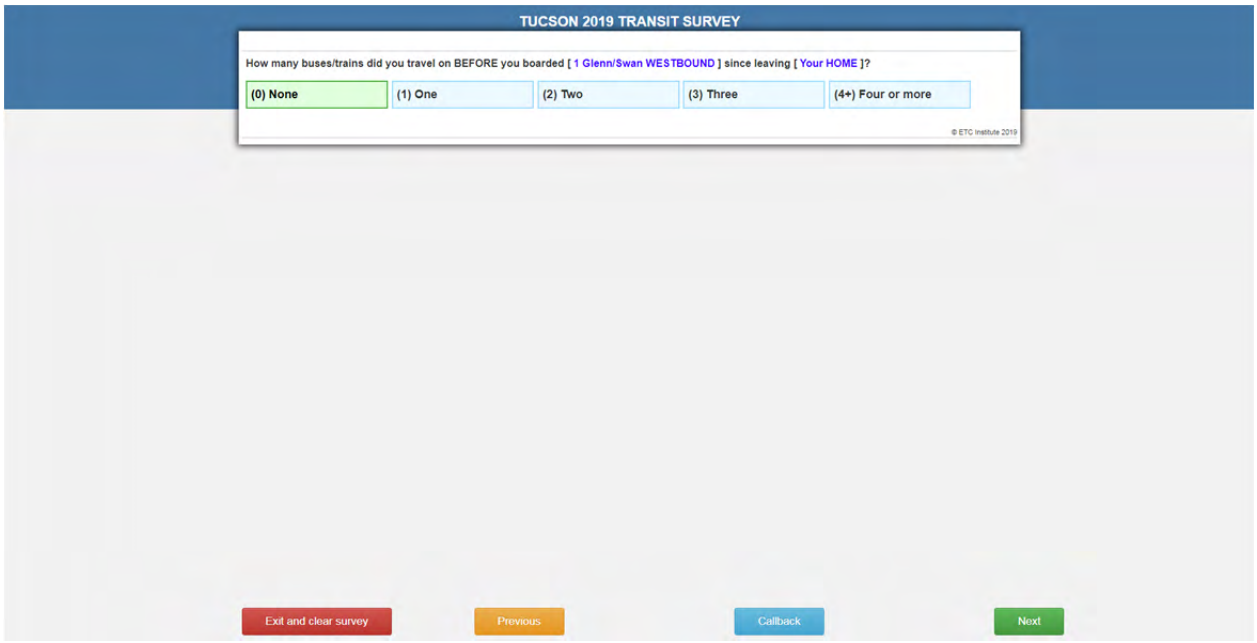

TUCSON 2019 TRANSIT SURVEY
Please choose a number between 1 and 6:
1 2 3 4 5 6
2
THIS ROUTE: 1 Glenn/Swan WESTBOUND
© ETC Institute 2019
Exit and clear survey
Previous
Callback
Next

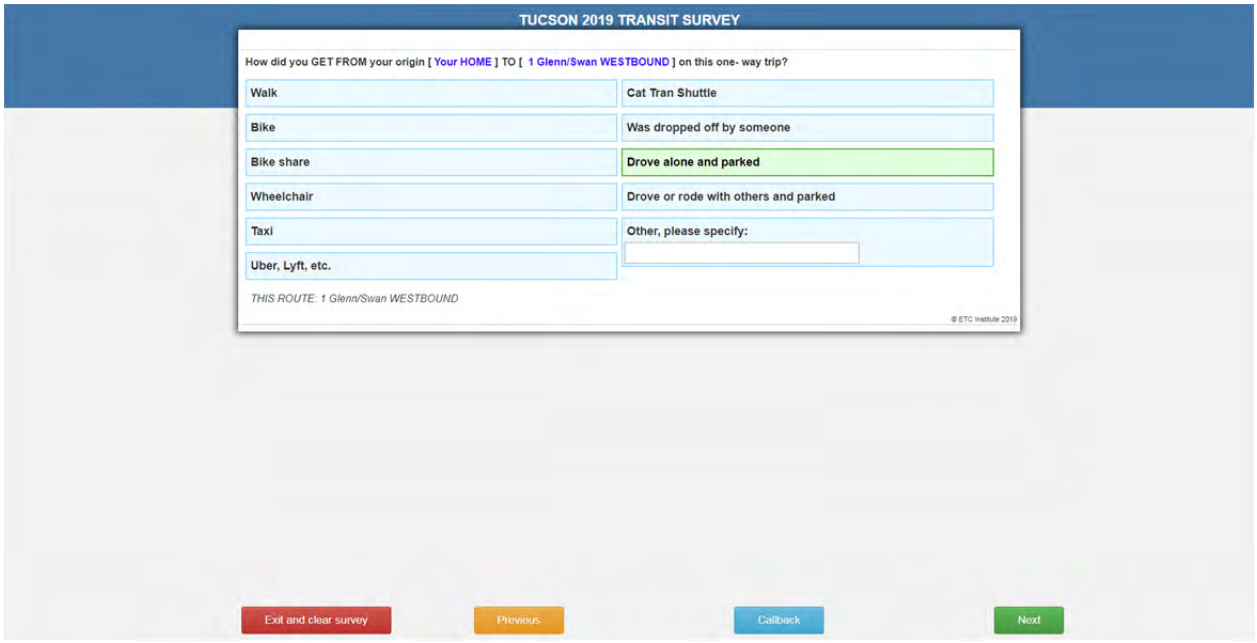

TUCSON 2019 TRANSIT SURVEY
Hello. My name is 999
We're doing a quick survey on transit services in Tucson. Do you mind if I ask you some questions about the trip you are making?
Survey data helps transit providers plan and provide bus service fairly for all customers, without regard to race, color, national 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

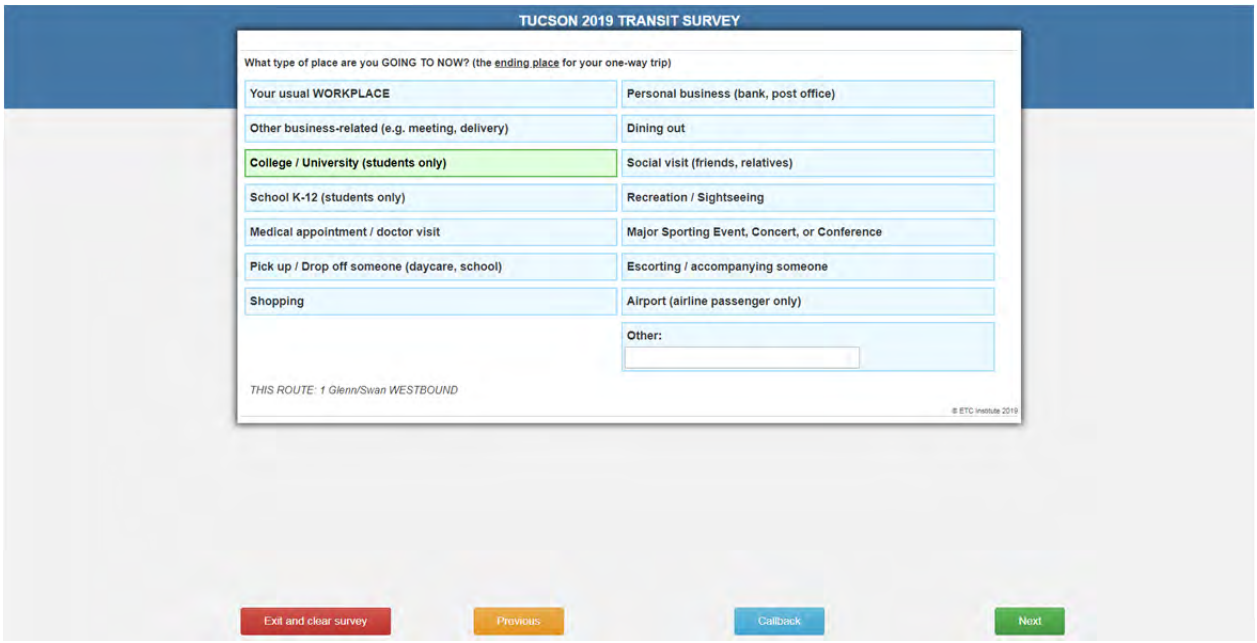

TUCSON 2019 TRANSIT SURVEY
Are you a visitor to Tucson?
Choose one of the following answers
Resident
Visitor
© ETC Institute 2019
Exit and clear survey
Previous
Callback
Next

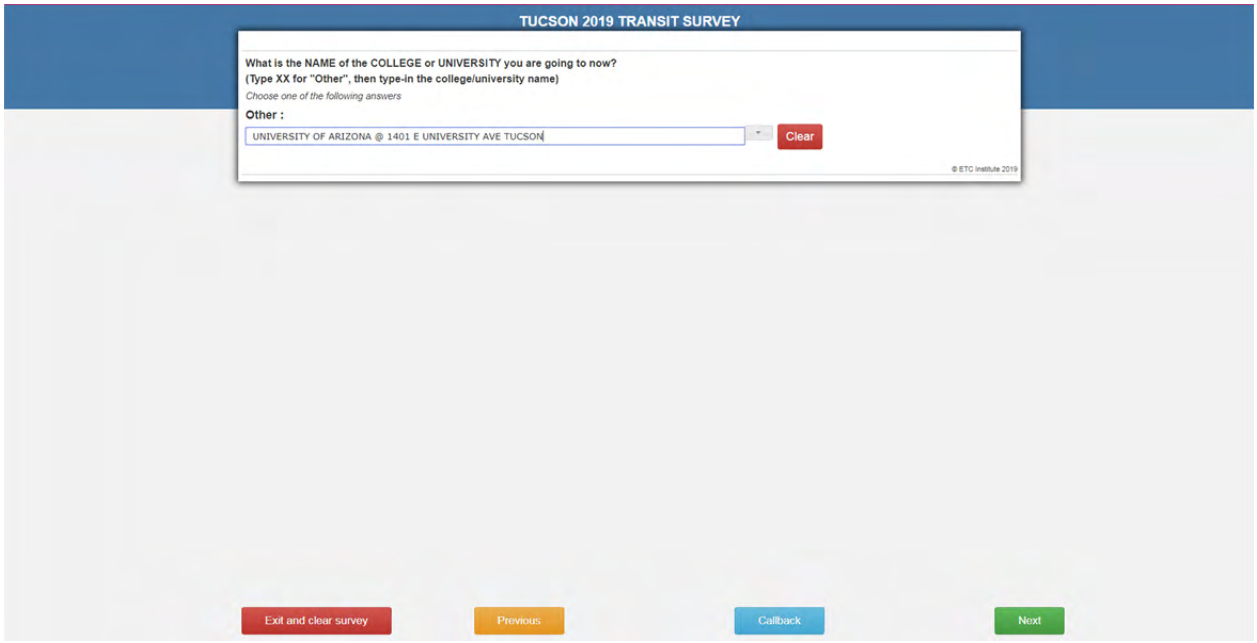

TUCSON 2019 TRANSIT SURVEY
What is your home address?
(Please be specific, ex: 123 W Main St)
Street Address
City
State
Zip Code
Latitude
Longitude
Enter a location here
Clear
Me
Map
Satellite
Tucson
1 Glenn/Swan WESTBOUND
© ETC Institute 2019
Exit and clear survey
Previous
Callback
Next

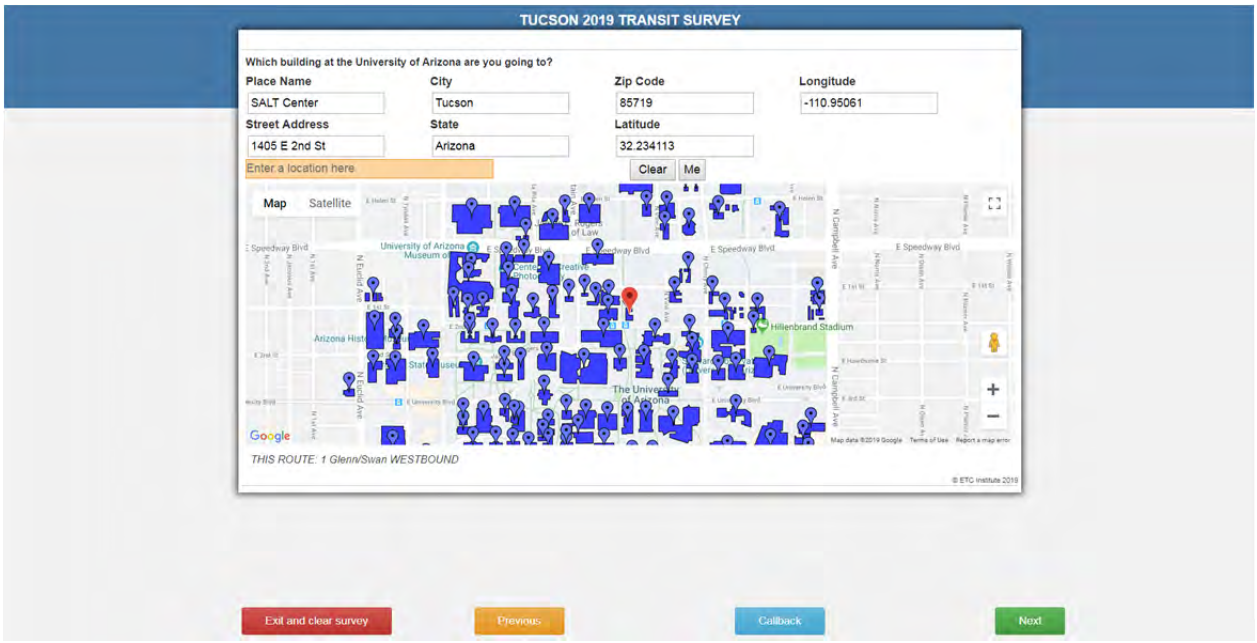

TUCSON 2019 TRANSIT SURVEY
What type of place are you COMING FROM NOW? (the starting place for your one-way trip)
Your usual WORKPLACE
Other business-related (e.g. meeting, delivery)
Your HOME
College / University (students only)
School K-12 (students only)
Medical appointment / doctor visit
Pick up / 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

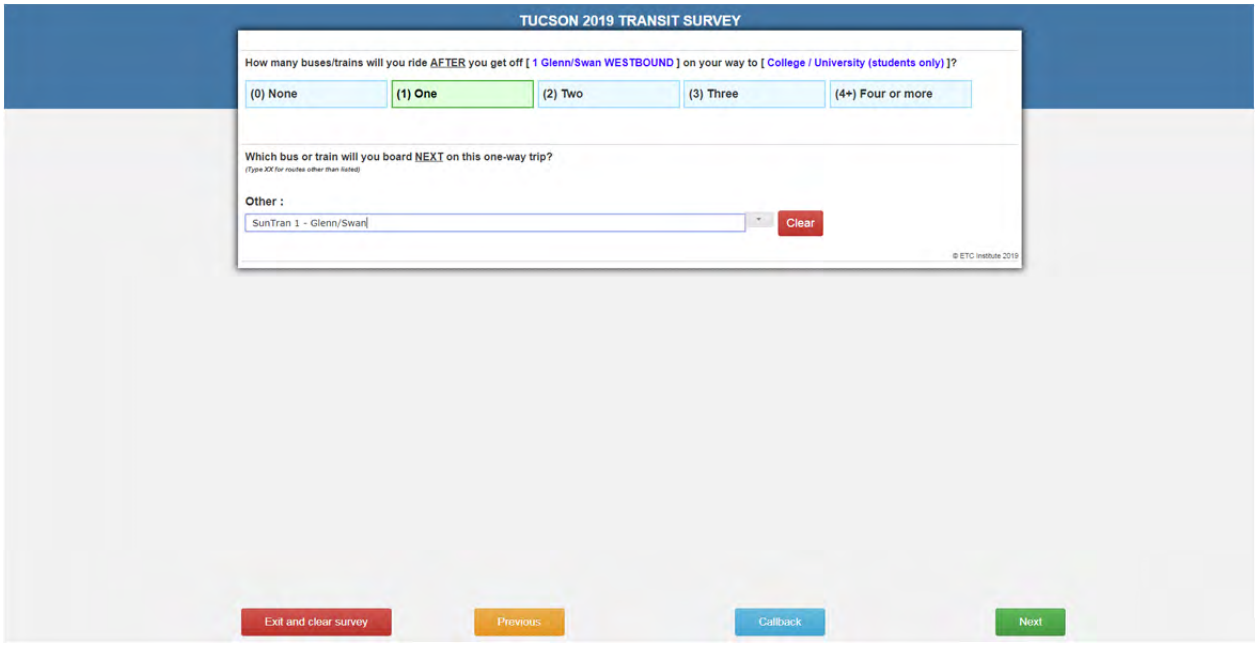

TUCSON 2019 TRANSIT SURVEY
How many buses/trains did you travel on BEFORE you boarded [ 1 Glenn/Swan WESTBOUND ] since leaving [ Your HOME ]?
(0) None
(1) One
(2) Two
(3) Three
(4+) Four or more
© ETC Institute 2019
Exit and clear survey
Previous
Callback
Next

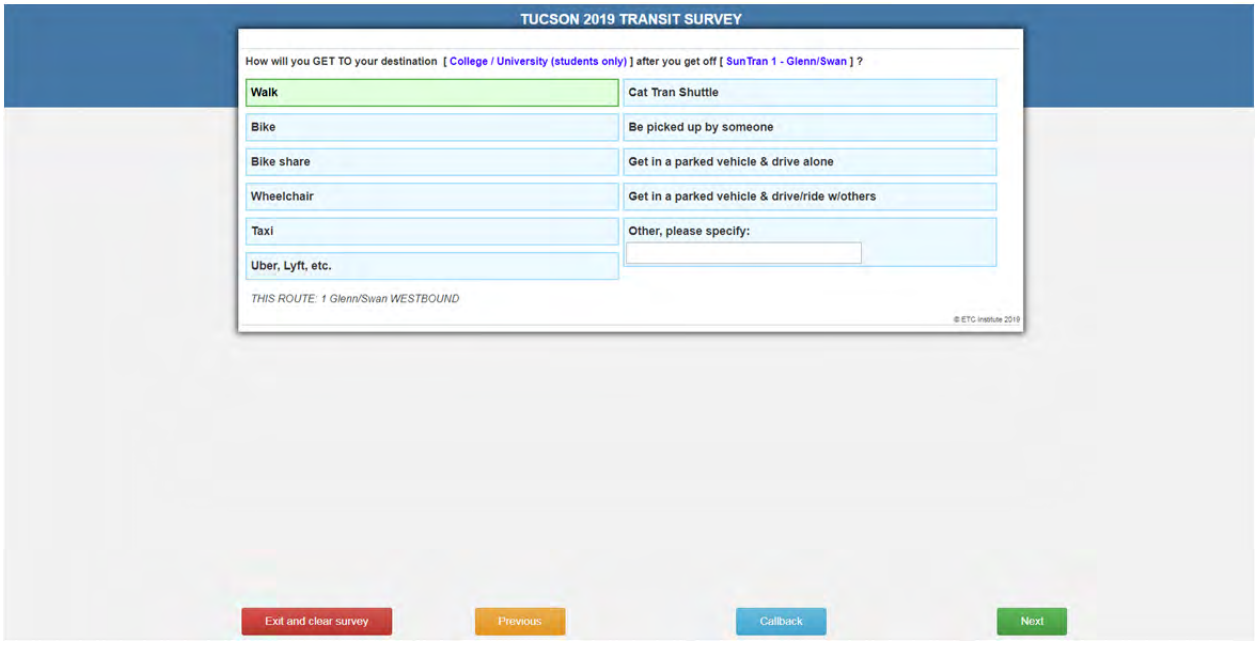

TUCSON 2019 TRANSIT SURVEY
How did you GET FROM your origin [ Your HOME ] TO [ 1 Glenn/Swan WESTBOUND ] on this one- way trip?
Walk
Bike
Bike share
Wheelchair
Taxi
Uber, Lyft, etc.
Cat Tran Shuttle
Was dropped off by someone
Drove alone and parked
Drove or rode with others and parked
Other, please specify: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

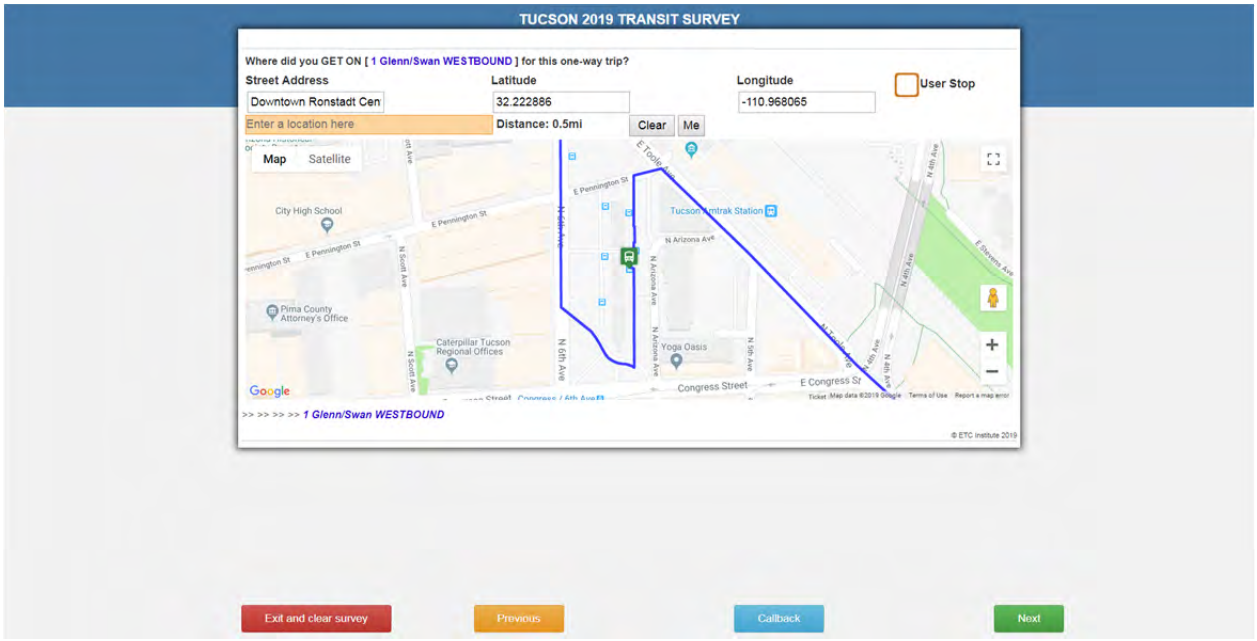

TUCSON 2019 TRANSIT SURVEY
What type of place are you GOING TO NOW? (the ending place for your one-way trip)
Your usual WORKPLACE
Other business-related (e.g. meeting, delivery)
College / University (students only)
School K-12 (students only)
Medical appointment / doctor visit
Pick up / Drop off someone (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

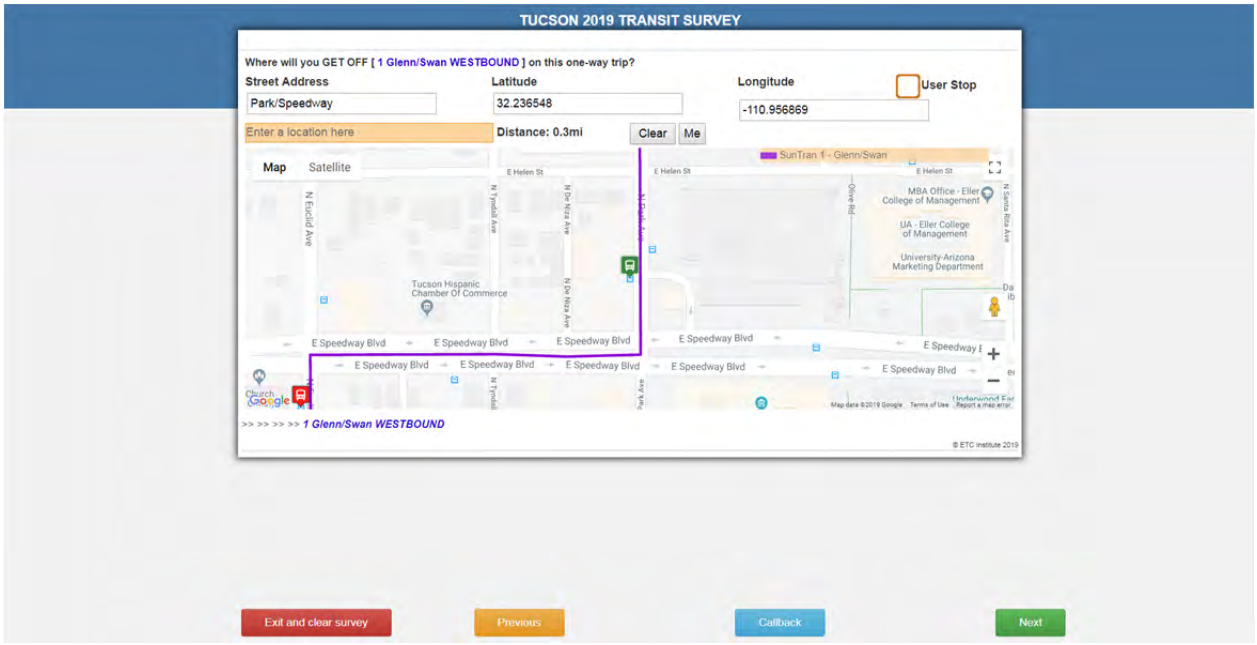

TUCSON 2019 TRANSIT SURVEY
What is the NAME of the COLLEGE or UNIVERSITY you are going to now?
(Type XX for "Other", then type-in the college/university name)
Choose one of the following answers
Other :
UNIVERSITY OF ARIZONA @ 1401 E UNIVERSITY AVE TUCSON
Clear
© ETC Institute 2019
Exit and clear survey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

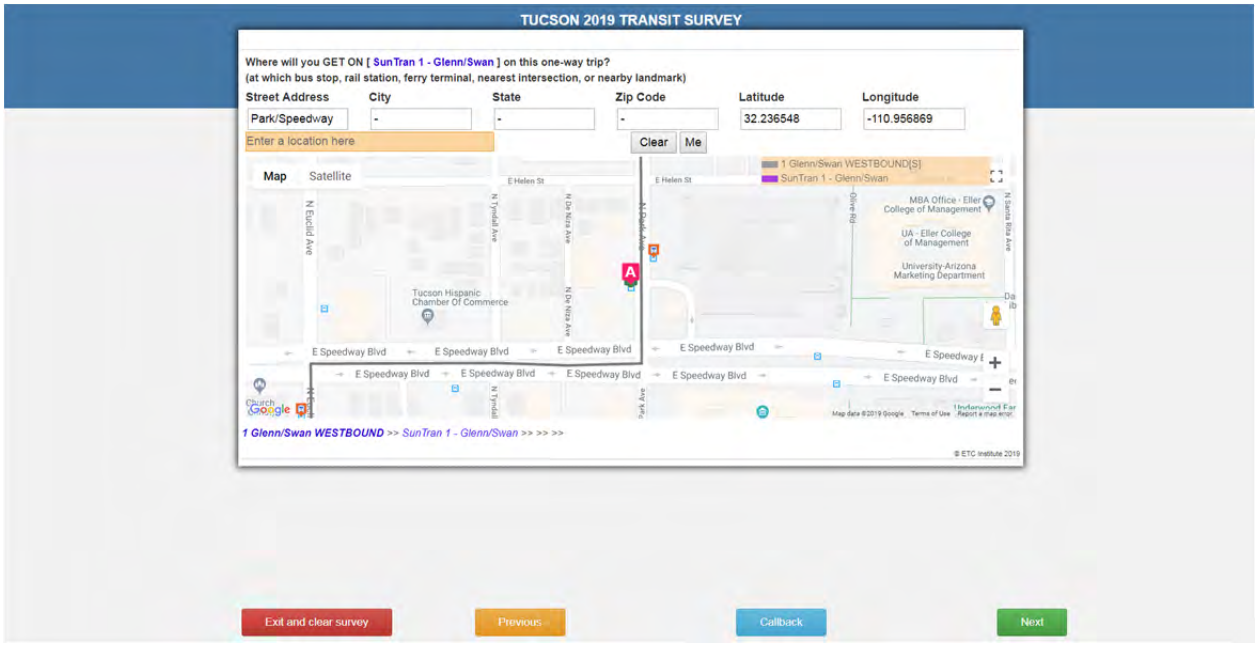

TUCSON 2019 TRANSIT SURVEY
Which building at the University of Arizona are you going to?
Place Name
SALT Center
City
Tucson
Zip Code
85719
Longitude
-110.95061
Street Address
1405 E 2nd St
State
Arizona
Latitude
32.234113
Enter a location here
Clear
Me
Map
Satellite
E Speedway Blvd
Hillenbrand Stadium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

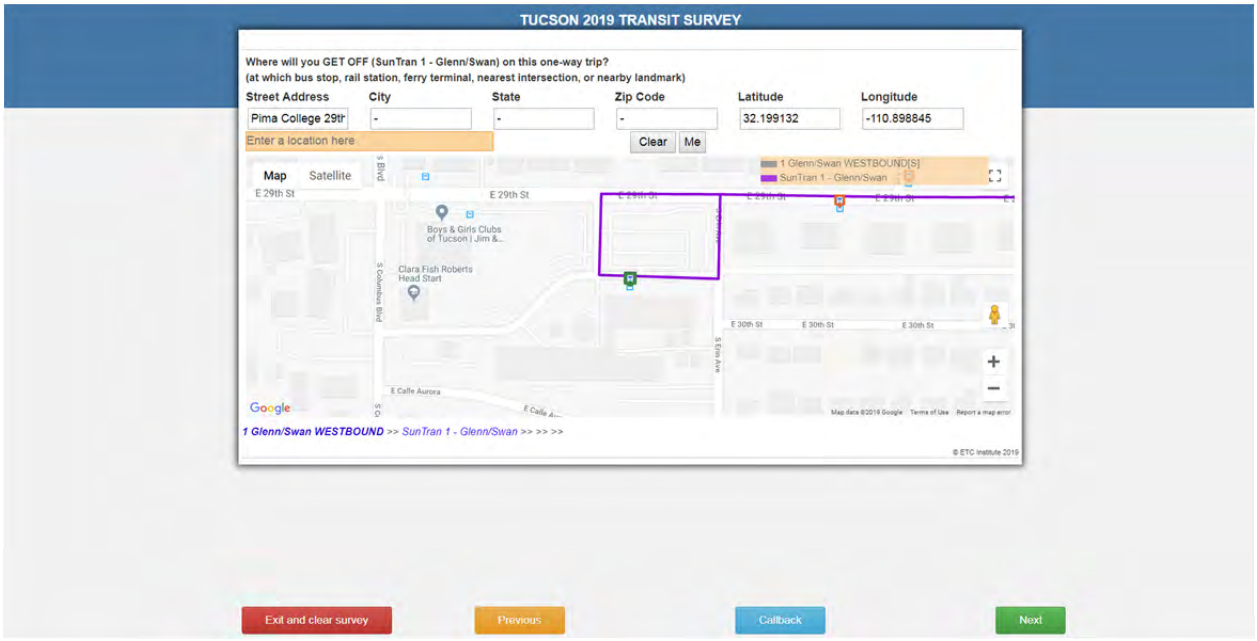

TUCSON 2019 TRANSIT SURVEY
How many buses/trains will you ride AFTER you get off [ 1 Glenn/Swan WESTBOUND ] on your way to [ College / University (students only) ]?
(0) None
(1) One
(2) Two
(3) Three
(4+) Four or more
Which bus or train will you board NEXT on this one-way trip?
(Type XX for routes other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

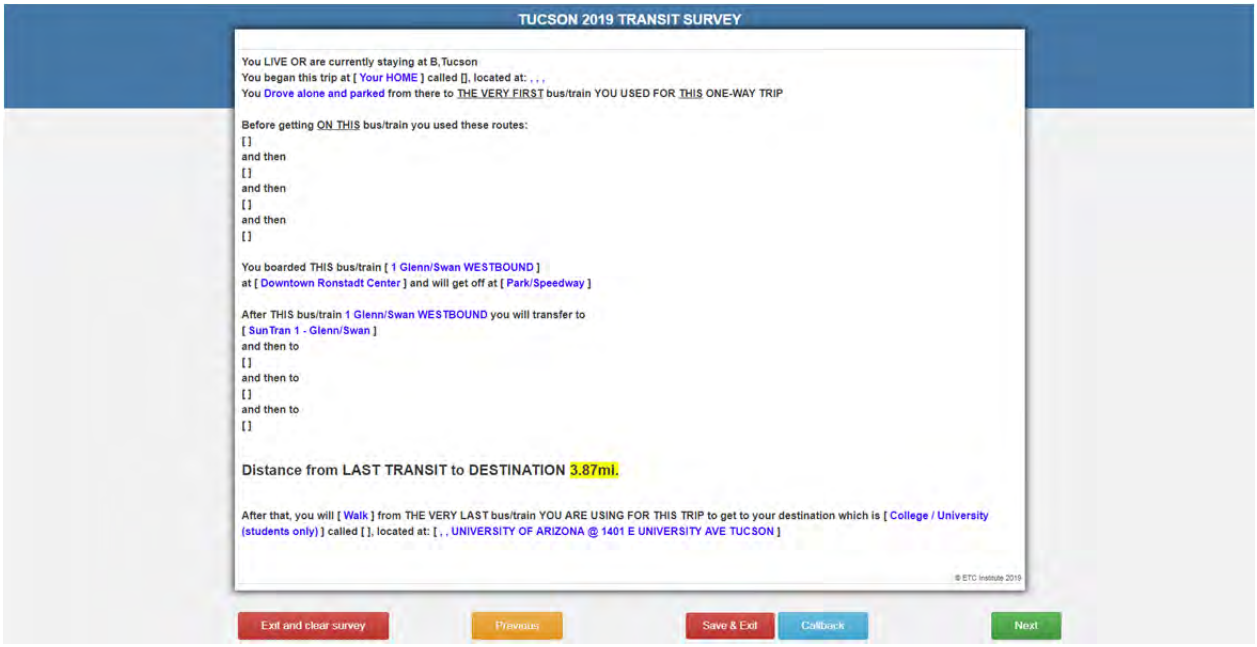

TUCSON 2019 TRANSIT SURVEY
How will you GET TO your destination [ College / University (students only) ] after you get off [ SunTran 1 - Glenn/Swan ] ?
Walk
Bike
Bike share
Wheelchair
Taxi
Uber, Lyft, etc.
Cat Tran Shuttle
Be picked up by someone
Get in a parked vehicle & drive alone
Get in a parked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

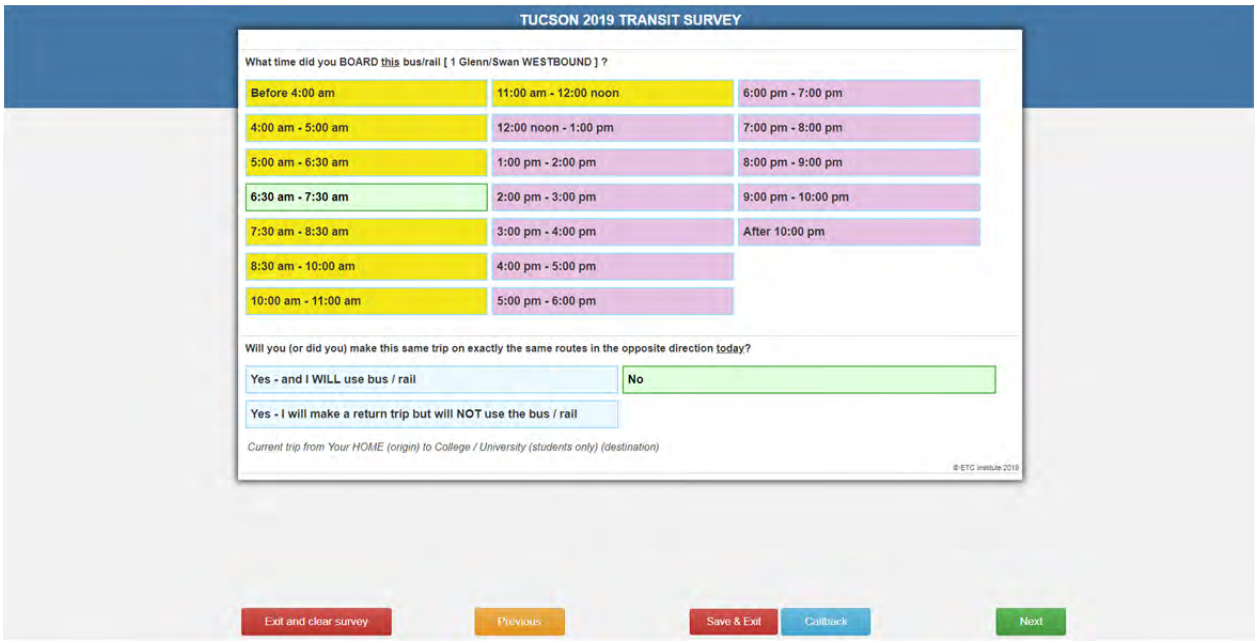

TUCSON 2019 TRANSIT SURVEY
Where did you GET ON [ 1 Glenn/Swan WESTBOUND ] for this one-way trip?
Street Address
Downtown Ronstadt Cen
Latitude
32.222886
Longitude
-110.968065
User Stop
Enter a location here
Distance: 0.5mi
Clear
Me
Map
Satellite
City High School
E Pennington St
N Scott Ave
Pima County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

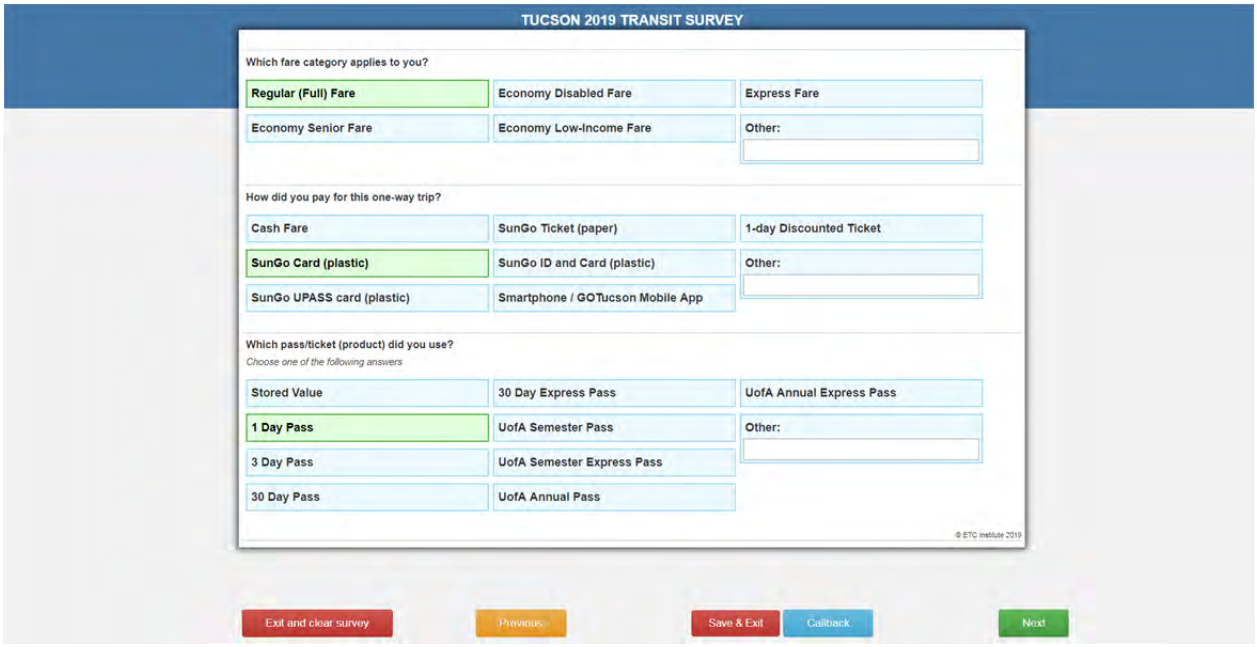

TUCSON 2019 TRANSIT SURVEY
Where will you GET OFF [ 1 Glenn/Swan WESTBOUND ] on this one-way trip?
Street Address
Park/Speedway
Latitude
32.236548
Longitude
-110.956869
User Stop
Enter a location here
Distance: 0.3mi
Clear
Me
Map
Satellite
SunTran 1 - Glenn/Swan
E Helen St
N Euclid Ave
N Tyndall Ave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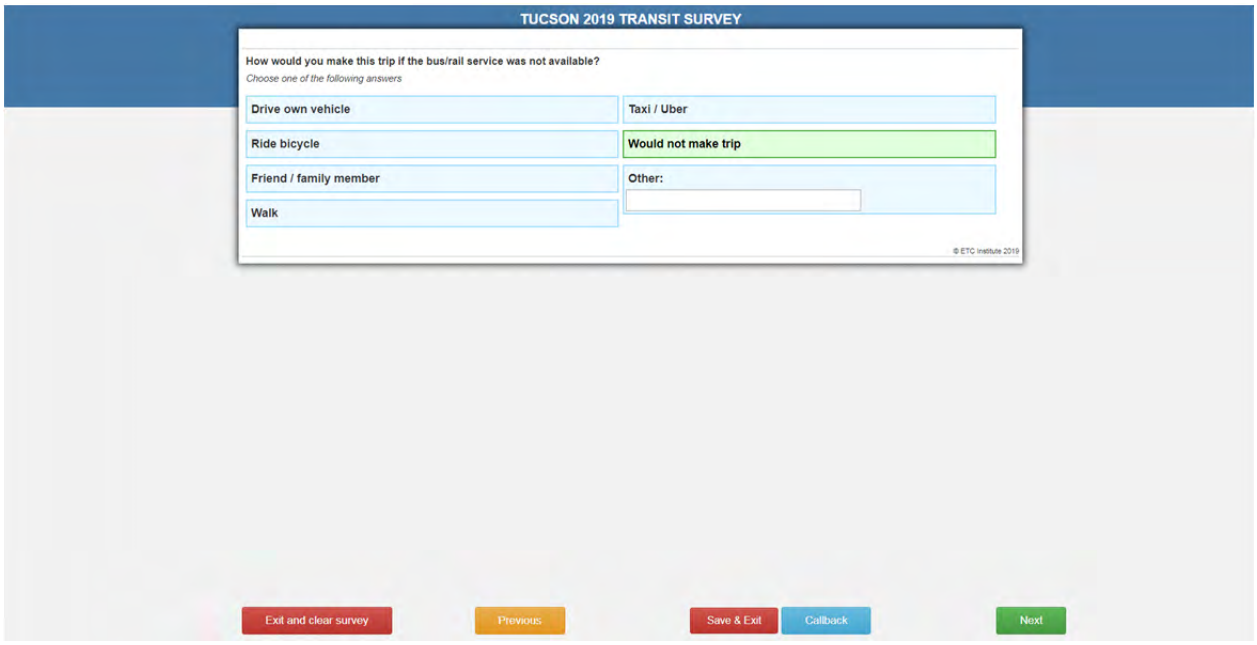
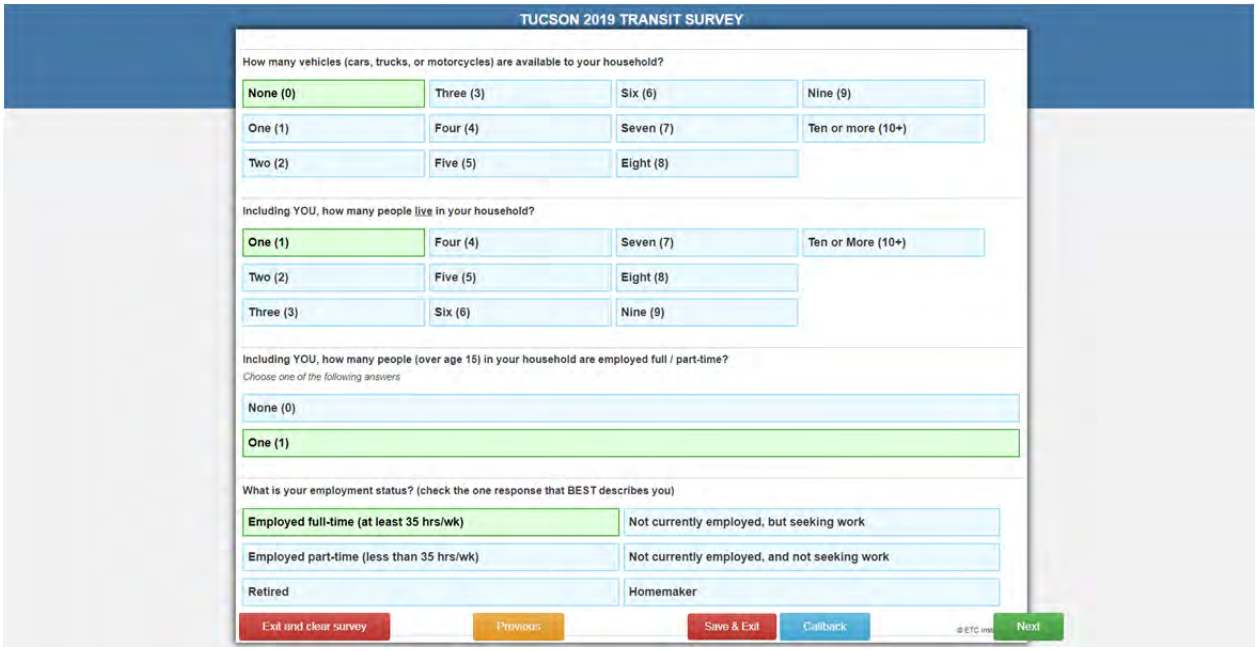
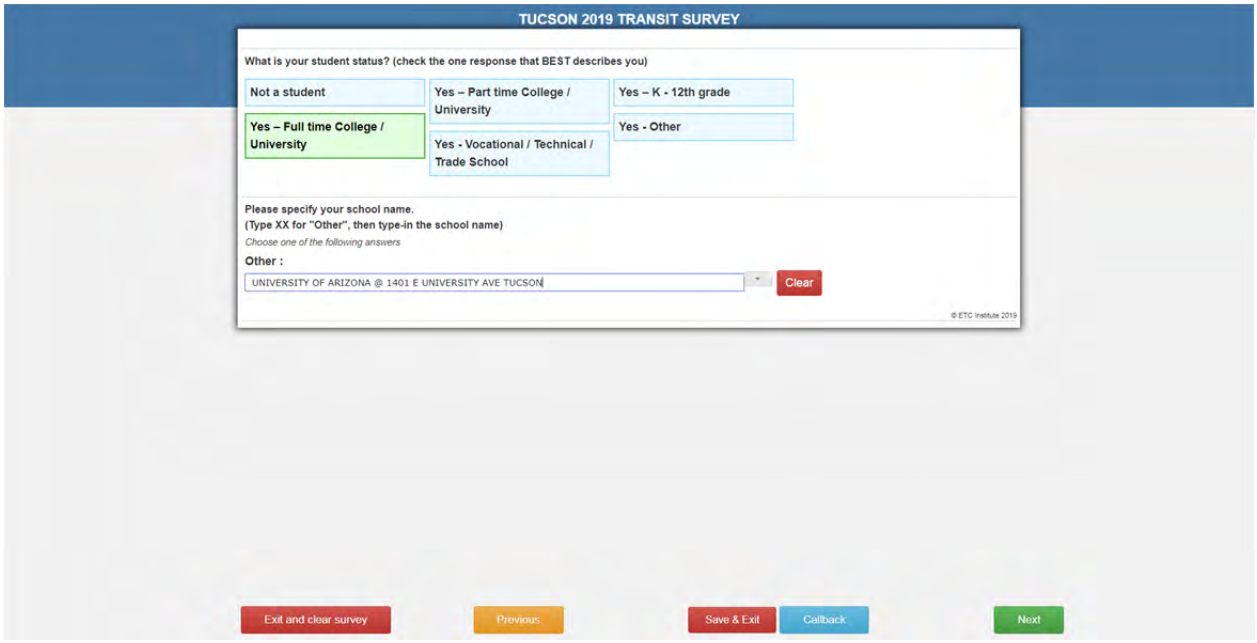
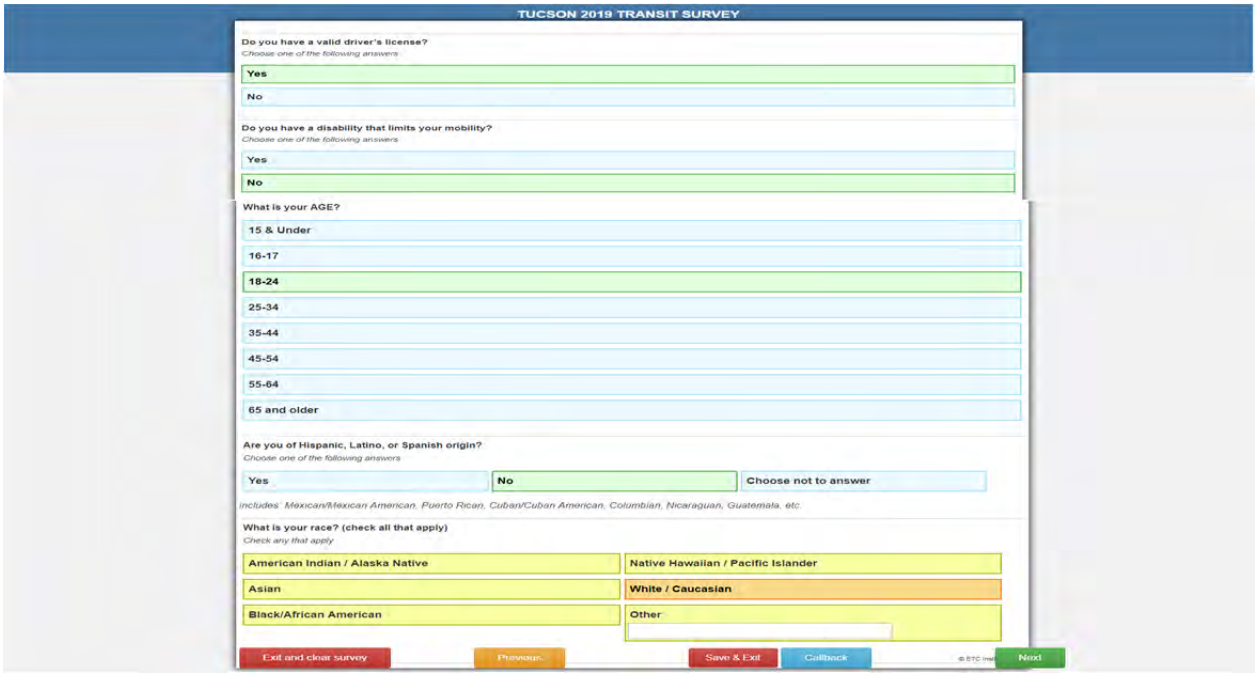
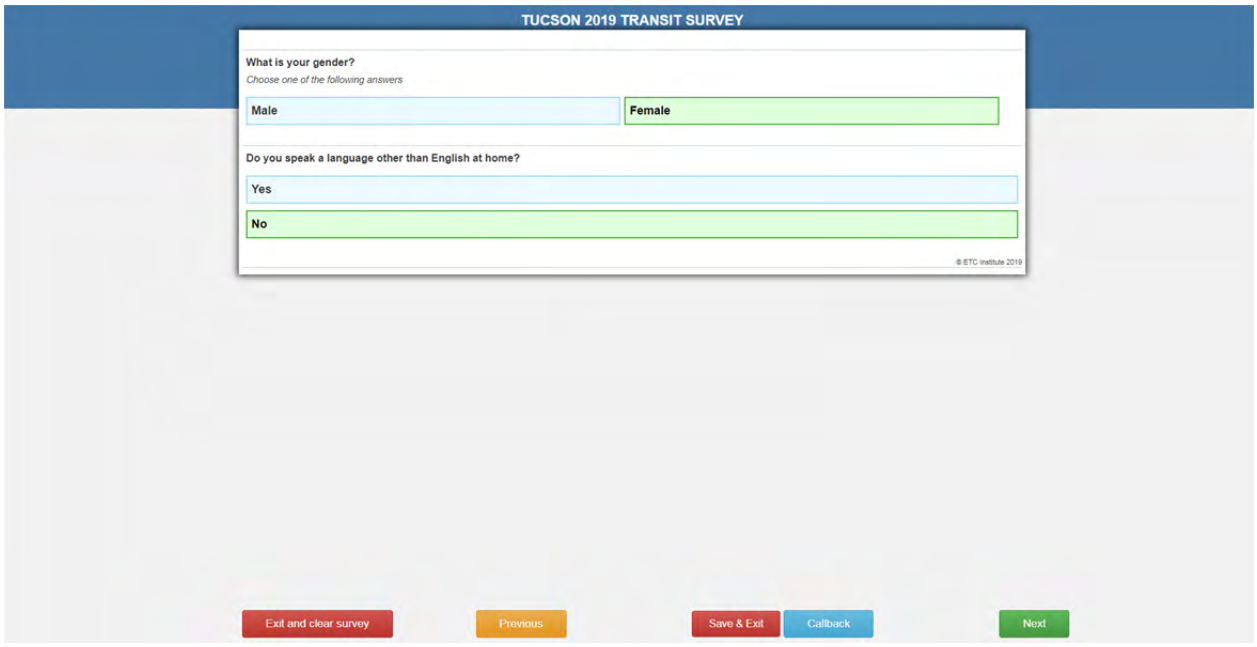
Exit and clear survey
Previous
Save & Exit
Callback
Next


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
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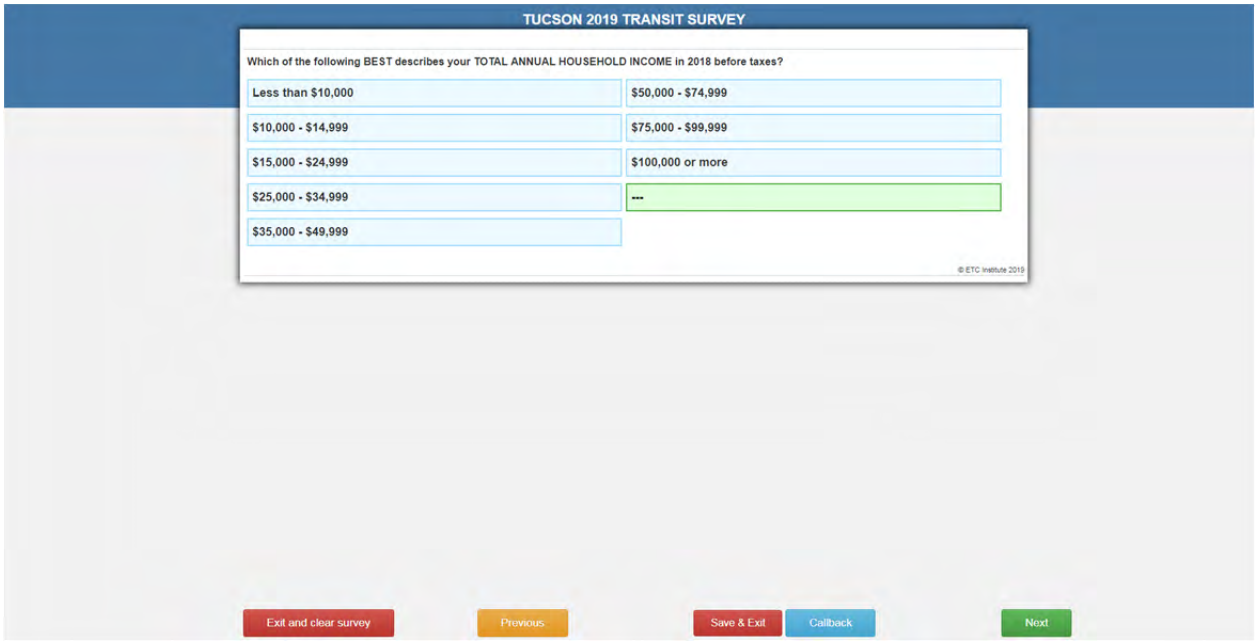
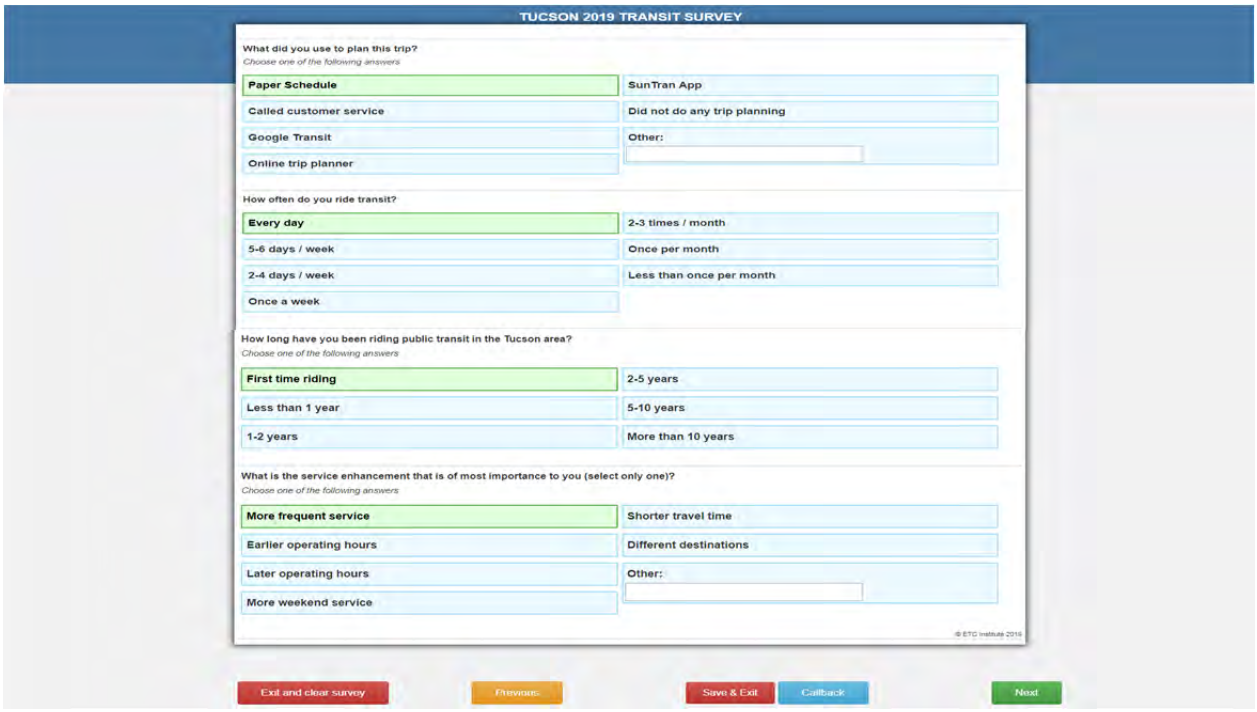
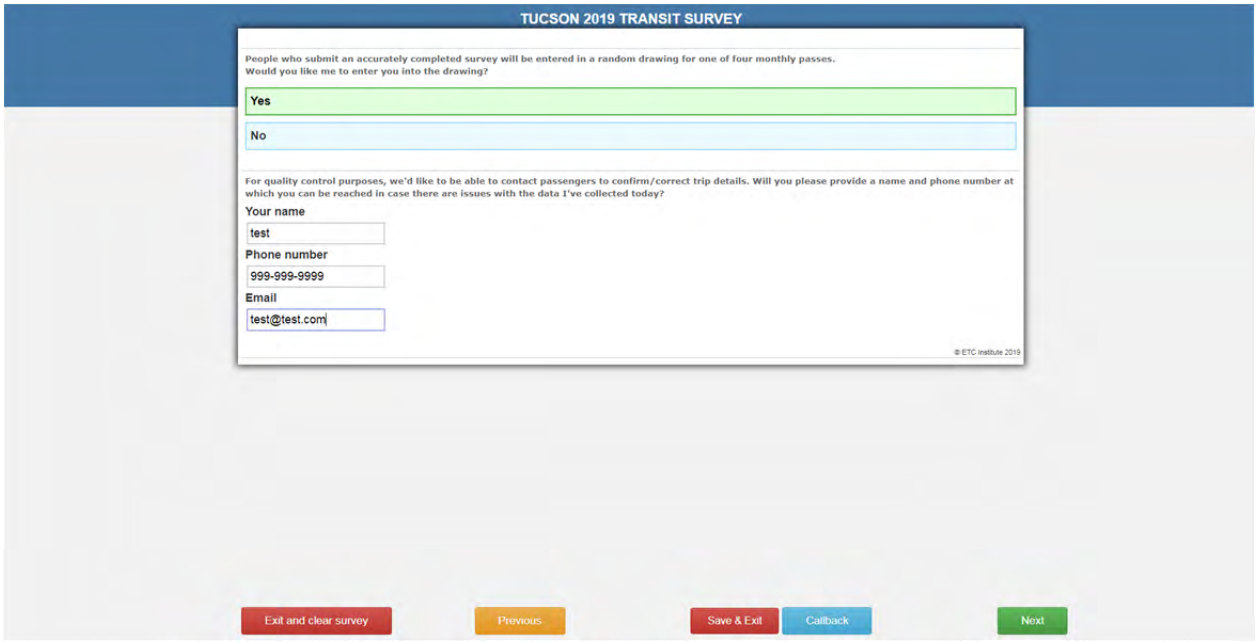
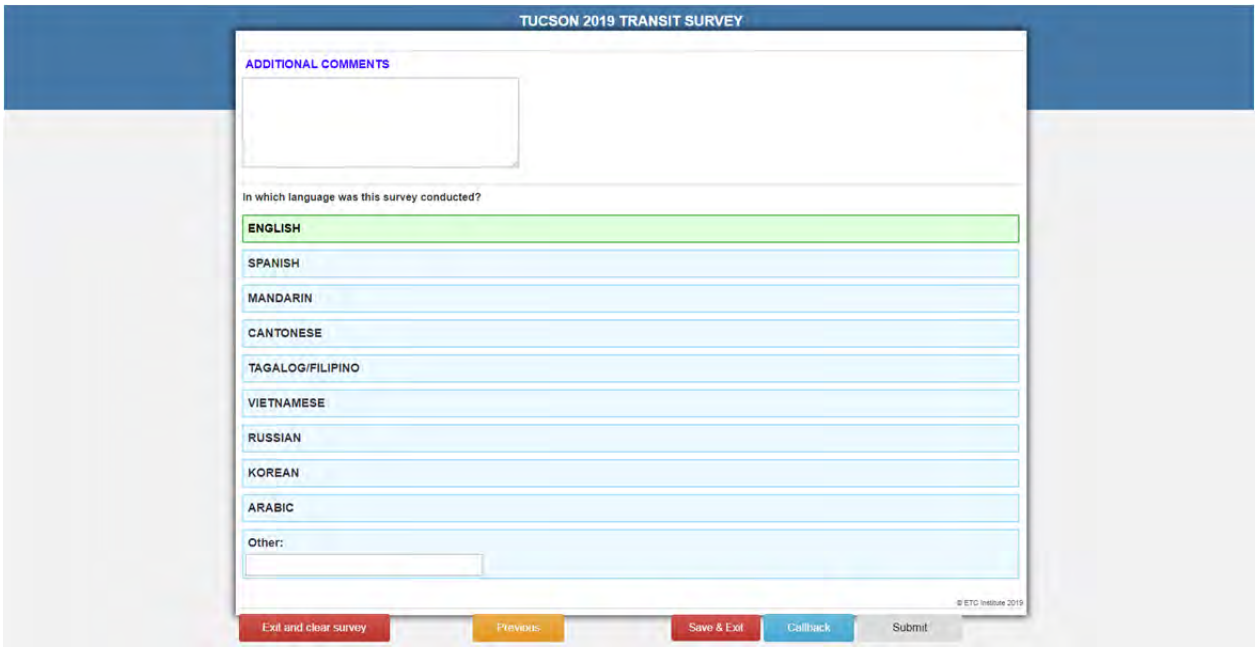
Exit and clear survey
Previous
Save & Exit
Callback
Next


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% |

# Appendix C: FTA Circular 4702.1B, Appendix K
# Service and Fare Equity Questionnaire Checklist
# Considerations for a Service Equity Analysis
# (App. K-1 – App. K-4)

# APPENDIX K

## SERVICE AND FARE EQUITY ANALYSIS QUESTIONNAIRE CHECKLIST (REQUIREMENT FOR TRANSIT PROVIDERS THAT OPERATE 50 OR MORE FIXED ROUTE VEHICLES IN PEAK SERVICE AND ARE LOCATED IN URBANIZED AREAS (UZA) OF 200,000 OR MORE PEOPLE, OR THAT OTHERWISE MEET THE THRESHOLD DEFINED IN CHAPTER IV)

## Background

Transit providers that operate 50 or more fixed route vehicles in peak service and are located in urbanized areas (UZA) of 200,000 or more people, or that otherwise meet the threshold defined in Chapter IV, must conduct a Title VI equity analysis whenever they plan a fare change and/or a major service change. Equity analyses are required regardless of whether proposed changes would cause positive or negative impacts to riders. In other words, transit providers must conduct an equity analysis for all fare changes and for major service reductions and major service expansions. Financial exigencies and other special circumstances (e.g., economic hardships, size of transit provider's service area or staff) do not exempt transit providers from the requirement to conduct equity analyses.

*The checklist below is provided for the purposes of guidance only.*

## Service and Fare Equity Questionnaire Checklist

### (1) Considerations for Service Equity Analysis

### *A. Major Service Change Policy*

- ❒ We have briefly and clearly stated our Major Service Change Policy.
- ❒ We have briefly and clearly explained how this particular service change meets or exceeds our Major Service Change Policy.
- ❒ Our Major Service Change Policy is presented as a numerical standard, applies to both service reductions and service increases, and is not set so high as to never require an analysis.
- ❒ We have included a description of the public engagement process for setting the major service change policy.
- ❒ We have included a copy of board meeting minutes or a resolution demonstrating the board's or governing entity or official(s)'s consideration, awareness, and approval of the major service change policy.

### *B. Adverse Effects*

- ❒ We have defined and analyzed adverse effects related to major service changes, paying attention to the fact that elimination of a route will likely have a greater adverse effect that a reduced frequency (headway change) in service. We have analyzed service between the existing and proposed service, and have considered the degree of the adverse effects when planning service changes.

### *C. Disparate Impact Policy*

- ❒ We have briefly and clearly stated our policy to determine when a "disparate impact" occurs in the context of major service changes, including both service reductions and/or expansions. In particular, our agency has established a threshold for determining whether adverse effects are borne disproportionately by minority populations.
- ❒ Our agency applies the disparate impact policy uniformly to all major service changes, regardless of mode.
- ❒ Our policy describes how we engaged the public in developing our policy for measuring disparate impacts.
- ❒ We have included a copy of board meeting minutes or a resolution demonstrating the board's or governing entity or official(s)'s consideration, awareness, and approval of the disparate impact policy.

### *D. Disproportionate Burden Policy*

- ❒ We have briefly and clearly stated our policy to determine when a disproportionate burden occurs in the context of major service changes. In particular, our agency has established a threshold for determining whether adverse effects are borne disproportionately by low-income populations.
- ❒ Our agency applies the disparate impact policy uniformly to all major service changes, regardless of mode
- ❒ Our policy describes how we engaged the public in developing the disproportionate burden policy.
- ❒ We have included a copy of board meeting minutes or a resolution demonstrating the board's or governing entity or official(s)'s consideration, awareness, and approval of the disproportionate burden policy.

### *E. Analysis Framework*

- ❒ We have described the dataset(s) used in the analysis and provided the reason for the dataset(s) selected, as well as the techniques and/or technologies used to collect the data.
- ❒ If using general population for the comparison population, we have described the geographic level (e.g., Census block, Census block group, TAZ, etc.) at which we have measured minority and low-income concentrations.
- ❒ If using ridership as the comparison population, we have described how we determined the minority and low-income ridership of affected routes and the system as a whole.

### *F. Assessing Impacts*

- ❒ We have shown how the proposed major service changes would impact minority and low-income populations at the geographic level by including the following:
  - **Overlay maps** showing proposed service changes as well as demographic data in order to study the affected population
  - **Tables** showing impacts associated with each type of route or service change (e.g., routing, frequency, span of service, addition or elimination of routes).
- ❒ We have used our adverse effects definition and our disparate impact policy and compared the proportion of minorities adversely affected to the proportion of non-minorities adversely affected.
- ❒ We have provided a step-by-step description of the analytical methodology we followed to determine whether the proposed change(s) would have a disparate impact on minority populations.
- ❒ We have identified whether minority populations will experience disparate impacts.
- ❒ If we have determined that a disparate impact exists, we have considered modifying our proposal to remove these impacts. If we modified our proposal, we have analyzed the modified proposal to determine whether minority populations will experience disparate impacts.
- ❒ If we have determined that a disparate impact exists and we will make the service changes despite these impacts, we have also:
  - Clearly demonstrated that we have a substantial legitimate justification for the proposed service changes; and

- Clearly demonstrated that we analyzed alternatives to determine whether the proposed service changes are the least discriminatory alternative.

❒ We have used our adverse effects definition and our disproportionate burden policy and compared the proportion of low-income persons adversely affected to the proportion of non-low-income persons adversely affected.

❒ We have provided a step-by-step description of the analytical methodology we followed to determine whether the proposed change(s) would have a disproportionate burden on low-income populations.

❒ We have identified whether low-income populations will experience disproportionate burdens.

❒ If we have determined that a disproportionate burden exists, we have also taken steps to avoid, minimize, or mitigate impacts where practicable. We have also described alternatives available to low-income passengers affected by the service changes.

- Note: Alternatives could include the availability of other lines or services, potentially involving transfers and/or other modes, which connect affected riders with destinations that they commonly access. Depending on the nature of impacts, service-related mitigation could include strategies such as alignment or frequency changes to nearby lines or services to offer more convenient access to affected areas.

❒ If we are proposing a service improvement, we have analyzed accrual of benefits for minority populations as compared to non-minority populations, and low-income populations as compared to non-low-income populations, using the comparison population we selected (i.e., ridership or service area).

❒ If service is proposed to be increased and/or expanded, but minority and/or low-income populations are not expected to benefit from the expansion as much as non-minority and/or non-low-income populations, then we have explained how our agency plans to improve service to the minority and/or low-income populations.

❒ We have described any plans our agency has developed to restore service as additional funds become available.