Title VI –
Fare Equity Analysis

Proposed Fare Changes Fiscal Year 2017

- SummerGO Youth Pass
- Annual Pass
- $25 for $20 Value Added Rebate Program

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Executive Summary and Purpose:

The Federal Transit Administration (FTA) requirements and guidelines as well as the City of Tucson's *Policy and Procedure for Solicitation and Consideration of Public comment on Fare Changes and Major Services Changes on Public Transportation,* require that any changes to fares including adding new permanent fare options or changes to media require a Title VI fare equity analysis.

Three promotional fares are being considered for inclusion in the permanent fare structure: the SummerGO Youth Pass, Annual Pass, and the $25 for $20 Value Added Rebate Program. The SummerGO and Annual passes were previously promotional fares, which were implemented for a period of six months under the City Manager's authority. The $25 for $20 Value Added Rebate Program is an ongoing promotion as directed by Mayor and Council during the fare change discussions, September 2016.

Based on the fare equity analyses performed, no disparate impact was determined for minority passengers and no disproportionate burden was determined for low-income passengers in any of the three fare options as proposed.

If approved, the SummerGO Youth Pass and Annual Pass would be available for sale within 30 days of approval. The stored value promotion will be evaluated upon completion of the promotion period for costs and public participation (usage) and possible inclusion in the permanent fare structure.

Background:

Staff completed a Title VI Fare Equity Analysis and held eight public input meetings, February 21, 2017 through March 8, 2017, on the potential conversion of three promotional fares into permanent fares:

- ***SummerGO Youth Pass*:** The SummerGO Youth Pass was a promotional pass program for the last two summers. Summer 2016, the pass was valid from May 22 to August 5. The cost of the pass was $45.00 with $15.00 going to the Parks and Recreation Department and $30.00 going to transit. This promotional product sold 1,473 passes in 2015 and 1,506 passes in 2016. The new permanent summer youth pass will be priced equivalent to a 30-day base fare pass, plus a new SunGO card for 76 calendar days.

- ***Annual Pass*:** The Annual pass promotional period of sale was from July through December 2015. Sixteen annual passes were sold. There are currently eight active passes; the last two expire on 8/1/2017. The new annual pass will be priced equivalent to 300 trips of the base fare for 365 consecutive days after first activated on a transit vehicle.

- ***$25 for $20 Value Added Rebate Program*:** This promotion was recommended by the Mayor and Council during the September 20, 2016 Mayor and Council Regular Session meeting and implemented on January 1, 2017. The promotion will run for six months at which time will be evaluated for permanent adoption as a fare option. This promotion requires that the rider has a registered SunGO card, places $20 in value on the registered card, and uses the value within 45 days. The rider would then contact Sun Tran through Customer Service via phone or the web comment portal using the "Sun GO $5 Rebate" drop down. SunGO techs will load the value after

researching that the $20 was loaded and used. Riders may apply for the $5 rebate every 45 days.

Staff recommends adding both the SummerGO Youth and Annual Passes to the permanent fare structure.

Title VI and Environmental Justice Considerations:

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*" complete a Fare Equity Analysis for all fare changes. On August 6, 2013, the City of Tucson adopted the *Policy and Procedure for Solicitation and Consideration of Public comment on Fare Changes and Major Service Changes on Public Transportation.* This policy establishes the requirement for an equity analysis on all fare changes and defines the Disparate Impact (i.e. non-discrimination of race, color, or national origin) and Disproportionate Burden (i.e. low-income) policies (see Appendix A – Resolution 22127 and *Policy and Procedure for Solicitation and Consideration of Public comment on Fare Changes and Major Service Changes on Public Transportation*).

The Fare Change and Major Service Change Policy defines thresholds for determining whether potential fare changes and major service changes will have an adverse effect based on a disparate impact or disproportionate burden for any proposed fare change, 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 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 that developed the major service change, disparate impact, and disproportionate burden policies

In addition to the public hearing on August 6, 2013, the following outreach activities were conducted prior to Mayor and Council's adoption of Resolution 22127 (*Policy and Procedure for Solicitation and Consideration of Public comment on 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
- Open houses were conducted on July 17 & 23, 2013
- 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.

The comments were documented from sixteen (16) telephone calls received by Sun Tran's Customer Service and four comments returned from seventeen (17) attendees at the July 2013 Open Houses, summarized as:

- Doing a good job complying with the established regulations
- Support the use of 20% as the threshold for disparate impact and disproportionate burden
- Advocate for a lower threshold for major service change
- Go beyond the newspaper notice for announcing the public hearing
- Provide explanation of the "Title VI" in advertisements

The policies were reviewed prior to acceptance for the 2016 Title VI Program and public comments were solicited online and at public open-house meetings. There were five (5) new comments received during the 16 public meetings (May 3 to June 17, 2016), via customer service, social media, or email in regards to maintaining the current policies for Fare Change, Major Service Change, Disparate Impact, and Disproportionate Burden.

Comments that were documented included:

- Comments support the 20% thresholds for minority populations and for disproportionate burden on low-income populations, and doing a good job, complying with the established regulations
- Comments advocate lower thresholds for minority populations and for disproportionate burden on low-income populations
- Comments request for non-traditional advertising in addition to traditional required newspaper notices of Title VI and Public Hearing processes, including definitions for public notices

Transit Program Goals and Objectives

The City of Tucson Transit Program has the following goals and objectives:

- Provide safe reliable service to the community within the fiscal constraints determined by the City of Tucson Mayor and Council via the City Manager's Office, Department of Transportation - 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 Frequent Transit Network
  - 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 Frequent Transit Network

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 2016 On-Board Transit Survey, completed by ETC Institute on August 2016 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: 36.98 percent (36.98%) Hispanic, 12.57 percent (12.57%) Black or African American, 6.59 percent (6.59%) American Indian, less than two percent (1.99%) were Asian, with 44.54 percent (44.54%) identified as White/Caucasian with no other ethnicity or race included. Table 1 also identifies the percentages of riders who identified their race and ethnicities for Sun Link and Sun Shuttle.

Percentage Minority* per 2016 On-Board Survey (Based on Unlinked Weight Factor)						
System(s)	**Black / African American**	**American Indian / Alaskan Native**	**Asian**	**Native Hawaiian / Pacific Islander**	**Hispanic**	**Non-Minority**
Sun Tran	12.57%	6.59%	1.99%	0.39%	36.98%	45.80%
Sun Link	7.37%	2.10%	8.62%	0.12%	20.80%	49.70%
Sun Shuttle	4.97%	24.15%	0.58%	0.00%	20.17%	60.98%

Table 1: 2016 On-Board Survey Minority percentages

*note: percentages do not add to 100% as individuals could mark all race/ethnicities that applied.

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 survey respondents for the three transit systems combined that identified themselves as minority was 52.4 percent (52.4%) and the number of respondents who identified their households as meeting the low-income thresholds were 35 percent (35.0%) for the overall transit systems.

Analysis and Fare Usage

Fare equity analysis requires the fare media be evaluated based on information from ridership surveys, indicating the percentage of riders that are minority and/or low-income. This information is used to determine if they are disproportionately more likely to use a mode of service, payment type, or fare media that may be subject to change. Each analysis includes a profile of the groups expected to use the method or media to pay their fare. The tables 2, 3, and 4 below indicate the fare payment method or type by income and/or minority usage.

Surveys by Payment Method	Low-Income	Refused / Unknown*	Non-Low-Income	Percentage of Total
Cash Fare (Single Trip)	19.4%	2.5%	11.6%	33.5%
Value on SunGo card	6.4%	1.5%	6.1%	14.0%
Value on SunGo ID & Card	11.5%	1.3%	3.8%	16.6%
1 Day Pass	2.3%	0.7%	1.4%	4.3%
1-day non-profit agency ticket	0.3%	0.0%	0.1%	0.4%
30-day full fare pass	4.9%	0.5%	3.4%	8.9%
30-day full fare ticket	0.9%	0.1%	0.8%	1.8%
30-day economy fare pass	8.6%	0.4%	1.5%	10.6%
30-day economy fare ticket	0.6%	0.0%	0.2%	0.9%
30-day express pass	0.1%	0.0%	0.8%	1.0%
GoTucson Mobile app / Smart Phone	1.0%	0.1%	0.5%	1.6%
University annual pass	1.0%	0.2%	1.1%	2.3%
University semester pass	2.2%	0.2%	1.1%	3.4%
University semester express pass	0.1%	0.0%	0.0%	0.2%
University annual express pass	0.2%	0.0%	0.2%	0.4%
Total	59.7%	7.5%	32.8%	100.0%

Table 2: 2016 On-Board Survey Fare Payment Method by Income

*note: Refused and Unknown respondents were included to represent the full population surveyed.

The percentages shown in the table above indicate the percentage of users within an individual fare or period pass category. For example, nine percent (8.9%) of all passengers pay with a 30-day full fare pass. Of this nine percent, five percent (4.9%) were considered low-income and three percent (3.4%) were not. This information was based on the overall reported household income as part of the 2016 On-Board Survey. These percentages are used to determine the impact of any fare change on that usage group.

The SummerGO Youth Pass, Annual Pass, and $25 for $20 Value Added Rebate Program promotional programs were not in existence at the time of the onboard survey. Therefore, the following analyses are based on fare type and the rider population the pass program is targeting. As previously noted, Survey respondents were asked to identify their household incomes. The City of Tucson in the 2016 Title VI Program, identified individuals with a Household Income less than $25,000 as low-income and individuals with a Household Income $25,000 or greater as non-low-income. This designation for the purpose of service and fare equity analyses is separate from Economy Fares. Economy fares users are those individuals or families that have been formally approved by application at the Special Services Office (35 W. Alameda). These requirements are based on proof of qualified disability, age of 65 or older (senior), Medicare cardholder, or annually qualified by income, from the Arizona Department of Economic Security, Social Security, and/or the U.S. Department of Labor's Lower Living Standard Income Level (LLSIL) table. The Non-Economy Fare is calculated from Base (Full) Fare and Express Fare identified riders. The tables 3 and 4 below show the Fare Types, specifically, Economy and Non-Economy Fares Riders, in relation to Minority vs Non-Minority and Income under $25,000 (low-income) vs Income over $25,000 (non-low-income).

The SummerGO Youth pass will be available to any student ages six (6) to eighteen (18) regardless of income. The Annual Pass and the $25 for $20 Value Added Rebate Program are targeted to riders paying Full Fare (Non-Economy Fare Riders). Economy Fare 30-day rolling passes for one year (12-months) are priced at less than half of the cost of an Annual Pass. Economy riders receive a substantial discount from Full Fare. The purpose of the $25 for $20 value added rebate program is to encourage infrequent riders to ride more often.

Please note that all percentages throughout the remainder of this document are rounded for ease of reading. All calculations were completed using an Excel spreadsheet. Any slight errors in subtraction are results of rounding to a whole number.

All Surveyed Passengers - Sun Tran / Sun Shuttle / Sun Link			
Household Income based on Payment Type	**Economy Fare Riders Percentage of Total**	**Non-Economy Fare Riders Percentage of Total**	**Percentage of Total**
Income under $25k	27.1%	32.54%	59.67%
Refused or did not know	1.9%	5.67%	7.54%
Income over $25k	6.0%	26.83%	32.79%
Percentage of total population	35.0%	65.0%	100.00%

Table 3: Income per Economy Fare and Non-Economy Fare users

All Surveyed Passengers - Sun Tran / Sun Shuttle / Sun Link			
Payment Type and Minority	**Minority**	**Non-Minority**	**Percentage of Total**
Economy Fare Riders	51.2%	48.8%	37.7%
Non-Economy Fare Riders	53.1%	46.9%	62.2%
Total population regardless of payment type	52.4%	47.6%	100.0%

Table 4: Minority per Economy Fare and Non-Economy Fare users

Proposed Fare Changes:

Current and Proposed Fare Change/Additions:

As noted above the fare products discussed below have only been available through promotions. These fare products are proposed to be included in the City of Tucson Transit Fare Policy.

SummerGO Youth Pass:

The SummerGO Youth Pass was priced at $45.00 the previous summer (e.g. 2016), and does not have a change in price. It will be priced equivalent to 30 trips of the Base Fare plus media fee. This value would be $45.00 plus the $2.00 SunGO card media fee. SummerGO pass participants are encouraged to register the SunGO card. Registered cards receive $2.00 in value added to the card when first registered, returning the media fee. If a registered card is lost or stolen, a new SummerGO Youth Pass will be issued at no charge for the remainder of the period. This assures that there is no change in price from the promotional period and such no change in cost was evaluated. However, differences between potential Minority and Non-Minority users and potential Low-Income and Non-Low Income users were evaluated.

Assumptions:

It was assumed that potential users were those students and youth identified in the 2016 On-Board Survey less than 18 years of age, that currently use the system. Tables 5 and 6 indicate all youth survey participants were compared for disparate impact to minorities or disproportionate burden for low-income users.

Youth under 18 years of age	Total Survey Pop %	Minority	Non-Minority	Difference (Minority vs Non-Minority)
15 or under	1.38%	0.47%	0.91%	-0.44%
16-17	3.89%	1.66%	2.23%	-0.57%
Total for Youth Populations	5.27%	2.13%	3.14%	-1.01%

Table 5: Youth Age Categories from 2016 On-Board Survey for Minority

Youth under 18 years of age	Refused or did not know	Low Income (Under $25k)	Non-Low Income (Over $25k)	Difference (Low Income vs. Non-Low Income)
Economy fare (income & disabled)	2.90%	13.50%	7.20%	6.30%
Non-economy fare (base & express fare)	20.70%	25.20%	30.50%	-5.30%
Total for Youth Populations	23.56%	38.70%	37.74%	0.96%

Table 6: Youth Age Categories from 2016 On-Board Survey for Income vs Fare Payment Type

Youth under 18 years of age constitutes five percent (5.27%) of the total ridership. Fifty-two percent (52.4%) of all surveyed transit ridership are minority with 73 percent (72.6%) of all youth under 18 years of age being part of the minority population. The percentage of the youth population in comparison to the overall population was used to calculate the differences between minority or non-minority and income under $25,000 or income over $25,000 potential users. The calculated difference of negative one percent (-1.01%) for potential Minority users vs Non-Minority users is less than the 20 percent (20%) threshold policy for Disparate Impact. Moreover, the calculated difference of one percent (0.96%) for income of Non-Economy Fare Users is less than the 20 percent (20%) threshold policy for Disproportionate Burden based on income. **Therefore, the addition of the SummerGO youth pass would not create a Disparate Impact to minority students or a Disproportionate Burden for low-income students**.

The SummerGO pass is the only youth specific fare or pass within the Regional Fare System. This pass will benefit all youth regardless of race, ethnicity, or income. The closest comparable products would be three 30-day rolling passes. The cost of three Economy Fare 30-day rolling passes would be more than the SummerGO pass, even though it has 14 fewer calendar days. The pass also includes the benefit of City of Tucson Pool admission.

Annual Pass:

The Annual Pass was priced the same as the College Annual Pass during the promotion period. It will be priced at $450.00 and as such does not have a change in price. The Transit Fare Policy will reflect the pass to be priced equivalent to 300 trips of the Base Fare. The pass will provide unlimited rides for 365 consecutive calendar days after the first activation on transit vehicles and offers an alternative to the current 1-Day Pass and 30-Day Full Fare rolling pass options for passengers who ride regularly throughout the year. As there was no change in pricing from the promotional period, no change in cost was evaluated. However, differences between potential Minority and Non-Minority users and potential Low-Income and Non-Low Income users were evaluated.

Assumptions:

It was assumed that potential users were Non-Economy Fare riders. Those individuals that are qualified under the Economy Fare Program, Low-Income Families, Seniors, or Persons with Disabilities would not participate in an Annual Pass program. Economy Fare 30-day rolling passes for one year (12-months) is priced at less than half of the Annual Pass. Tables 7 and 8 indicate all survey participants from the 2016

On-Board survey that were in this demographic. They were compared for disparate impact to minorities or disproportionate burden for low-income users.

All Surveyed Passengers - Sun Tran / Sun Shuttle / Sun Link				
Payment Type and Minority	Minority	Non-Minority	Total Population Percentage	Difference (Minority vs Non-Minority)
Economy Fare	51.2%	48.8%	37.7%	2.4%
Non-Economy Fare Riders	53.1%	46.9%	62.3%	6.1%
Total population regardless of payment type	52.4%	47.6%	100%	4.8%

Table 7: 2016 On-Board Surveys Minority / Non-Minority by Fare Payment Type (Economy vs. Non-Economy)

All Surveyed Passengers - Sun Tran / Sun Shuttle / Sun Link	Refused or did not know	Low Income (Under $25k)	Non-Low Income (Over $25k)	Difference (Low Income vs Non-Low Income)
Economy fare (income & disabled)	1.9%	27.1%	6.0%	21.2%
Non-economy fare (base & express fare)	5.67%	32.54%	26.8%	5.72%
Percentage of total population	7.5%	59.7%	32.8%	

Table 8: 2016 On-Board Surveys for Income vs. Fare Payment Type

The overall population for the three transit systems was used to calculate the differences between minority or non-minority and income under $25,000 or income over $25,000 potential users. The calculated difference of six percent (6.1%) for potential Minority users vs Non-Minority users is less than the 20 percent (20%) threshold policy for Disparate Impact. Moreover, the calculated difference of six percent (5.72%) for income of Non-Economy Fare Users is less than the 20 percent (20%) threshold policy for Disproportionate Burden based on income. **Therefore, the addition of the Annual pass would not create a Disparate Impact to minority users or a Disproportionate Burden for low-income users**.

The Economy Fare minority users or users based on income were not used in this analysis. The Annual pass is not eligible to be loaded on a SunGO ID and card, which are used only by Economy Fare users. As noted above, it would not be cost effective for Economy Fare individuals to purchase the Annual Pass. Economy Fare riders would be encouraged to purchase the 30-day Economy Fare rolling passes.

$25 for $20 Value Added Rebate Program:

The Mayor and Council during the fare change discussions in September 2016 recommended a promotion to provide an incentive for infrequent full fare passengers. This promotion would be advertised to encourage infrequent riders to consider riding transit more frequently as one of their transportation modes. This promotion is ongoing until June 30, 2017. The conditions of the program are that users load $20 in stored value onto their SunGO card and use the value within 45 calendar days. This promotion is not available to users with a SunGO ID and Card, which are used by qualified Economy Fare users. Once the value is used, the individual contacts Customer Service via phone or through the web portal, using the "SunGO $5 Rebate" dropdown. The request is researched and value is added to the individual's card. Riders may qualify for the $5 rebate once every 45 calendar days. As this was a new promotion of its kind there is no pricing change to compare, as such no change in cost was evaluated. However, differences between potential Minority and Non-Minority users and potential Low-Income and Non-Low Income users were evaluated.

Assumptions:

It was assumed that potential users were Non-Economy Fare riders. Those individuals that are qualified under the Economy Fare Program, Low-Income Families, Seniors, or Persons with Disabilities are not eligible to participate in the program. The rebate program is priced if used completely, similar to the Economy Fare if stored value is loaded on the SunGO ID and card. Tables 9 and 10 indicate all survey participants from the 2016 On-Board survey that were in this demographic. They were compared for disparate impact to minorities or disproportionate burden for low-income users.

All Surveyed Passengers - Sun Tran / Sun Shuttle / Sun Link				
Payment Type and Minority	Minority	Non-Minority	Total Population Percentage	Difference (Minority vs. Non-Minority)
Economy Fare	51.2%	48.8%	37.7%	2.4%
Non-Economy Fare Riders	53.1%	46.9%	62.3%	6.1%
Total population regardless of payment type	52.4%	47.6%	100%	4.8%

Table 9: 2016 On-Board Surveys Minority / Non-Minority by Fare Payment Type (Economy vs. Non-Economy)

All Surveyed Passengers - Sun Tran / Sun Shuttle / Sun Link	Refused or did not know	Low Income (Under $25k)	Non-Low Income (Over $25k)	Difference (Low Income vs Non- Low Income)
Economy fare (income & disabled)	1.9%	27.1%	6.0%	21.2%
Non-economy fare (base & express fare)	5.67%	32.54%	26.8%	5.72%
Percentage of total population	7.5%	59.7%	32.8%	

Table 10: 2016 On-Board Surveys for Income vs. Fare Payment Type

The overall population for the three transit systems was used to calculate the differences between minority or non-minority and income under $25,000 or income over $25,000 potential users. The calculated difference of six percent (6.1%) for potential Minority users vs Non-Minority users is less than the 20 percent (20%) threshold policy for Disparate Impact. Moreover, the calculated difference of six percent (5.72%) for income of Non-Economy Fare Users is less than the 20 percent (20%) threshold policy for Disproportionate Burden based on income. **Therefore, the $25 for $20 Value Added Rebate Program does not create a Disparate Impact to minority users or a Disproportionate Burden for low-income users**.

The Economy Fare minority users or users based on income were not used in this analysis. As noted above the $25 for $20 Value Added Rebate program is not eligible to be loaded on a SunGO ID and card, which are used only by Economy Fare users. Economy Fare riders would be encouraged to purchase stored value or the 30-day Economy Fare rolling pass.

Fare Equity Analysis Conclusions:

No disparate impact for minority passengers or disproportionate burden for low-income passengers was found for the proposed permanent fare products or the promotional rebate program. Staff recommends adding the two fare products (SummerGO, Annual Pass) discussed to the permanent fare system. Staff also recommends evaluating the $25 for $20 Value Added Rebate Program for future consideration.

Appendices

Appendix A – City of Tucson, Resolution Number 22127
Policy and Procedure for Solicitation and Consideration of Public comment on Fare Changes and Major Service Changes on Public Transportation

City of Tucson Policy and Procedure for Solicitation and Consideration of Public Comment on Fare Changes and Major Service Changes on Public Transportation

I. Purpose of the Policy:

The Federal Transit Administration (FTA) Circular 4702.1B, "*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.

III. Requirements:

a) Fare Changes:

A public hearing must be held if there is any fare change to any of the public transportation modes (e.g., Sun Tran, Sun Van, or Sun Link). For changes to existing transit fares, the FTA requires all City of Tucson transit providers (e.g., 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 (e.g., 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 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.

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:

A major service change (thresholds) is defined as any change in service that would add or eliminate more than:

1. Twenty-five percent (25%) or more of the route revenue miles on any individual route; or

2. Twenty-five percent (25%) or more of the route revenue hours on any individual route; or

3. Twenty-five percent (25%) or more of the ridership on any individual route (based on the most recent route survey or sample).

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.

- 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.

c) Public Notice Requirements:

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 in the newspaper of general circulation in the urbanized area. Two notices will be published at least thirty (30) days prior to the hearing and the second one at least five (5) days prior to the hearing. 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. Public transportation users will be notified through placards or notices on the vehicles, all outlets selling bus passes, and all transit centers. 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 (e.g., elimination of route, shortlining 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.

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 (e.g. 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 (e.g. 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.

c) 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) <u>Disproportionate Burden Policy</u>

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.

ADOPTED BY THE
MAYOR AND COUNCIL

August 6, 2013

RESOLUTION NO. 22127

RELATING TO TRANSPORTATION; APPROVING CITY OF TUCSON POLICY AND PROCEDURE FOR SOLICITATION AND CONSIDERATION OF PUBLIC COMMENT ON FARE CHANGES AND MAJOR SERVICE CHANGES ON PUBLIC TRANSPORTATION; RESCINDING RESOLUTION NO. 15460 DATED OCTOBER 8, 1990; AND DECLARING AN EMERGENCY.

WHEREAS, at the start of Federal Fiscal Year 2013, the Federal Transit Administration ("FTA") updated their Title VI requirements and guidelines; and

WHEREAS, as a recipient of FTA financial assistance, the City of Tucson is required to comply with all Title VI requirements; and

WHEREAS, the updated FTA Title VI requirements mandate that transit providers such as the City of Tucson adopt revised policies on Fare Change, Major Service Change, Disparate Impact, and Disproportionate Burden.

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 attached "City of Tucson Policy and Procedure for Solicitation and Consideration of Public Comment on

Fare Changes and Major Service Changes on Public Transportation", attached hereto as Exhibit A.

SECTION 2. Resolution No. 15460 dated October 8, 1990, is hereby rescinded.

SECTION 3. The various City officers and employees are authorized and directed to perform all acts necessary or desirable to give effect to this Resolution.

SECTION 4. WHEREAS, it is necessary for the preservation of the peace, health and safety of the City of Tucson that this Resolution become immediately effective, an emergency is hereby 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, August 6, 2013.

_____
MAYOR

ATTEST:

_____
CITY CLERK

APPROVED BY:

_____
CITY ATTORNEY

REVIEWED BY:

_____
CITY MANAGER

DF/mgs
7/23/13

Appendix B – 2016 City of Tucson On-Board Survey

2016 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

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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 of Pima County

1 Executive Summary

The City of Tucson conducted a transit on-board survey during the spring of 2016. The purpose of this project was to gather updated travel behavior data from transit users that encompasses all streetcar and bus fixed route services in the City of Tucson. The data will be used for the following purposes:

- 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. High Capacity Transit Study);
- Assist in fulfilling the City of Tucson's commitment to update Pima Association of Governments' Regional Travel Model; and,
- Meet the Title VI Civil Rights Requirements per the latest Federal Transit Administration (FTA) guidance.

The goal was to obtain at least 6,200 Origin-Destination completed surveys. Of those, 5,800 were to be completed with Sun Tran and Sun Shuttle passengers and 400 were to be completed with Sun Link passengers. The actual number of completed Origin-Destination surveys was 7,912. Of these, 7,067 were completed with Sun Tran and Sun Shuttle passengers and 845 were completed with Sun Link passengers.
The objectives of the 2016 Origin-Destination (OD) Survey analysis were two-fold: (1) examine the demographics, and (2) 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 the average bus/streetcar riders are the following: (includes findings from combined Sun Tran, Sun Shuttle, and Sun Link)

- Just over half (53.02%) of riders do not have a working vehicle in their household.
- Sixty nine percent of riders (69.38%) do not have a vehicle they could have used on their one-way trip.
- Seventy six percent of riders (76.26%) indicated they are not a student.
- Sixty three percent (63.13%) of riders are employed either full time or part time.
- Forty seven percent (46.78%) of riders indicated that they do have a valid driver's license.
- The highest frequency riders were between the ages of 25-34 years old (26.29%), while 18-24 years old were the second highest age range (21.83%).

- The majority, at 77.65%, of riders make less than $35,000 per year for their overall household income.
- Fifty three percent (52.78%) of riders indicated they are male, while 47.16% indicated they are female and 0.06% indicated “Don’t Know / Refuse”.
- Ninety two percent (91.81%) of riders indicated they did not have any type of disability that limits their mobility.
- Seventy one percent (70.92%) of riders specified their race/ethnicity is “White”.
- Seventy seven percent (77.49%) of riders do not speak another language other than English at home.
- The majority of riders got from their Origin to the very first place they boarded the bus they were being surveyed on by Walking (94.56%).
- Walking was the preferred method for riders to get from their Alighting location to their final destination (95.49%).
- Seventy four percent (73.66%) of riders used no additional transfers for their one-way trip.
- Eighty nine percent (89.11%) 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 (54.13%) of Sun Tran riders do not have a working vehicle in their household.
- Seventy three percent of Sun Tran riders (73.47%) do not have a vehicle they could have used on their one-way trip.
- Seventy nine percent of riders (79.09%) indicated they are not a student.
- Approximately sixty four percent (63.94%) of riders are employed either full time or part time.
- Fifty one percent (51.26%) 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 (27.14%), while 18-24 years old were the second highest age range (19.38%) followed very closely by 35-44 years old (19.19%).
- The majority, at 78.39%, of Sun Tran riders make less than $35,000 per year for their overall household income.

- Fifty three percent (53.26%) of Sun Tran riders indicated they are male, while 46.72% indicated they are female and 0.02% indicated “Don’t Know / Refuse”.
- Ninety two percent (91.65%) of riders indicated they did not have any type of disability that limits their mobility.
- Seventy one percent (70.77%) of Sun Tran riders specified their race/ethnicity is “White”.
- Seventy eight percent (77.55%) of Sun Tran riders do not speak another language other than English at home.
- The majority of Sun Tran riders got from their Origin to the very first place they boarded the bus they were being surveyed on by Walking (94.79%).
- Walking was the preferred method for riders to get from their Alighting location to their final destination (95.59%).
- Seventy two percent (72.36%) of Sun Tran riders used no additional transfers for their one-way trip.
- Nearly ninety percent (89.49%) 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:

- Fifty seven percent (57.00%) of Sun Shuttle riders do not have a working vehicle in their household.
- Seventy nine percent of Sun Shuttle riders (78.55%) do not have a vehicle they could have used on their one-way trip.
- Ninety percent of riders (90.24%) indicated they are not a student.
- Approximately fifty percent (49.85%) of riders are employed either full time or part time.
- Forty eight percent (48.24%) of Sun Shuttle riders indicated that they do have a valid driver’s license while 2% indicated “Unknown”.
- The highest frequency rider for the Sun Shuttle service were between the ages of 25-34 years old (26.23%), while 35-44 years old were the second highest age range (20.33%).
- The majority, at 62.28%, of Sun Shuttle riders make less than $25,000 per year for their overall household income.
- Forty six percent (46.44%) of Sun Shuttle riders indicated they are male, while 49.48% indicated they are female and 4.07% indicated “Don’t Know / Refuse”.

- Seventy three percent (73.31%) of riders indicated they did not have any type of disability that limits their mobility.
- Sixty eight percent (67.54%) of Sun Shuttle riders specified their race/ethnicity is “White”.
- Ninety one percent (90.57%) of Sun Shuttle riders do not speak another language other than English at home.
- The majority of Sun Shuttle riders got from their Origin to the very first place they boarded the bus they were being surveyed on by Walking (91.08%).
- Walking was the preferred method for riders to get from their Alighting location to their final destination (92.13%).
- Seventy one percent (71.43%) of Sun Shuttle riders used no additional transfers for their one-way trip.
- Nearly ninety three percent (92.78%) 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 six percent (35.67%) of Sun Link riders do not have a working vehicle in their household.
- Twenty four percent of Sun Shuttle riders (24.28%) do not have a vehicle they could have used on their one-way trip.
- Thirty one percent of riders (31.38%) indicated they are not a student.
- Approximately fifty three percent (52.58%) of riders are employed either full time or part time.
- Eighty three percent (83.31%) of Sun Link riders indicated that they do have a valid driver’s license.
- The highest frequency riders for the Sun Link service were between the ages of 18-24 years old (58.85%), while 25-34 years old were the second highest age range (13.90%).
- Half (50.78%) of Sun Link riders make less than $15,000 per year for their overall household income.
- Forty seven percent (46.65%) of Sun Link riders indicated they are male, while 53.23% indicated they are female and 0.12% indicated “Don’t Know / Refuse”.
- Ninety seven percent (96.83%) of riders indicated they did not have any type of disability that limits their mobility.

- Seventy four percent (74.01%) of Sun Link riders specified their race/ethnicity is “White”.
- Nearly seventy five percent (74.89%) of Sun Link riders do not speak another language other than English at home.
- The majority of Sun Link riders got from their Origin to the very first place they boarded the bus they were being surveyed on by Walking (91.59%).
- Walking was the preferred method for riders to get from their Alighting location to their final destination (94.49%).
- Ninety three percent (93.06%) of Sun Link riders used no additional transfers for their one-way trip.
- Eighty three percent (83.12%) of Sun Link riders either began their trip, or ended their trip, at home.

2 Survey Overview

The 2016 City of Tucson (the City) Onboard Transit Survey involved two types of onboard surveys with bus and streetcar riders in the Tucson service area. Surveys were conducted on the Sun Tran, Sun Shuttle and Sun Link services.

The survey consisted of two major elements. On-to-Off Counts, which are intended to identify boarding and alighting patterns of transit riders as well as provide a basis for expanding the results of the Origin-Destination (OD) Survey. And the OD Survey, which consisted of detailed surveys of riders conducted onboard streetcar and bus routes. Overall, the contracted goals were to complete 690 Sun Link On-to-Off Counts (30% of ridership) and approximately 6,200 Origin-Destination (OD) Surveys for all services combined. Ultimately, over 900 Sun Link On-to-Off Counts and over 7,900 OD Surveys combined for Sun Tran, Sun Link, and Sun Shuttle were completed. 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 of 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 in order 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

In addition to the required questions above, if a respondent was not a visitor, a record also needed approximately 80% of the demographic questions answered to be considered complete. Visitors were exempt from a portion of the demographic questions pertaining to their specific household.

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. The database was expanded to the total average daily ridership which equals 62,245.

3.1 Demographic Characteristics

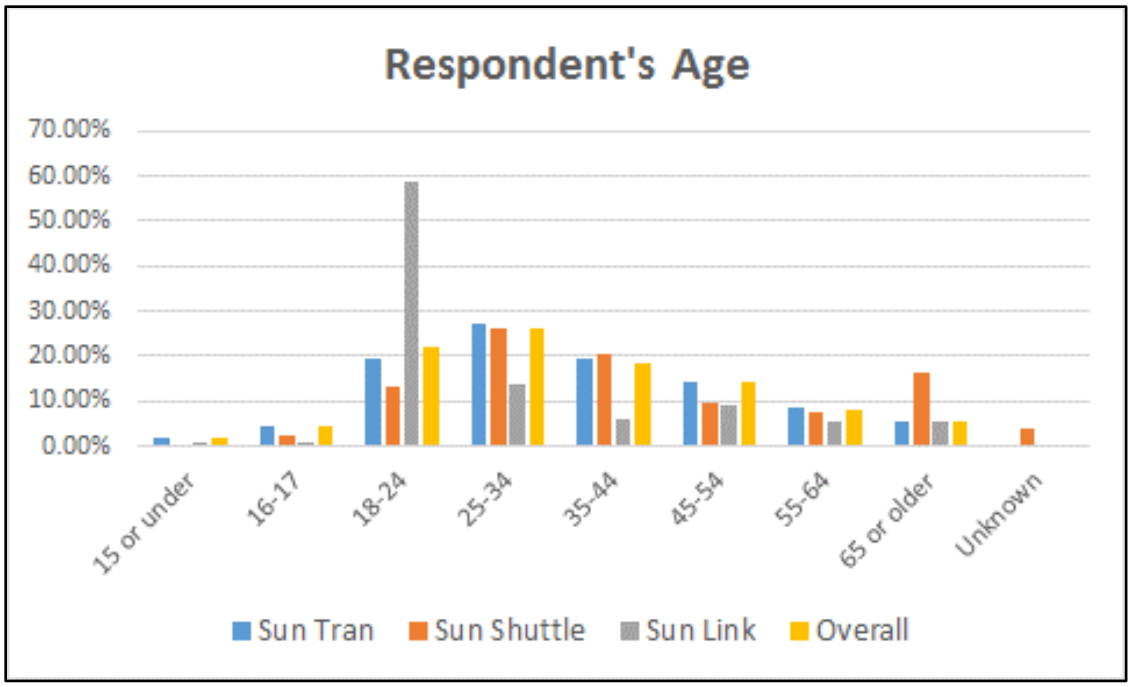
3.1.1 Age

The majority of all transit riders indicated that they were between the ages of 18 and 54 (80.53%). Nearly 6% of riders (5.91%) were indicated to be under the age of 18 as shown in Table 3-1 below and in Chart 3-1 on the following page.

Table 3-1. Age of Transit Riders

Respondent's Age Based on Linked Weight Factor Excluding Visitors				
	Sun Tran	Sun Shuttle	Sun Link	Overall
15 or under	1.75%	0.36%	0.57%	1.66%
16-17	4.49%	2.46%	0.97%	4.25%
18-24	19.38%	13.04%	58.85%	21.83%
25-34	27.14%	26.23%	13.90%	26.29%
35-44	19.19%	20.33%	5.95%	18.36%
45-54	14.43%	9.49%	9.08%	14.05%
55-64	8.36%	7.73%	5.50%	8.17%
65 or older	5.25%	16.28%	5.19%	5.34%
Unknown	0.00%	4.07%	0.00%	0.03%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Chart 3-1. Age of Transit Riders



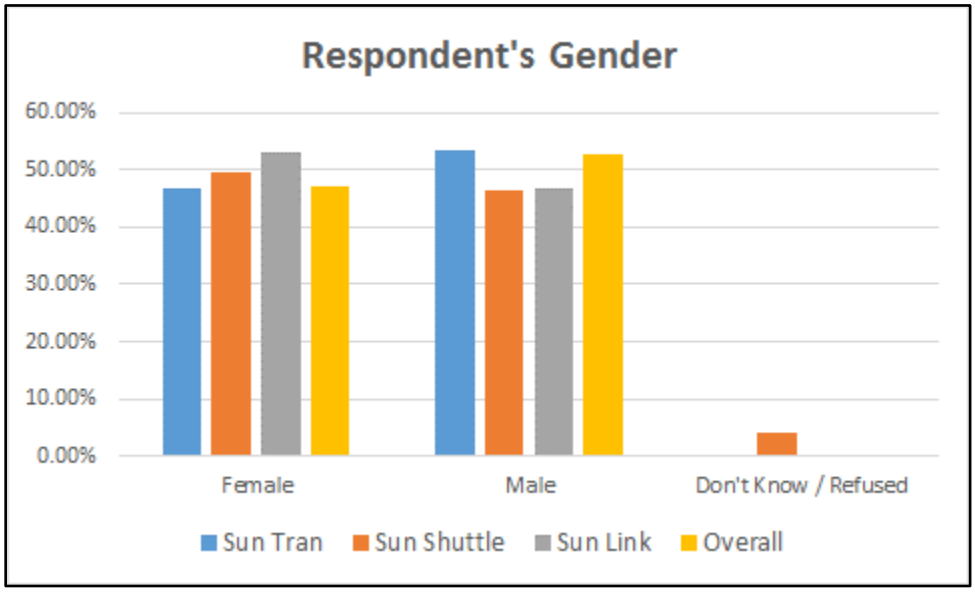
3.1.2 Gender

As indicated in Table 3-2 below and in Chart 3-2 on the following page, more female riders (53.23%) take the Sun Link than male riders (46.65%), while more male riders (53.26%) take the Sun Tran than female riders (46.72%).

Table 3-2. Gender of Transit Riders

Respondent's Gender Based on Linked Weight Factor Excluding Visitors				
	Sun Tran	Sun Shuttle	Sun Link	Overall
Female	46.72%	49.48%	53.23%	47.16%
Male	53.26%	46.44%	46.65%	52.78%
Don't Know / Refused	0.02%	4.07%	0.12%	0.06%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Chart 3-2. Gender of Transit Riders



3.1.3 Race/Ethnicity

Thirty six percent (35.81%) 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 3-3 below.

Table 3-3. Race/Ethnicity

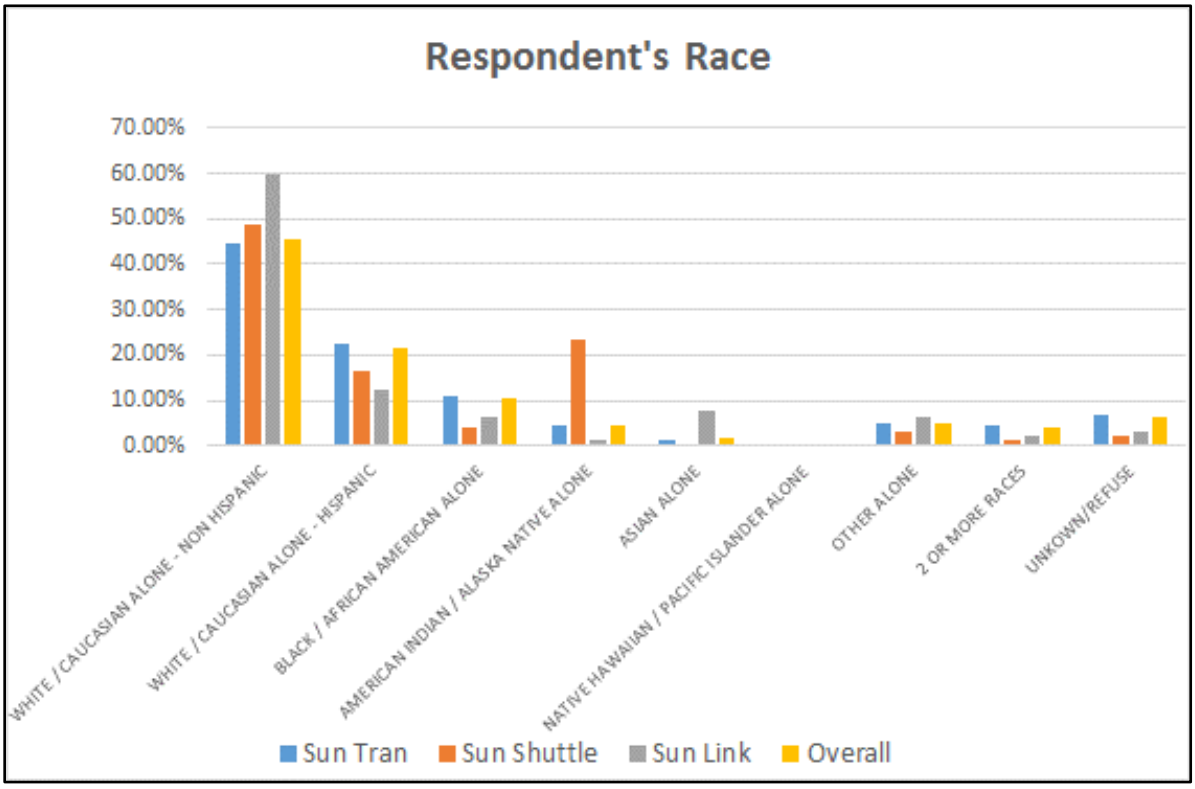
Whether Respondent is of Hispanic, Latino, or Spanish Origin Based on Linked Weight Factor Excluding Visitors				
	Sun Tran	Sun Shuttle	Sun Link	Overall
No	63.02%	79.83%	79.20%	64.19%
Yes	36.98%	20.17%	20.80%	35.81%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

The majority of all transit riders (Sun Tran, Sun Shuttle, and Sun Link combined) identified themselves as White (67.27%) with approximately one-third being Hispanic (21.73%). Four percent (4.18%) of all transit riders identified themselves as being 2 or more races as shown in Table 3-4 and in Chart 3-3 on the following page.

Table 3-4. Race/Ethnicity

Respondent's Race Based on Linked Weight Factor Excluding Visitors	Sun Tran	Sun Shuttle	Sun Link	Overall
WHITE / CAUCASIAN ALONE - NON HISPANIC	44.54%	48.50%	59.76%	45.54%
WHITE / CAUCASIAN ALONE - HISPANIC	22.42%	16.54%	12.42%	21.73%
BLACK / AFRICAN AMERICAN ALONE	10.81%	3.96%	6.55%	10.48%
AMERICAN INDIAN / ALASKA NATIVE ALONE	4.55%	23.52%	1.40%	4.50%
ASIAN ALONE	1.33%	0.58%	8.00%	1.74%
NATIVE HAWAIIAN / PACIFIC ISLANDER ALONE	0.21%	0.00%	0.12%	0.21%
OTHER ALONE	4.92%	3.27%	6.46%	5.00%
2 OR MORE RACES	4.34%	1.27%	2.21%	4.18%
UNKOWN/REFUSE	6.89%	2.36%	3.09%	6.61%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Chart 3-3. Race/Ethnicity



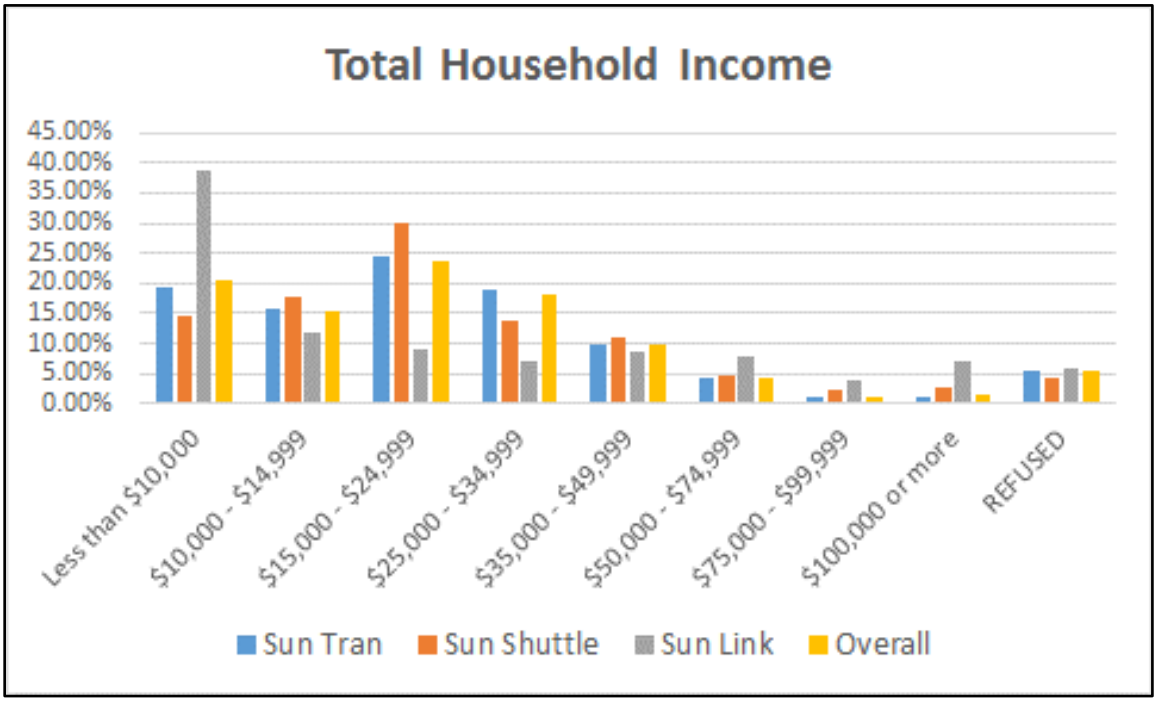
3.1.4 Income

As shown in Table 3-5 and Chart 3-4 below, Sun Link riders indicate the lowest annual household income of Less than $10,000 per year (38.93%), while also indicating the highest annual household income of $100,000 or More per year of the three services (6.82%).

Table 3-5. Total Annual Household Income

Income Based on Linked Weight Factor Excluding Visitors				
	Sun Tran	**Sun Shuttle**	**Sun Link**	**Overall**
Less than $10,000	19.30%	14.41%	38.93%	20.46%
$10,000 - $14,999	15.74%	17.85%	11.85%	15.52%
$15,000 - $24,999	24.54%	30.02%	8.83%	23.62%
$25,000 - $34,999	18.81%	13.57%	7.06%	18.05%
$35,000 - $49,999	9.88%	10.78%	8.58%	9.80%
$50,000 - $74,999	4.18%	4.43%	8.00%	4.42%
$75,000 - $99,999	1.07%	2.22%	4.00%	1.26%
$100,000 or more	0.91%	2.57%	6.82%	1.29%
REFUSED	5.56%	4.15%	5.93%	5.57%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Chart 3-4. Total Annual Household Income



3.1.5 Employed Status of Transit Rider

Sun Shuttle (33.33%) and Sun Link (32.65%) had the highest ridership for not having any household members employed, either part-time or full-time as shown in Table 3-6 below. The majority of overall riders (67.49%) had one or two household members employed either part-time or full-time.

Table 3-6. Employment Status of Respondent

Employed In Household Based on Linked Weight Factor Excluding Visitors				
	Sun Tran	Sun Shuttle	Sun Link	Overall
None (0)	16.88%	33.33%	32.65%	17.99%
One (1)	32.25%	31.56%	34.83%	32.40%
Two (2)	35.88%	26.24%	24.22%	35.09%
Three (3)	10.77%	5.08%	5.69%	10.41%
Four (4)	3.45%	1.53%	1.98%	3.34%
Five (5)	0.38%	2.26%	0.26%	0.39%
Six (6)	0.10%	0.00%	0.00%	0.10%
Seven (7)	0.09%	0.00%	0.00%	0.08%
Eight (8)	0.05%	0.00%	0.00%	0.04%
Nine (9)	0.05%	0.00%	0.38%	0.07%
Ten or More (10+)	0.10%	0.00%	0.00%	0.09%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

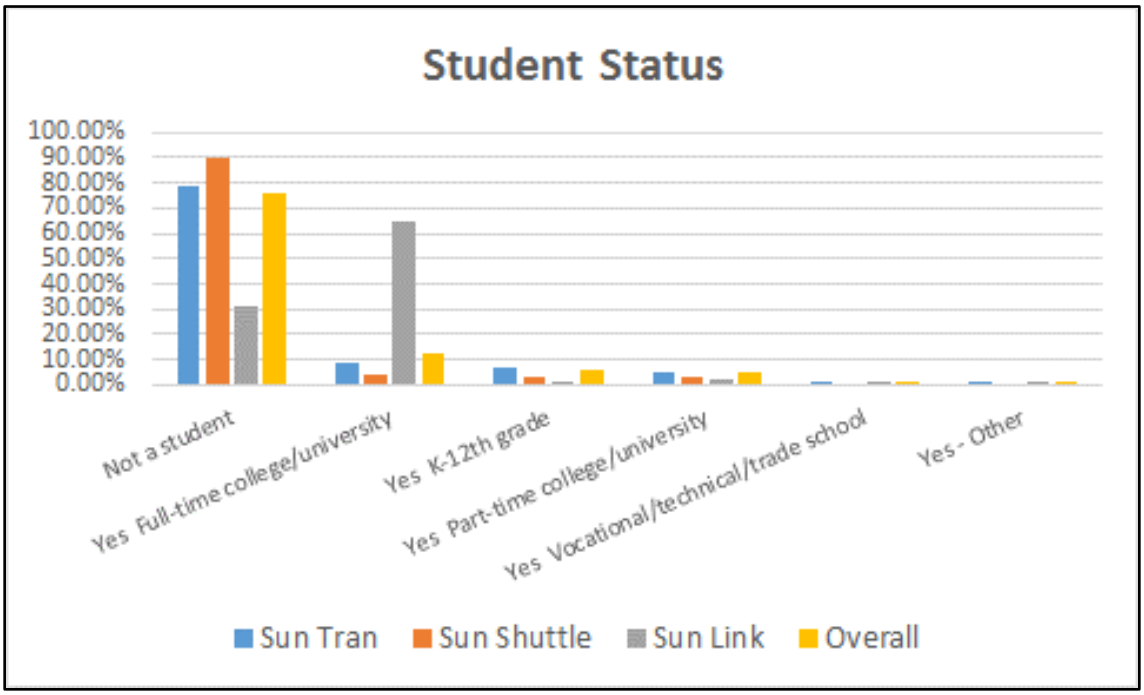
3.1.6 Student Status

The majority of Sun Tran (79.09%) and Sun Shuttle (90.24%) riders indicated they were not a student of any kind. The majority of Sun Link (65.05%) indicated they were a full-time college/university student as shown in Table 3-7 below and in Chart 3-5 on the following page.

Table 3-7. Student Status

Student Status Based on Linked Weight Factor Excluding Visitors				
	Sun Tran	Sun Shuttle	Sun Link	Overall
Not a student	79.09%	90.24%	31.38%	76.26%
Yes Full-time college/university	8.74%	4.05%	65.05%	12.16%
Yes K-12th grade	6.75%	2.83%	1.08%	6.37%
Yes Part-time college/university	5.01%	2.89%	2.40%	4.83%
Yes Vocational/technical/trade school	0.34%	0.00%	0.04%	0.32%
Yes - Other	0.07%	0.00%	0.05%	0.07%
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 (22.45%) and Sun Link (25.11%) have the highest percentage of the services of riders who do speak another language other than English at home as shown in Table 3-8 below.

Table 3-8. Transit Riders that Speak another Language besides English at home

Speak Another Language Other than English at Home Based on Linked Weight Factor Excluding Visitors				
	Sun Tran	Sun Shuttle	Sun Link	Overall
No	77.55%	90.57%	74.89%	77.49%
Yes	22.45%	9.43%	25.11%	22.51%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Of those riders who indicated they did speak another language other than English at home, the majority of all riders speak English either “Very well” or “Well” (92.91%) as shown in Table 3-9 below.

Table 3-9. Transit Riders that Speak another Language besides English at home English Ability

English Ability Based on Linked Weight Factor Excluding Visitors				
	Sun Tran	Sun Shuttle	Sun Link	Overall
Very well	71.46%	77.54%	85.39%	72.46%
Well	21.20%	16.72%	10.90%	20.45%
Less than well	6.16%	3.90%	3.04%	5.93%
Not at all	1.19%	1.84%	0.67%	1.16%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

3.1.8 Transit Riders with Disabilities

Ninety two percent (91.81%) 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 3-10 below.

Table 3-10. Transit Riders with Disabilities

Disability Based on Linked Weight Factor Excluding Visitors				
	Sun Tran	Sun Shuttle	Sun Link	Overall
No	91.65%	73.31%	96.83%	91.81%
Yes	8.35%	26.69%	3.17%	8.19%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

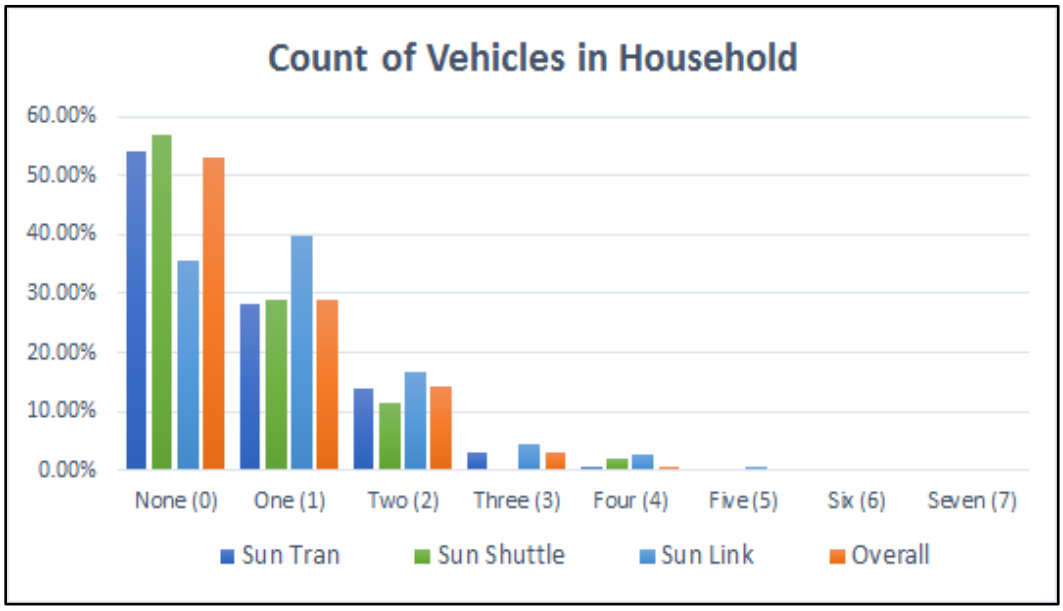
3.1.9 Vehicle Availability

Fifty three percent (53.02%) of overall riders do not have a working vehicle available to their household. Sun Link riders had the highest percentage of riders (64.32%) that had at least one or more working vehicles in their household as shown in Table 3-11 below and Chart 3-6 on the following page.

Table 3-11. Number of Working Vehicles in Household (by percentage of transit riders surveyed, excluding visitors)

Count of Vehicles in Household Based on Linked Weight Factor Excluding Visitors				
	Sun Tran	**Sun Shuttle**	**Sun Link**	**Overall**
None (0)	54.13%	57.00%	35.67%	53.02%
One (1)	28.25%	29.02%	39.63%	28.96%
Two (2)	13.91%	11.33%	16.71%	14.06%
Three (3)	2.98%	0.26%	4.36%	3.04%
Four (4)	0.56%	2.04%	2.79%	0.71%
Five (5)	0.13%	0.35%	0.70%	0.17%
Six (6)	0.02%	0.00%	0.13%	0.02%
Seven (7)	0.02%	0.00%	0.00%	0.02%
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)



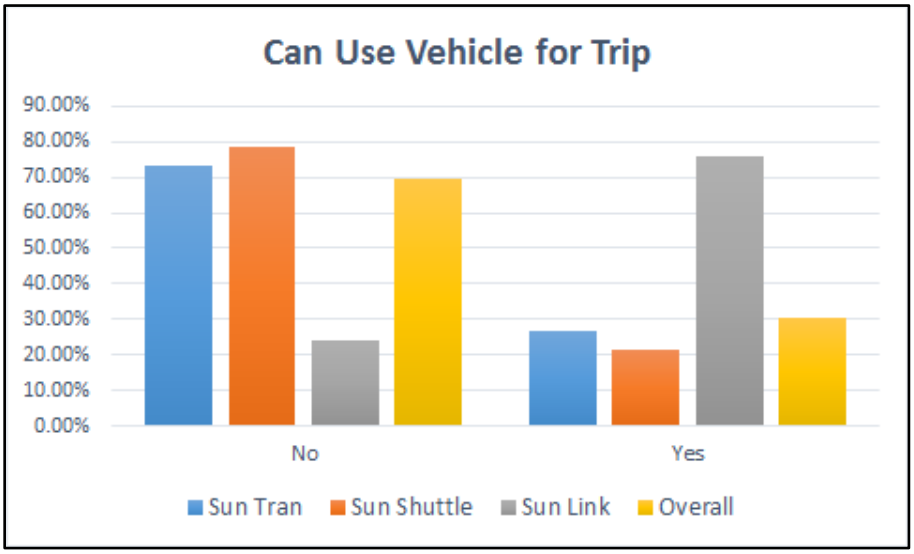
3.1.10 Could transit rider use household vehicle to make trip

Of those passengers that had at least one working vehicle in their household, seventy six percent (75.72%) 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 (26.53%) and Sun Shuttle riders (21.45%) as shown in Table 3-12 below and in Chart 3-7 on the following page.

Table 3-12. Could transit rider use household vehicle to make trip (by percentage of transit riders surveyed who had at least one working vehicle available to their household, excluding visitors)

Can Use Vehicle for Trip Based on Linked Weight Factor Excluding Visitors				
	Sun Tran	Sun Shuttle	Sun Link	Overall
No	73.47%	78.55%	24.28%	69.38%
Yes	26.53%	21.45%	75.72%	30.62%
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 to have a valid driver's license (83.31%) compared to Sun Tran riders (51.26%) and Sun Shuttle riders (48.24%) as shown in Table 3-13 below.

Table 3-13. Valid Driver's License

Driver's License Based on Linked Weight Factor Excluding Visitors				
	Sun Tran	Sun Shuttle	Sun Link	Overall
No	48.74%	49.72%	16.69%	46.78%
Yes	51.26%	48.24%	83.31%	53.20%
Unknown	0.00%	2.04%	0.00%	0.02%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

3.2 Travel Characteristics

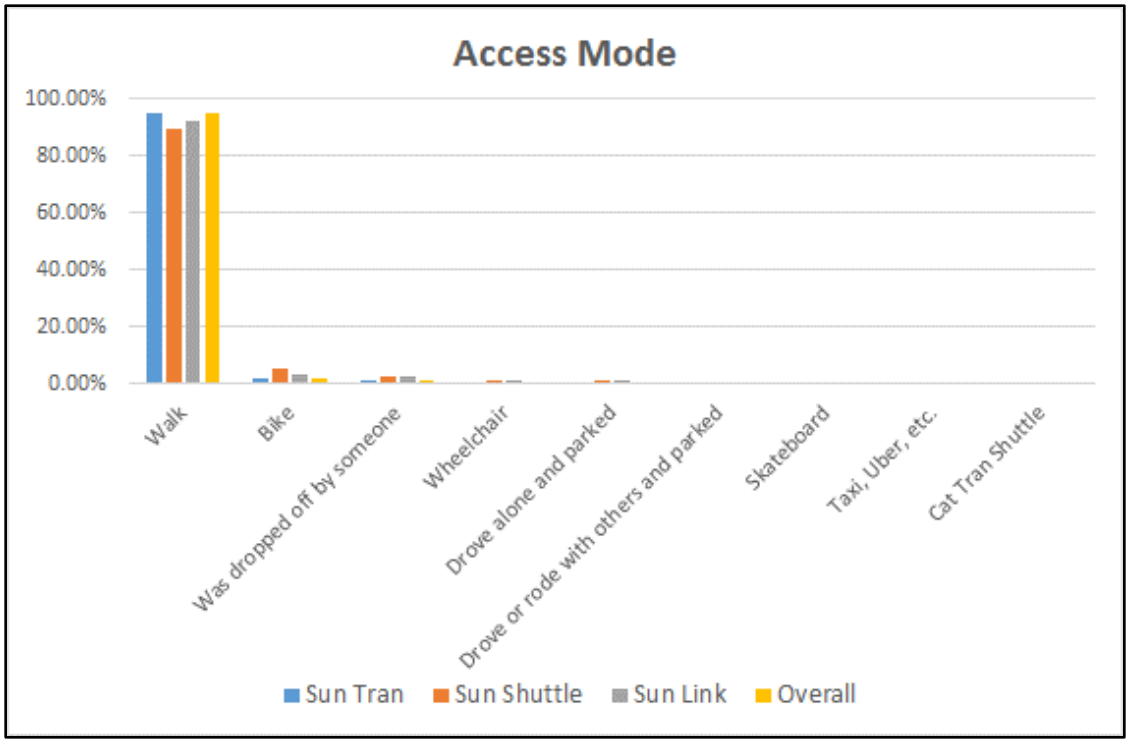
3.2.1 How Passengers Access Public Transit

The majority of all transit riders (Sun Tran, Sun Shuttle, and Sun Link combined) indicated that they accessed public transit by walking (95.18%). Sun Shuttle had the highest percentage of riders who indicated they took a bike to access public transit (4.94%) as shown in Table 3-14 and Chart 3-8 below.

Table 3-14. Mode to Access Public Transit

Access Mode Based on Unlinked Weight Factor Excluding Visitors	Sun Tran	Sun Shuttle	Sun Link	Overall
Walk	95.41%	89.67%	91.99%	95.18%
Bike	2.13%	4.94%	2.94%	2.09%
Was dropped off by someone	1.24%	2.84%	2.37%	1.25%
Wheelchair	0.60%	0.92%	1.31%	0.58%
Drove alone and parked	0.41%	0.90%	0.88%	0.55%
Drove or rode with others and parked	0.21%	0.45%	0.38%	0.32%
Skateboard	0.01%	0.28%	0.12%	0.01%
Taxi, Uber, etc.	0.00%	0.00%	0.00%	0.01%
Cat Tran Shuttle	0.00%	0.00%	0.00%	0.01%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Chart 3-8. Mode to Access Public Transit



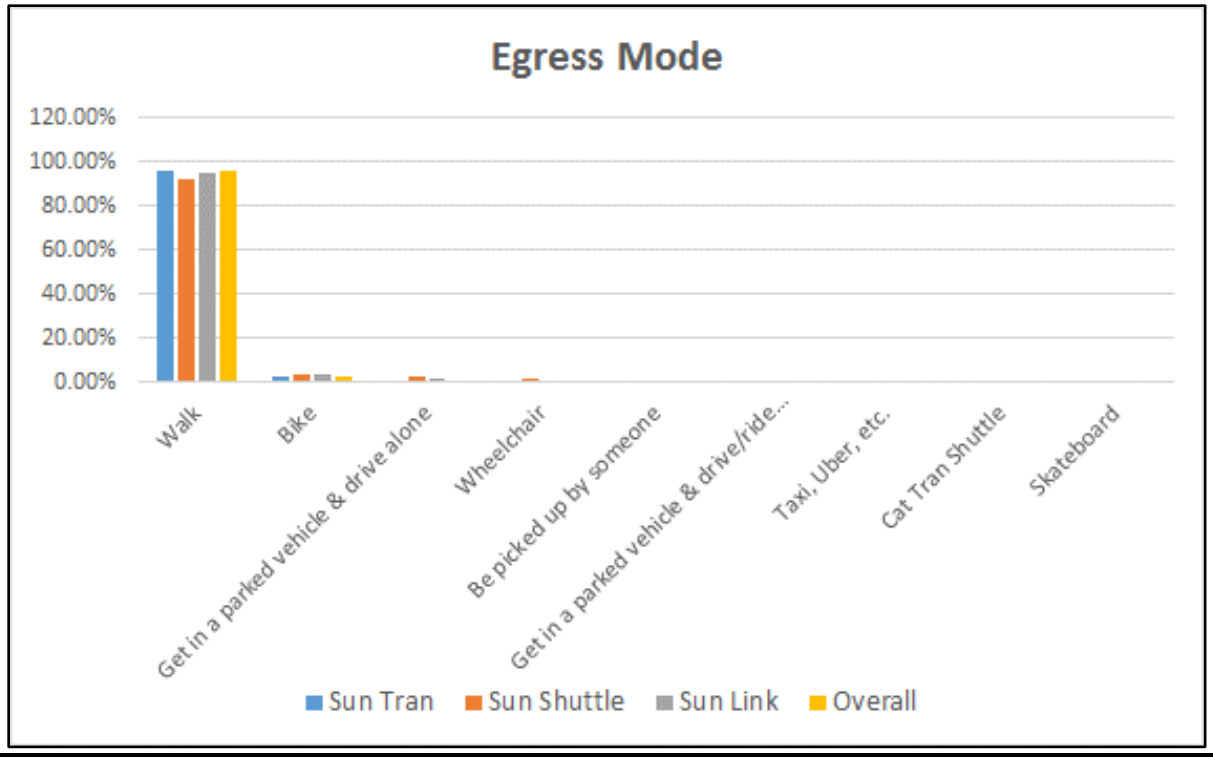
3.2.2 How Passengers Traveled from Transit to Their Final Destination

The majority of all transit riders (Sun Tran, Sun Shuttle, and Sun Link combined) indicated that they traveled from public transit to their final destination by walking (96.03%). Sun Shuttle (2.95%) riders were more likely to use a vehicle compared to Sun Link (1.82%), and Sun Tran riders (1.16%) as shown in Table 3-15 and Chart 3-9 below.

Table 3-15. Egress Mode to Destination

Egress Mode Based on Unlinked Weight Factor Excluding Visitors	Sun Tran	Sun Shuttle	Sun Link	Overall
Walk	96.14%	92.27%	94.80%	96.03%
Bike	2.20%	3.68%	2.98%	2.16%
Get in a parked vehicle & drive alone	0.61%	2.05%	1.04%	0.62%
Wheelchair	0.48%	1.10%	0.40%	0.60%
Be picked up by someone	0.39%	0.90%	0.40%	0.41%
Get in a parked vehicle & drive/ride w/others	0.09%	0.00%	0.38%	0.11%
Taxi, Uber, etc.	0.05%	0.00%	0.00%	0.04%
Cat Tran Shuttle	0.02%	0.00%	0.00%	0.02%
Skateboard	0.01%	0.00%	0.00%	0.01%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Chart 3-9. Egress Mode to Destination



3.2.3 Transfers

Over half of all riders (Sun Tran, Sun Shuttle, and Sun Link combined) did not take any additional transfers during their one way trip (56.83%). Sun Tran riders had the highest percentage of riders to take 4 or more transfers (0.05%) as shown in Table 3-16 and Chart 3-10 below.

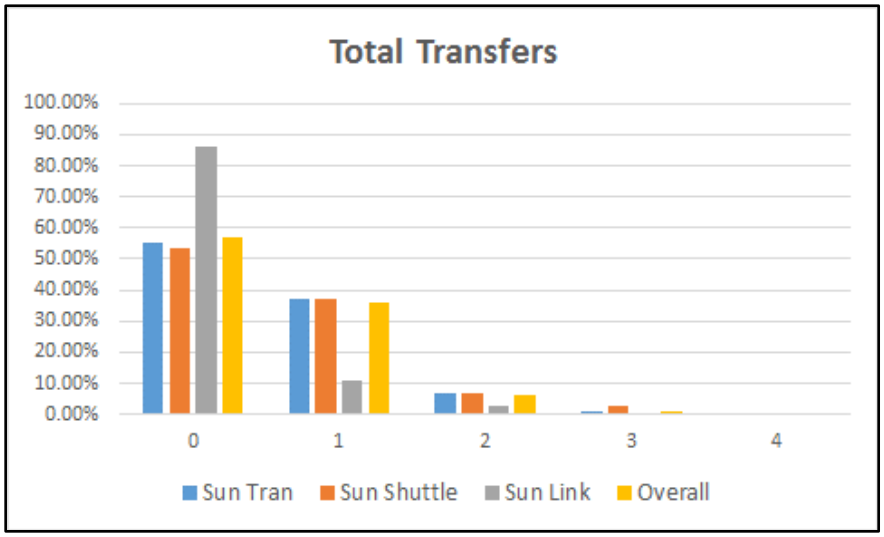
Maps (Appendix B) detail the individual transfer routes taken for a service census block group. For example, *Total Transfers: Sun Link Eastbound* show all transfer routes taken by respondents for the Sun Link census block.

Regarding Express Routes, 91.46% of all Express route riders took no transfers to or from their Origin or Destination. Three percent (3.04%) of riders did take at least one transfer from their Origin to the place where they boarded the route they were surveyed on, while 6.01% of riders took at least one transfer from the place they alighted at to their Destination.

Table 3-16. Total Number of Transfers

Total Transfers Based on Unlinked Weight Factor Excluding Visitors				
	Sun Tran	Sun Shuttle	Sun Link	Overall
0	55.21%	53.58%	86.16%	56.83%
1	37.38%	37.14%	10.93%	35.98%
2	6.63%	6.50%	2.83%	6.43%
3	0.74%	2.78%	0.07%	0.72%
4	0.05%	0.00%	0.00%	0.05%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Chart 3-10. Egress Mode to Destination



3.3 Most Common Types of Place Riders and Coming from and Going To

The most common type of place a rider was coming from was their Home (48.87%), followed by their usual workplace (16.68%) and then shopping as the third most common place (6.93%). As Table 3-17 below shows, Sun Link riders were the highest percentage riders that were most commonly coming from College/University (26.76%).

Table 3-17 below and Table 3-18 on the following page show the estimated most common types of places that riders were coming from and also going to during their one-way trips. This does not include trips that were made in the opposite direction.

Maps illustrating where a person's origin and destination are in a census block group, broken down by route and direction are shown in Appendix B. For example, the map for *Origins and Destinations: Sun Link Eastbound* show only origins and destinations for the Sun Link census block.

Table 3-17. Most common types of places riders are coming from

Origin Place Type Based on Unlinked Weight Factor Excluding Visitors				
	Sun Tran	**Sun Shuttle**	**Sun Link**	**Overall**
Your Home	49.23%	54.56%	41.69%	48.87%
Your usual Workplace	17.06%	13.72%	10.41%	16.68%
Shopping	7.09%	7.47%	3.96%	6.93%
College / University	4.67%	4.46%	26.76%	5.83%
Personal business	5.58%	4.08%	4.07%	5.49%
Social visit	3.75%	0.91%	1.91%	3.63%
Medical appointment / doctor visit	3.21%	9.11%	0.95%	3.14%
School K-12	2.88%	1.06%	0.80%	2.75%
Other business related	2.69%	2.31%	1.45%	2.62%
Dining out	1.57%	0.86%	5.77%	1.79%
Recreation / Sightseeing	1.44%	1.16%	1.96%	1.46%
Pick up / drop off someone	0.51%	0.00%	0.04%	0.48%
Escorting / accompanying someone	0.13%	0.00%	0.00%	0.13%
Hotel / Motel / Lodging	0.05%	0.00%	0.07%	0.05%
Airport (passengers only)	0.04%	0.00%	0.04%	0.04%
Major Sporting Event, Concert, or Conference	0.04%	0.00%	0.00%	0.04%
Your usual workspace	0.00%	0.00%	0.00%	0.00%
Unknown	0.06%	0.28%	0.11%	0.06%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

The most common type of place a rider was going to was their Home (40.21%), followed by their usual workplace (22.28%) and then personal business as the third most common place (6.77%). As Table 3-18 below shows, Sun Link riders were the highest percentage riders that were most commonly going to College/University (24.59%).

Table 3-18. Most common types of places riders are going to

Destination Place Type Based on Unlinked Weight Factor Excluding Visitors				
	Sun Tran	**Sun Shuttle**	**Sun Link**	**Overall**
Your Home	40.18%	37.94%	41.13%	40.21%
Your usual Workplace	23.06%	25.58%	7.87%	22.28%
Personal business	7.01%	5.31%	2.77%	6.77%
Shopping	6.57%	12.41%	4.62%	6.51%
College / University	4.88%	3.25%	24.59%	5.91%
Social visit	5.60%	3.49%	3.55%	5.48%
Medical appointment / doctor visit	3.50%	9.33%	0.93%	3.42%
School K-12	3.10%	0.86%	0.43%	2.94%
Other business related	2.16%	0.63%	1.23%	2.10%
Dining out	1.58%	0.00%	6.92%	1.84%
Recreation / Sightseeing	1.51%	1.20%	4.34%	1.65%
Pick up / drop off someone	0.44%	0.00%	0.00%	0.41%
Major Sporting Event, Concert, or Conference	0.08%	0.00%	1.63%	0.16%
Airport (passengers only)	0.16%	0.00%	0.00%	0.15%
Escorting / accompanying someone	0.08%	0.00%	0.00%	0.07%
Hotel / Motel / Lodging	0.08%	0.00%	0.00%	0.07%
Unknown	0.02%	0.00%	0.00%	0.01%
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 at least 6,200 Origin-Destination surveys for all services and On-to-Off Counts with at least 690 Sun Link service riders.

4.1.1 Sampling Goals for On-to-Off Counts

Table 4-1 shows the original goals and the actual number of completed On-to-Off Counts that were obtained for Sun Link by station and direction. ETC Institute has several methods for collecting On-to-Off Counts based on the type of service being addressed. The Sun Link On-to-Off Counts were conducted using the rail method as described in section 5 of this report. The goals and number of Counts completed by station and direction are shown in table 4-1.

Table 4-1. Sampling Goals and On-to-Off Counts Completed for Sun Link

Station	Direction	On-to-Off Counts Goal	Counts Completed
Av del Convento/Congress St.	Eastbound	53	79
Cushing/Frontage Rd	Eastbound	3	13
Granada/Cushing	Eastbound	4	6
Congress/Granada Av	Eastbound	10	21
Broadway/Church	Eastbound	9	20
Broadway/Stone	Eastbound	11	13
Broadway/6th Av	Eastbound	24	40
Toole/Congress	Eastbound	64	82
4th Av/9th St	Eastbound	34	47
4th Av/7th St	Eastbound	24	32
4th Av/5th St	Eastbound	60	86
University/3rd Av	Eastbound	16	25
University/Tyndall	Eastbound	16	26
2nd St/Olive Av	Eastbound	7	14
2nd St/Highland Av	Eastbound	11	9
2nd St/Cherry Av	Eastbound	2	4
Helen/Warren	Eastbound	0	72
Helen/Warren	Westbound	53	21
2nd St/Cherry Av	Westbound	13	71
2nd St/Highland Av	Westbound	64	60
2nd St/Olive Av	Westbound	49	106
University/Tyndall	Westbound	97	19
University/3rd Av	Westbound	8	6
4th Av/5th St	Westbound	5	12
4th Av/7th St	Westbound	14	7
4th Av/9th St	Westbound	13	26
Congress/6th Av	Westbound	16	6
Congress/Stone	Westbound	5	2
Congress/Church	Westbound	4	4
Congress/Granada Av	Westbound	1	4
Granada/TCC	Westbound	1	0
Cushing/Frontage Rd	Westbound	1	0
Cushing/Av del Convento	Westbound	0	0

4.1.2 Sampling Goals for the OD Survey

Table 4-2 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 4-3 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 4-2. Sampling Goals for Sun Link by Station, Time Period and Direction

	Original Sampling Goals				Completed			
Station	AM Peak (6:30-8:30 am)	Midday (8:30 am-4:00 pm)	PM Peak (4-6 pm)	Evening (After 6 pm)	AM Peak (6:30-8:30 am)	Midday (8:30 am-4:00 pm)	PM Peak (4-6 pm)	Evening (After 6 pm)
Eastbound	34	143	23	32	60	240	69	35
Av del Convento/Congress St	6	21	4	5	19	58	14	7
Cushing/Frontage Rd	0	1	0	0	1	8	3	0
Granada/Cushing - EB	1	1	0	0	1	5	3	0
Congress/Granada Ave	1	4	1	0	1	14	2	1
Broadway/Church - EB	1	3	1	1	3	10	3	0
Broadway/Stone - EB	1	4	2	1	4	14	5	2
Broadway/6th Ave - EB	2	9	2	3	5	23	9	5
Toole/Congress - EB	8	27	3	4	8	33	9	5
4th Ave/9th St	4	13	2	4	7	15	5	3
4th Ave/7th St	2	10	2	3	2	11	5	4
4th Ave/5th St	6	27	3	4	6	26	5	4
University/3rd Ave	2	7	1	1	2	9	3	1
University/Tyndall	1	6	1	2	1	6	2	2
2nd St/Olive Ave	0	3	1	1	0	2	1	1
2nd St/Highland Ave	0	5	1	1	0	5	0	0
2nd St/Cherry Ave	0	1	0	0	0	1	0	0
Helen/Warren	0	0	0	0	0	0	0	0
Westbound	6	125	47	51	23	251	101	65
Helen/Warren	3	19	6	7	6	49	32	7
2nd St/Cherry Ave	0	4	2	3	6	15	8	4
2nd St/Highland Ave	0	25	10	8	1	43	17	15
2nd St/Olive Ave	0	20	8	5	1	24	9	9
University/Tyndall	1	32	14	18	2	58	15	22
University/3rd Ave	0	3	1	1	2	9	4	2
4th Ave/5th St	0	2	1	1	2	16	3	1
4th Ave/7th St	0	6	1	2	1	9	1	1
4th Ave/9th St	0	5	1	2	1	7	7	0
Congress/6th Ave - WB	1	6	2	3	1	8	2	2
Congress/Stone - WB	0	2	1	1	0	6	2	1
Congress/Church - WB	0	1	1	1	0	6	1	1
Congress/Granada Av	0	0	0	0	0	0	0	0
Granada/TCC - WB	0	0	0	0	0	1	0	0
Cushing/Frontage Rd	0	0	0	0	0	0	0	0
Cushing/Av del Convento	0	0	0	0	0	0	0	0
Av del Convento/Congress St	0	0	0	0	0	0	0	0

Table 4-3. Sampling Goals for Sun Tran and Sun Shuttle OD Surveys by Route, Time Period and Direction

Route	Route Name	Direction	Service	Original Sampling Goals					Completed				
				Early (Before 6:30 am)	AM Peak (6:30-8:30 am)	Midday (8:30 am-4:00 pm)	PM Peak (4-6 pm)	Evening (After 6 pm)	Early (Before 6:30 am)	AM Peak (6:30-8:30 am)	Midday (8:30 am-4:00 pm)	PM Peak (4-6 pm)	Evening (After 6 pm)
1	Glenn/Swan	NB	Sun Tran	1	8	28	10	7	5	13	31	11	12
1	Glenn/Swan	SB	Sun Tran	4	11	26	6	6	5	10	36	12	7
2	Pueblo Gardens	NB	Sun Tran	3	9	27	6	5	2	11	38	5	6
2	Pueblo Gardens	SB	Sun Tran	1	7	26	11	6	2	12	43	13	5
3	6th St./Wilmot	EB	Sun Tran	9	16	62	19	15	9	20	90	27	17
3	6th St./Wilmot	WB	Sun Tran	7	23	70	10	13	7	23	90	26	14
4	Speedway	EB	Sun Tran	8	33	141	44	32	9	35	159	49	34
4	Speedway	WB	Sun Tran	14	42	146	28	24	17	45	144	67	27
5	Pima/West Speedway	EB	Sun Tran	1	10	31	8	2	1	10	41	8	4
5	Pima/West Speedway	WB	Sun Tran	2	10	30	8	1	2	9	39	6	3
6	Euclid/N. 1st Ave.	NB	Sun Tran	4	15	60	20	12	5	15	58	23	13
6	Euclid/N. 1st Ave.	SB	Sun Tran	7	20	63	17	9	8	21	69	28	12
7	22nd St.	EB	Sun Tran	7	15	54	18	13	10	27	53	20	13
7	22nd St.	WB	Sun Tran	5	13	51	15	12	3	18	54	15	20
8	Broadway	EB	Sun Tran	12	40	155	40	24	19	45	169	48	27
8	Broadway	WB	Sun Tran	18	36	158	33	25	15	33	178	43	29
9	E. Grant Road	EB	Sun Tran	6	17	77	19	15	13	22	94	20	16
9	E. Grant Road	WB	Sun Tran	8	18	73	16	11	9	24	86	22	17
10	Flowing Wells	NB	Sun Tran	1	9	34	13	9	3	10	47	13	9
10	Flowing Wells	SB	Sun Tran	5	12	37	10	10	7	11	50	12	11
11	Alvernon Way	NB	Sun Tran	8	21	112	31	18	10	21	121	35	23
11	Alvernon Way	SB	Sun Tran	13	34	112	29	16	14	37	113	25	16
12	10th/12th Ave	NB	Sun Tran	5	17	44	11	8	6	15	60	14	15
12	10th/12th Ave	SB	Sun Tran	2	10	45	18	11	3	20	59	18	12
15	Campbell Ave.	NB	Sun Tran	4	9	44	13	11	4	7	49	23	12
15	Campbell Ave.	SB	Sun Tran	3	14	47	13	10	4	13	60	13	9
16	Oracle/Ina	NB	Sun Tran	12	40	159	39	29	13	42	165	51	26
16	Oracle/Ina	SB	Sun Tran	13	32	143	33	26	14	33	165	69	52
17	Country Club/29th St.	NB	Sun Tran	11	25	75	24	10	14	25	78	30	14
17	Country Club/29th St.	SB	Sun Tran	15	18	80	17	15	14	24	98	23	14
18	S. 6th Ave.	NB	Sun Tran	3	13	76	11	9	4	22	86	22	12
18	S. 6th Ave.	SB	Sun Tran	8	20	109	26	21	8	26	106	29	18
19	Stone Ave.	NB	Sun Tran	1	3	23	9	9	1	7	27	15	10
19	Stone Ave.	SB	Sun Tran	2	5	28	7	11	3	3	33	11	11
20	West Grant Road	EB	Sun Tran	0	5	13	3	0	0	4	18	5	0
20	West Grant Road	WB	Sun Tran	0	3	13	3	1	0	4	17	3	1
21	Congress/Silverbell	NB	Sun Tran	0	4	23	6	5	0	4	32	11	7
21	Congress/Silverbell	SB	Sun Tran	1	4	15	3	2	1	6	25	3	4
22	Grande	NB	Sun Tran	1	5	25	7	5	1	5	24	11	3
22	Grande	SB	Sun Tran	2	5	18	4	2	3	9	27	7	3
23	Mission Road	NB	Sun Tran	4	6	22	6	7	4	12	29	6	14
23	Mission Road	SB	Sun Tran	3	5	22	7	9	3	16	34	7	9
24	S. 12th Ave.	NB	Sun Tran	3	4	16	4	3	5	6	15	4	5
24	S. 12th Ave.	SB	Sun Tran	1	2	17	5	4	2	4	21	12	7
25	S. Park Ave	NB	Sun Tran	9	18	57	14	12	9	15	66	11	14
25	S. Park Ave	SB	Sun Tran	3	15	51	19	15	4	16	52	21	14
26	Benson Highway	WB	Sun Tran	2	5	31	11	12	4	23	35	12	11
26	Benson Highway	EB	Sun Tran	3	8	23	3	3	3	5	39	11	12
27	Midvale Park	NB	Sun Tran	5	10	31	8	7	4	11	45	16	9
27	Midvale Park	SB	Sun Tran	3	9	46	15	11	4	9	43	26	14
29	Valencia	EB	Sun Tran	3	8	31	7	3	3	9	34	10	6
29	Valencia	WB	Sun Tran	2	6	36	14	9	3	6	39	16	13
34	Craycroft/Ft. Lowell	NB	Sun Tran	1	12	47	11	13	1	11	64	19	14
34	Craycroft/Ft. Lowell	SB	Sun Tran	0	14	49	16	11	0	16	67	19	11

Table 4-3 Sampling Goals for Sun Tran and Sun Shuttle OD Surveys Completed by Time of Day and Direction (CONTINUED)

Route	Route Name	Direction	Service	Original Sampling Goals					Completed				
				Early (Before 6:30 am)	AM Peak (6:30-8:30 am)	Midday (8:30 am-4:00 pm)	PM Peak (4-6 pm)	Evening (After 6 pm)	Early (Before 6:30 am)	AM Peak (6:30-8:30 am)	Midday (8:30 am-4:00 pm)	PM Peak (4-6 pm)	Evening (After 6 pm)
37	Pantano	NB	Sun Tran	1	8	15	4	1	1	8	18	3	2
37	Pantano	SB	Sun Tran	2	5	13	4	1	3	7	30	5	2
50	Ajo Way	EB	Sun Tran	2	4	11	2	2	3	4	9	6	3
50	Ajo Way	WB	Sun Tran	1	2	15	4	3	1	6	18	9	4
61	La Cholla	NB	Sun Tran	1	5	20	4	2	3	4	20	4	1
61	La Cholla	SB	Sun Tran	1	3	13	4	2	1	4	20	6	2
101X	Golf Links-Downtown Express	EB	Sun Tran	0	0	0	2	0	0	0	0	3	0
101X	Golf Links-Downtown Express	WB	Sun Tran	0	5	0	0	0	0	5	0	0	0
102X	Northwest-UA Express	NB	Sun Tran	0	0	0	2	0	0	0	0	5	0
102X	Northwest-UA Express	SB	Sun Tran	0	2	0	0	0	0	4	0	0	0
103X	Northwest-Downtown Express	NB	Sun Tran	0	0	0	3	0	0	0	0	2	0
103X	Northwest-Downtown Express	SB	Sun Tran	1	3	0	0	0	1	3	0	0	0
104X	Marana-Downtown Express	NB	Sun Tran	0	0	0	3	0	0	0	0	6	0
104X	Marana-Downtown Express	SB	Sun Tran	0	2	0	0	0	0	6	0	0	0
105X	Foothills-Downtown Express	NB	Sun Tran	0	1	0	1	0	0	0	0	3	0
105X	Foothills-Downtown Express	SB	Sun Tran	0	0	0	1	0	0	3	0	0	0
107X	Oro Valley-Downtown Express	NB	Sun Tran	0	0	0	1	0	0	0	0	8	0
107X	Oro Valley-Downtown Express	SB	Sun Tran	0	1	0	0	0	1	8	0	0	0
108X	Broadway-Downtown Express	EB	Sun Tran	0	0	0	4	0	0	0	0	6	0
108X	Broadway-Downtown Express	WB	Sun Tran	1	4	0	0	0	1	5	0	0	0
109X	Catalina Hwy-Downtown Express	EB	Sun Tran	0	0	0	5	0	0	0	0	6	0
109X	Catalina Hwy-Downtown Express	WB	Sun Tran	0	2	0	0	0	0	4	0	0	0
110X	Rita Ranch-Downtown Express	NB	Sun Tran	0	5	0	1	0	0	6	0	2	0
110X	Rita Ranch-Downtown Express	SB	Sun Tran	0	2	0	3	0	0	3	0	4	0
201X	Eastside-Aero Park Express	EB	Sun Tran	0	0	0	2	0	0	0	0	3	0
201X	Eastside-Aero Park Express	WB	Sun Tran	4	0	0	0	0	3	0	0	0	0
202X	Northwest- Aero Park Express	NB	Sun Tran	0	0	0	2	0	0	0	0	5	0
202X	Northwest- Aero Park Express	SB	Sun Tran	0	1	0	0	0	5	1	0	0	0
203X	Oro Valley-Aero Park Express	NB	Sun Tran	0	0	2	0	0	0	0	2	1	0
203X	Oro Valley-Aero Park Express	SB	Sun Tran	5	0	0	0	0	6	0	0	0	0
312X	Oro Valley-Tohono Express	NB	Sun Tran	0	0	0	0	0	0	0	0	2	0
312X	Oro Valley-Tohono Express	SB	Sun Tran	0	0	0	1	0	0	0	0	2	0
401	N. Oracle/Catalina	NB	Sun Shuttle	0	1	5	1	0	0	3	4	1	0
401	N. Oracle/Catalina	SB	Sun Shuttle	0	1	3	1	0	0	1	4	2	0
410	Anway/Trico	EB	Sun Shuttle	0	1	3	1	0	0	1	3	1	0
410	Anway/Trico	WB	Sun Shuttle	0	0	2	1	0	0	1	3	1	1
411	Cortaro/Silverbell	NB	Sun Shuttle	0	0	2	0	0	0	0	2	0	0
411	Cortaro/Silverbell	SB	Sun Shuttle	0	0	2	0	0	0	0	2	0	0
412	Thornydale/Dove Mountain	NB	Sun Shuttle	1	1	5	1	1	1	3	10	2	0
412	Thornydale/Dove Mountain	SB	Sun Shuttle	1	1	3	1	2	1	1	9	3	1
413	Marana/I-10	NB	Sun Shuttle	0	1	2	0	0	0	1	5	1	1
413	Marana/I-10	SB	Sun Shuttle	0	2	6	1	0	0	2	6	2	1
421	Green Valley/Sahuarita Connector	NB	Sun Shuttle	0	4	4	1	1	0	5	12	2	4
421	Green Valley/Sahuarita Connector	SB	Sun Shuttle	1	2	7	1	0	1	1	8	7	0
430	Tucson Estates	EB	Sun Shuttle	0	3	3	0	0	0	3	3	2	0
430	Tucson Estates	WB	Sun Shuttle	0	2	6	2	2	0	2	6	2	2
440	San Xavier	NB	Sun Shuttle	0	3	7	3	1	0	3	12	5	2
440	San Xavier	SB	Sun Shuttle	0	2	8	3	1	0	2	12	6	1
450	Southeast Tucson/Rita Ranch	NB	Sun Shuttle	0	1	2	1	0	0	1	3	1	0
450	Southeast Tucson/Rita Ranch	SB	Sun Shuttle	0	1	2	1	0	0	1	4	3	0
486	Ajo/Tucson	EB	Sun Shuttle	0	0	0	0	0					
486	Ajo/Tucson	WB	Sun Shuttle	0	0	0	0	0					
Other	Green Valley/Sahuarita	DAR	Sun Shuttle							2	6		
Other	Oro Valley	DAR	Sun Shuttle						1	1	4		

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 159 completed surveys. With 165 completed surveys for Route 16 during the 2016 onboard survey, the sample target was achieved. In the case of Sun Tran Route 1 during the "AM Peak" time period heading "Southbound", the goal was 11 completed surveys. Since the number of completed surveys (10) for this route was within 10 of the goal, the target was achieved. Overall, when including the overall goals plus the goals by time and direction, there were 587 total goals. All 587 goals were achieved (100%).

A survey was considered "complete" if all of 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 1,600 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 On-to-Off Counts Participants

For Sun Link, an online survey is the preferred method because it allows an interviewer to ask rail users which station they boarded their current streetcar and which station they would alight. This was used in place of the scanning technology typically used by ETC Institute on buses, because unlike bus users, the majority of all rail users know the name of the locations they board and alight at. The short length of this survey, and the high level of knowledge regarding the boarding and alighting location by the rail users, allowed for one surveyor to survey every rider per streetcar. One surveyor per streetcar could effectively administer the On-to-Off Counts to each rail rider.

4.2.2 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 particular 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, with the exception of the placement of the surveyors. 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 with regard to 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 (After 6pm). 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 to on the following page shows the system wide estimated ridership by time period. Figure 4-2 shows the number of On-to-Off Counts that were collected for Sun Link by time period, and Figure 4-3 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

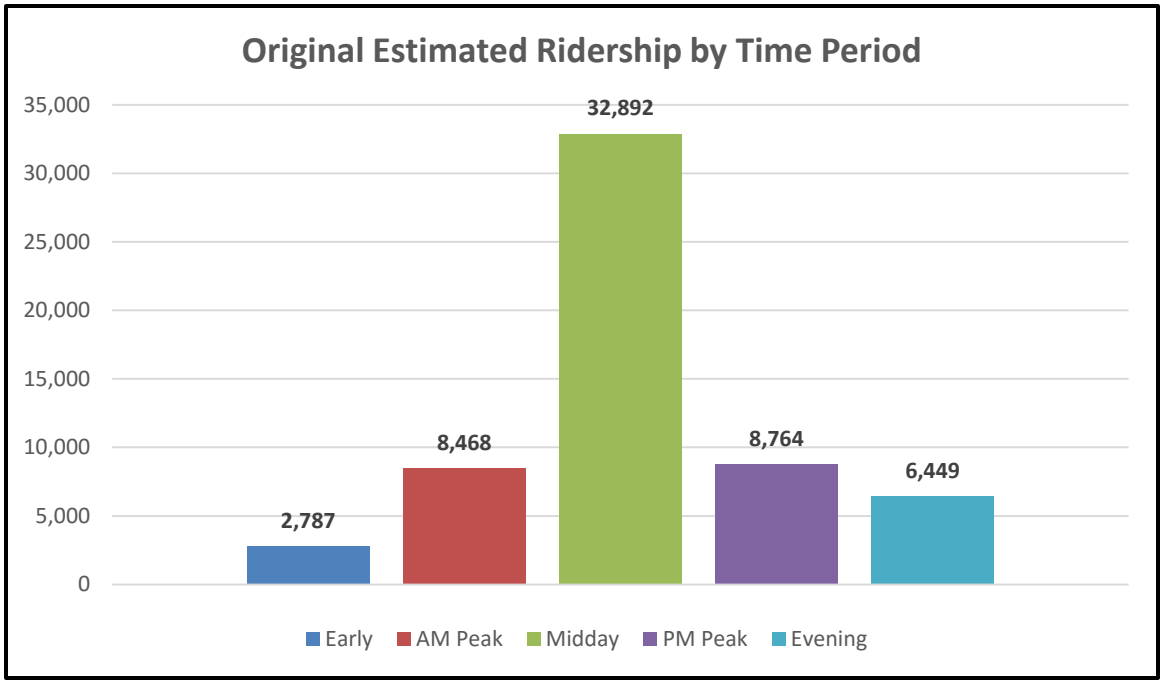


Figure 4-2. Number of On-to-Off Counts Collected on Sun Link by Time Period

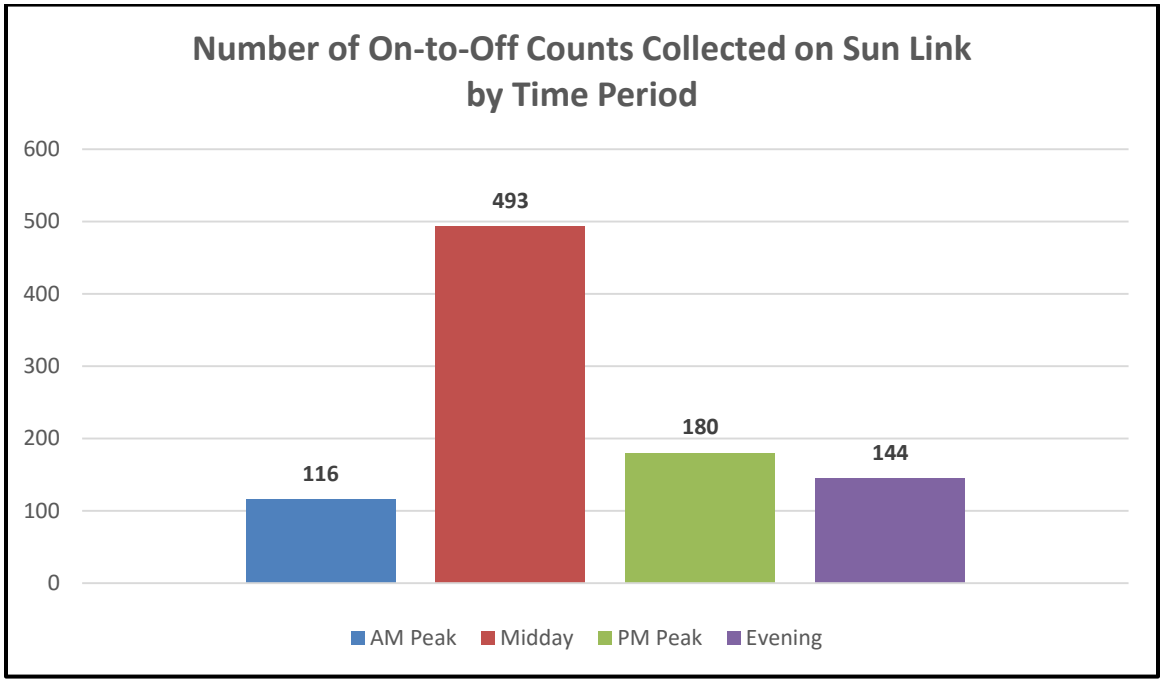
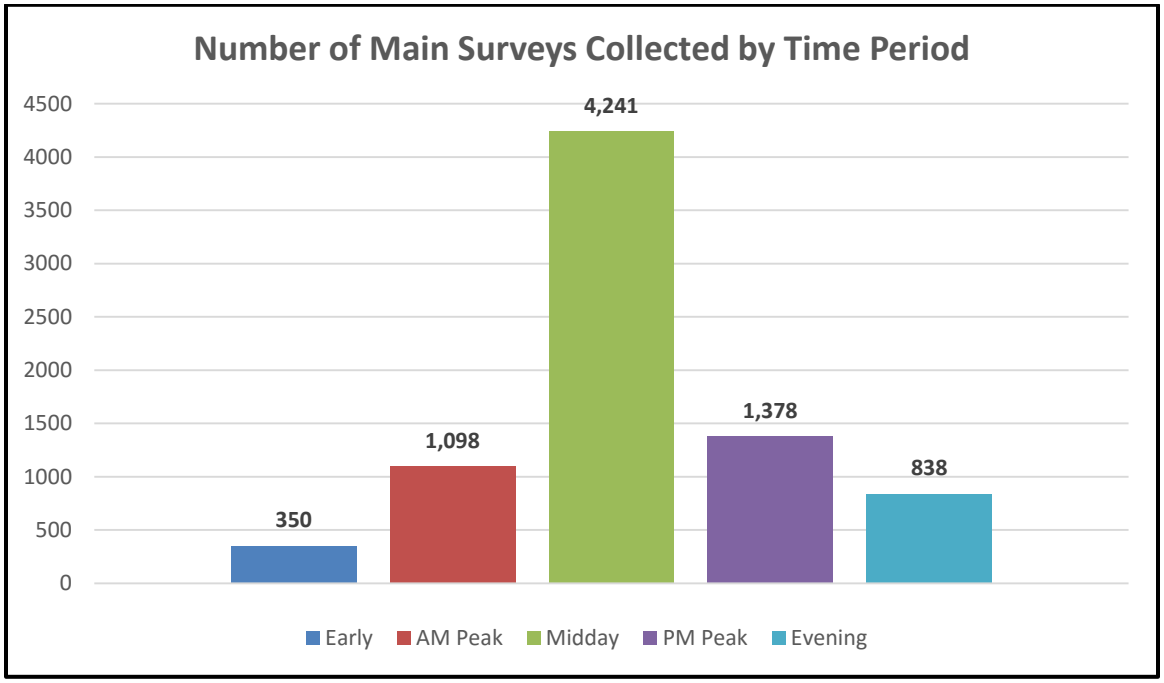


Figure 4-3. Number of OD Surveys Collected by Time Period



5 On-to-Off Administration Methodology

On-to-Off Counts for this project were meant to capture the ridership flow of the Sun Link streetcar service. In-other-words, the On-to-Off Counts captured where the individual rider boarded Sun Link and the corresponding location where the rider alighted. This allows for a more comprehensive understanding of the true ridership flow, which then allows the OD Survey data to be more accurately expanded.

5.1 Recruiting and Training Surveyors

Assembling a team of high-quality surveyors was one of the most important steps in the On-to-Off administration process. For this project, ETC Institute complemented its team of supervisors with temporary surveyors who were local to the area. Surveyors recruited by the staffing agency were required to have a familiarity with the service areas, a solid work history, ability to work with the public, a professional attitude and appearance, and an ability to operate a tablet PC and become proficient with ETC Institute's On-to-Off software program.

Each surveyor was required to attend ETC Institute's training session. During this training session, surveyors were taught how to operate the tablet PCs and the On-to-Off software, execute the On-to-Off Count procedures, and deal with various situations that could be encountered during their surveying period.

The surveyor training was conducted in a classroom style setting at a local meeting location. The training provided information to all personnel who participated in the administration of the On-to-Off Counts to ensure that they were fully prepared for the project is described below:

- Overview of the onboard survey objectives
- On-to-Off equipment/software overview and training
- One-on-one tutoring/mock interview with an ETC Institute supervisor
- Overview of rules and procedures and a code of conduct to be followed while representing Sun Tran, Sun Link, or Sun Shuttle and ETC Institute in the field

Once the training was completed, and an ETC Institute supervisor approved of each surveyor's abilities in the classroom, the surveyors then spent several days in the field under the supervision of an ETC Institute field supervisor who assessed each surveyor's ability to properly conduct the On-to-Off procedures. Surveyors who did not demonstrate proficiency in all of the required tasks were released.

5.2 ETC Institute's On-to-Off Program Procedure

For Sun Link, an online survey was used that allowed an interviewer to ask rail users which station they boarded their current train and which station they would alight. This was used in place of the scanning technology used on buses because unlike bus users, the majority of rail users know the name of the locations they board and alight at. The short length of this two question survey, and the high level of knowledge regarding the boarding and alighting location by the rail users, allowed for one surveyor to survey every rider per streetcar. One surveyor per streetcar could effectively administer the On-to-Off Counts to each rail rider.

The purpose of the On-to-Off software program is to identify ridership patterns based on an individual's boarding and alighting locations that were then used to help develop the sampling plan for the OD Survey. This was accomplished on Sun Link by using the online survey tool which asked passengers where they boarded and where they alighted.

5.3 Organization of the Survey Team

The On-to-Off Counts were administered by teams that were directly supervised by an ETC Institute supervisor. The supervisors were responsible for reviewing the performance of each team and ensuring that all parts of the On-to-Off procedure were being followed and the sampling goals for each route were met. The supervisors operated from centralized locations, such as transit centers, so that the performance of all teams could be evaluated.

The On-to-Off Counts Team sizes for Sun Link were determined by route ridership levels and streetcar size. A typical team consisted of two members, based on a medium to high-ridership level. On-to-Off teams were typically deployed on at least two streetcars running in opposite directions.

5.4 Timing of the On-to-Off Counts

The On-to-Off Counts were administered during weekdays (Monday through Thursday) with the exceptions of holidays and college/school breaks.

The On-to-Off Counts were administered at the time of day that coincided with the hours that each route was operational. This ensured that the On-to-Off data would provide the OD Survey with an accurate sampling plan for administration and for the data expansion. The administration of the On-to-Off Counts began when the service started in the morning and continued as late as 10 pm.

6 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.

6.1 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 of the required tasks for the OD Survey were released.

6.2 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. The signs were posted on buses and streetcars during the On-to-Off phase of the survey and throughout the duration of the OD Survey.

A pilot test was also conducted in order to thoroughly test the equipment, the surveyors, the logistics, and the survey instrument. There were no issues and the pilot test was considered a success and ready for the OD Survey administration to begin.

6.3 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 or 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 of the required questions had been answered, the interviewer asked the respondent if he or 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 additional 2 to 3 minutes to complete the survey, the interviewer selected the Call Back option on the bottom of the screen, where they were then able to capture the respondents 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.

6.3.1 After the Administration of the Survey

Field Supervisor Quality Checks

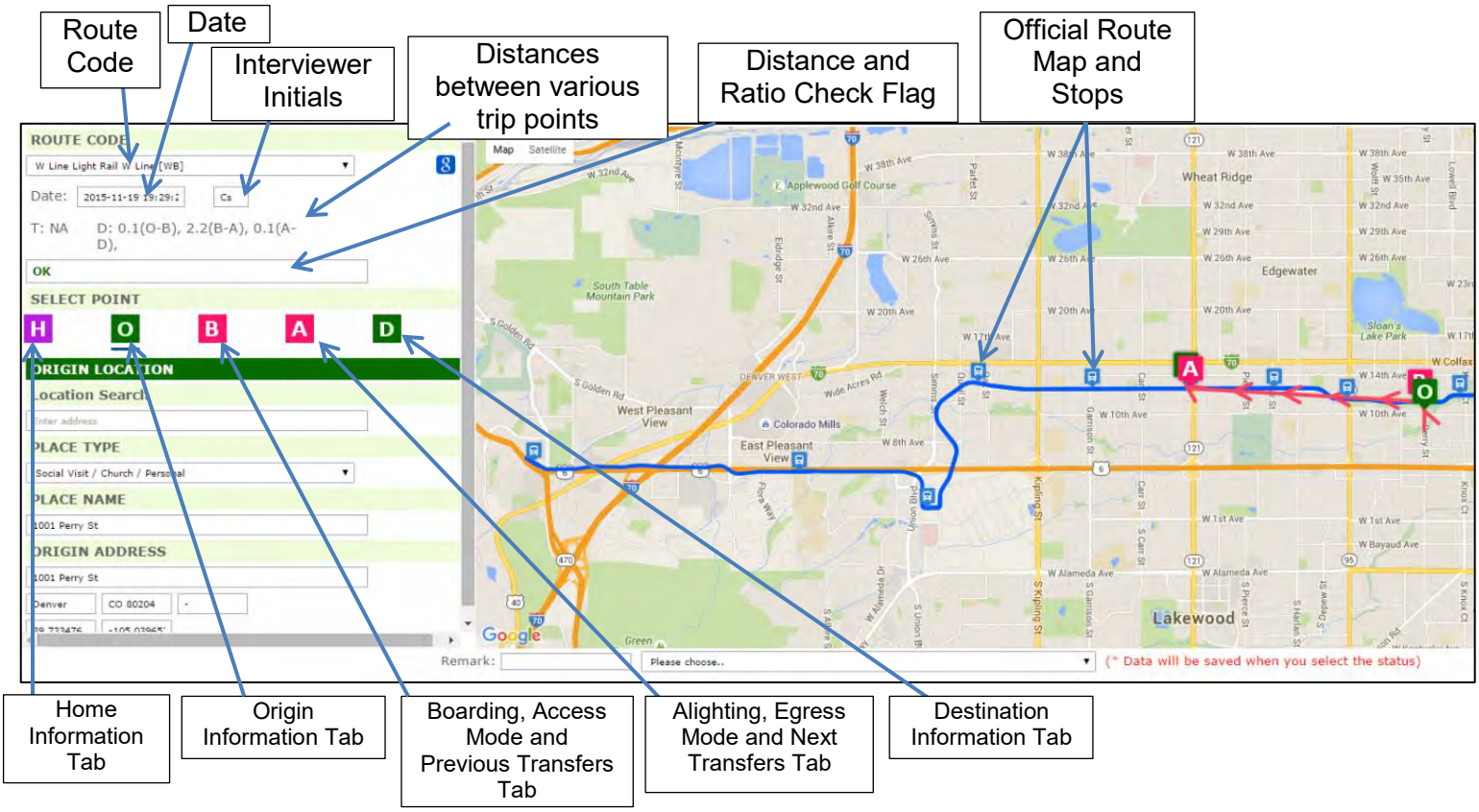
ETC Institute employs Field Supervisors (FS) who are responsible for: training, scheduling, and managing transit data collection efforts. ETC Institute continually adds steps to improve the FS' ability to effectively manage field staff. One tool is the use of an online dashboard created for each project. 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 6-1. Online Visual Review Tool (Read-Only Version)



6.4 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 2016 – March 2016. Upon completion of this OD Survey, the analysis of results indicated some gaps regarding the targeted number of responses per bus route and streetcar. To fill in the gaps, follow-up OD Surveys were carried out in late March 2016.

7 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.

7.1.1 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:

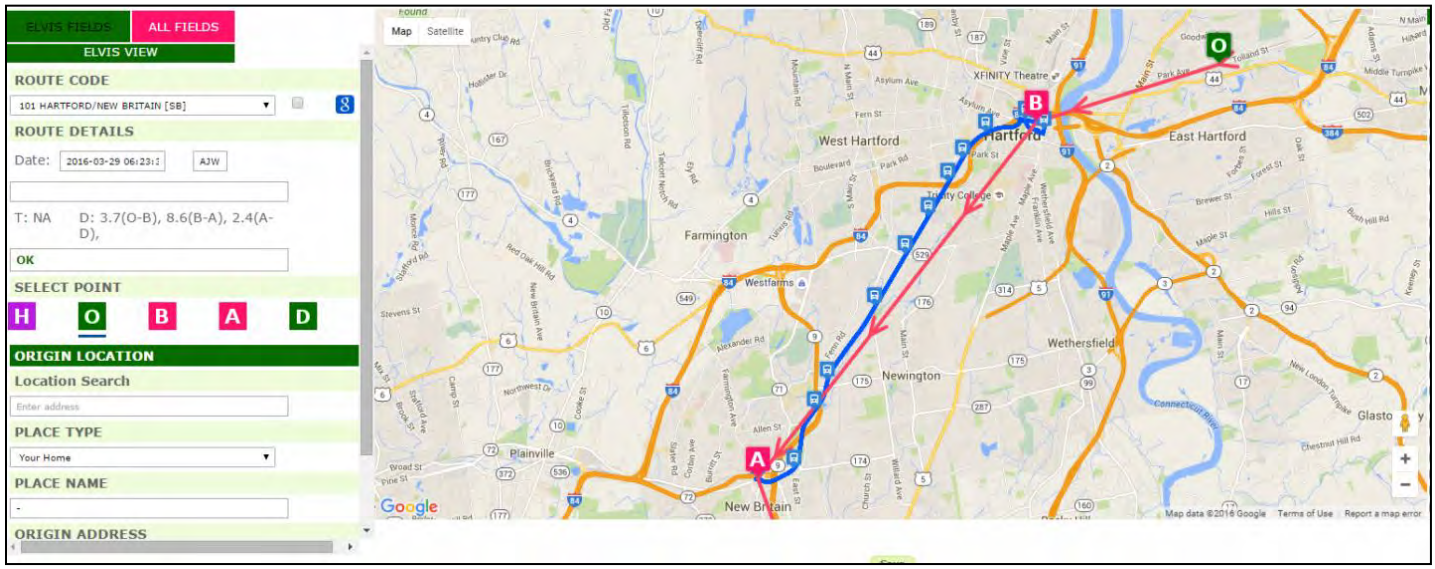
- Route / Direction
- Time of trip
- Transfers made
- Home address
- Origin address
- Destination address
- Origin place type
- Destination place type
- Access mode
- Egress mode
- Boarding location
- Alighting location

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 7-1. Online Visual Review Tool (Editable Version)



7.2 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 takes into account the curvature of the earth.

Access/Egress Mode Distance Check

Table 7-1 on the following page shows the distance checks for access (Origin to Boarding) and egress modes (Alighting to Destination).

Table 7-1. Origin to Boarding and Alighting to Destination Distance 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 7-2 below shows the distance checks based on the origin and destination locations.

Table 7-2. 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 7-3 on the following page shows the distance checks based on the boarding and alighting locations.

Table 7-3. 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

7.3 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 7-4 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 7-4. 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

7.3.1 Transit Review Team (TRT)

ETC Institute has a dedicated team whose priority is reviewing and editing completed records through the use of 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 7-5 on the following page describes the general issues that could occur within a trip where changes may have been appropriate.

Table 7-5. 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 7-6 on the following page describes the transfer issues that could occur within a trip where changes may have been appropriate.

Table 7-6. 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.

7.4 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.

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.

8.1 Sources of Ridership Data

8.1.1 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 25th-February 29th, 2016. Sun Shuttle ridership was provided separately by RTA staff and displayed by RTD. Due to some limitations in the APC data and to ensure a more accurate representation of the number of passengers who ride the services on an average weekday, ETC Institute took the percentage distribution of the APC data and normalized it with the farebox data from that same time period, so that the APC data equaled the farebox ridership while still maintaining the distribution collected by the APC data.

8.2 Data Expansion Overview

When survey goals are created, they are typically based off of 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 of 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.

8.2.1 Sun Link Data Expansion

Although daily boarding and alighting data by station for Sun Link was available, data on the number of trips between stations was not available. While the number of passengers that board and alight at each stop is important, the next step is learning where a passenger boards and then correspondingly where that same passenger alights. In order to estimate actual ridership between stops along the Sun Link route, an On-to-Off survey was administered with the goal of obtaining a sample of approximately 30% of Sun Link passengers. Ultimately over 40% of the originally estimated daily ridership participated in an On-to-Off survey.

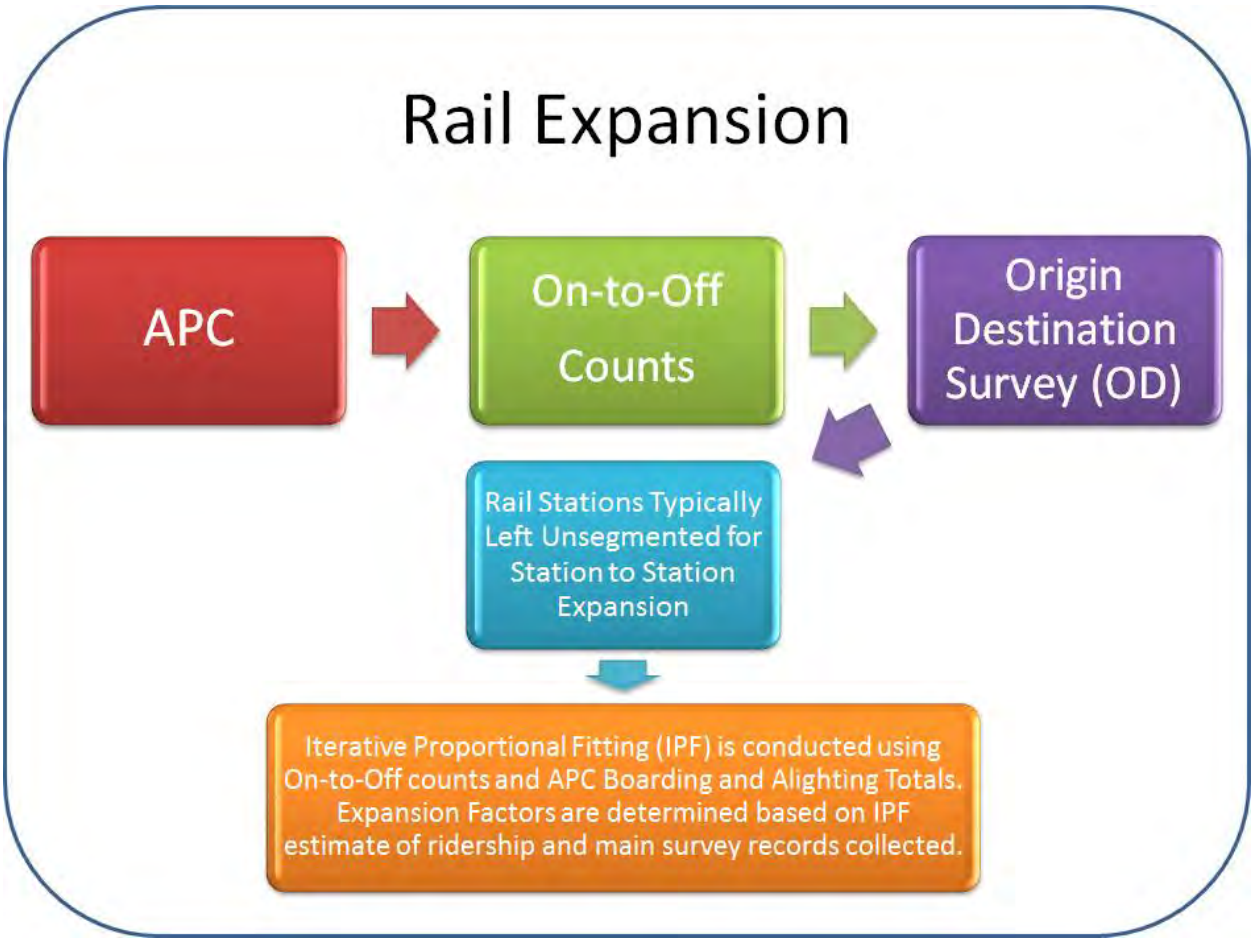


Table 8-1 on the following page shows a portion of the results for the On-to-Off Survey that was administered during the "AM Peak" period going eastbound. Each row in the table identifies the station where passengers boarded the streetcar. The columns in the table identify the stations where people got off the streetcar. For illustration purposes, only boarding and alighting stations for 6 of the 17 eastbound stations are shown.

Table 8-1. Sun Link Data Expansion Table Results of On-to-Off Survey

AM PEAK - EASTBOUND		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	0	0	1	1	3	3
Cushing/Frontage Rd	1	0	0	0	0	0	0
Granada/Cushing	1	0	0	0	0	0	0
Congress/Granada Av	5	0	0	0	0	0	0
Broadway/Church	2	0	0	0	0	0	0
Broadway/Stone	1	0	0	0	0	0	0

Table 8-2 shows the distribution of the data in Table 8-1 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 8-2. 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 8-2. Table 8-3 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 8-3. 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

Since the On-to-Off Survey did not cover 100 percent of the Sun Link boardings and alightings, the distribution in Table 8-3 was compared to the actual boarding and alighting data collected for each major station. The top portion of Table 8-4 below shows the boarding and alighting counts for each major station on the route based on the calculations described in Section 8.1. The bottom portion of the table shows the difference between the projected boardings and alightings at each station (from Table 8-3) and the average calculated counts.

Table 8-4. 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 (shown in Table 8-3) and the average calculated counts at each station (shown in Table 8-4).

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 (shown in Table 8-3) was multiplied by the ratio of the calculated boardings from the APC/Farebox 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 8-5. To calculate the expansion factors, the final estimate of ridership between major stations shown in Table 8-5 was divided by the actual number of main surveys that were completed by station shown in Table 8-6.

Table 8-5. 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 8-6. 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.

8.2.2 Route Segmentation with APC Data

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 APC data were separated based on direction, then divided into three segments based on the total boardings. After approximately one-third of the route's total APC ridership had boarded, a new segment began. After approximately two-thirds of the route's total APC ridership had boarded the final third segment began. Table 8-7 below is a simplified example of APC Data Segmenting. *(Note: Iterative Proportional Fitting (IPF) is used in multiple types of expansion discussed in this document. In order 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 8-7. Route Segmenting: APC Provided Routes

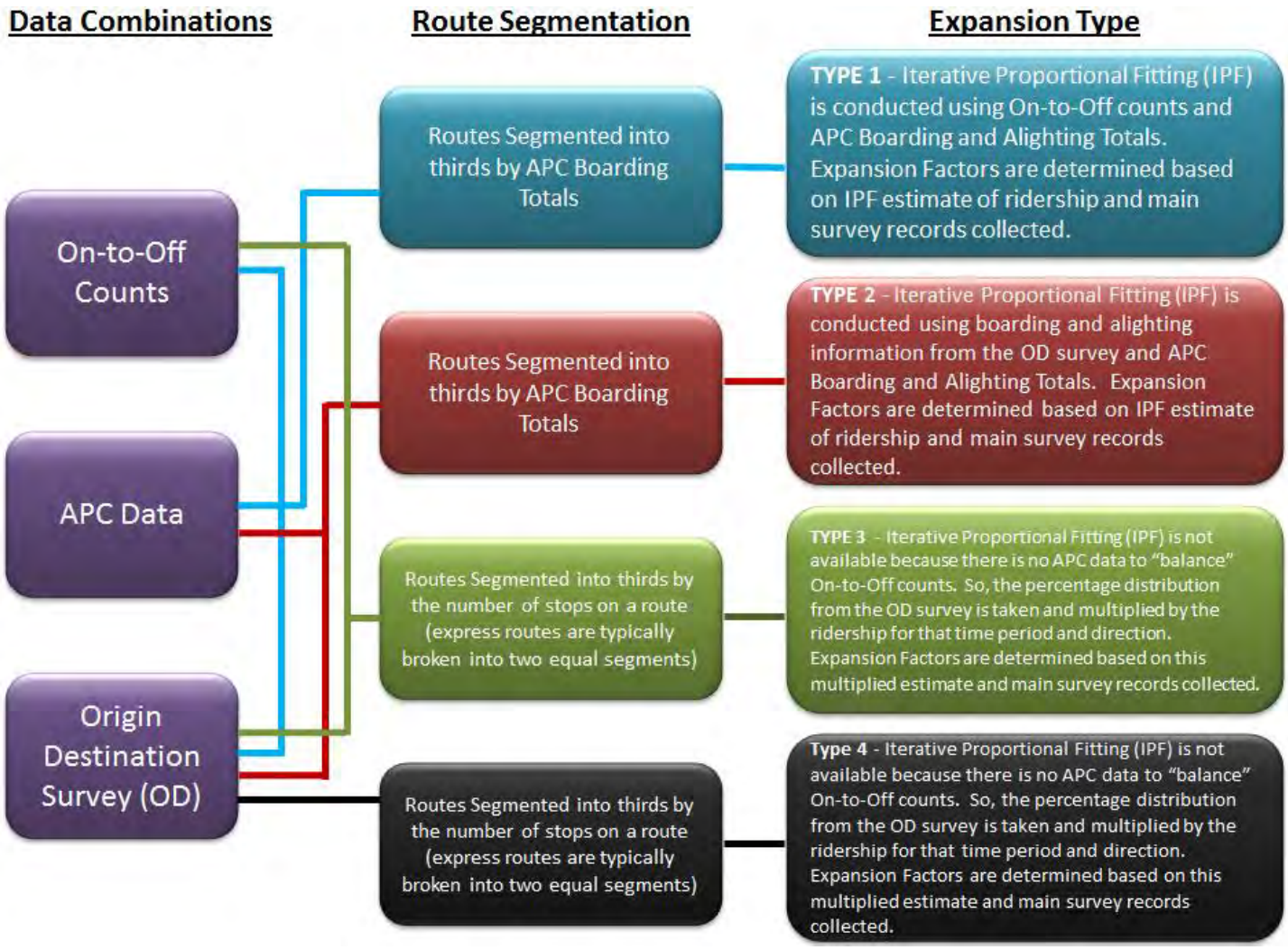
Segmentation with APC Example					
Direction: Eastbound	APC DATA		Segmentation		
Stops	Boardings	Alightings	Running Total of Boardings	Running Percentage of Total Boardings	Segment
Stop 1	35	0	35	23.0%	1
Stop 2	20	10	55	36.2%	1
Stop 3	20	5	75	49.3%	2
Stop 4	15	10	90	59.2%	2
Stop 5	5	12	95	62.5%	2
Stop 6	4	4	99	65.1%	2
Stop 7	19	4	118	77.6%	3
Stop 8	12	3	130	85.5%	3
Stop 9	15	5	145	95.4%	3
Stop 10	3	10	148	97.4%	3
Stop 11	2	15	150	98.7%	3
Stop 12	2	11	152	100.0%	3
Stop 13	0	10	152	100.0%	3
Stop 14	0	15	152	100.0%	3
Stop 15	0	38	152	100.0%	3
	152	152			

8.3 Types of Bus Data Expansion

The type of bus data expansion conducted depended on the data available for the specific bus route. The three types of data that created the combinations that guided the type of expansion used were: APC data (from Client), On-to-Off Counts Data (collected by ETC Institute), and Origin-Destination (OD) Survey Data (collected by ETC Institute). Figure 8-1 below shows the data combinations, the corresponding route segmentation, and type of expansion used.

Due to some limitations in the APC data and to ensure a more accurate representation of the number of passengers who ride the services on an average weekday, ETC Institute took the percentage distribution of the APC data and normalized it with the farebox data from that same time period. That ensured that the APC data equaled the farebox ridership while still maintaining the distribution collected by the APC data.

Figure 8-1 Types of Bus Data Expansion

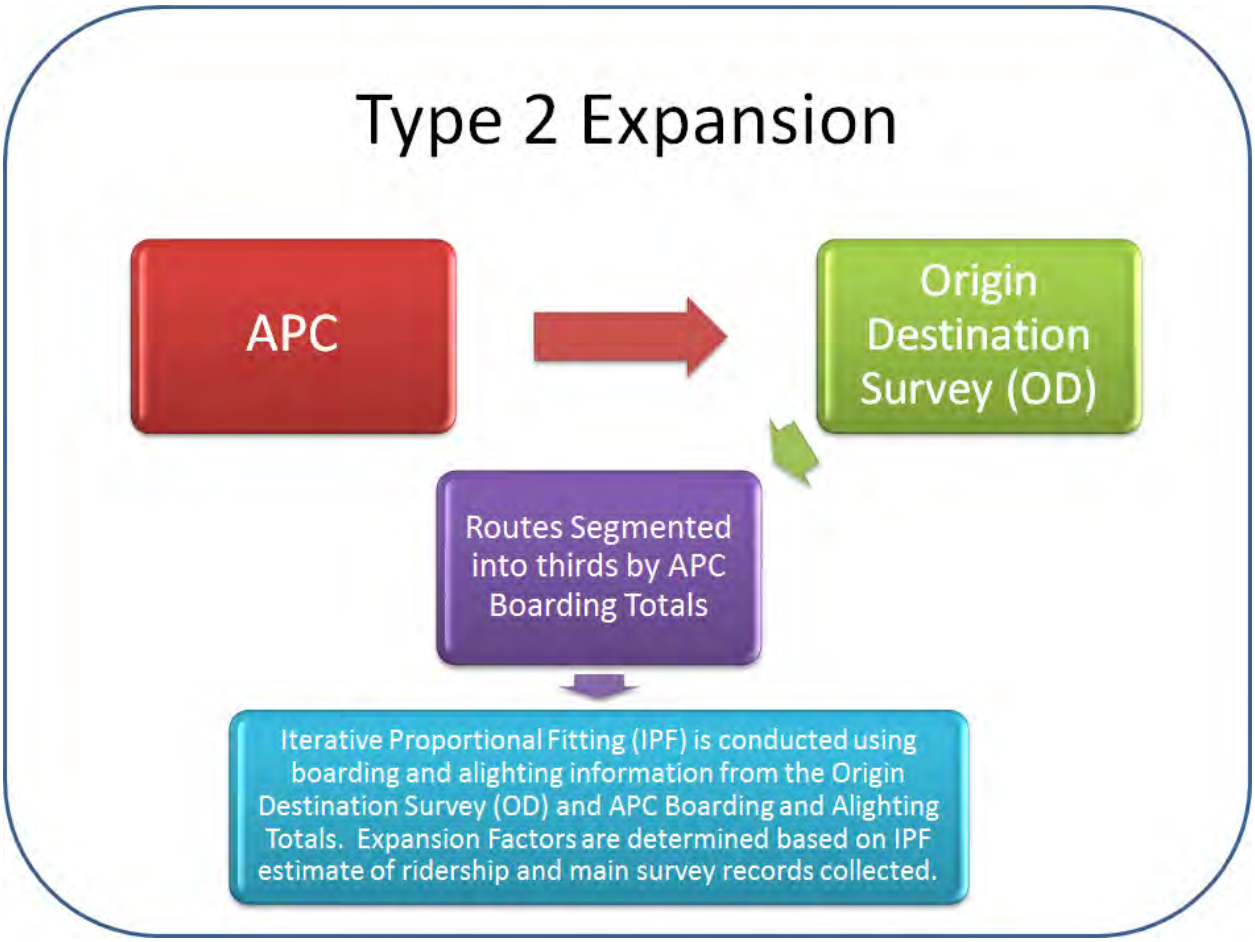


For this project, only expansion types 2 and 4 in the table above were utilized, so those are the only expansion processes explained subsequently.

Type 2 Expansion: Bus Routes with APC Data, OD Survey Data, but no On-to-Off Counts Data

On-to-Off counts are not always collected. However, sometimes these routes will have APC data available. In this case, Type 2 expansion is appropriate. This type of expansion also divided stops into three segments based on total boarding distribution by direction. These segments were then appended to the OD records based on the boarding and alighting locations. The 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 in Figure 8-1. The methodology for Type 2 expansion is as follows:

Figure 8-2 Type 2 Expansion



Type 2: Expansion Methodology for Bus Routes with APC Data, OD Survey Data, but no On-to-Off Counts Data

Table 8-8 shows the segmented results from the OD survey that replaced the On-to-Off counts. Each row in the table identifies the segment where passengers boarded the bus. The columns in the table identify the segments where people alighted. For example, 10 OD surveys had riders board on segment 2 and alight on segment 3.

Table 8-8: Bus Data Expansion Table Results of On-to-Off Survey

TABLE 1: RESULTS OF THE MAIN SURVEY				
Route: Example Eastbound (6am-9am)		Replacing On-to-Off Results		
Segment	Total	1	2	3
1	32	3	9	20
2	17		7	10
3	8			8
Total	57	3	16	38

Table 8-9 shows the distribution of the data in Table 6-8, expressed as a percentage of all boardings for the time period and direction. Table 6-9 was created by dividing each cell in Table 6-8 by the sum of all records in Table 6-8, which is 57. For example, 10/57 (17.5%) of all trips boarded on segment 2 and alighted at segment 3 as shown in Table 8-9.

Table 8-9: Bus Data Expansion Table Distribution of On-to-Off Survey

TABLE 2: DISTRIBUTION OF THE ON-TO-OFF SURVEY				
Route: Example Eastbound (6am-9am)		PERCENTAGE DISTRIBUTION OF RIDERSHIP COUNTS FROM THE ON/OFF SURVEY		
Segment	Total	1	2	3
1	56.1%	5.3%	15.8%	35.1%
2	29.8%	0.0%	12.3%	17.5%
3	14.0%	0.0%	0.0%	14.0%
Total	100.0%	5.3%	28.1%	66.7%

The ridership for the route by time period and direction was applied to the “on-to-off” (boarding to alighting information from the OD survey) distribution shown in Table 8-9. This produces an estimate of the ridership flow on the route based on the boarding segment to the alighting segment as shown in Table 8-10. Applying the actual ridership of 320 to the distribution created an initial estimate that 56 trips (17.5% x 320) boarded on segment 2 and alighted on segment 3.

Table 8-10: Bus Data Expansion Table Initial Estimate of Ridership Flows Between Segments

TABLE 3: INITIAL ESTIMATE OF RIDERSHIP FLOWS BETWEEN STATION				
(percentages in table 2 were applied to the total boardings for this time period in this direction)				
Route: Example Eastbound (6am-9am)		PROJECTED RIDERSHIP BASED ON THE ON-TO-OFF SURVEY		
Segment	Total	1	2	3
1	180	17	51	112
2	95	0	39	56
3	45	0	0	45
Total	320	17	90	213

In order to develop a more accurate estimate of ridership flows between segments for each route, ETC Institute developed an Iterative Proportional Fitting Algorithm to balance the differences between the initial estimated ridership (shown in Table 8-10) and the ridership observed by APC data at each segment (shown in Table 8-11). *(Note: The APC Data shown in Table 8-11 was normalized with the farebox data from the same time period to create a more accurate representation)*.

Table 8-11: APC Data

TABLE 4: BOARDINGS and ALIGHTINGS BY STATION				
Route: Example Eastbound (6am-9am)				
Average Weekday Ridership	Total	1	2	3
BOARDINGS	320	100	100	120
ALIGHTINGS	320	20	100	200
DIFFERENCE FROM PROJECTED				
BOARDINGS	0	-80	5	75
ALIGHTINGS	0	3	10	-13

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 (boarding to alighting information from the OD survey) for each route (shown in Table 8-10) was multiplied by the ratio of the actual boardings from the APC/Farebox data for each segment by the estimated boardings for each segment. For example, if the actual boardings for Segment 1 were 120 and the estimated boardings were 100, each cell associated with Segment 1 would have been multiplied by 1.2 (120 / 100) to adjust the estimated boardings to actual boardings.

Step 2: Correction for the Alightings. Once the correction in Step 1 was applied, the estimated boardings would equal the actual boardings. However, the adjustment to the boardings total may change 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 actual alightings from the APC data for each segment by the estimated alightings for each segment from Step 1. For example, if the actual alightings for Segment 2 were 220 and the estimated alightings from Step 1 were 200, each cell associated with Segment 2 would have been multiplied by 1.1 (220 / 200) to adjust the estimated alightings from Step 1 to actual alightings.

The processes described in Step 1 and Step 2 were repeated sequentially until the difference between the actual and estimated boardings and alightings was zero. Table 8-12 shows that after six balancing iterations in this algorithm, there were no differences between the projected distribution and the actual boardings and alightings.

Table 8-12. Iterative Balance Process

6th STEP of ITERATIVE BALANCING TO CORRECT DISTRIBUTION OF RIDERSHIP BY ALIGHTING Location					
Segment	Total	DIFFERENCE FROM ACTUAL BOARDINGS	1	2	3
1	100	0	20	40	41
2	100	0	0	60	40
3	120	0	0	0	120
Total	320	0	20	100	200
DIFFERENCE FROM ACTUAL ALIGHTINGS	0		0	0	0
6th STEP of ITERATIVE BALANCING TO CORRECT DISTRIBUTION OF RIDERSHIP BY BOARDING Location					
Segment	Total	DIFFERENCE FROM ACTUAL BOARDINGS	1	2	3
1	100	0	20	40	40
2	100	0	0	60	40
3	120	0	0	0	120
Total	320	0	20	100	200
DIFFERENCE FROM ACTUAL ALIGHTINGS	0		0	0	0

The final estimate for ridership flows is shown in Table 8-13 below.

Table 8-13: Final Estimate of Ridership Flows between Stations

TABLE 6: FINAL ESTIMATE OF RIDERSHIP FLOWS BETWEEN STATIONS				
Route: Example Eastbound (6am-9am)				
Segment	Total	1	2	3
1	100	20	40	40
2	100	0	60	40
3	120	0	0	120
Total	320	20	100	200
DIFFERENCE FROM ACTUAL ALIGHTINGS	0	0	0	0

The actual number of OD records that were completed for each boarding to alighting segment is shown in Table 8-14. To calculate the expansion factors, the final estimate of ridership between segments shown in Table 8-13 was divided by the actual number of OD records that were completed as shown in Table 8-14. This calculation produces the expansion shown in Table 8-15.The 40 estimated riders were divided by the 10 completed surveys to produce a factor of 3.96 to be applied to riders who board at segment 2 and alighting at segment 3, as shown Table 8-15.

Table 8-14: Number of Completed Surveys (Bus)

TABLE 7: NUMBER OF COMPLETED SURVEYS				
Route: Example Eastbound (6am-9am)				
Segment	Total	1	2	3
1	32	3	9	20
2	17		7	10
3	8			8
Total	57	3	16	38

Table 8-15: Weighting Factors (Bus)

TABLE 8: WEIGHTING FACTORS				
Route: Example Eastbound (6am-9am)				
Segment	Total	1	2	3
1	3.13	6.67	4.40	2.02
2	5.88	0.00	8.63	3.96
3	15.00	0.00	0.00	15.00
Total	5.61	6.67	6.25	5.26

Type 4 Expansion: Bus Routes with OD Survey Data, without On-to-Off Counts Data or APC Data

For routes that only have OD Survey data and ridership information by time period and direction like the Sun Shuttle routes, Type 4 expansion 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.

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.

8.3.2 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/farebox combination 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 8-16 below.

Table 8-16: 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

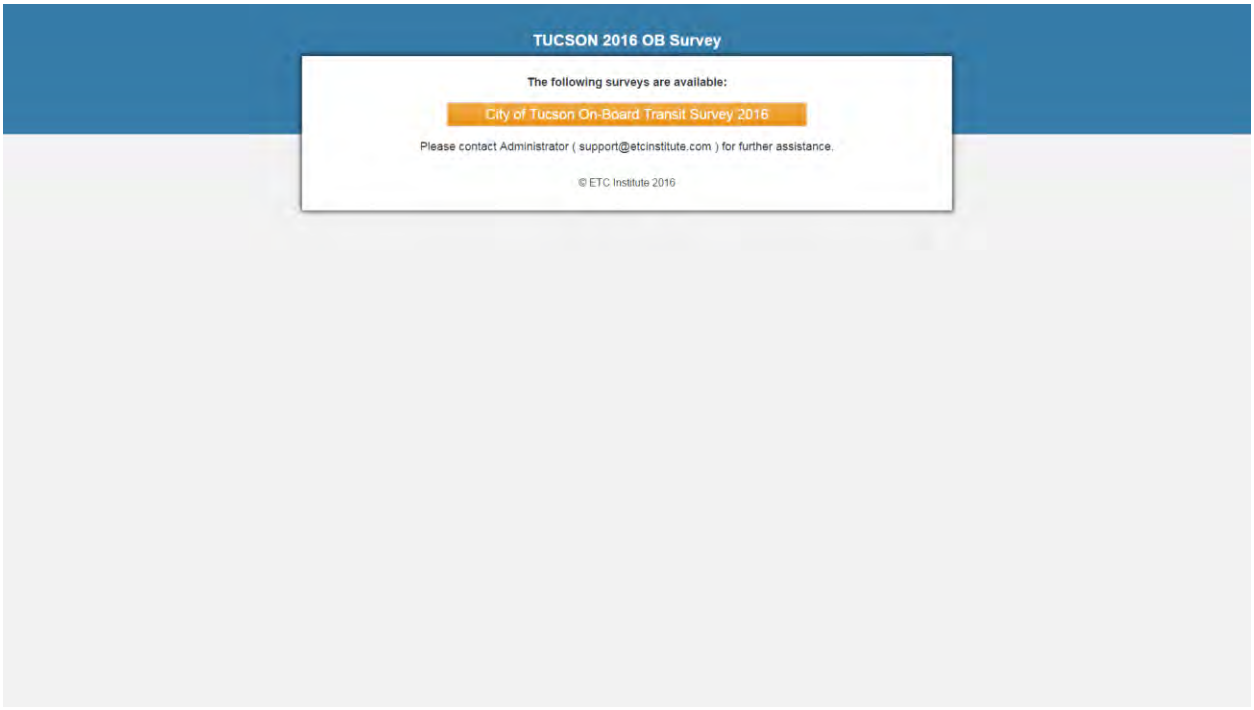
Once the linked trip multiplier is created it is multiplied by the unlinked expansion factor to create the linked expansion factor.

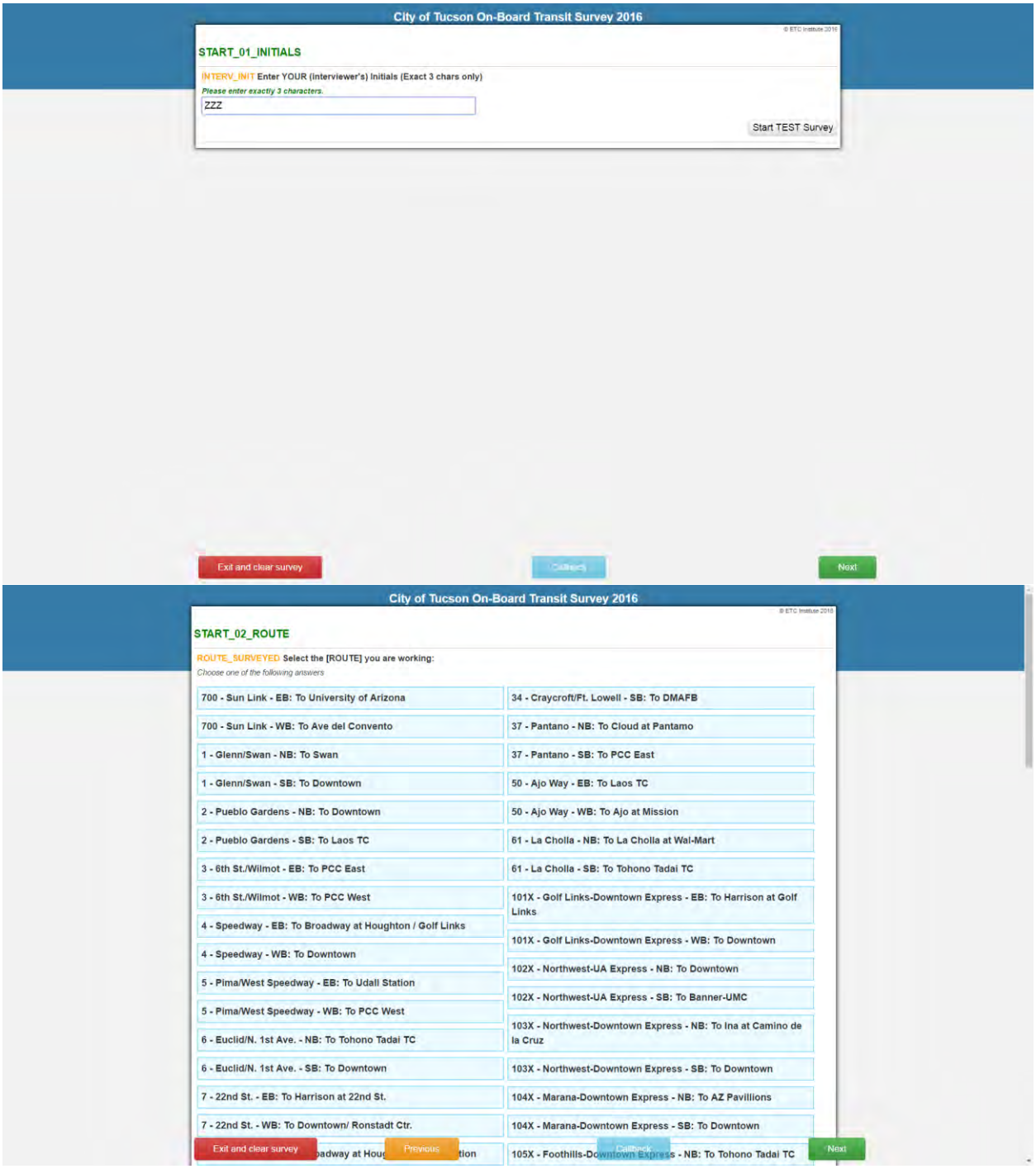
Assessment of Expansion Factor Values

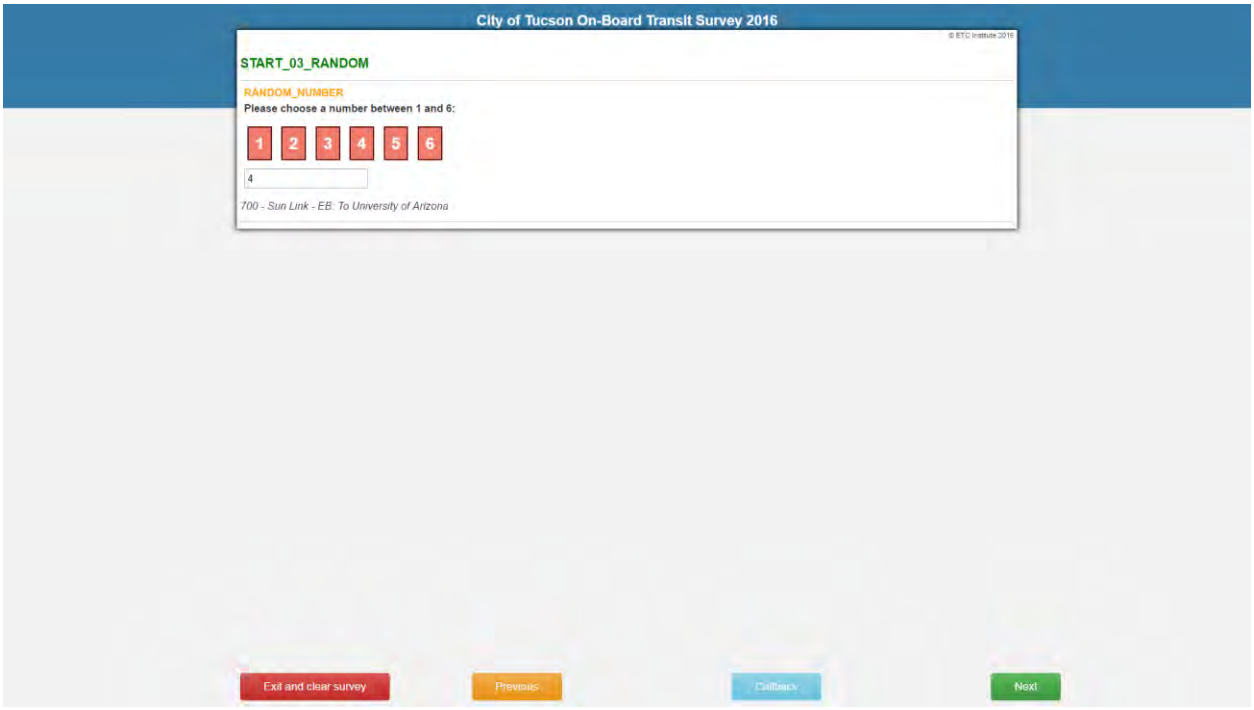
The average value of all unlinked expansion factors in the database is 7.87. Of the 7,905 records in the database, 7,203 (91% of the sample) have an expansion factor of 15 or less and 7629 (97% of the sample) have a value less than 20. Only 46 records in the database have an expansion factor greater than 30.

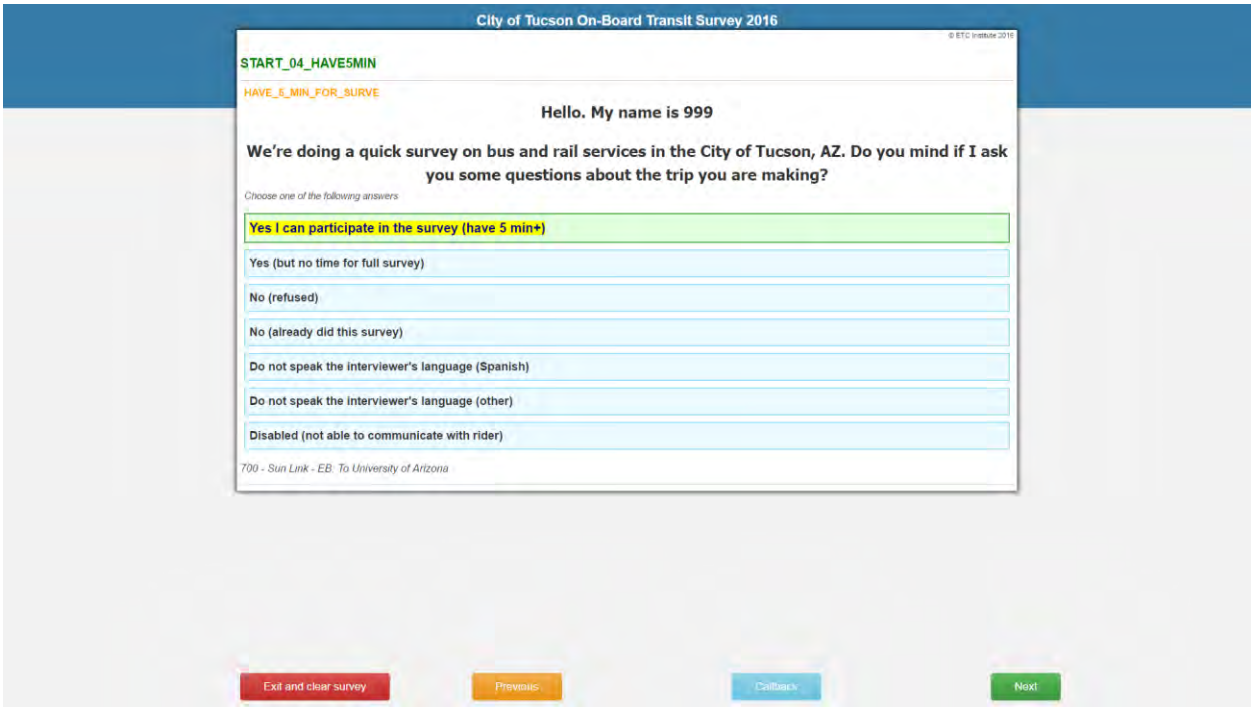
Tablet Survey

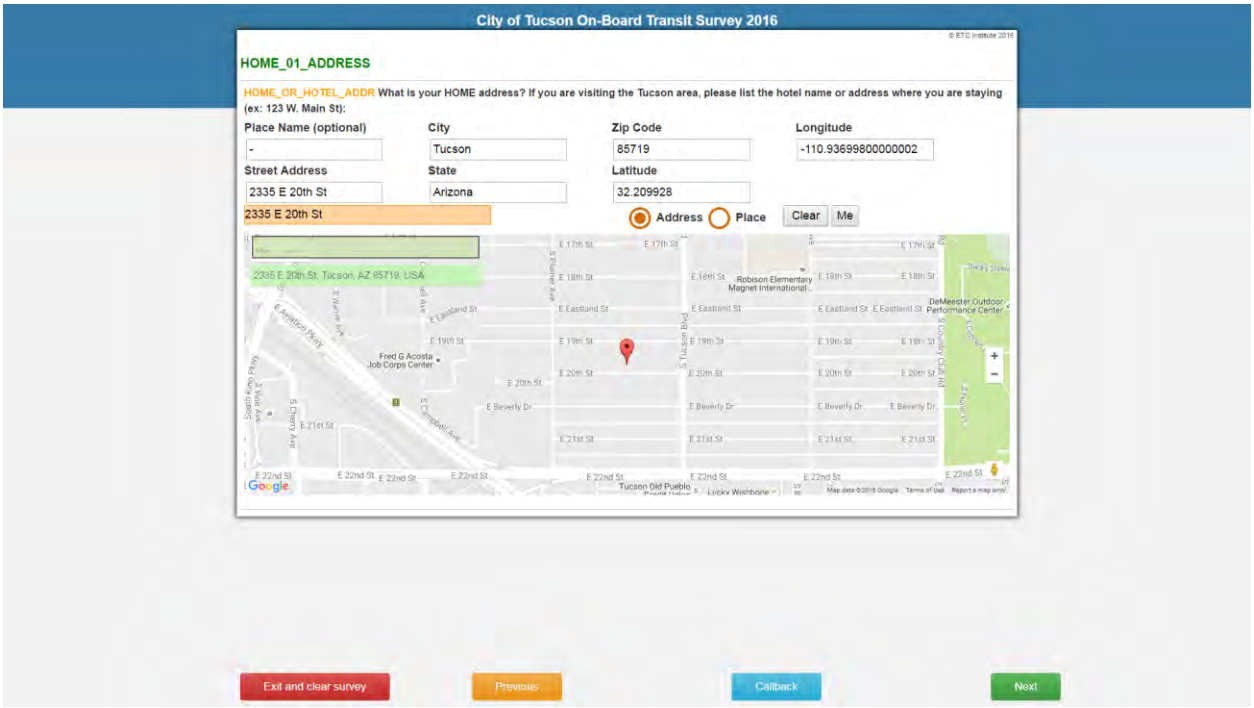
Screenshots of the tablet survey are shown on the following pages. *(Note: Not all "paths" are shown in the screenshots. For example, during the demographic portion of the survey, if a respondent indicated that they spoke another language other than English at home, a secondary question for what type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

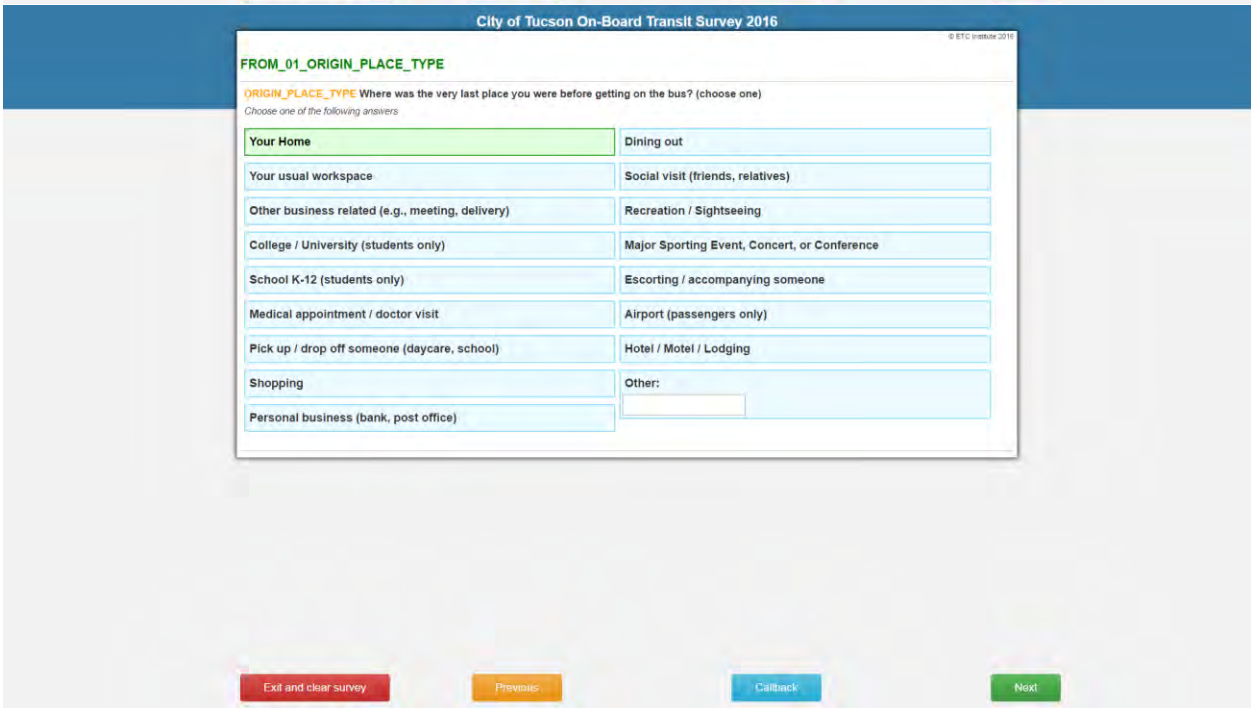


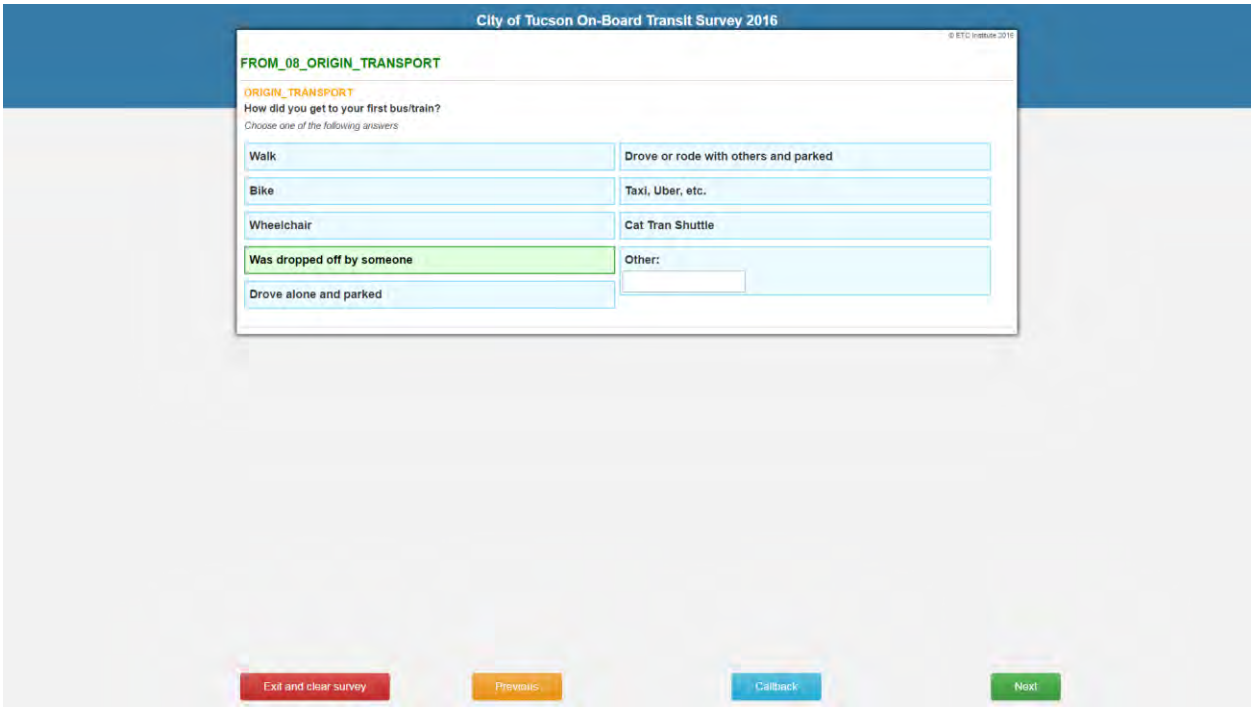

City of Tucson On-Board Transit Survey 2016
START_01_INITIALS
INTERV_INIT Enter YOUR (interviewer's) Initials (Exact 3 chars only)
Please enter exactly 3 characters.
ZZZ
Start TEST Survey
Exit and clear survey
Next
City of Tucson On-Board Transit Survey 2016
START_02_ROUTE
ROUTE_SURVEYED Select the [ROUTE] you are working:
Choose one of the following answers
700 - Sun Link - EB: To University of Arizona
700 - Sun Link - WB: To Ave del Convento
1 - Glenn/Swan - NB: To Swan
1 - Glenn/Swan - SB: To Downtown
2 - Pueblo Gardens - NB: To Downtown
2 - Pueblo Gardens - SB: To Laos TC
3 - 6th St./Wilmot - EB: To PCC East
3 - 6th St./Wilmot - WB: To PCC West
4 - Speedway - EB: To Broadway at Houghton / Golf Links
4 - Speedway - WB: To Downtown
5 - Pima/West Speedway - EB: To Udall Station
5 - Pima/West Speedway - WB: To PCC West
6 - Euclid/N. 1st Ave. - NB: To Tohono Tadai TC
6 - Euclid/N. 1st Ave. - SB: To Downtown
7 - 22nd St. - EB: To Harrison at 22nd St.
7 - 22nd St. - WB: To Downtown/ Ronstadt Ctr.
34 - Craycroft/Ft. Lowell - SB: To DMAFB
37 - Pantano - NB: To Cloud at Pantamo
37 - Pantano - SB: To PCC East
50 - Ajo Way - EB: To Laos TC
50 - Ajo Way - WB: To Ajo at Mission
61 - La Cholla - NB: To La Cholla at Wal-Mart
61 - La Cholla - SB: To Tohono Tadai TC
101X - Golf Links-Downtown Express - EB: To Harrison at Golf Links
101X - Golf Links-Downtown Express - WB: To Downtown
102X - Northwest-UA Express - NB: To Downtown
102X - Northwest-UA Express - SB: To Banner-UMC
103X - Northwest-Downtown Express - NB: To Ina at Camino de la Cruz
103X - Northwest-Downtown Express - SB: To Downtown
104X - Marana-Downtown Express - NB: To AZ Pavillions
104X - Marana-Downtown Express - SB: To Downtown
105X - Foothills-Downtown Express - NB: To Tohono Tadai TC
Exit and clear survey
Previous
Next

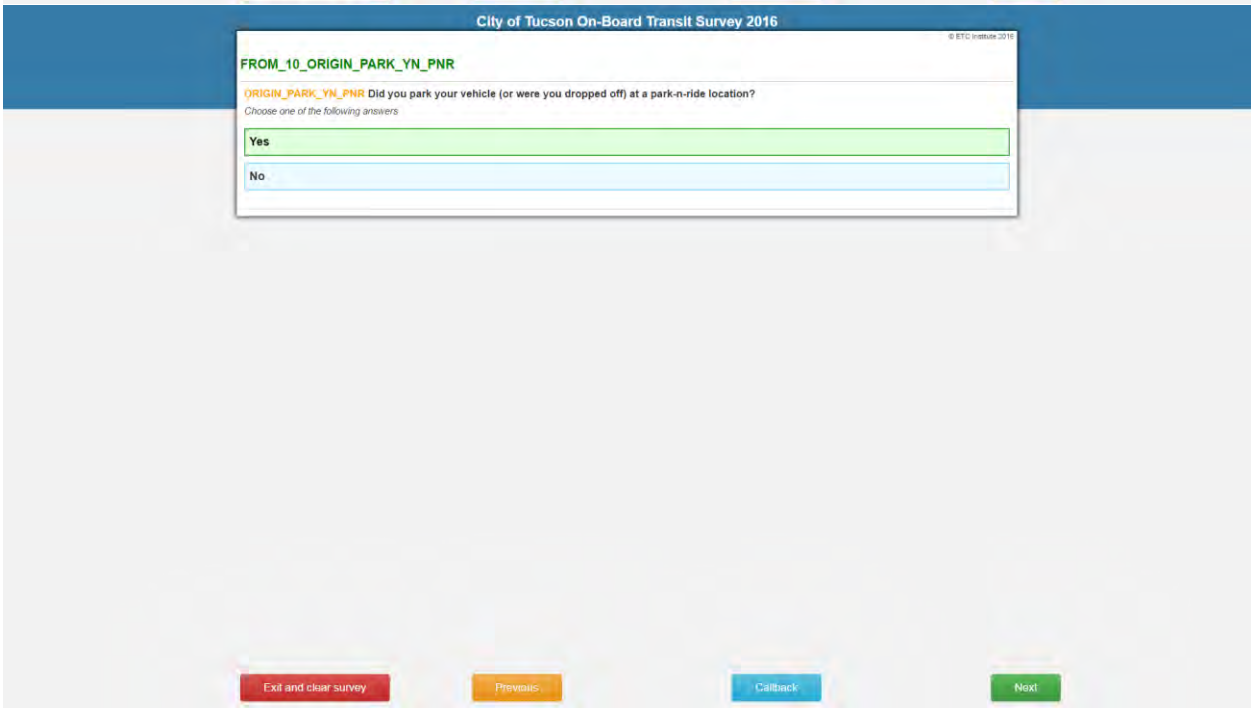

City of Tucson On-Board Transit Survey 2016
START_03_RANDOM
RANDOM_NUMBER
Please choose a number between 1 and 6:
1 2 3 4 5 6
4
700 - Sun Link - EB: To University of Arizona
Exit and clear survey
Previous
Callback
Next

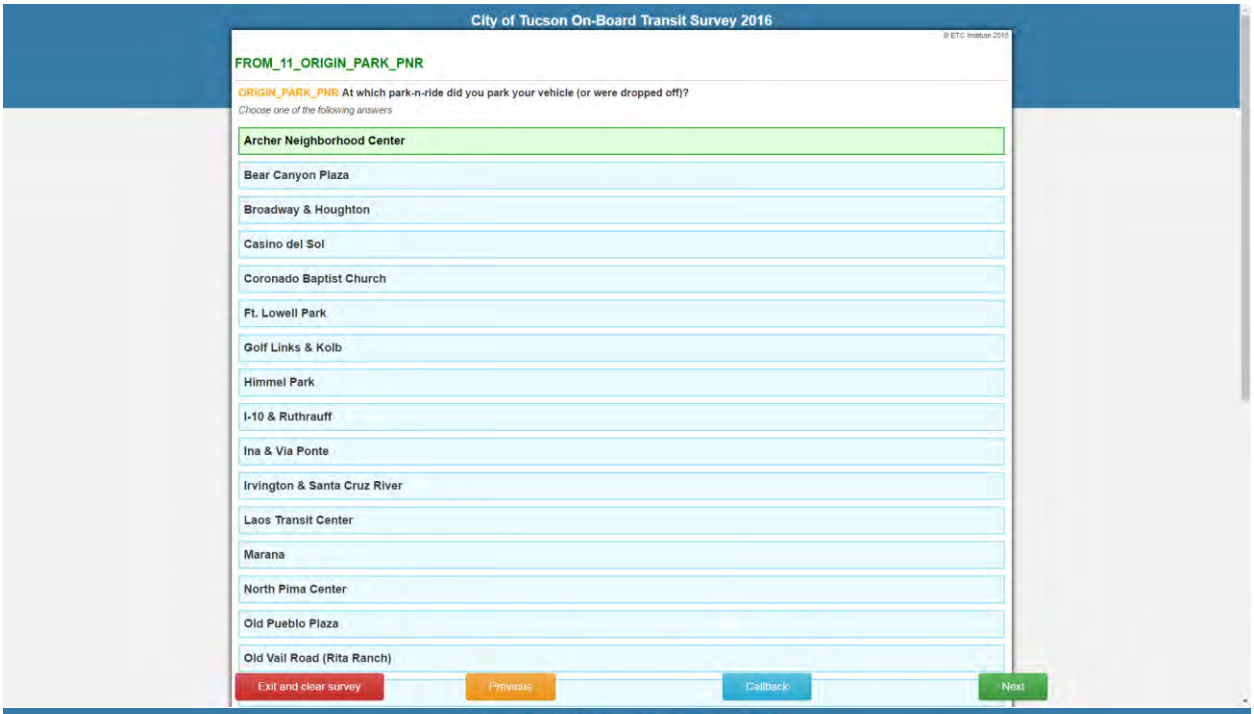

City of Tucson On-Board Transit Survey 2016
START_04_HAVE5MIN
HAVE_5_MIN_FOR_SURVE
Hello. My name is 999
We're doing a quick survey on bus and rail services in the City of Tucson, AZ. Do you mind if I ask you some questions about the trip you are making?
Choose one of the following answers
Yes I can participate in the survey (have 5 min+)
Yes (but no time for full survey)
No (refused)
No (already did this survey)
Do not speak the interviewer's language (Spanish)
Do not speak the interviewer's language (other)
Disabled (not able to communicate with rider)
700 - Sun Link - EB: To University of Arizona
Exit and clear survey
Previous
Callback
Next

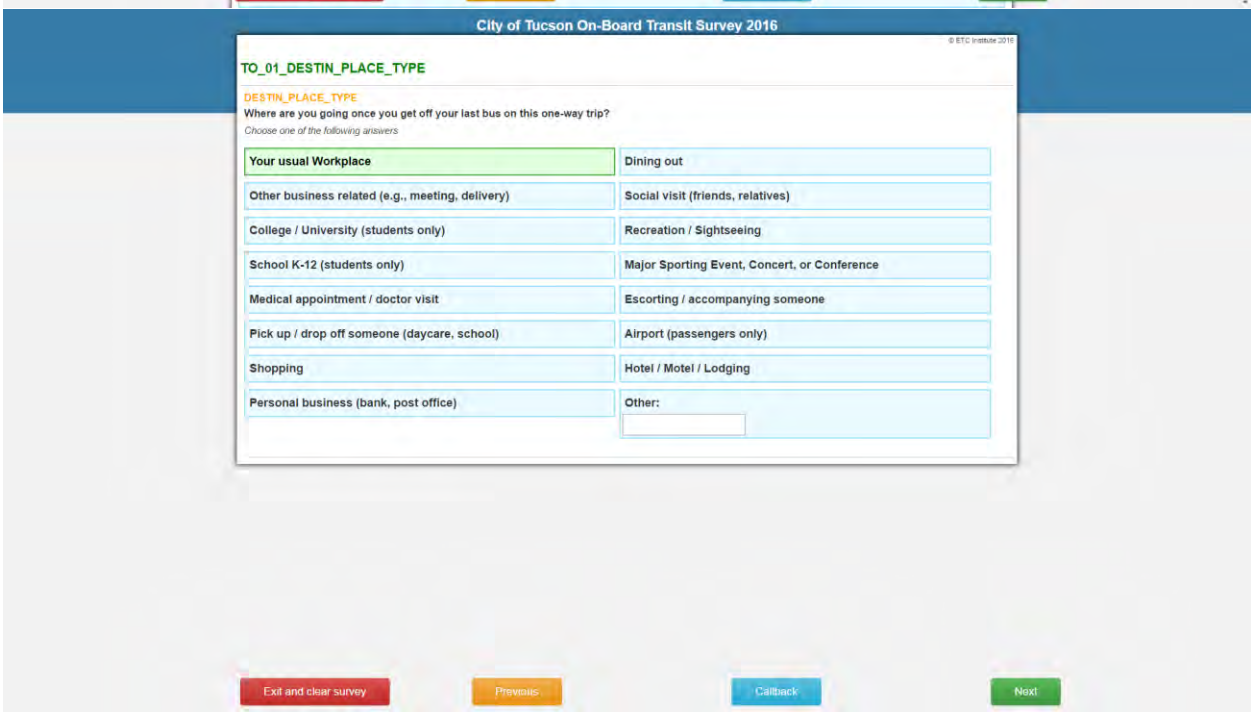

City of Tucson On-Board Transit Survey 2016
HOME_01_ADDRESS
HOME_OR_HOTEL_ADDR What is your HOME address? If you are visiting the Tucson area, please list the hotel name or address where you are staying (ex: 123 W. Main St):
Place Name (optional)
City
Zip Code
Longitude
-
Tucson
85719
-110.93699800000002
Street Address
State
Latitude
2335 E 20th St
Arizona
32.209928
2335 E 20th St
Address
Place
Clear
Me
2335 E 20th St, Tucson, AZ 85719, USA
Exit and clear survey
Previous
Callback
Next

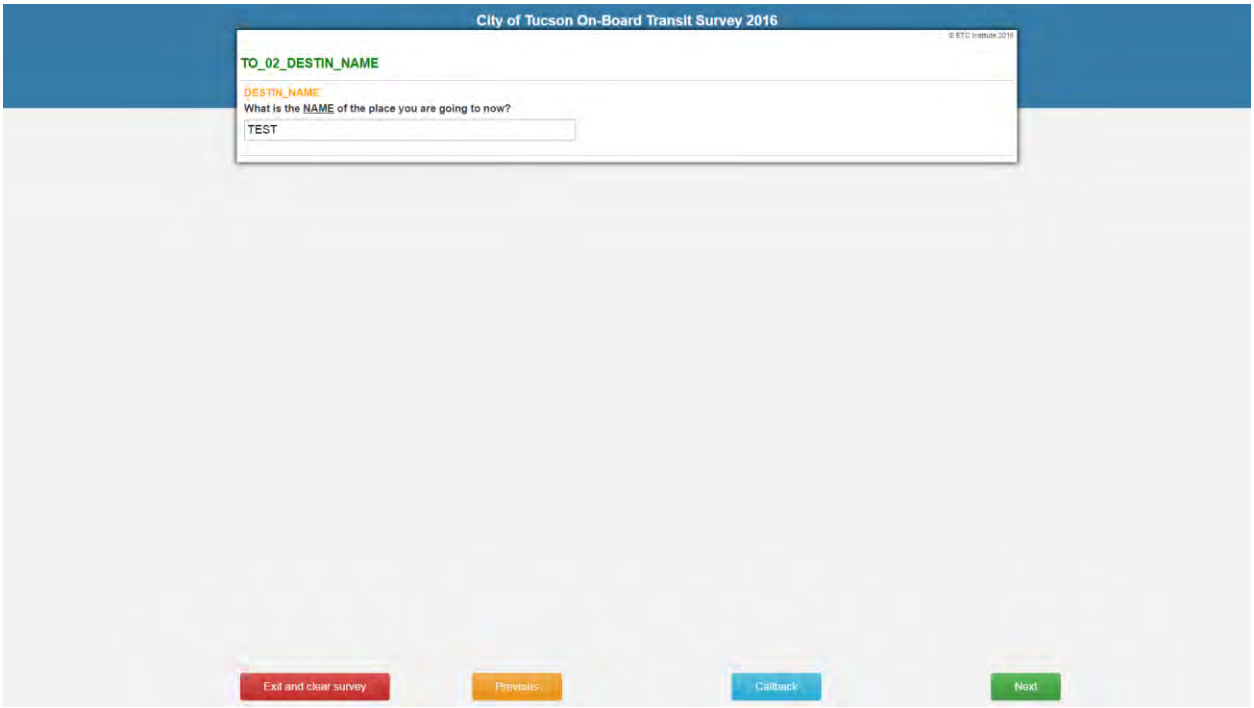

City of Tucson On-Board Transit Survey 2016
FROM_01_ORIGIN_PLACE_TYPE
ORIGIN_PLACE_TYPE Where was the very last place you were before getting on the bus? (choose one)
Choose one of the following answers
Your Home
Your usual workspace
Other business related (e.g., meeting, delivery)
College / University (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 (passengers only)
Hotel / Motel / Lodging
Other:
Exit and clear survey
Previous
Callback
Next

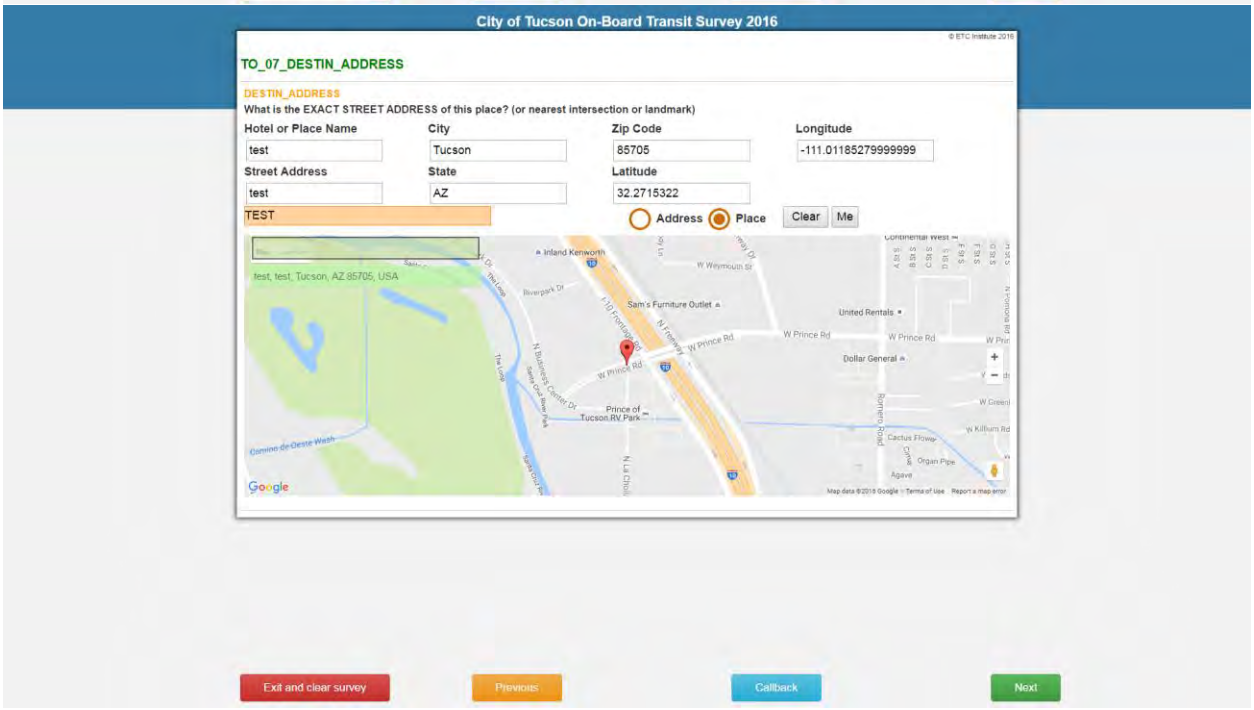

City of Tucson On-Board Transit Survey 2016
© ETC Institute 2016
FROM_08_ORIGIN_TRANSPORT
ORIGIN_TRANSPORT
How did you get to your first bus/train?
Choose one of the following answers
Walk
Bike
Wheelchair
Was dropped off by someone
Drove alone and parked
Drove or rode with others and parked
Taxi, Uber, etc.
Cat Tran Shuttle
Other:
Exit and clear survey
Previous
Callback
Next

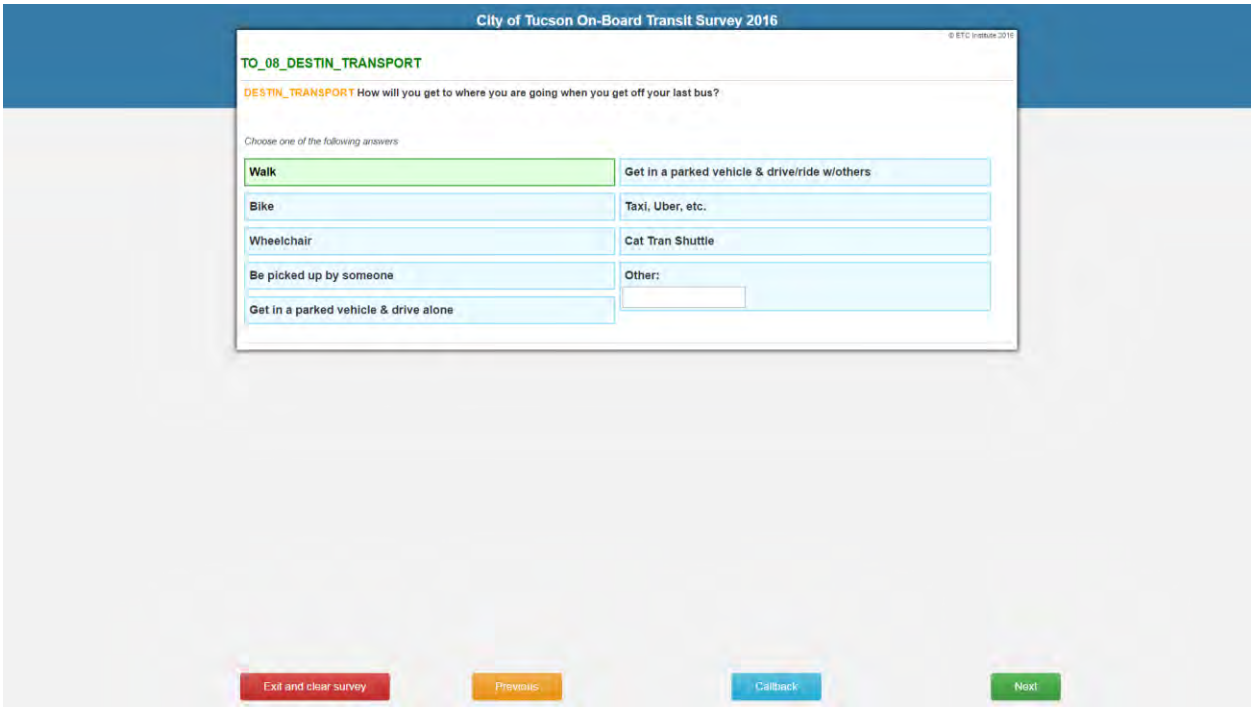

City of Tucson On-Board Transit Survey 2016
© ETC Institute 2016
FROM_10_ORIGIN_PARK_YN_PNR
ORIGIN_PARK_YN_PNR Did you park your vehicle (or were you dropped off) at a park-n-ride location?
Choose one of the following answers
Yes
No
Exit and clear survey
Previous
Callback
Next

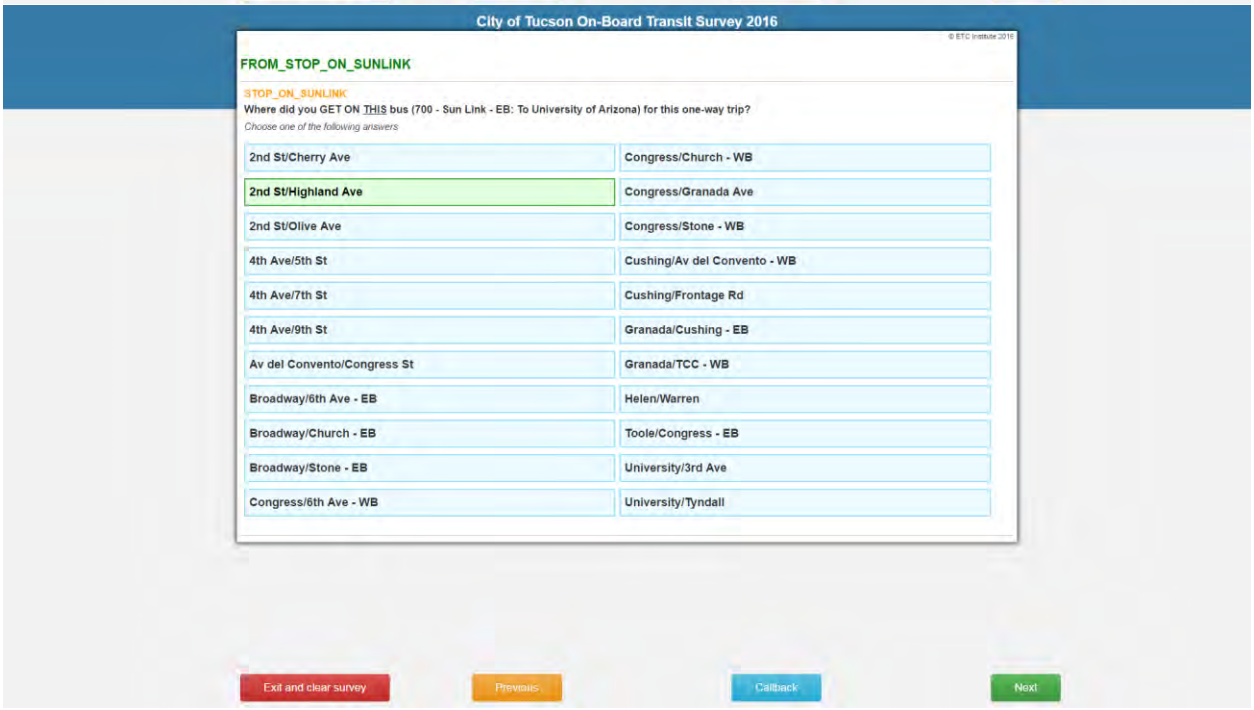

City of Tucson On-Board Transit Survey 2016
FROM_11_ORIGIN_PARK_PNR
ORIGIN_PARK_PNR At which park-n-ride did you park your vehicle (or were dropped off)?
Choose one of the following answers
Archer Neighborhood Center
Bear Canyon Plaza
Broadway & Houghton
Casino del Sol
Coronado Baptist Church
Ft. Lowell Park
Golf Links & Kolb
Himmel Park
I-10 & Ruthrauff
Ina & Via Ponte
Irvington & Santa Cruz River
Laos Transit Center
Marana
North Pima Center
Old Pueblo Plaza
Old Vail Road (Rita Ranch)
Exit and clear survey
Previous
Callback
Next

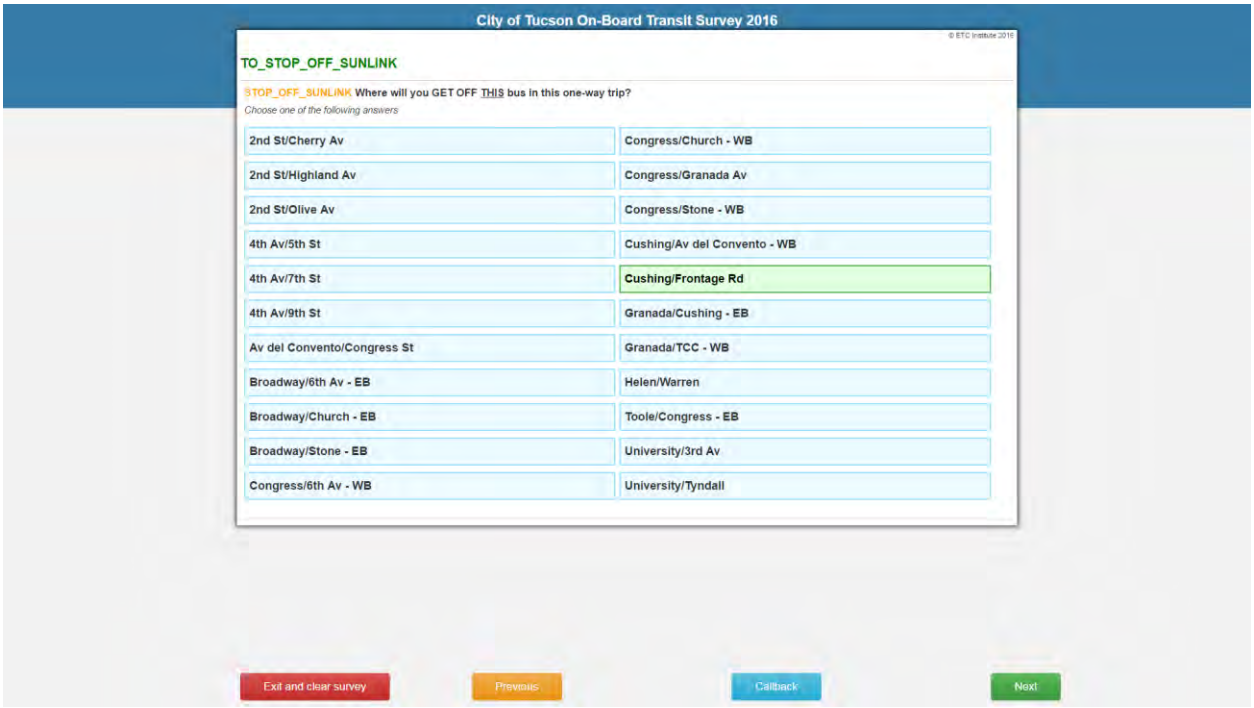

City of Tucson On-Board Transit Survey 2016
TO_01_DESTIN_PLACE_TYPE
DESTIN_PLACE_TYPE
Where are you going once you get off your last bus on this one-way trip?
Choose one of the following answers
Your usual Workplace
Other business related (e.g., meeting, delivery)
College / University (students only)
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 (passengers only)
Hotel / Motel / Lodging
Other:
Exit and clear survey
Previous
Callback
Next

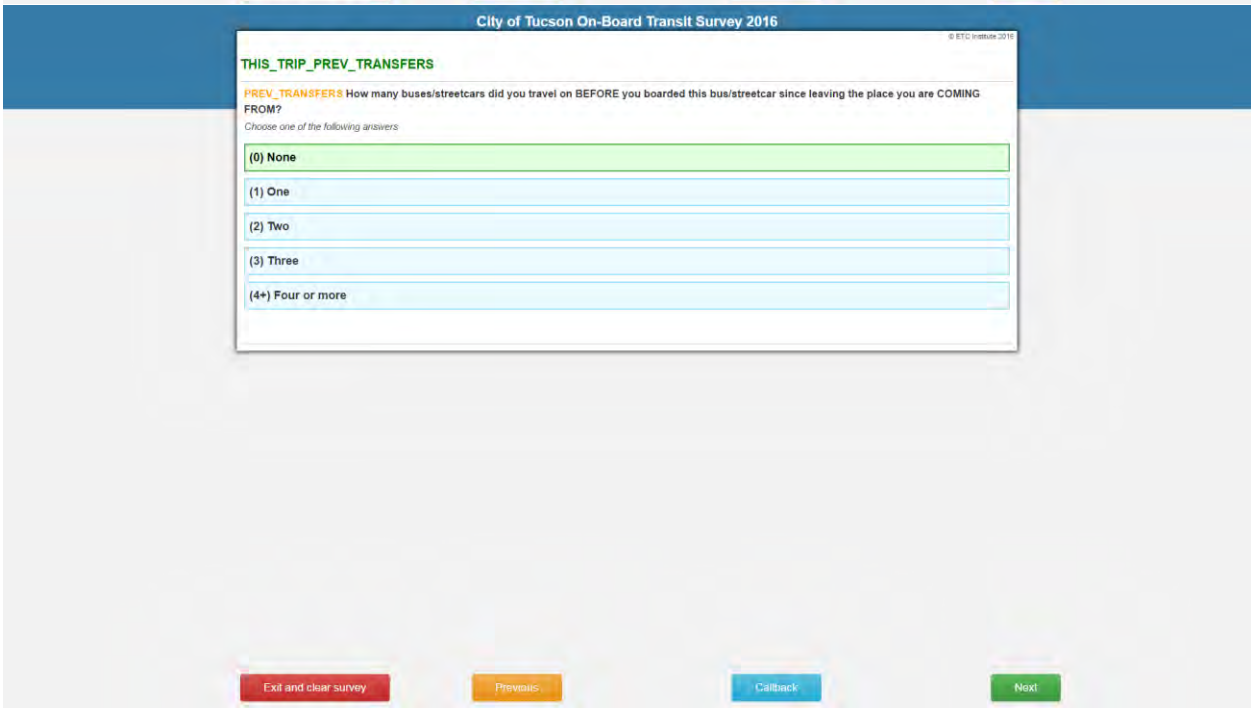

City of Tucson On-Board Transit Survey 2016
TO_02_DESTIN_NAME
DESTIN_NAME
What is the NAME of the place you are going to now?
TEST
Exit and clear survey
Previous
Callback
Next

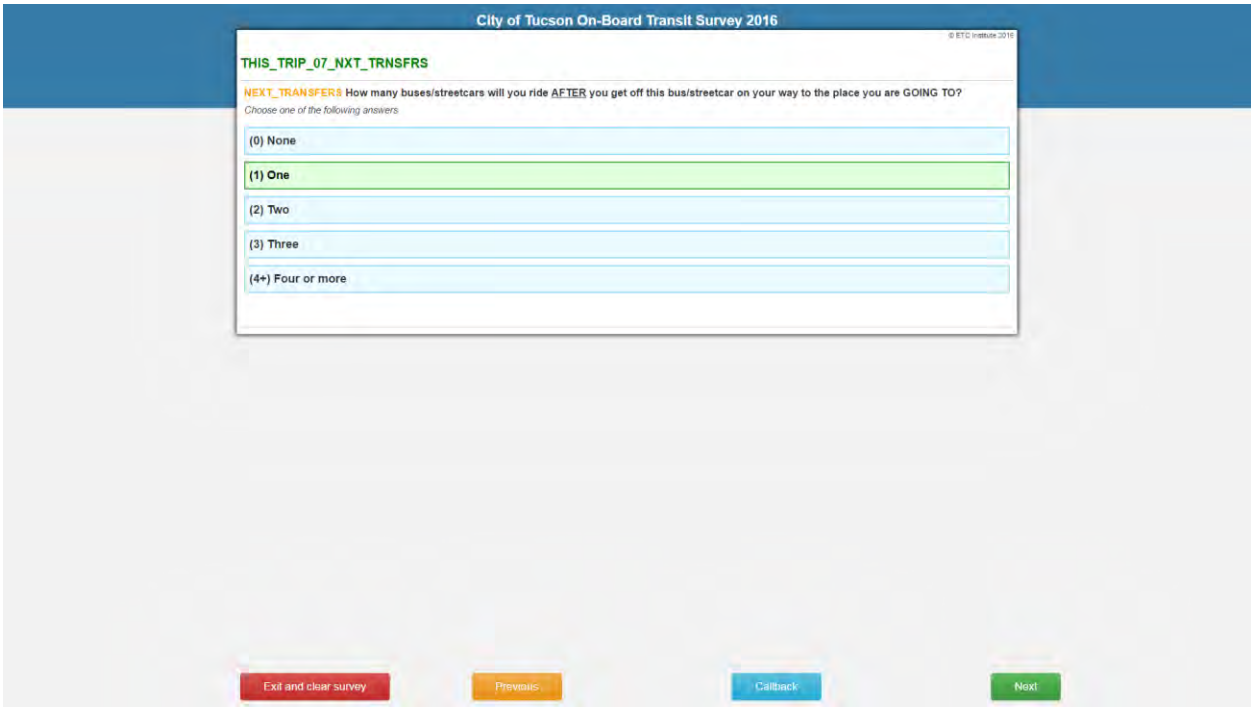

City of Tucson On-Board Transit Survey 2016
TO_07_DESTIN_ADDRESS
DESTIN_ADDRESS
What is the EXACT STREET ADDRESS of this place? (or nearest intersection or landmark)
Hotel or Place Name
test
City
Tucson
Zip Code
85705
Longitude
-111.01185279999999
Street Address
test
State
AZ
Latitude
32.2715322
TEST
Address
Place
Clear
Me
test, test, Tucson, AZ 85705, USA
Exit and clear survey
Previous
Callback
Next

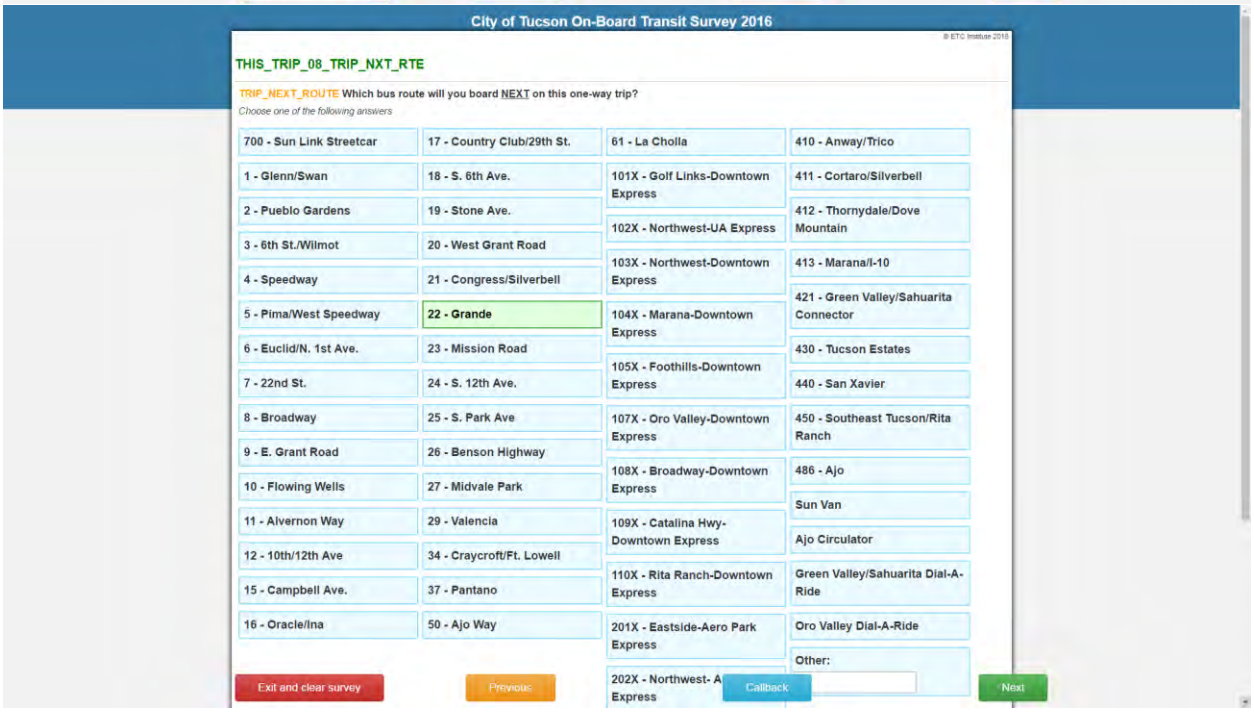

City of Tucson On-Board Transit Survey 2016
© ETC Institute 2016
TO_08_DESTIN_TRANSPORT
DESTIN_TRANSPORT How will you get to where you are going when you get off your last bus?
Choose one of the following answers
Walk
Bike
Wheelchair
Be picked up by someone
Get in a parked vehicle & drive alone
Get in a parked vehicle & drive/ride w/others
Taxi, Uber, etc.
Cat Tran Shuttle
Other:
Exit and clear survey
Previous
Callback
Next

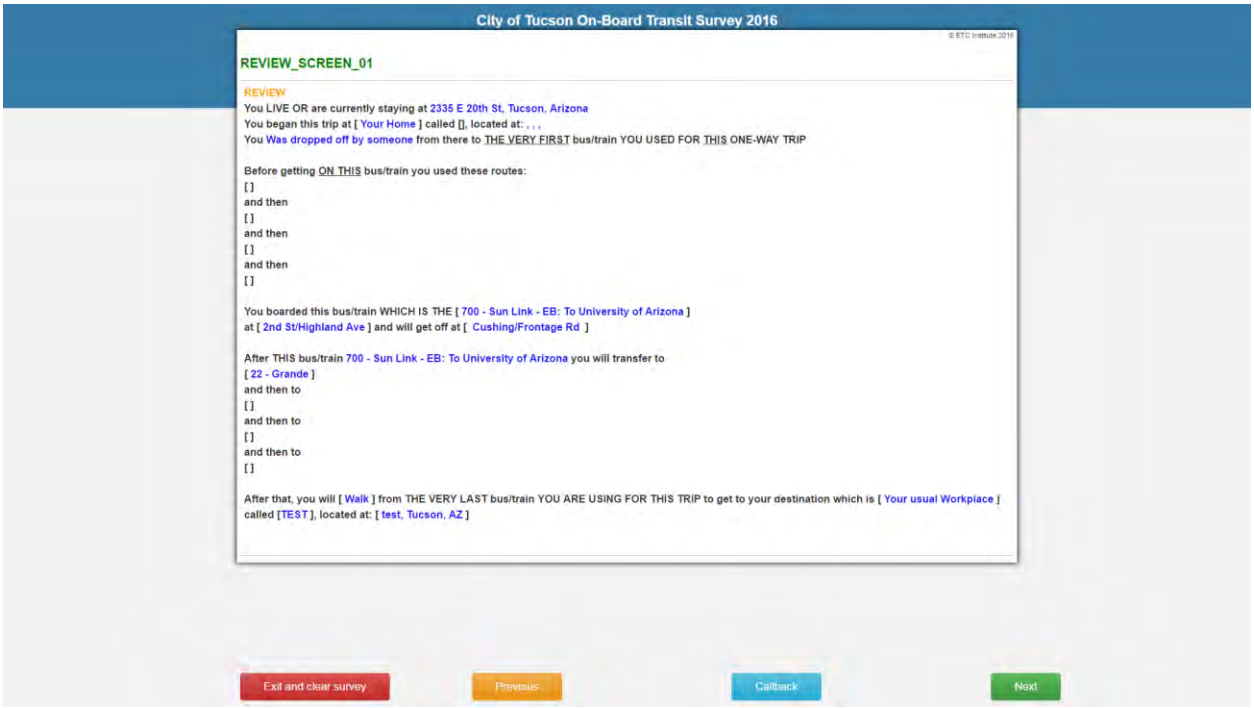

City of Tucson On-Board Transit Survey 2016
© ETC Institute 2016
FROM_STOP_ON_SUNLINK
STOP_ON_SUNLINK
Where did you GET ON THIS bus (700 - Sun Link - EB: To University of Arizona) for this one-way trip?
Choose one of the following answers
2nd St/Cherry Ave
2nd St/Highland Ave
2nd St/Olive Ave
4th Ave/5th St
4th Ave/7th St
4th Ave/9th St
Av del Convento/Congress St
Broadway/6th Ave - EB
Broadway/Church - EB
Broadway/Stone - EB
Congress/6th Ave - WB
Congress/Church - WB
Congress/Granada Ave
Congress/Stone - WB
Cushing/Av del Convento - WB
Cushing/Frontage Rd
Granada/Cushing - EB
Granada/TCC - WB
Helen/Warren
Toole/Congress - EB
University/3rd Ave
University/Tyndall
Exit and clear survey
Previous
Callback
Next


City of Tucson On-Board Transit Survey 2016
© ETC Institute 2016
TO_STOP_OFF_SUNLINK
STOP_OFF_SUNLINK Where will you GET OFF THIS bus in this one-way trip?
Choose one of the following answers
2nd St/Cherry Av
2nd St/Highland Av
2nd St/Olive Av
4th Av/5th St
4th Av/7th St
4th Av/9th St
Av del Convento/Congress St
Broadway/6th Av - EB
Broadway/Church - EB
Broadway/Stone - EB
Congress/6th Av - WB
Congress/Church - WB
Congress/Granada Av
Congress/Stone - WB
Cushing/Av del Convento - WB
Cushing/Frontage Rd
Granada/Cushing - EB
Granada/TCC - WB
Helen/Warren
Toole/Congress - EB
University/3rd Av
University/Tyndall
Exit and clear survey
Previous
Callback
Next


City of Tucson On-Board Transit Survey 2016
© ETC Institute 2016
THIS_TRIP_PREV_TRANSFERS
PREV_TRANSFERS How many buses/streetcars did you travel on BEFORE you boarded this bus/streetcar since leaving the place you are COMING FROM?
Choose one of the following answers
(0) None
(1) One
(2) Two
(3) Three
(4+) Four or more
Exit and clear survey
Previous
Callback
Next


City of Tucson On-Board Transit Survey 2016
THIS_TRIP_07_NXT_TRNSFRS
NEXT_TRANSFERS How many buses/streetcars will you ride AFTER you get off this bus/streetcar on your way to the place you are GOING TO?
Choose one of the following answers
(0) None
(1) One
(2) Two
(3) Three
(4+) Four or more
Exit and clear survey
Previous
Callback
Next


City of Tucson On-Board Transit Survey 2016
THIS_TRIP_08_TRIP_NXT_RTE
TRIP_NEXT_ROUTE Which bus route will you board NEXT on this one-way trip?
Choose one of the following answers
700 - Sun Link Streetcar
1 - Glenn/Swan
2 - Pueblo Gardens
3 - 6th St./Wilmot
4 - Speedway
5 - Pima/West Speedway
6 - Euclid/N. 1st Ave.
7 - 22nd St.
8 - Broadway
9 - E. Grant Road
10 - Flowing Wells
11 - Alvernon Way
12 - 10th/12th Ave
15 - Campbell Ave.
16 - Oracle/Ina
17 - Country Club/29th St.
18 - S. 6th Ave.
19 - Stone Ave.
20 - West Grant Road
21 - Congress/Silverbell
22 - Grande
23 - Mission Road
24 - S. 12th Ave.
25 - S. Park Ave
26 - Benson Highway
27 - Midvale Park
29 - Valencia
34 - Craycroft/Ft. Lowell
37 - Pantano
50 - Ajo Way
61 - La Cholla
101X - Golf Links-Downtown Express
102X - Northwest-UA Express
103X - Northwest-Downtown Express
104X - Marana-Downtown Express
105X - Foothills-Downtown Express
107X - Oro Valley-Downtown Express
108X - Broadway-Downtown Express
109X - Catalina Hwy-Downtown Express
110X - Rita Ranch-Downtown Express
201X - Eastside-Aero Park Express
202X - Northwest- A Express
410 - Anway/Trico
411 - Cortaro/Silverbell
412 - Thornydale/Dove Mountain
413 - Marana/I-10
421 - Green Valley/Sahuarita Connector
430 - Tucson Estates
440 - San Xavier
450 - Southeast Tucson/Rita Ranch
486 - Ajo
Sun Van
Ajo Circulator
Green Valley/Sahuarita Dial-A-Ride
Oro Valley Dial-A-Ride
Other:
Exit and clear survey
Previous
Callback
Next


City of Tucson On-Board Transit Survey 2016
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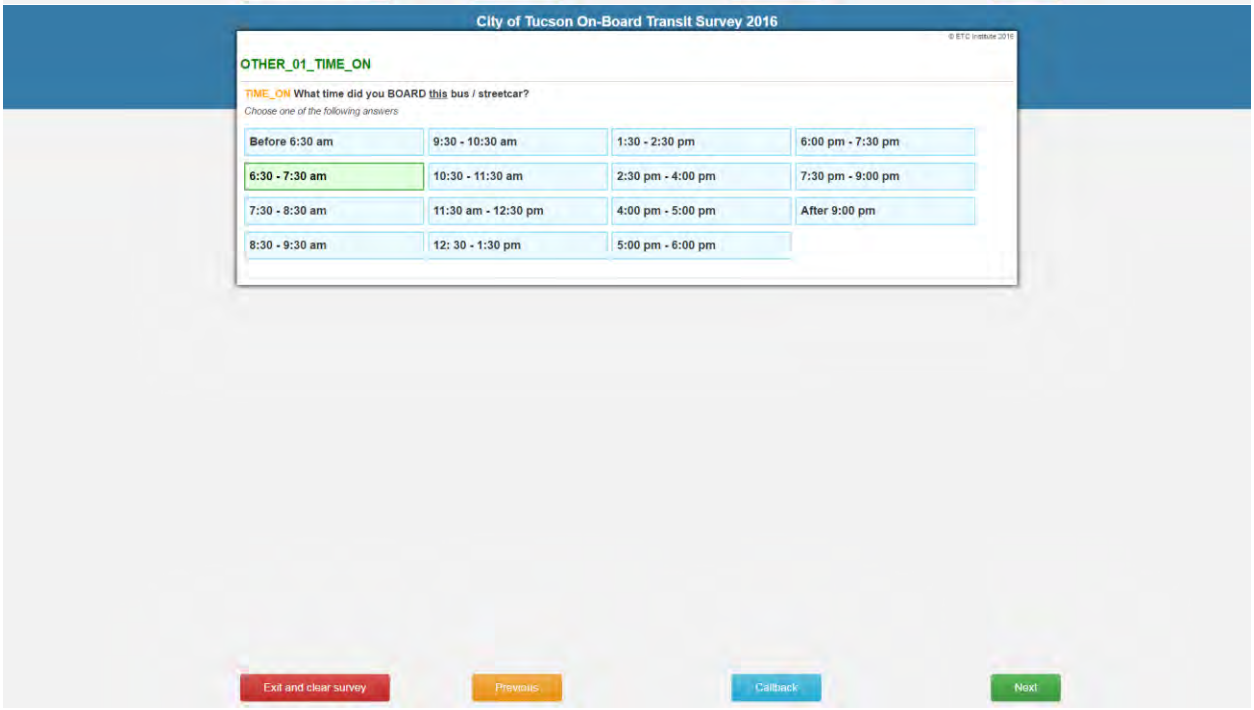
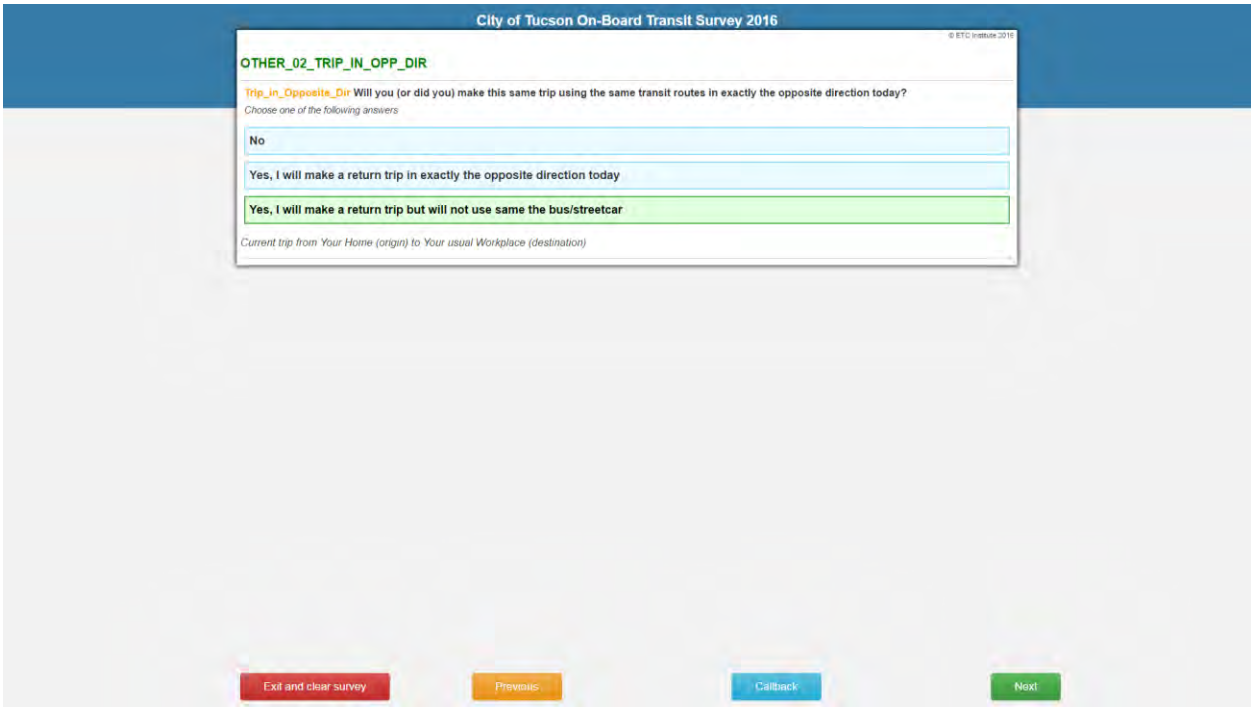
REVIEW_SCREEN_01
REVIEW
You LIVE OR are currently staying at 2335 E 20th St, Tucson, Arizona
You began this trip at [Your Home] called [], located at: , , ,
You Was dropped off by someone from there to THE VERY FIRST bus/train YOU USED FOR THIS ONE-WAY TRIP
Before getting ON THIS bus/train you used these routes:
[ ]
and then
[ ]
and then
[ ]
and then
[ ]
You boarded this bus/train WHICH IS THE [700 - Sun Link - EB: To University of Arizona]
at [2nd St/Highland Ave] and will get off at [Cushing/Frontage Rd]
After THIS bus/train 700 - Sun Link - EB: To University of Arizona you will transfer to
[22 - Grande]
and then to
[ ]
and then to
[ ]
and then to
[ ]
After that, you will [Walk] from THE VERY LAST bus/train YOU ARE USING FOR THIS TRIP to get to your destination which is [Your usual Workplace]
called [TEST], located at: [test, Tucson, AZ]
Exit and clear survey
Previous
Callback
Next


City of Tucson On-Board Transit Survey 2016
© ETC Institute 2016
OTHER_01_TIME_ON
TIME_ON What time did you BOARD this bus / streetcar?
Choose one of the following answers
Before 6:30 am
6:30 - 7:30 am
7:30 - 8:30 am
8:30 - 9:30 am
9:30 - 10:30 am
10:30 - 11:30 am
11:30 am - 12:30 pm
12: 30 - 1:30 pm
1:30 - 2:30 pm
2:30 pm - 4:00 pm
4:00 pm - 5:00 pm
5:00 pm - 6:00 pm
6:00 pm - 7:30 pm
7:30 pm - 9:00 pm
After 9:00 pm
Exit and clear survey
Previous
Callback
Next


City of Tucson On-Board Transit Survey 2016
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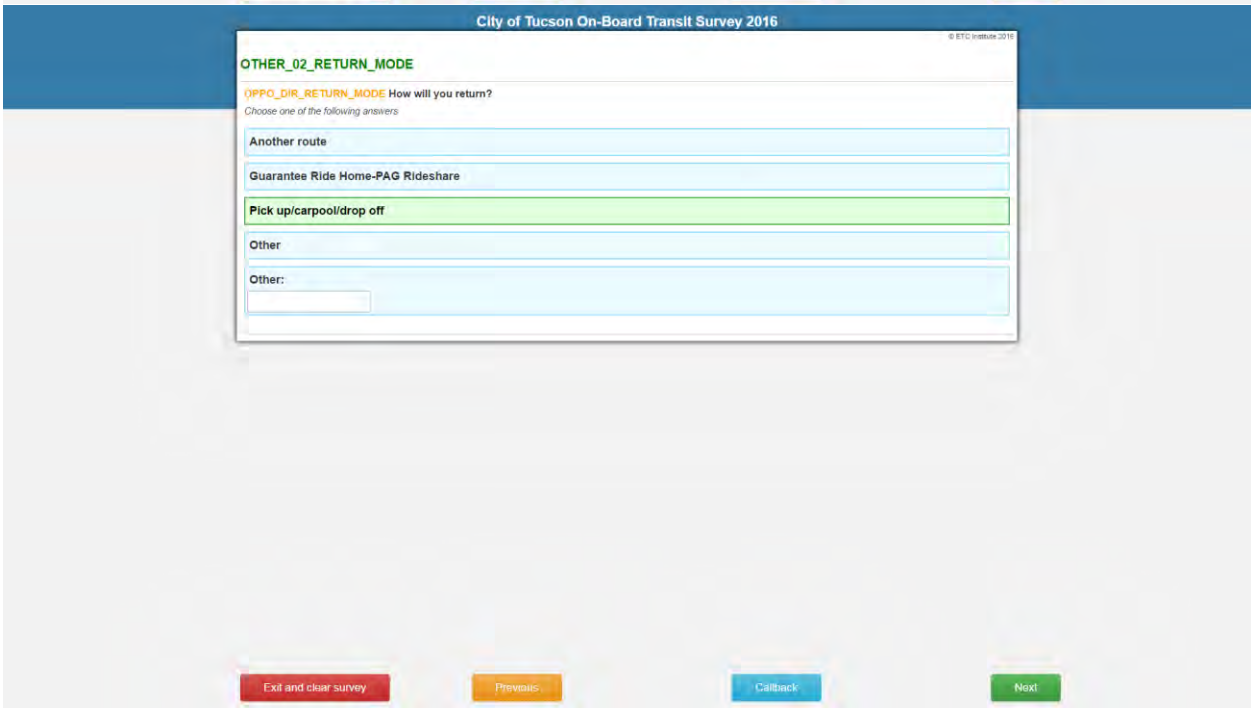
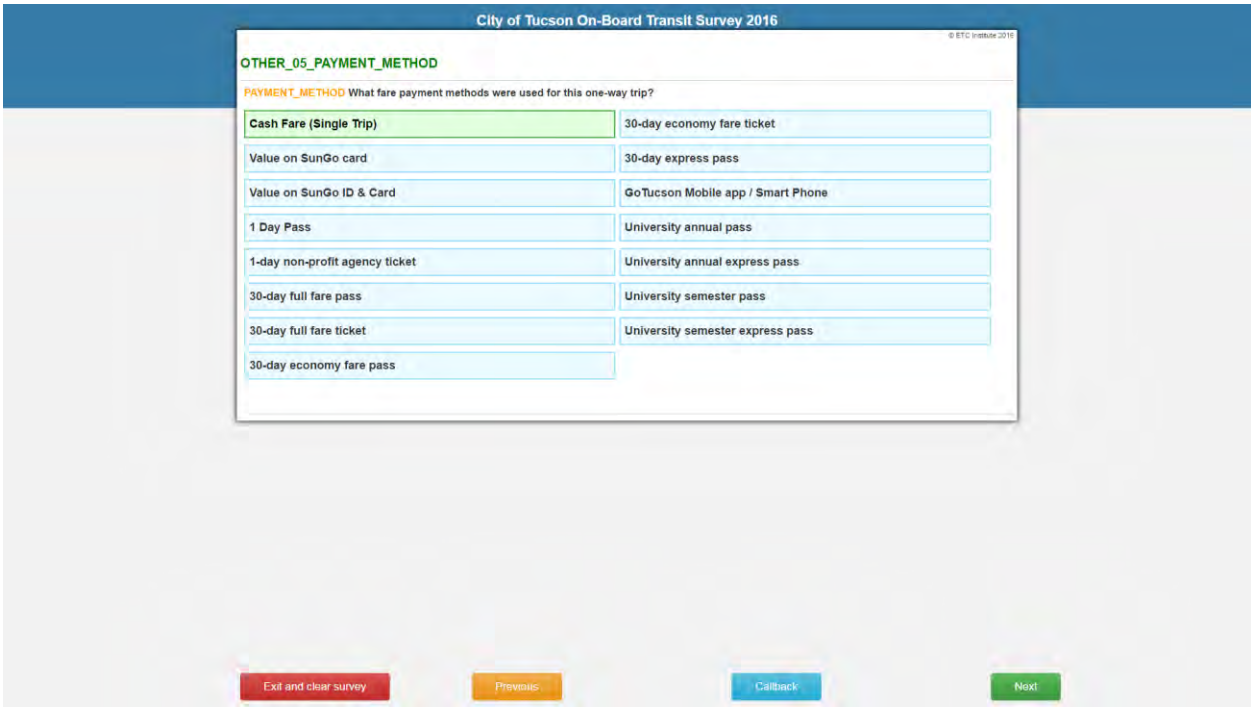
OTHER_02_TRIP_IN_OPP_DIR
Trip_in_Opposite_Dir Will you (or did you) make this same trip using the same transit routes in exactly the opposite direction today?
Choose one of the following answers
No
Yes, I will make a return trip in exactly the opposite direction today
Yes, I will make a return trip but will not use same the bus/streetcar
Current trip from Your Home (origin) to Your usual Workplace (destination)
Exit and clear survey
Previous
Callback
Next


City of Tucson On-Board Transit Survey 2016
© ETC Institute 2016
OTHER_02_RETURN_MODE
OPPO_DIR_RETURN_MODE How will you return?
Choose one of the following answers
Another route
Guarantee Ride Home-PAG Rideshare
Pick up/carpool/drop off
Other
Other:
Exit and clear survey
Previous
Callback
Next


City of Tucson On-Board Transit Survey 2016
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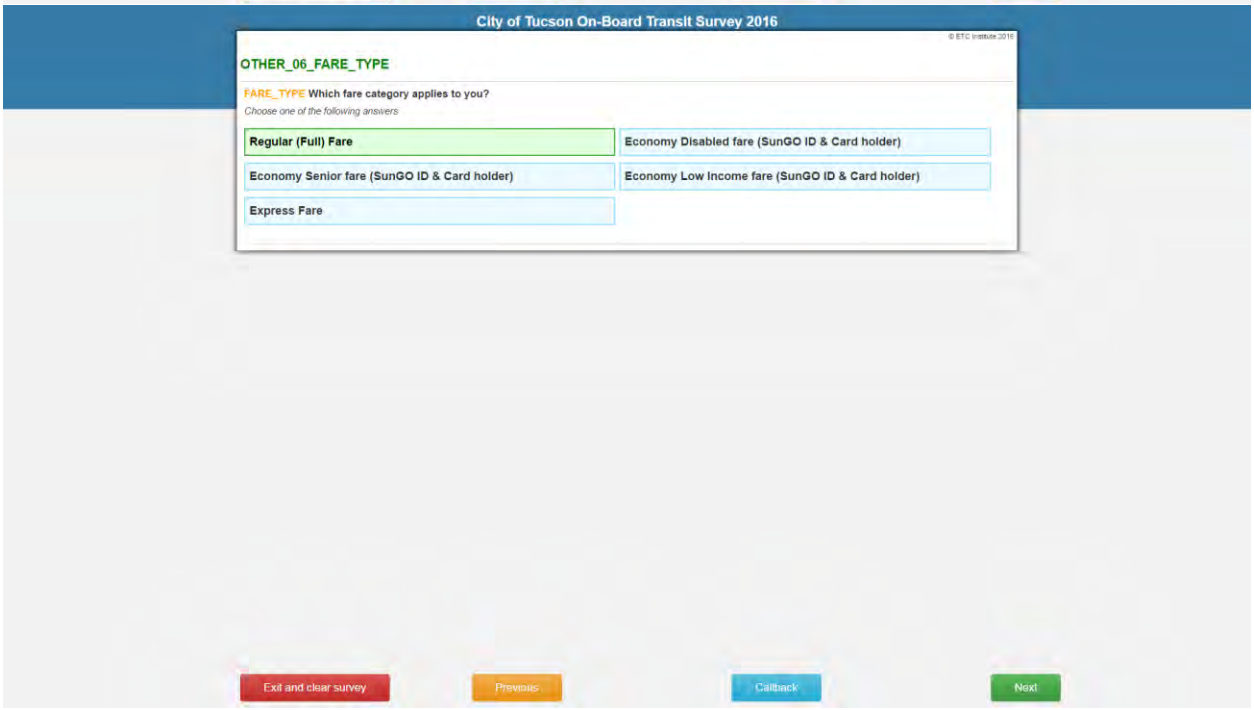
OTHER_05_PAYMENT_METHOD
PAYMENT_METHOD What fare payment methods were used for this one-way trip?
Cash Fare (Single Trip)
Value on SunGo card
Value on SunGo ID & Card
1 Day Pass
1-day non-profit agency ticket
30-day full fare pass
30-day full fare ticket
30-day economy fare pass
30-day economy fare ticket
30-day express pass
GoTucson Mobile app / Smart Phone
University annual pass
University annual express pass
University semester pass
University semester express pass
Exit and clear survey
Previous
Callback
Next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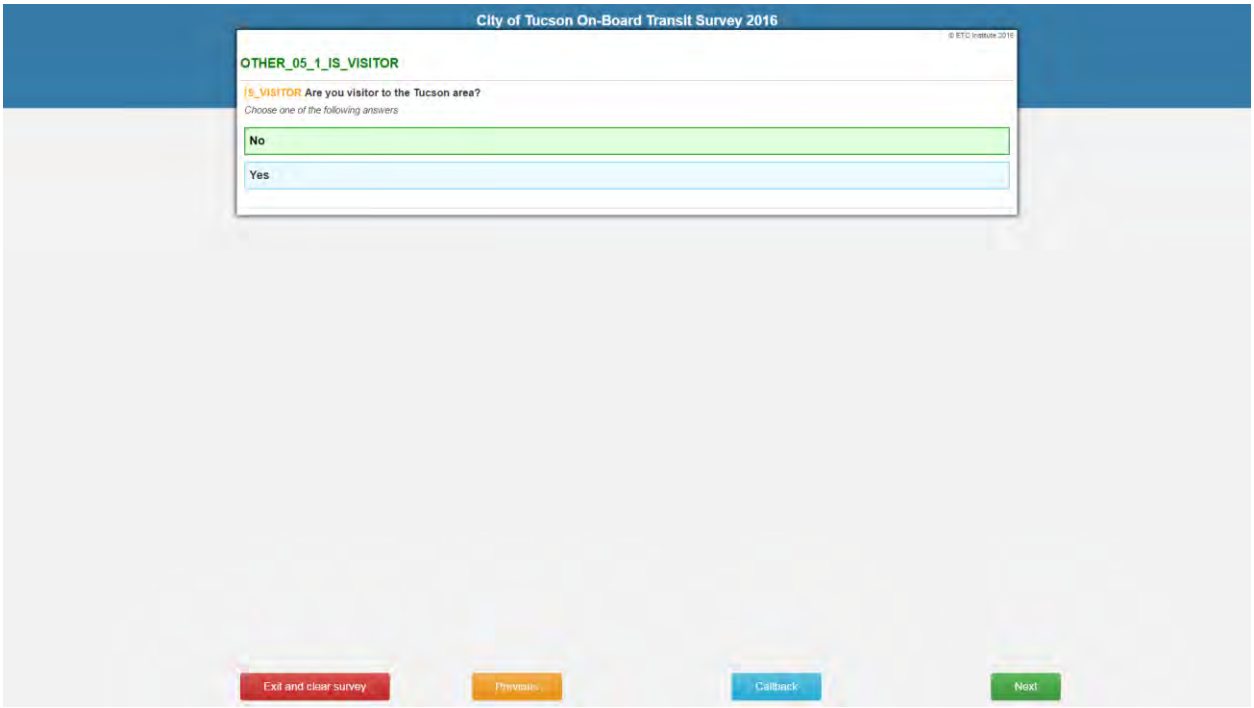
OTHER_06_FARE_TYPE
FARE_TYPE Which fare category applies to you?
Choose one of the following answers
Regular (Full) Fare
Economy Senior fare (SunGO ID & Card holder)
Express Fare
Economy Disabled fare (SunGO ID & Card holder)
Economy Low Income fare (SunGO ID & Card holder)
Exit and clear survey
Previous
Callback
Next


City of Tucson On-Board Transit Survey 2016
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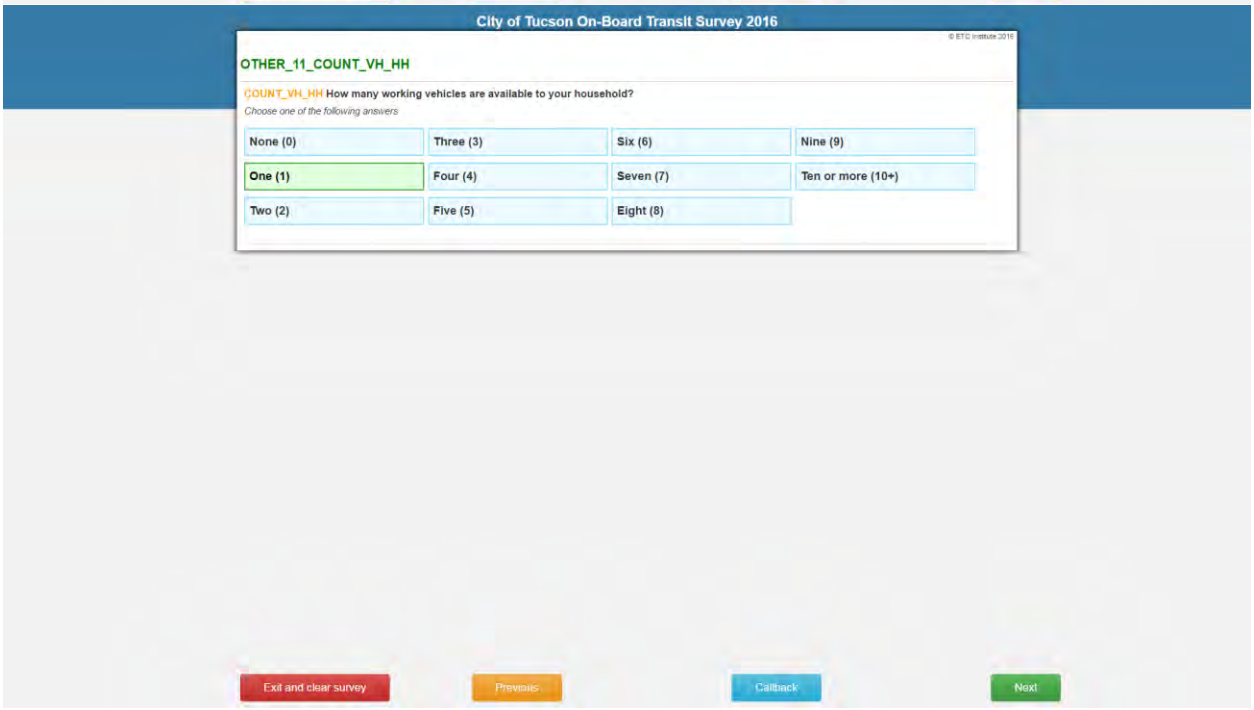
OTHER_05_1_IS_VISITOR
IS_VISITOR Are you visitor to the Tucson area?
Choose one of the following answers
No
Yes
Exit and clear survey
Previous
Callback
Next


City of Tucson On-Board Transit Survey 2016
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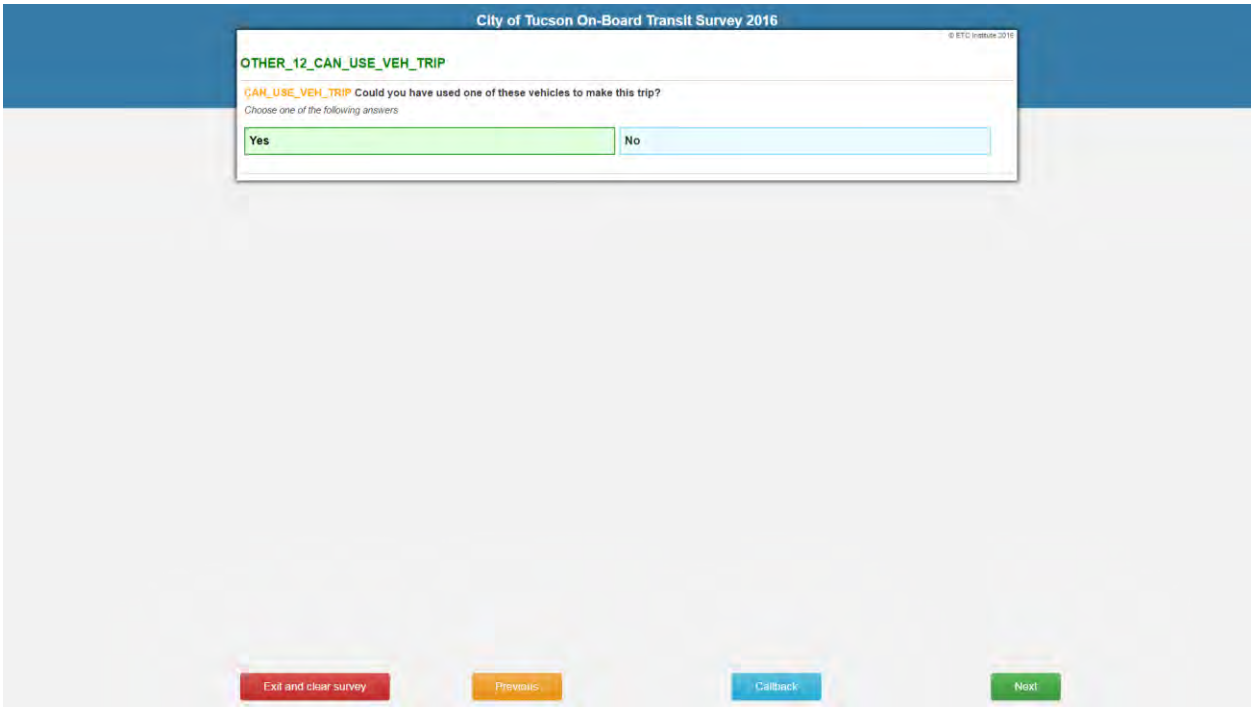
OTHER_11_COUNT_VH_HH
COUNT_VH_HH How many working vehicles are available to your household?
Choose one of the following answers
None (0)
One (1)
Two (2)
Three (3)
Four (4)
Five (5)
Six (6)
Seven (7)
Eight (8)
Nine (9)
Ten or more (10+)
Exit and clear survey
Previous
Callback
Next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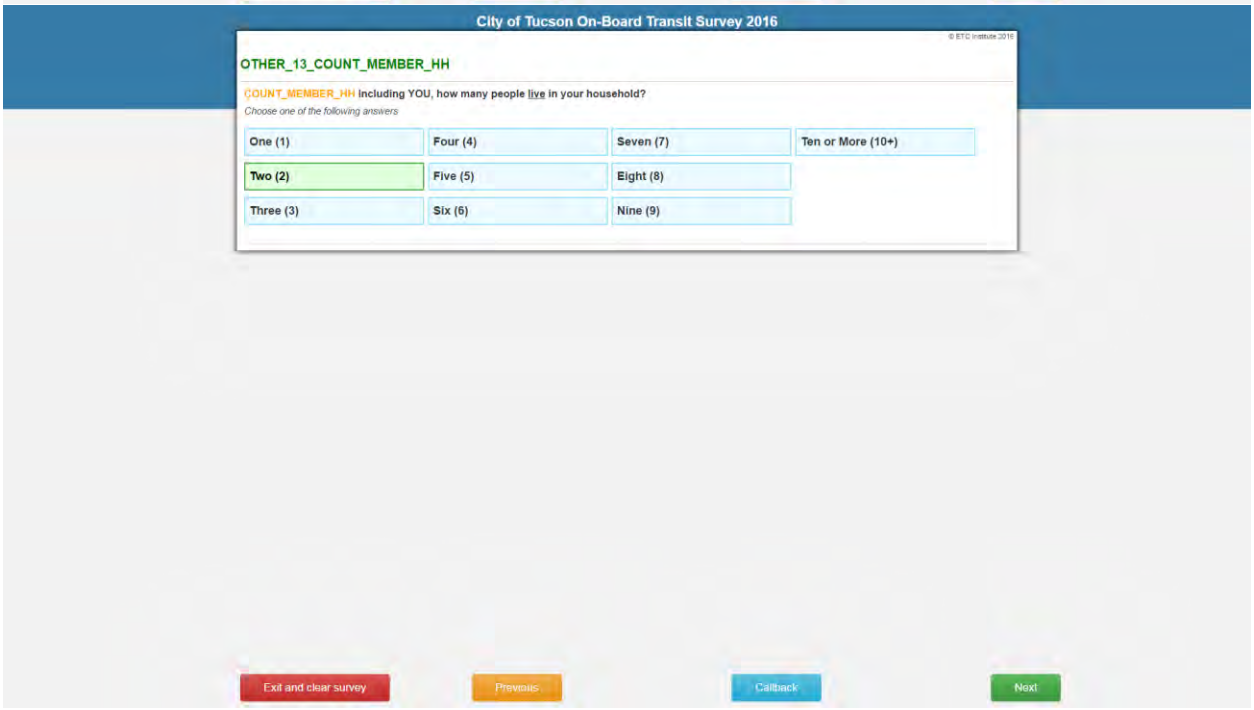
OTHER_12_CAN_USE_VEH_TRIP
CAN_USE_VEH_TRIP Could you have used one of these vehicles to make this trip?
Choose one of the following answers
Yes
No
Exit and clear survey
Previous
Callback
Next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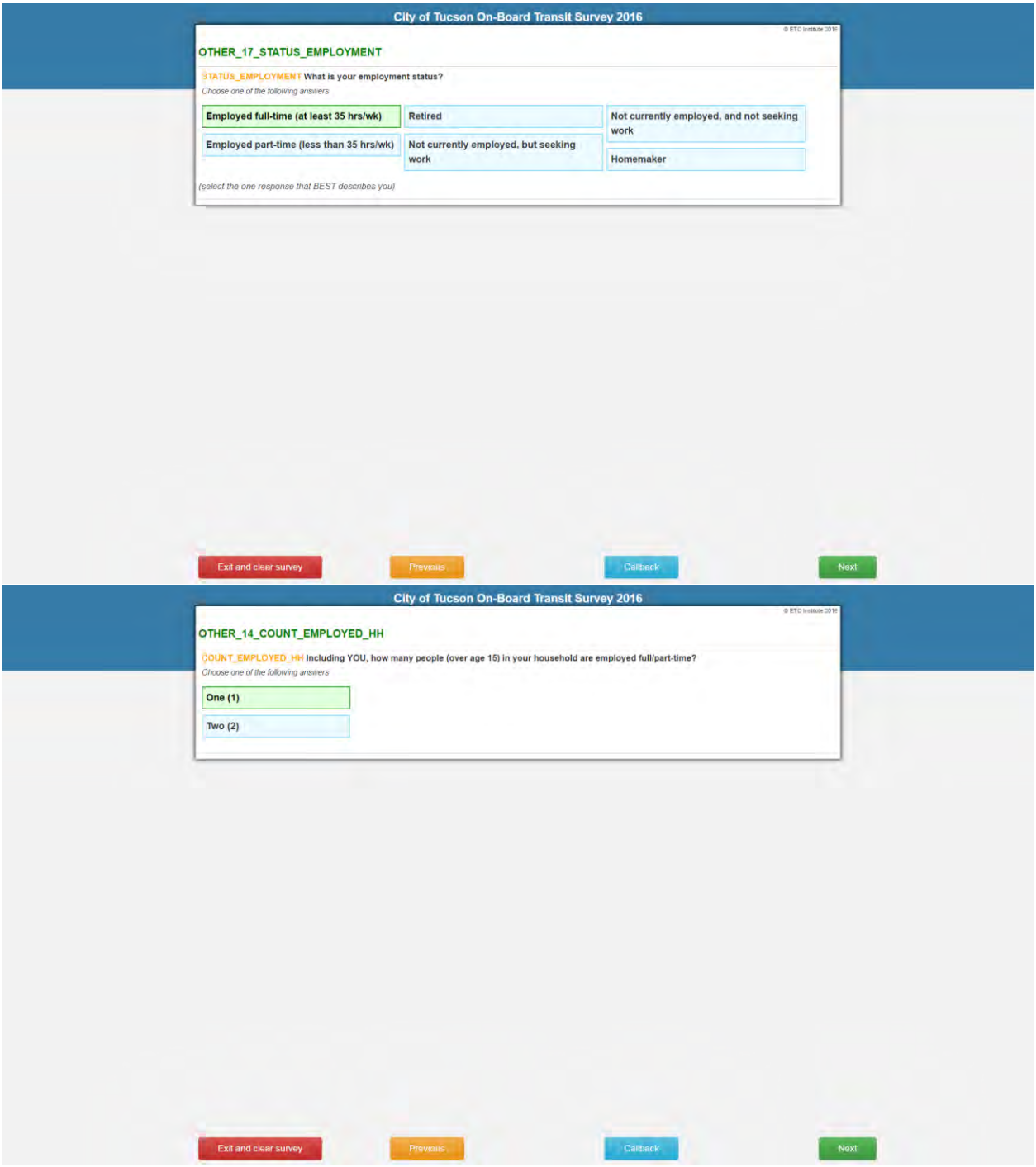
OTHER_13_COUNT_MEMBER_HH
COUNT_MEMBER_HH Including YOU, how many people live in your household?
Choose one of the following answers
One (1)
Two (2)
Three (3)
Four (4)
Five (5)
Six (6)
Seven (7)
Eight (8)
Nine (9)
Ten or More (10+)
Exit and clear survey
Previous
Callback
Next


City of Tucson On-Board Transit Survey 2016
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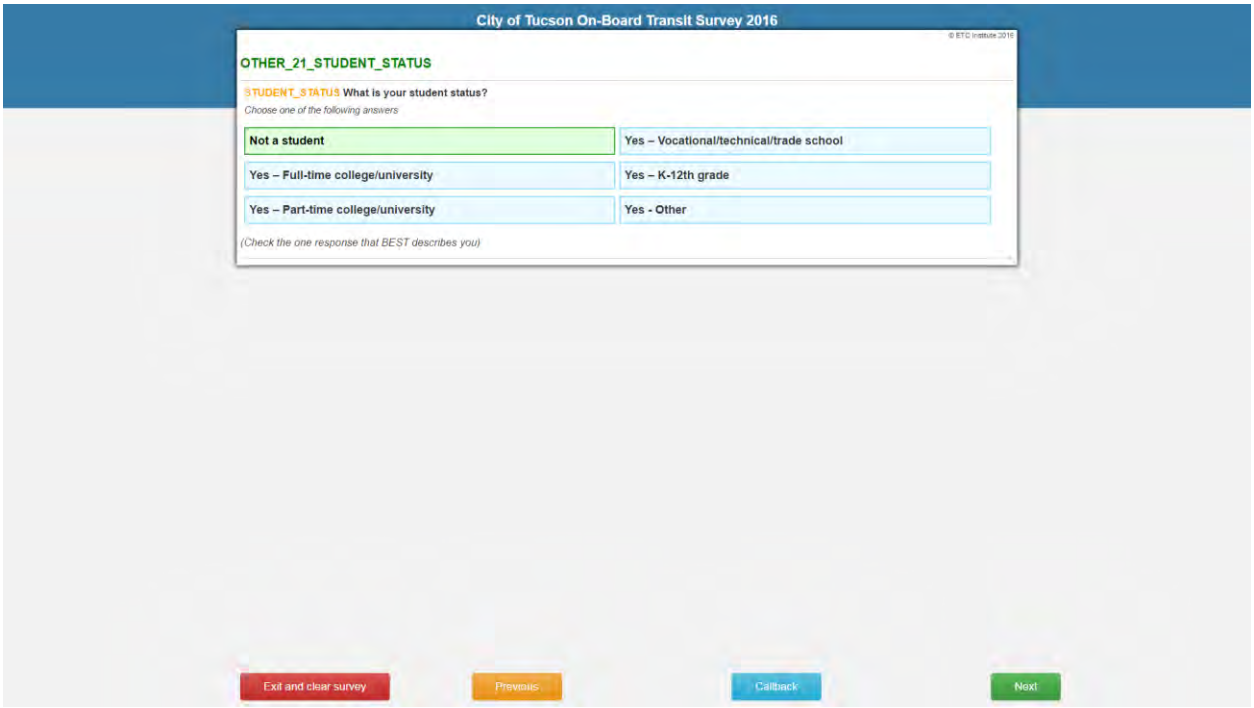
OTHER_17_STATUS_EMPLOYMENT
STATUS_EMPLOYMENT What is your employment status?
Choose one of the following answers
Employed full-time (at least 35 hrs/wk)
Employed part-time (less than 35 hrs/wk)
Retired
Not currently employed, but seeking work
Not currently employed, and not seeking work
Homemaker
(select the one response that BEST describes you)
Exit and clear survey
Previous
Callback
Next
City of Tucson On-Board Transit Survey 2016
© ETC Institute 2016
OTHER_14_COUNT_EMPLOYED_HH
COUNT_EMPLOYED_HH Including YOU, how many people (over age 15) in your household are employed full/part-time?
Choose one of the following answers
One (1)
Two (2)
Exit and clear survey
Previous
Callback
Next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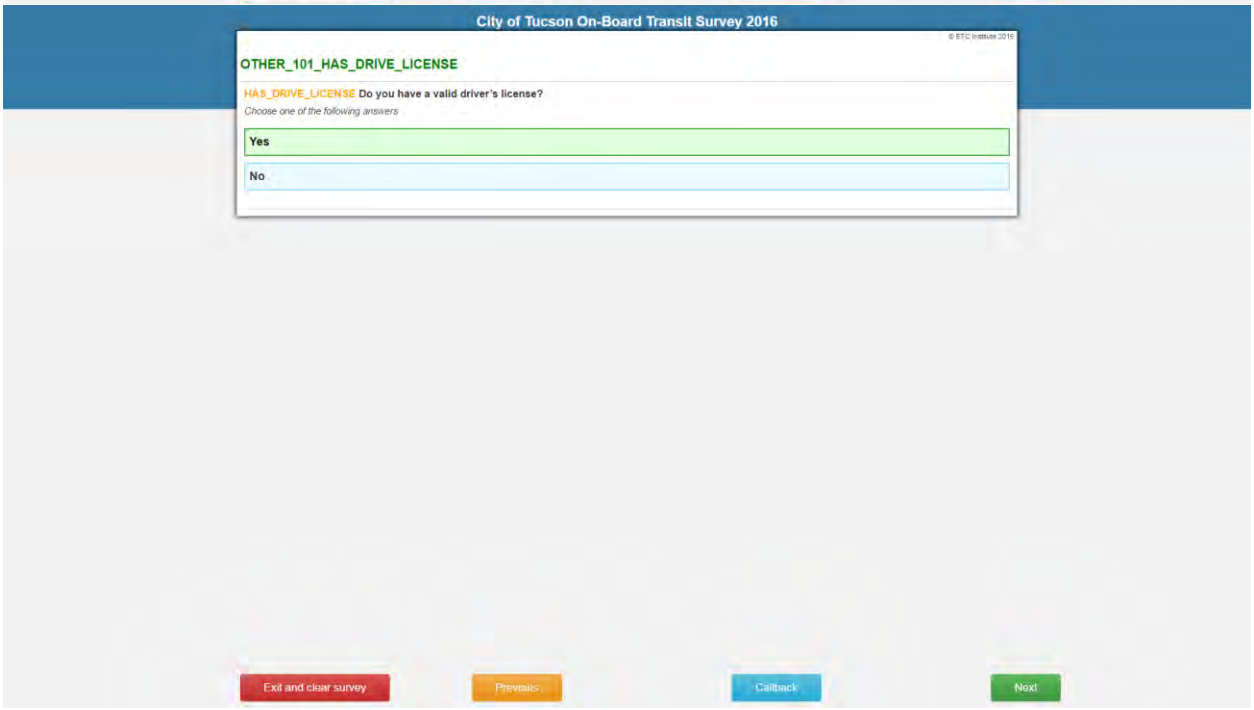
OTHER_21_STUDENT_STATUS
STUDENT_STATUS What is your student status?
Choose one of the following answers
Not a student
Yes – Vocational/technical/trade school
Yes – Full-time college/university
Yes – K-12th grade
Yes – Part-time college/university
Yes - Other
(Check the one response that BEST describes you)
Exit and clear survey
Previous
Callback
Next


City of Tucson On-Board Transit Survey 2016
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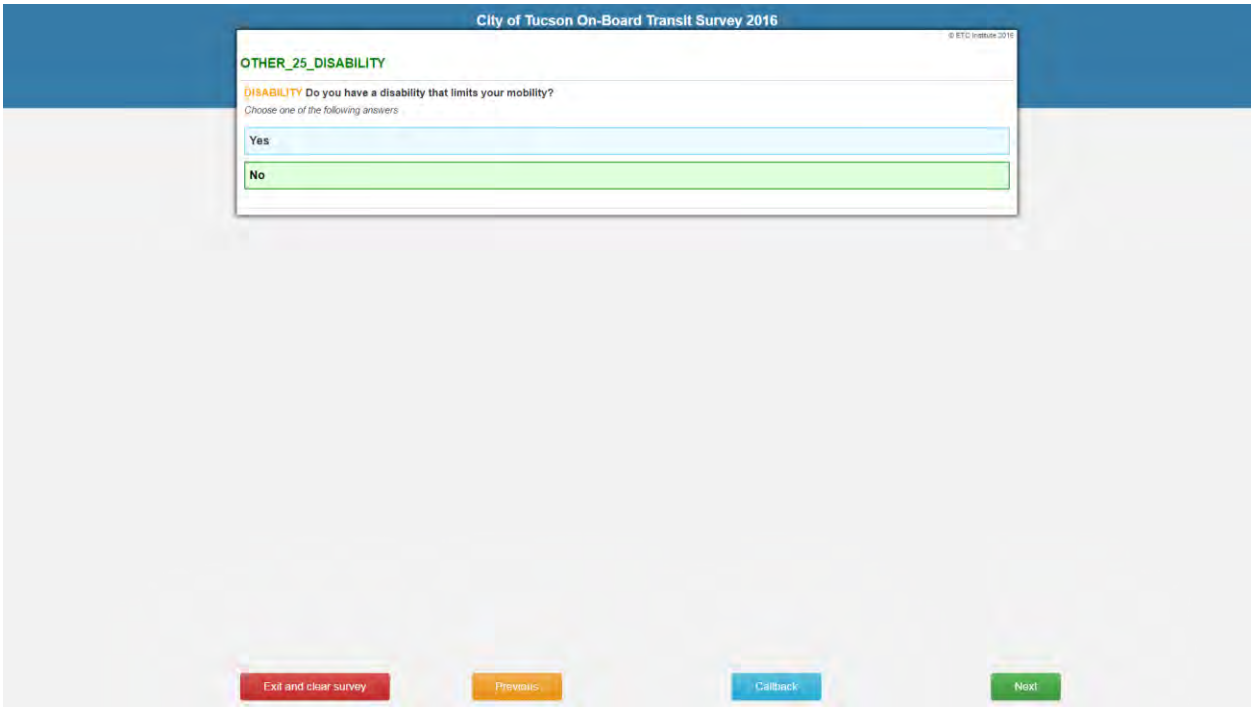
OTHER_101_HAS_DRIVE_LICENSE
HAS_DRIVE_LICENSE Do you have a valid driver's license?
Choose one of the following answers
Yes
No
Exit and clear survey
Previous
Callback
Next


City of Tucson On-Board Transit Survey 2016
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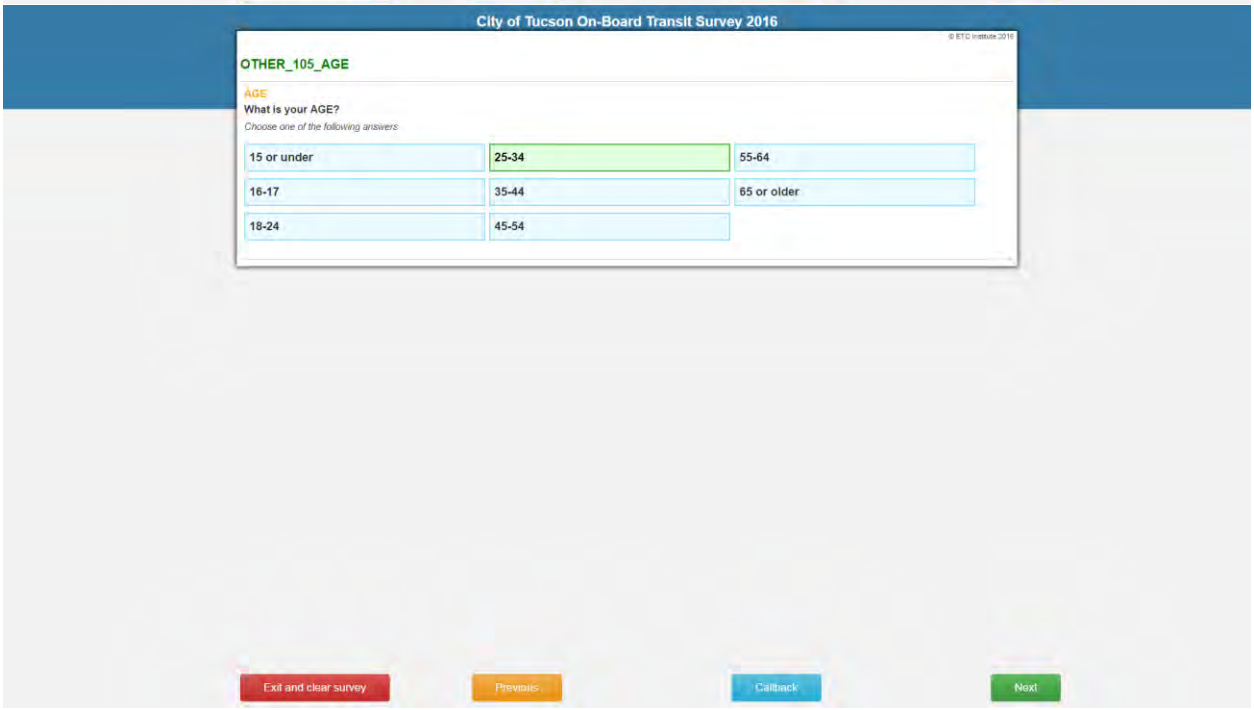
OTHER_25_DISABILITY
DISABILITY Do you have a disability that limits your mobility?
Choose one of the following answers
Yes
No
Exit and clear survey
Previous
Callback
Next


City of Tucson On-Board Transit Survey 2016
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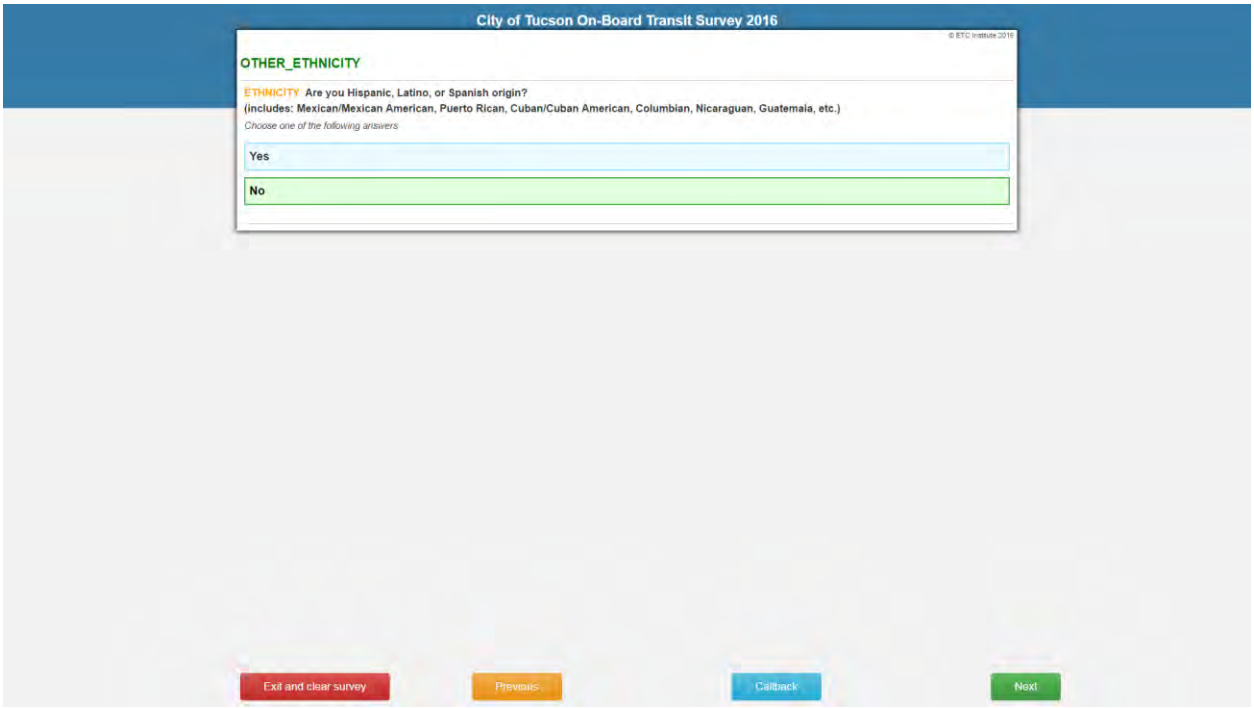
OTHER_105_AGE
AGE
What is your AGE?
Choose one of the following answers
15 or under
16-17
18-24
25-34
35-44
45-54
55-64
65 or older
Exit and clear survey
Previous
Callback
Next


City of Tucson On-Board Transit Survey 2016
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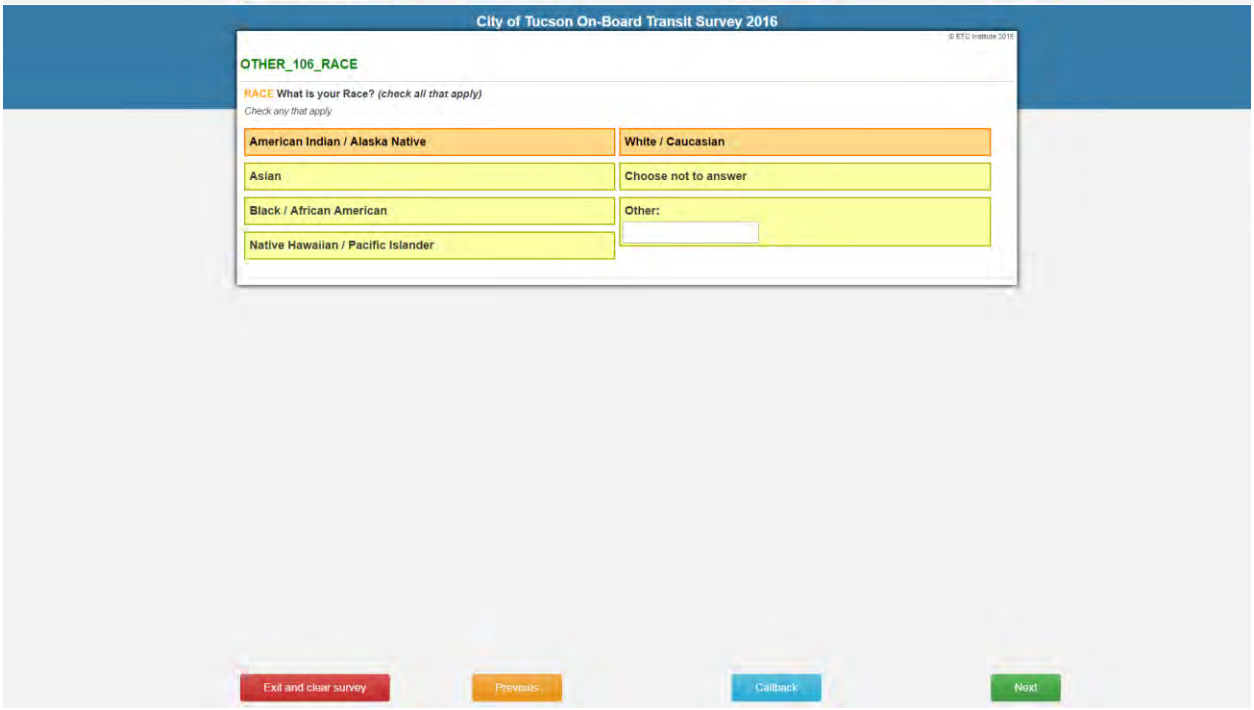
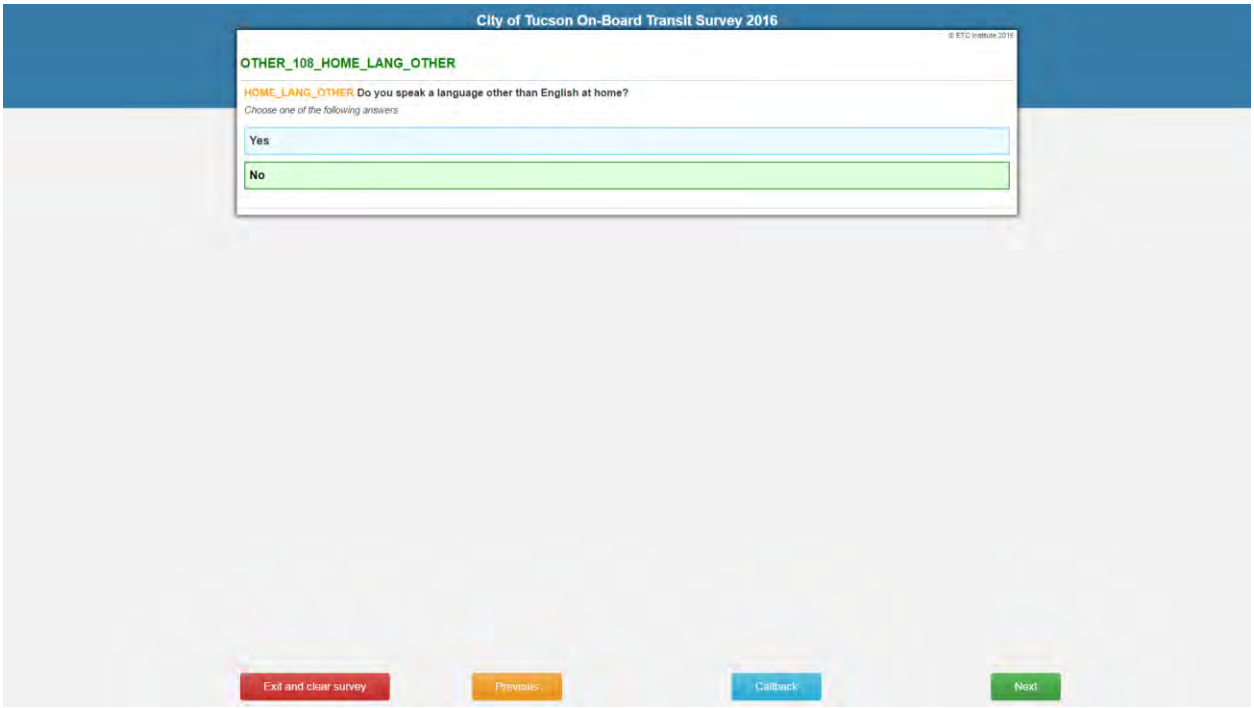
OTHER_ETHNICITY
ETHNICITY Are you Hispanic, Latino, or Spanish origin?
(includes: Mexican/Mexican American, Puerto Rican, Cuban/Cuban American, Columbian, Nicaraguan, Guatemala, etc.)
Choose one of the following answers
Yes
No
Exit and clear survey
Previous
Callback
Next


City of Tucson On-Board Transit Survey 2016
© ETC Institute 2016
OTHER_106_RACE
RACE What is your Race? (check all that apply)
Check any that apply
American Indian / Alaska Native
Asian
Black / African American
Native Hawaiian / Pacific Islander
White / Caucasian
Choose not to answer
Other:
Exit and clear survey
Previous
Callback
Next


City of Tucson On-Board Transit Survey 2016
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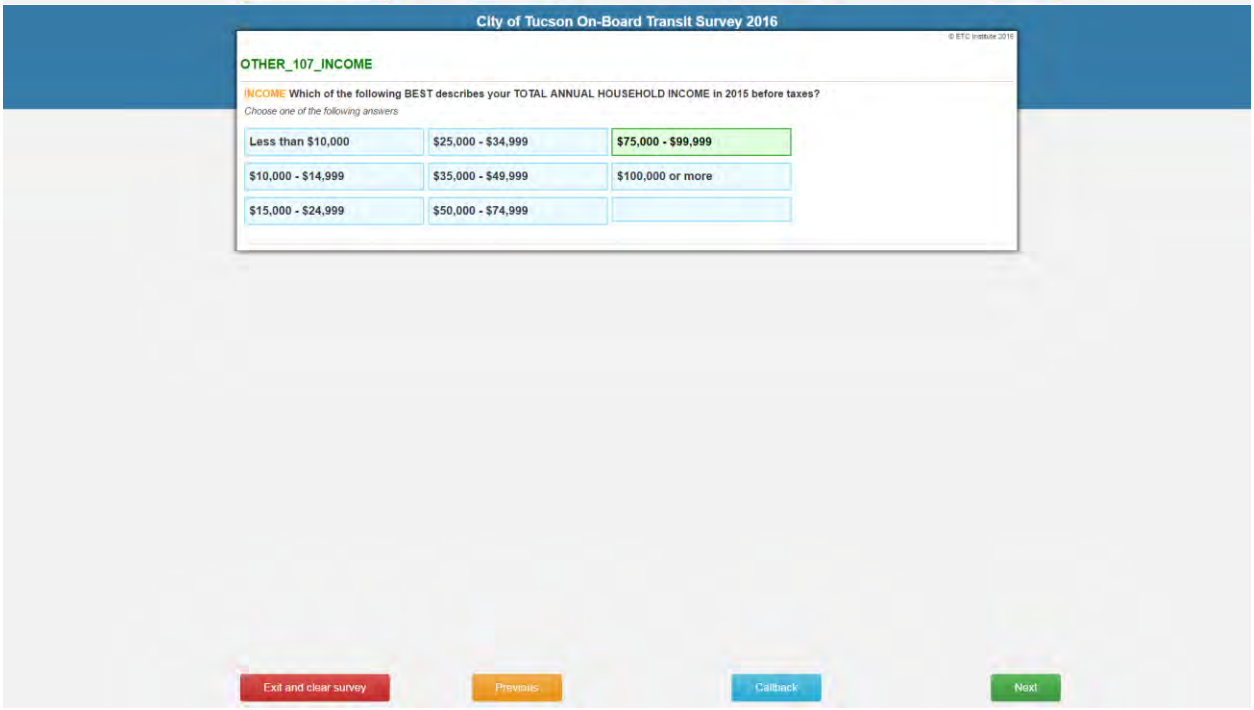
OTHER_108_HOME_LANG_OTHER
HOME_LANG_OTHER Do you speak a language other than English at home?
Choose one of the following answers
Yes
No
Exit and clear survey
Previous
Callback
Next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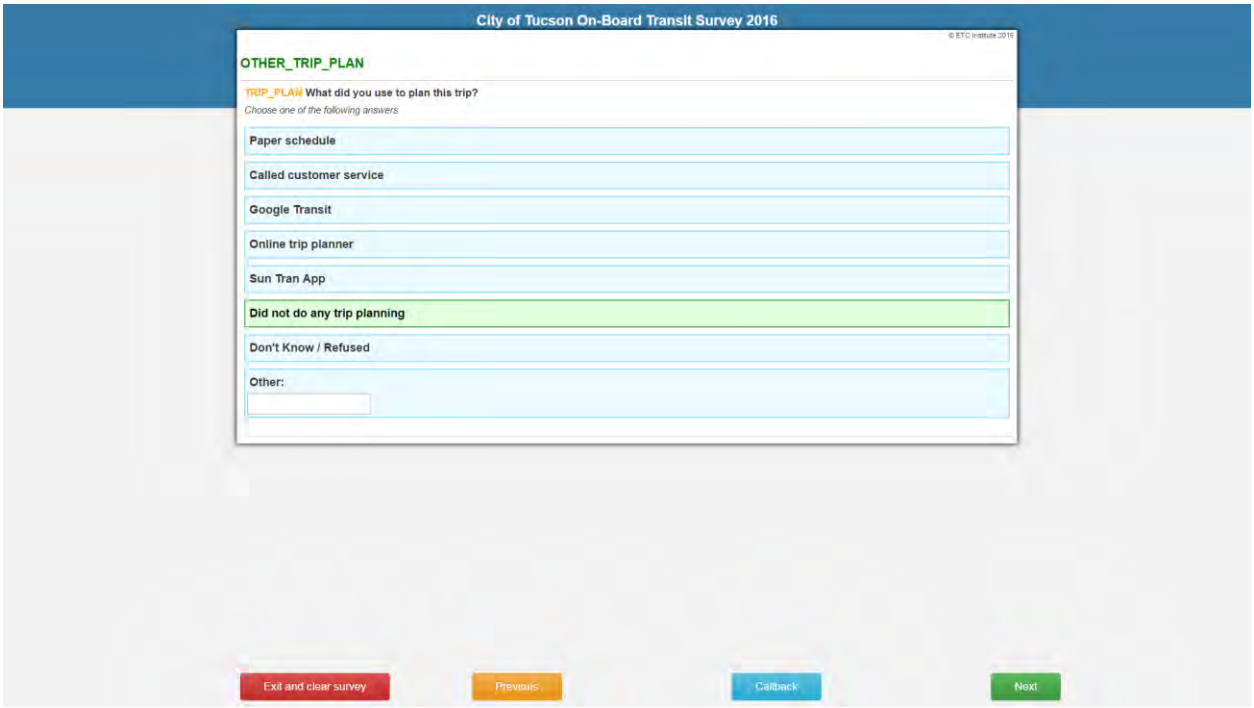
OTHER_107_INCOME
INCOME Which of the following BEST describes your TOTAL ANNUAL HOUSEHOLD INCOME in 2015 before taxes?
Choose one of the following answers
Less than $10,000
$10,000 - $14,999
$15,000 - $24,999
$25,000 - $34,999
$35,000 - $49,999
$50,000 - $74,999
$75,000 - $99,999
$100,000 or more
Exit and clear survey
Previous
Callback
Next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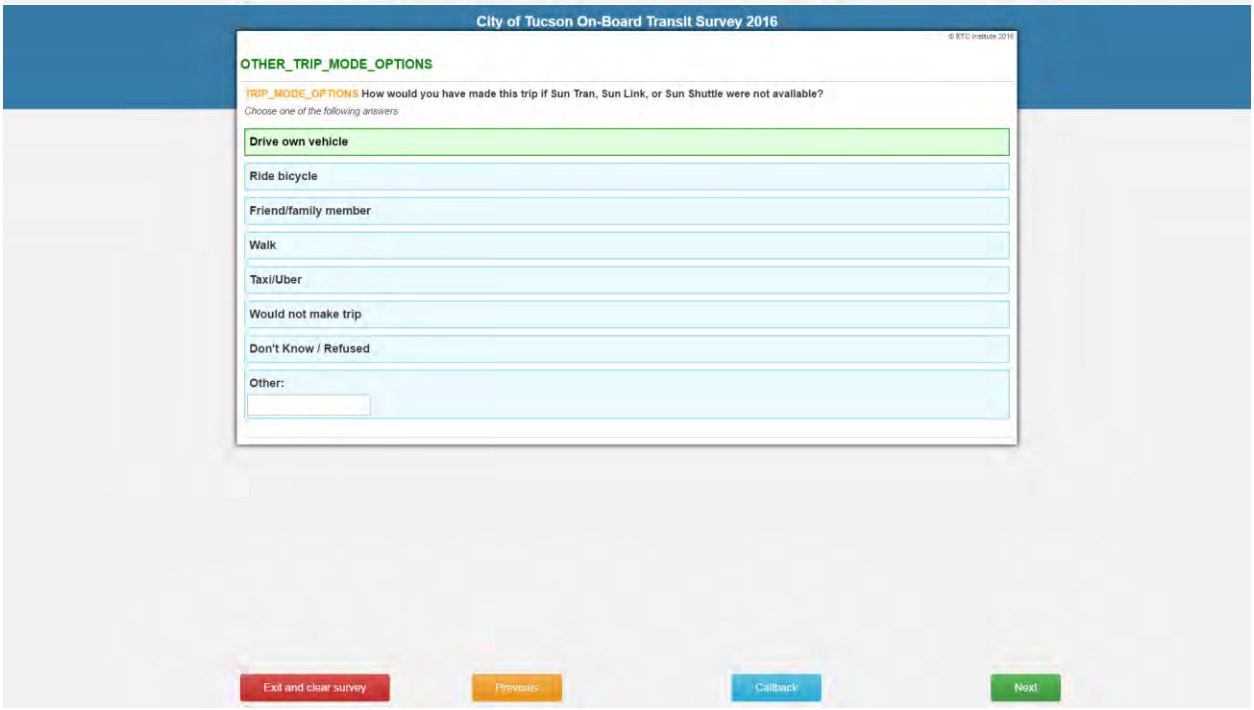
OTHER_TRIP_PLAN
TRIP_PLAN What did you use to plan this trip?
Choose one of the following answers
Paper schedule
Called customer service
Google Transit
Online trip planner
Sun Tran App
Did not do any trip planning
Don't Know / Refused
Other:
Exit and clear survey
Previous
Callback
Next


City of Tucson On-Board Transit Survey 2016
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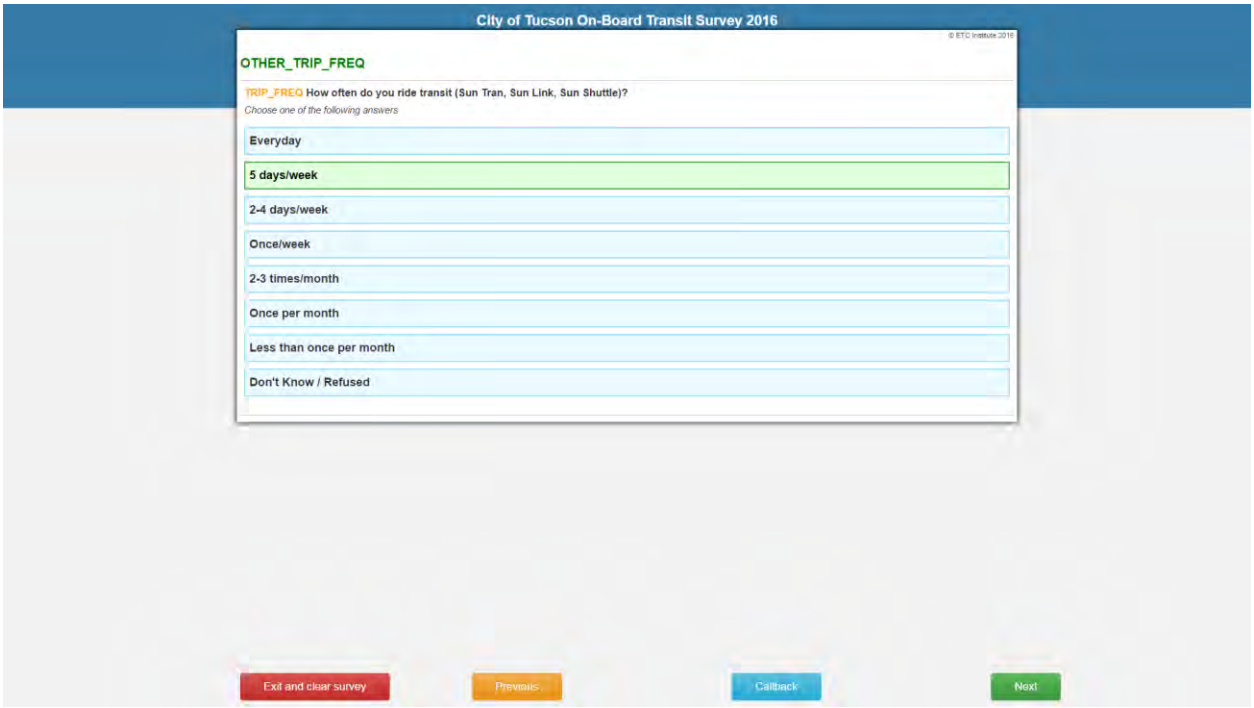
OTHER_TRIP_MODE_OPTIONS
TRIP_MODE_OPTIONS How would you have made this trip if Sun Tran, Sun Link, or Sun Shuttle were not available?
Choose one of the following answers
Drive own vehicle
Ride bicycle
Friend/family member
Walk
Taxi/Uber
Would not make trip
Don't Know / Refused
Other:
Exit and clear survey
Previous
Callback
Next


City of Tucson On-Board Transit Survey 2016
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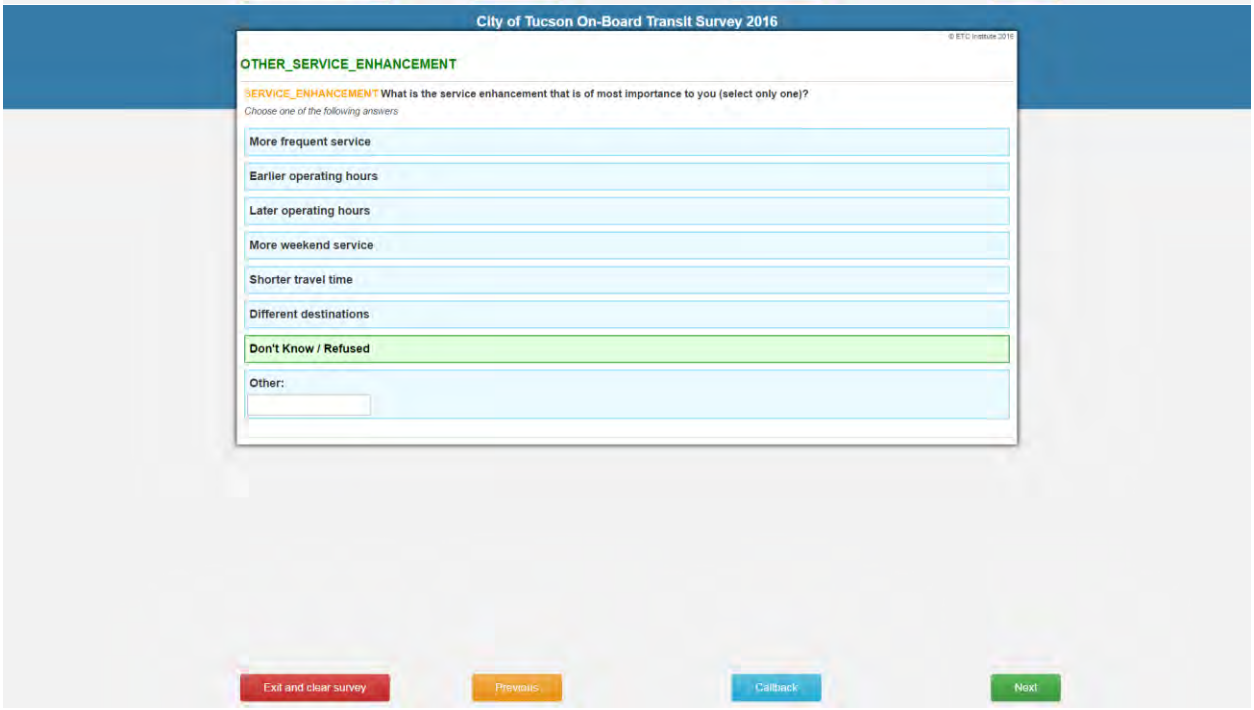
OTHER_TRIP_FREQ
TRIP_FREQ How often do you ride transit (Sun Tran, Sun Link, Sun Shuttle)?
Choose one of the following answers
Everyday
5 days/week
2-4 days/week
Once/week
2-3 times/month
Once per month
Less than once per month
Don't Know / Refused
Exit and clear survey
Previous
Callback
Next


City of Tucson On-Board Transit Survey 2016
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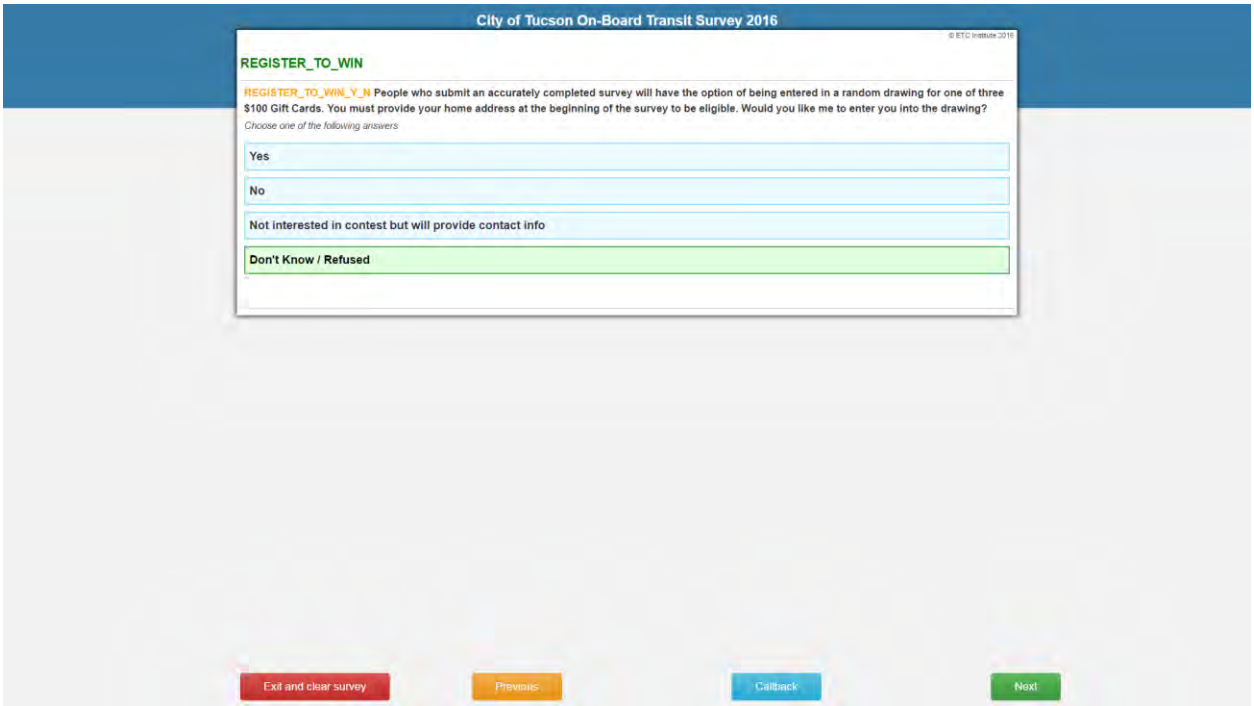
OTHER_SERVICE_ENHANCEMENT
SERVICE_ENHANCEMENT What is the service enhancement that is of most importance to you (select only one)?
Choose one of the following answers
More frequent service
Earlier operating hours
Later operating hours
More weekend service
Shorter travel time
Different destinations
Don't Know / Refused
Other:
Exit and clear survey
Previous
Callback
Next


City of Tucson On-Board Transit Survey 2016
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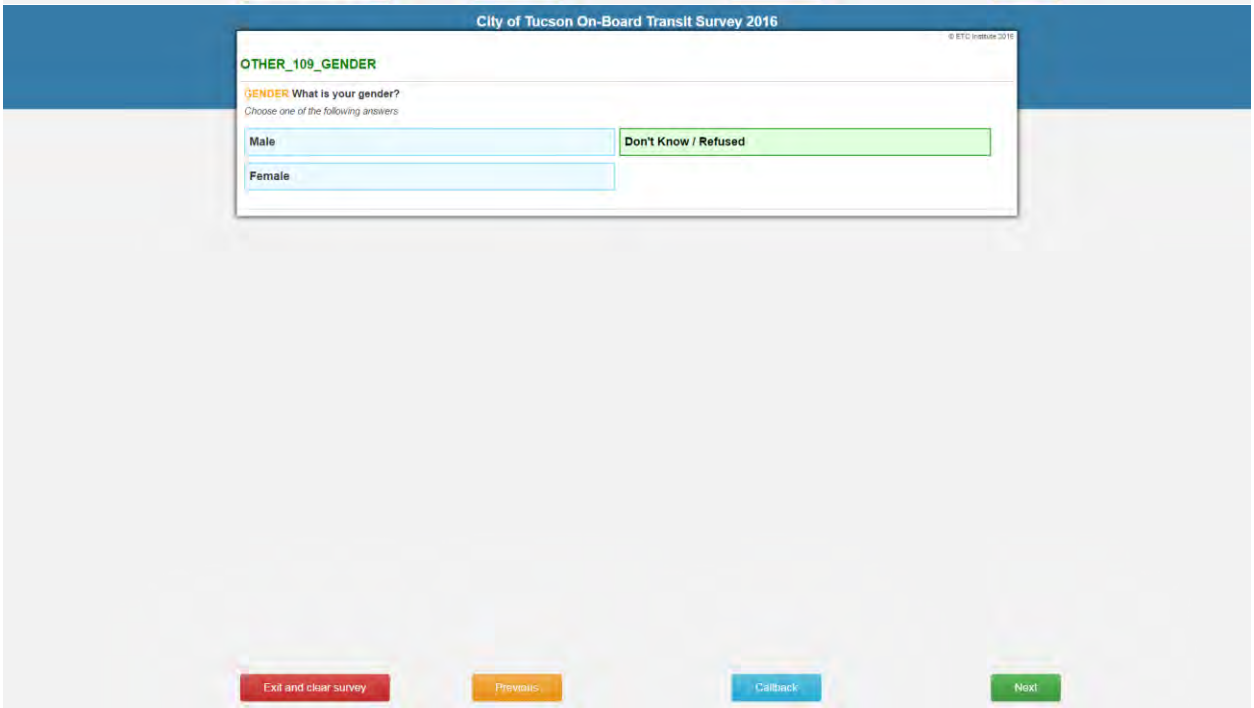
REGISTER_TO_WIN
REGISTER_TO_WIN_Y_N People who submit an accurately completed survey will have the option of being entered in a random drawing for one of three $100 Gift Cards. You must provide your home address at the beginning of the survey to be eligible. Would you like me to enter you into the drawing?
Choose one of the following answers
Yes
No
Not interested in contest but will provide contact info
Don't Know / Refused
Exit and clear survey
Previous
Callback
Next


City of Tucson On-Board Transit Survey 2016
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OTHER_109_GENDER
GENDER What is your gender?
Choose one of the following answers
Male
Female
Don't Know / Refused
Exit and clear survey
Previous
Callback
Next

Paper Survey

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_____

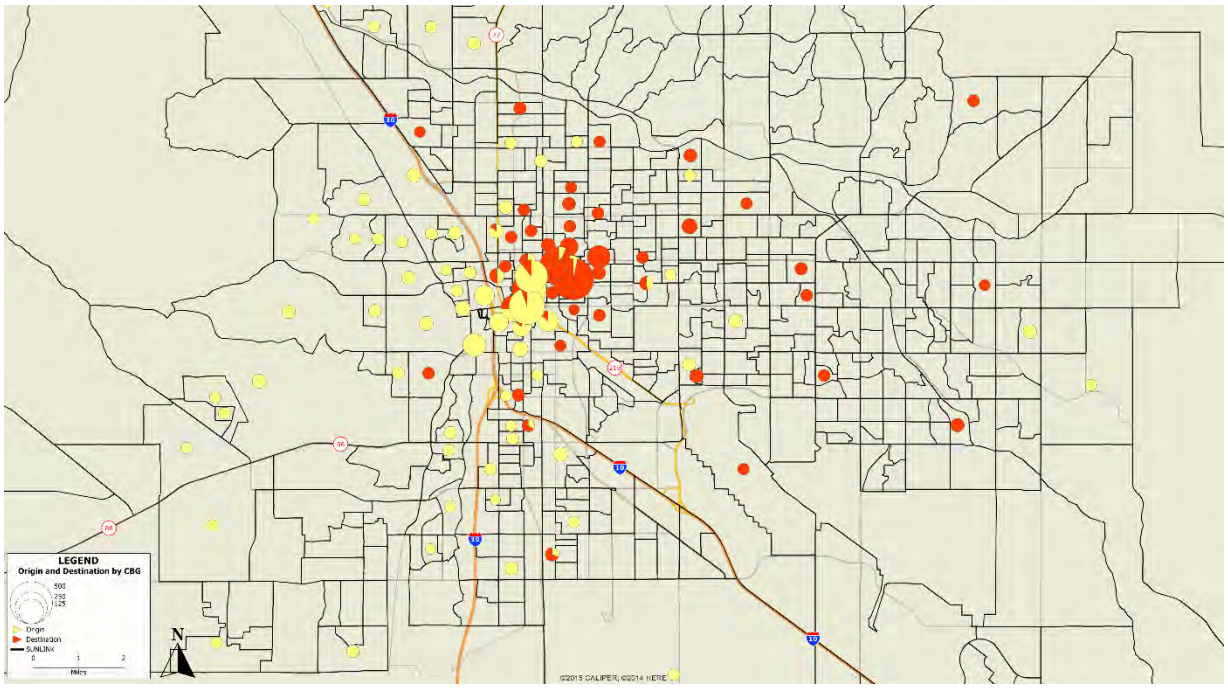
35. How often do you ride transit (Sun Tran, Sun Link, Sun Shuttle)? O Everyday O 5 days/week
O 2-4 days/week O Once/week O 2-3 times/month O Once per month O Less than once per month

36. What is the service enhancement that is of most importance to you (select only one)?

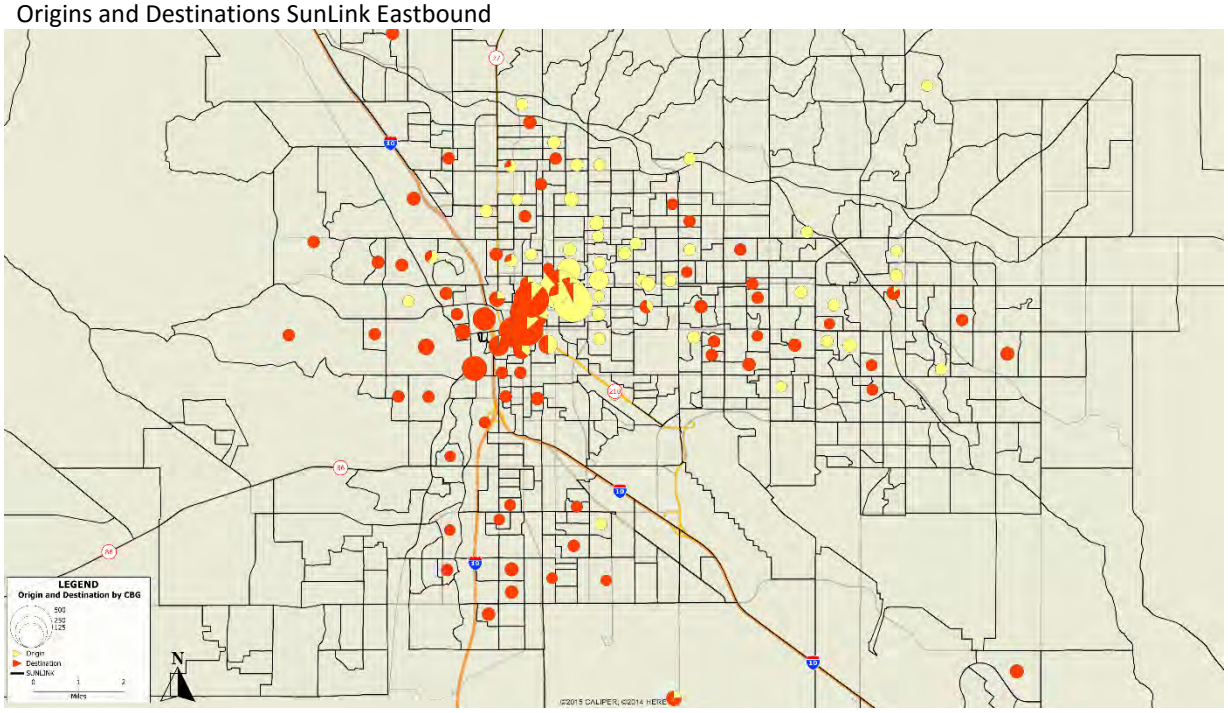
O More frequent service O Earlier operating hours O Later operating hours
O More weekend service O Shorter travel time O Different destinations
O Other

Appendix B Ridership Pattern Maps

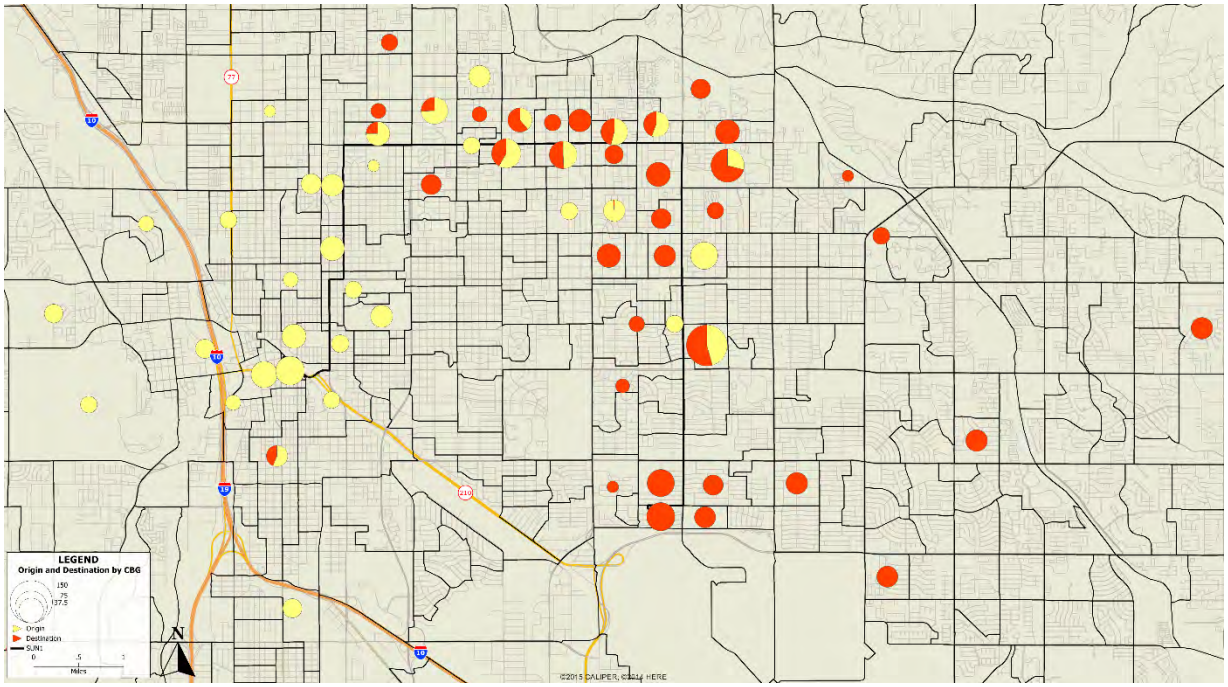
The maps on the following pages contain Origin and Destination, Boarding and Alighting, and Transfer Locations for individual route by direction.



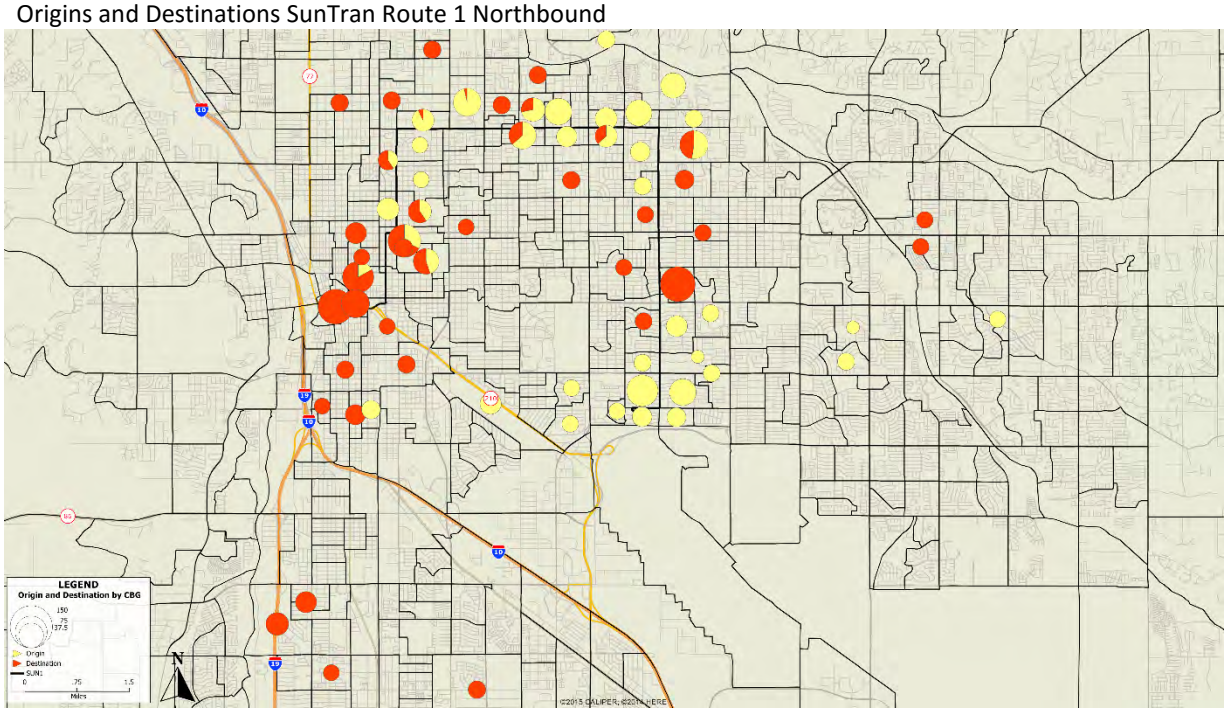
Origins and Destinations SunLink Eastbound



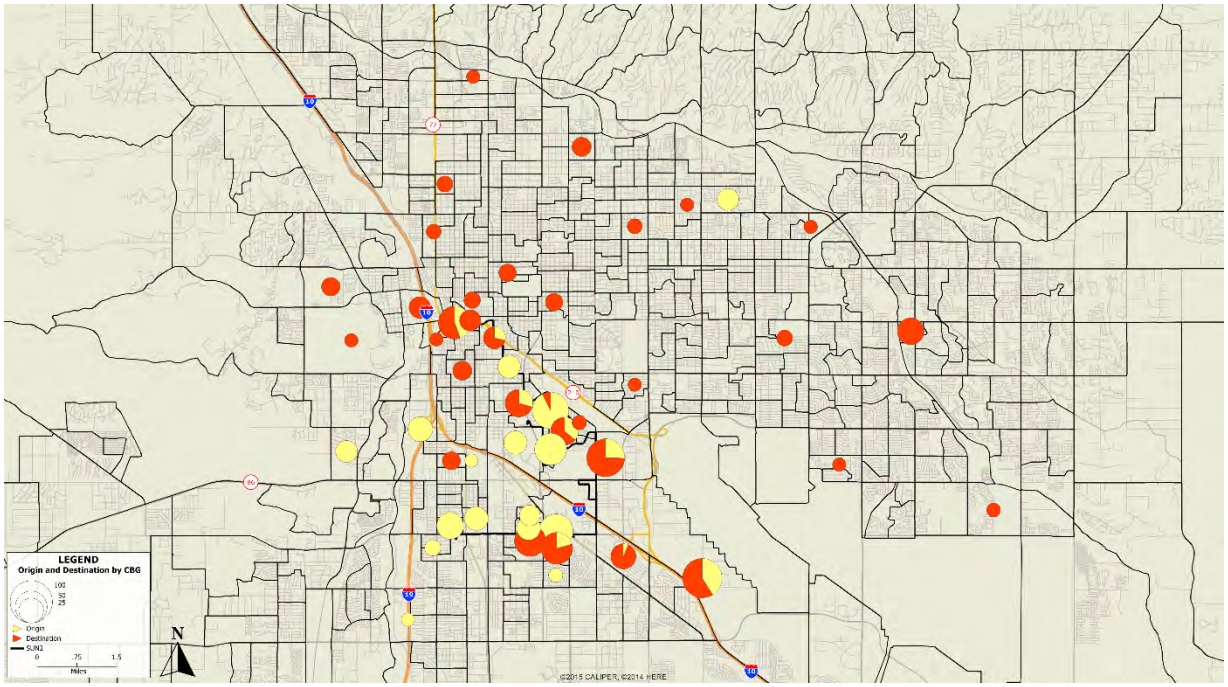
Origins and Destinations SunLink Westbound



Origins and Destinations SunTran Route 1 Northbound



Origins and Destinations SunTran Route 1 Southbound



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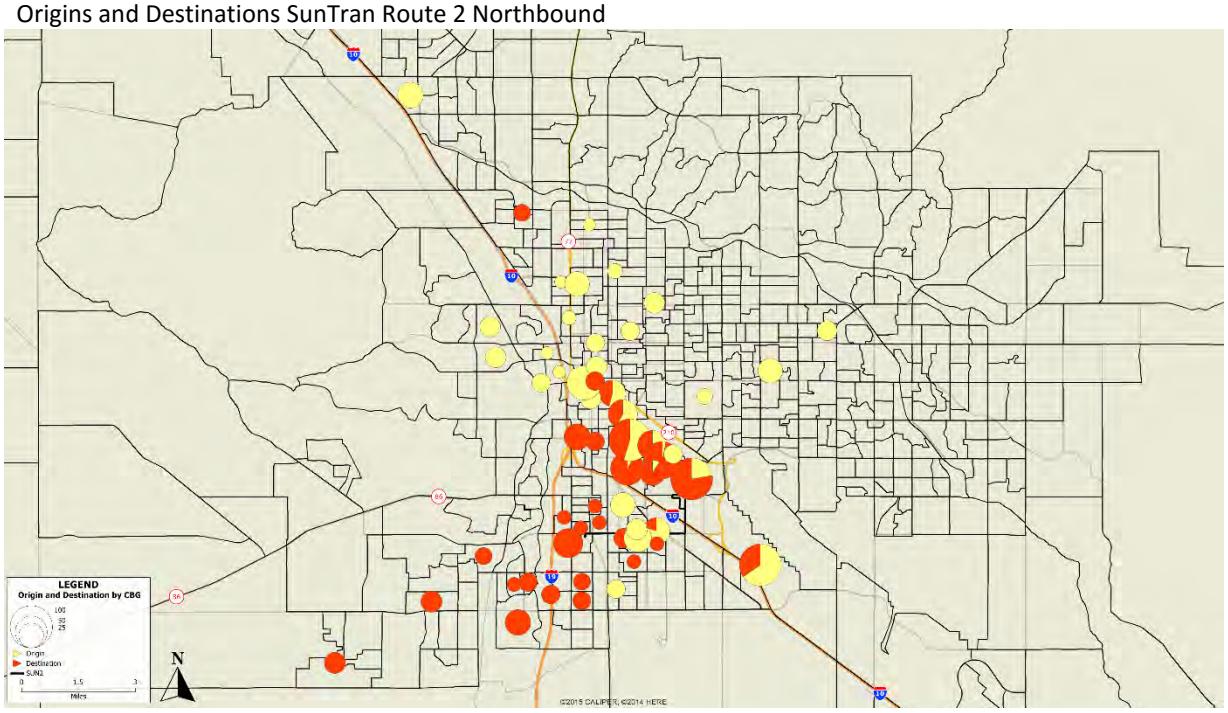
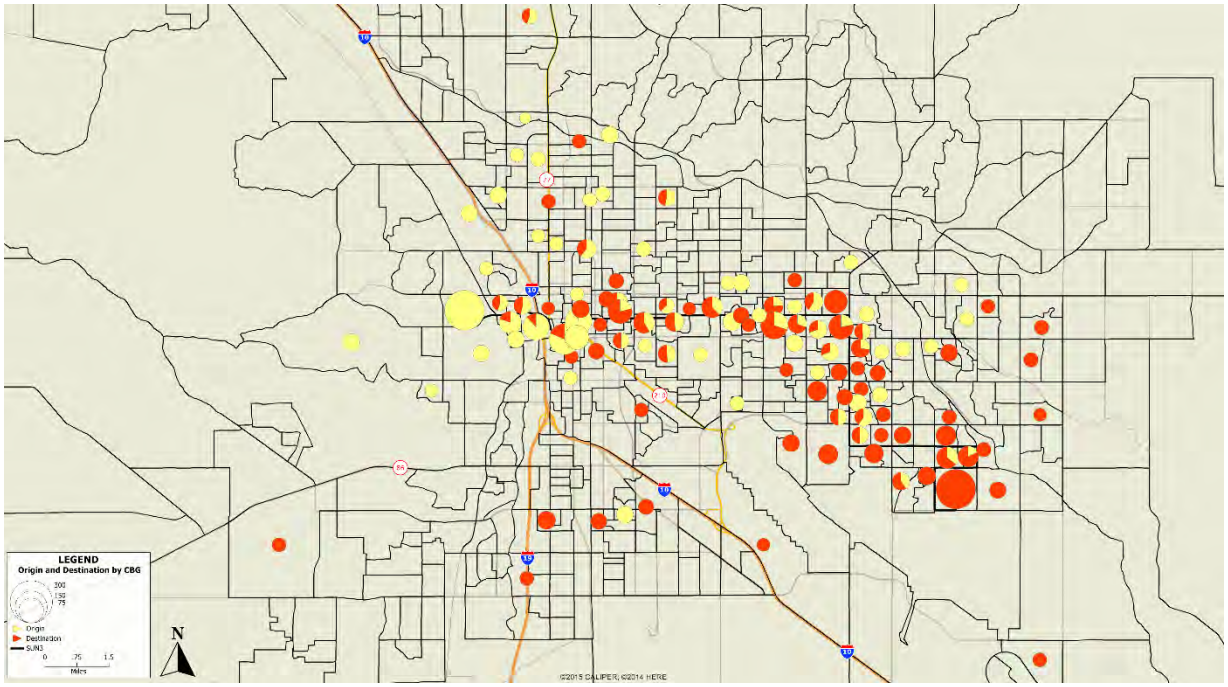
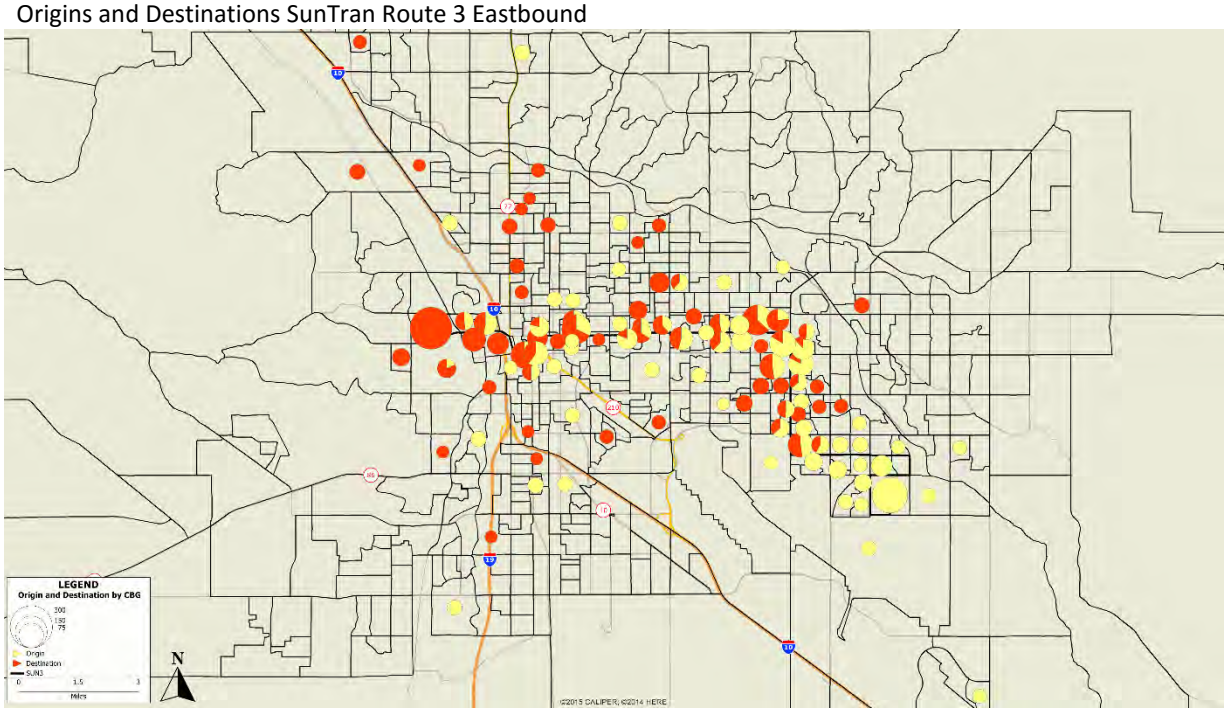


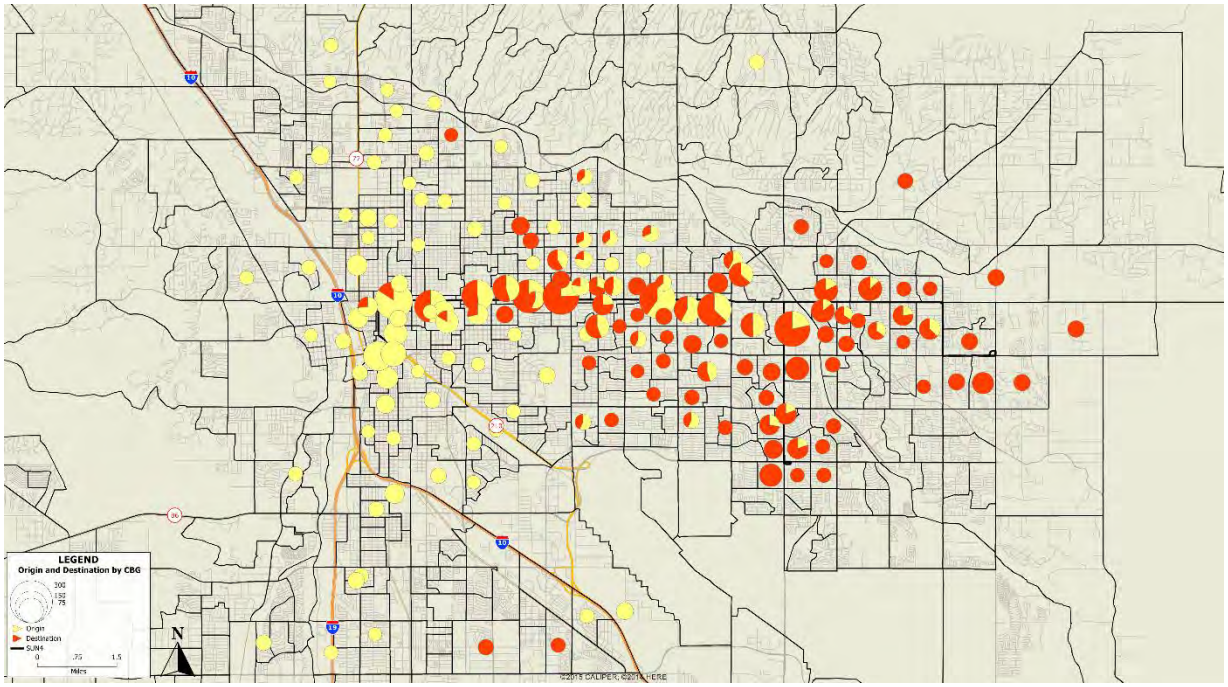
Origins and Destinations SunTran Route 2 Southbound



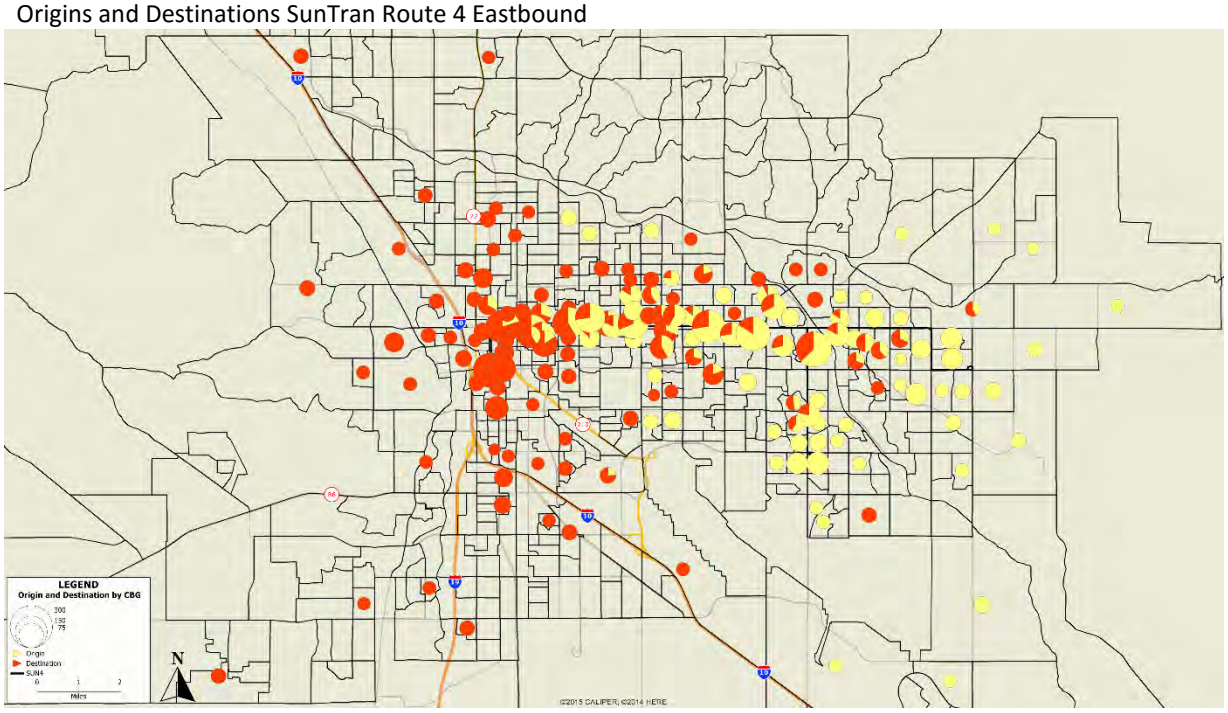
Origins and Destinations SunTran Route 3 Eastbound



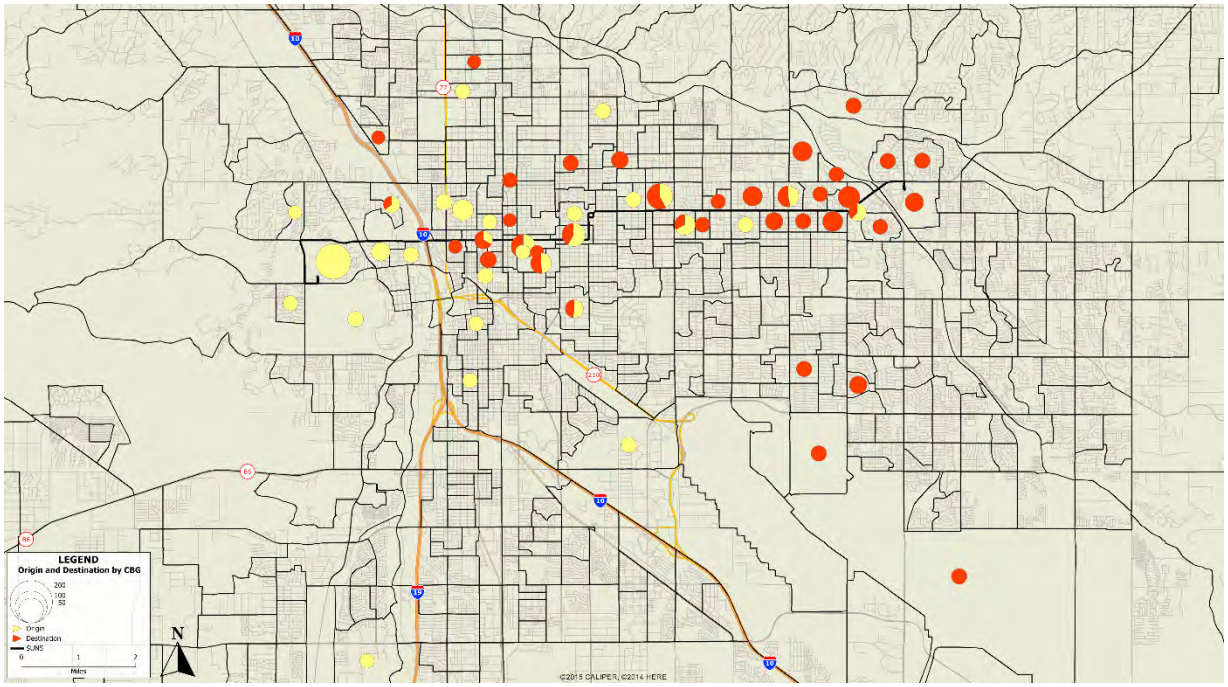
Origins and Destinations SunTran Route 3 Westbound



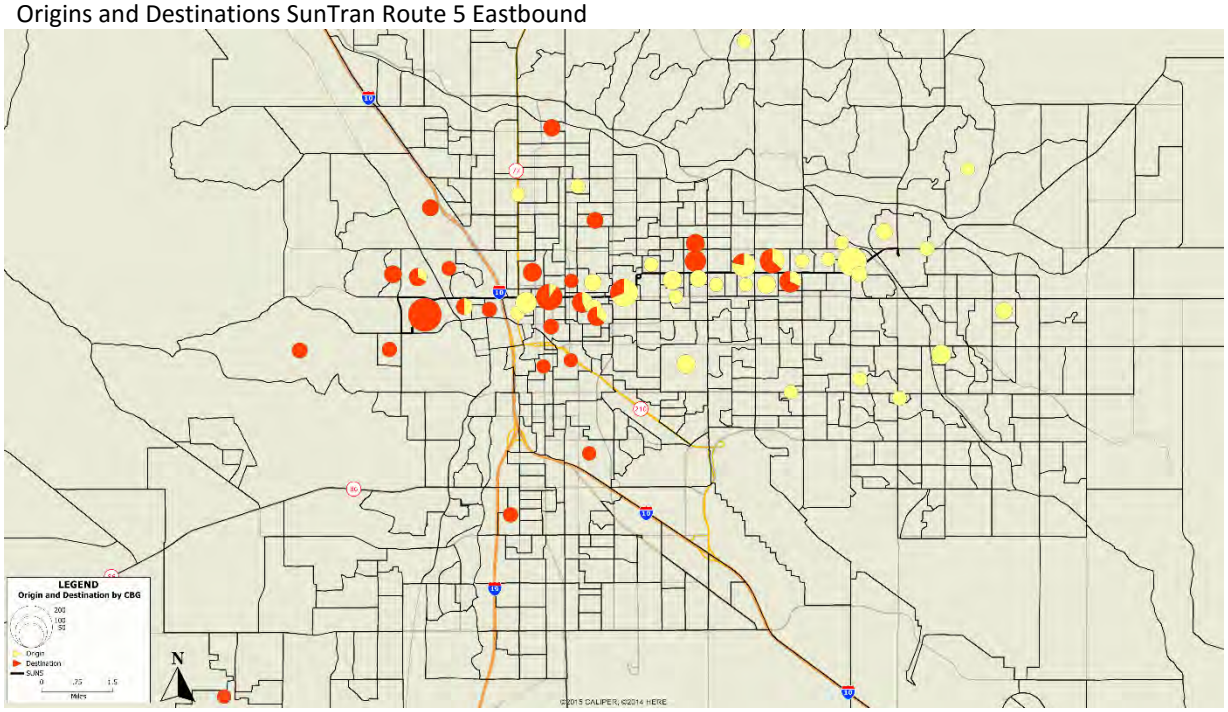
Origins and Destinations SunTran Route 4 Eastbound



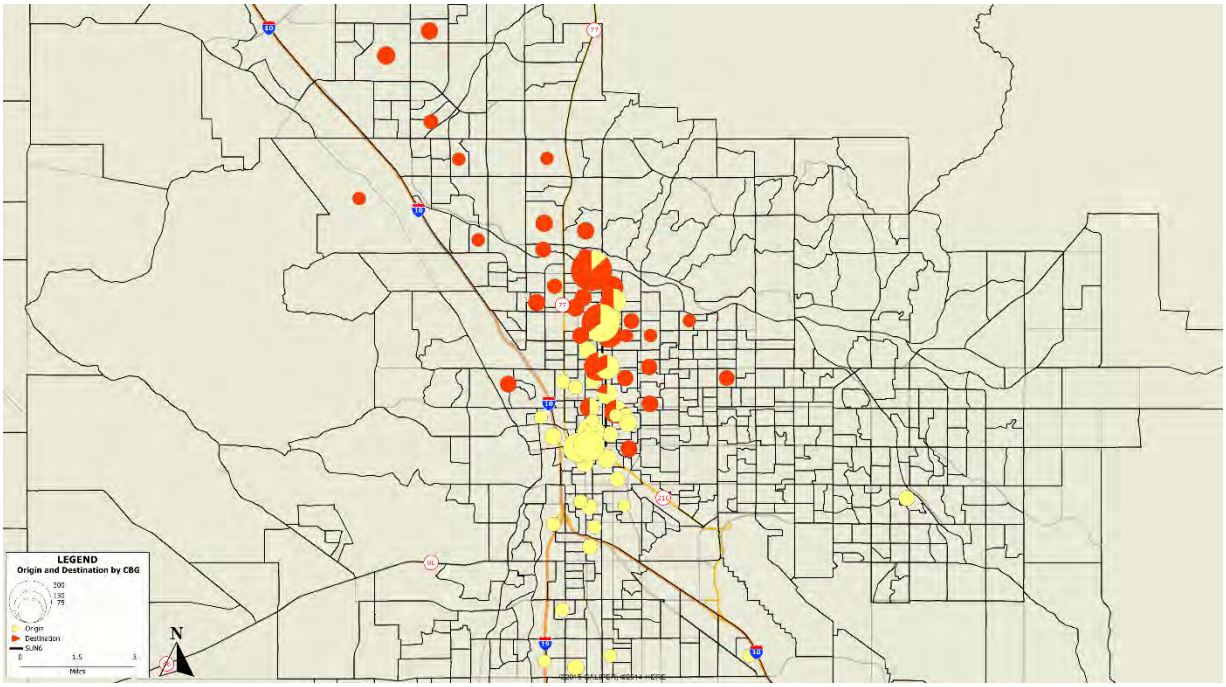
Origins and Destinations SunTran Route 4 Westbound



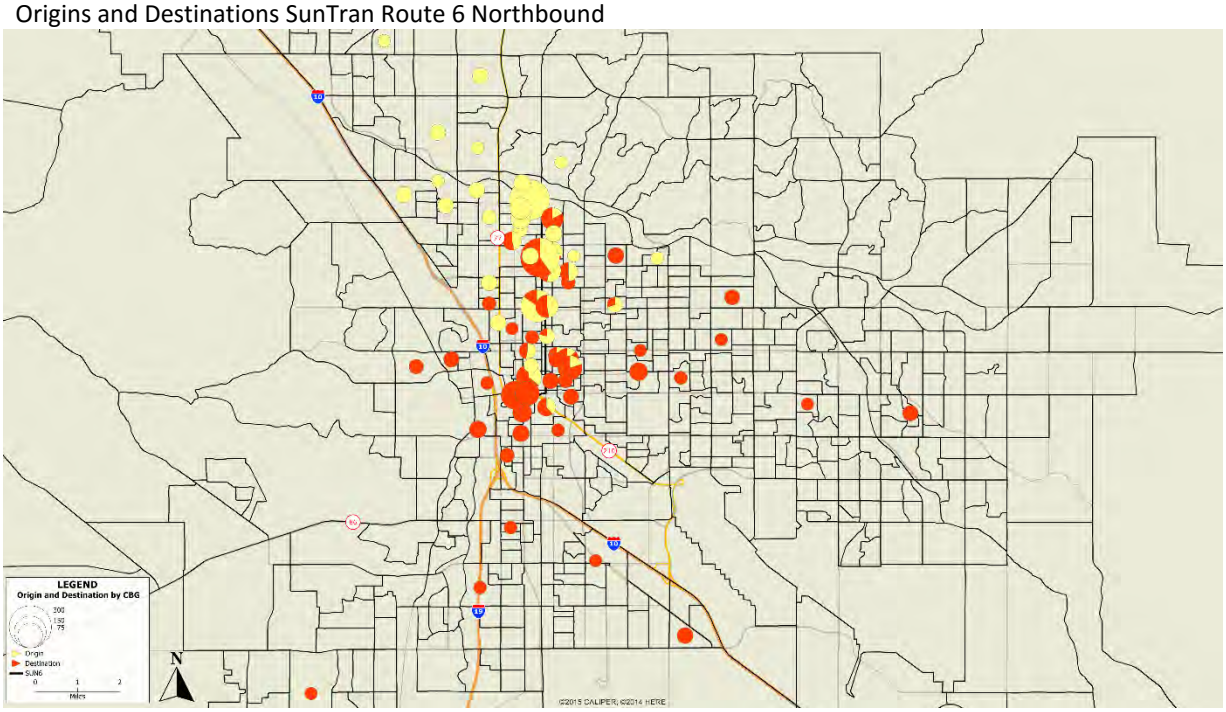
Origins and Destinations SunTran Route 5 Eastbound



Origins and Destinations SunTran Route 5 Westbound



Origins and Destinations SunTran Route 6 Northbound



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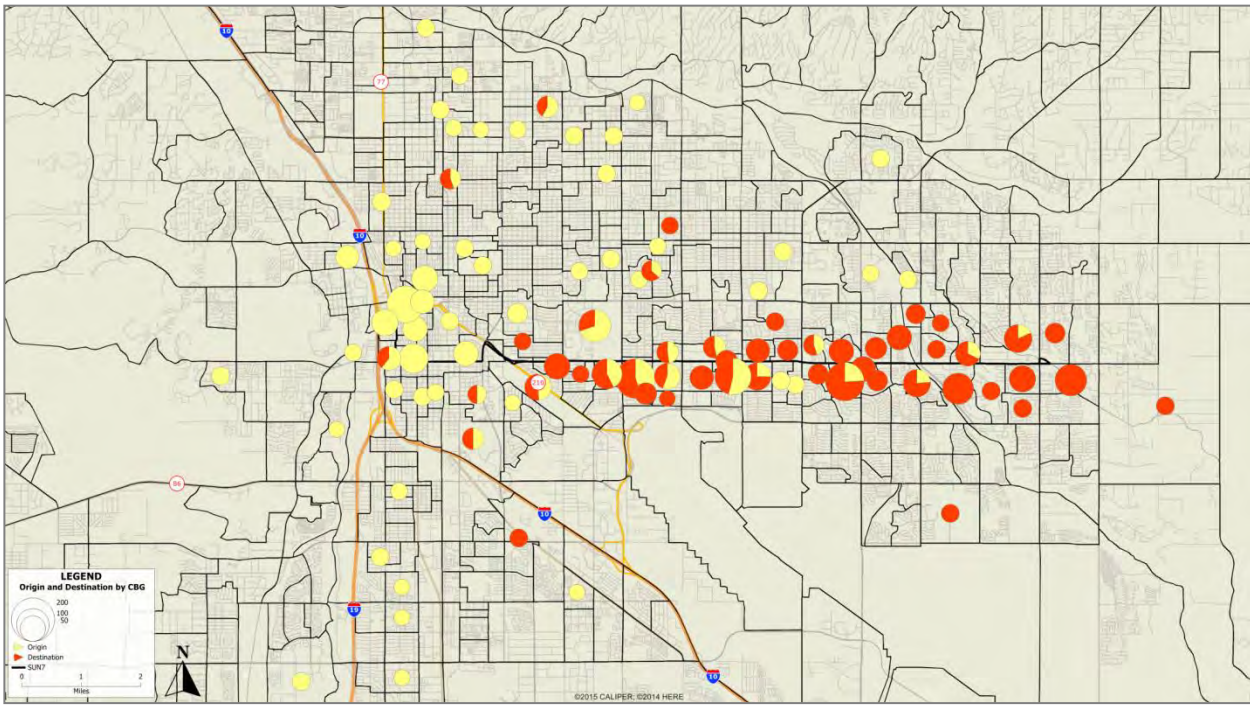
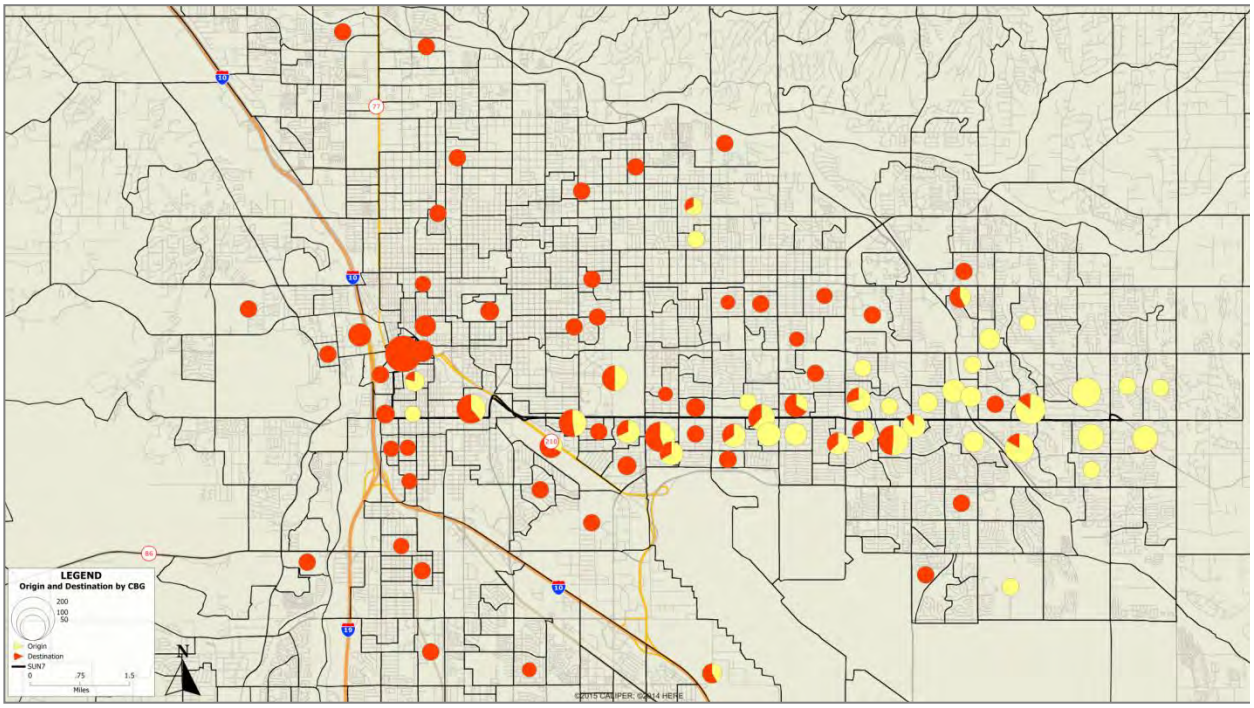
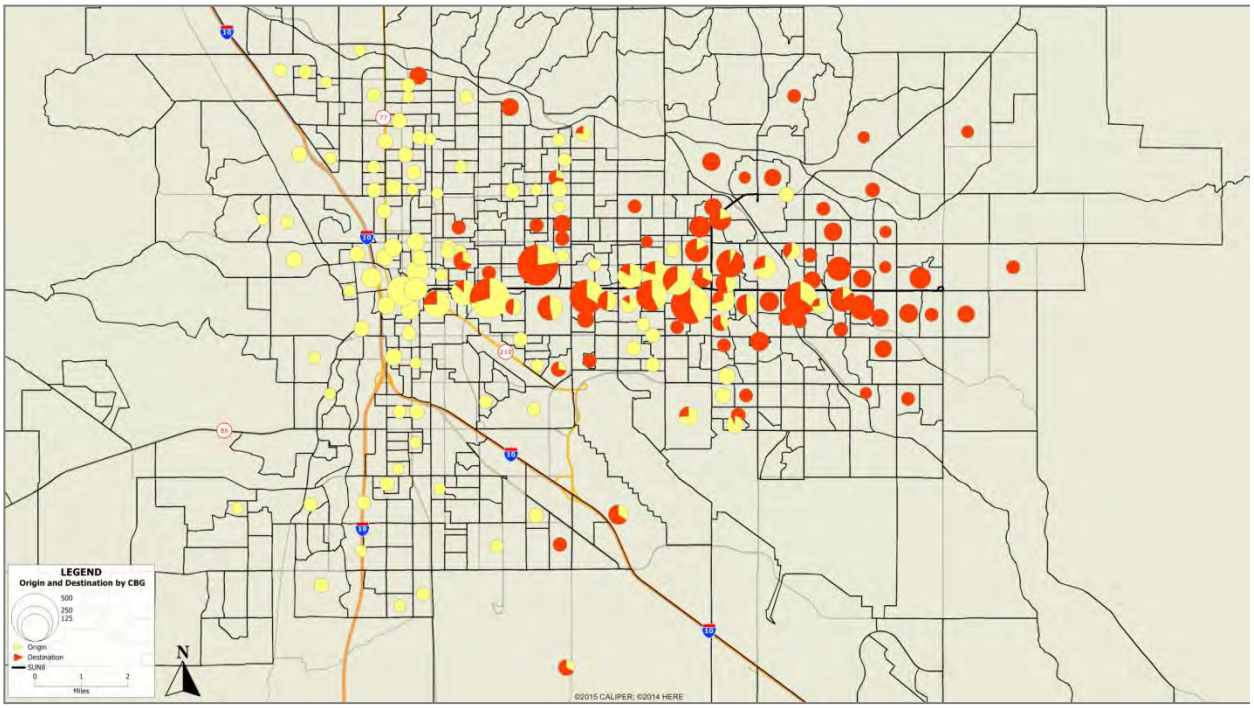


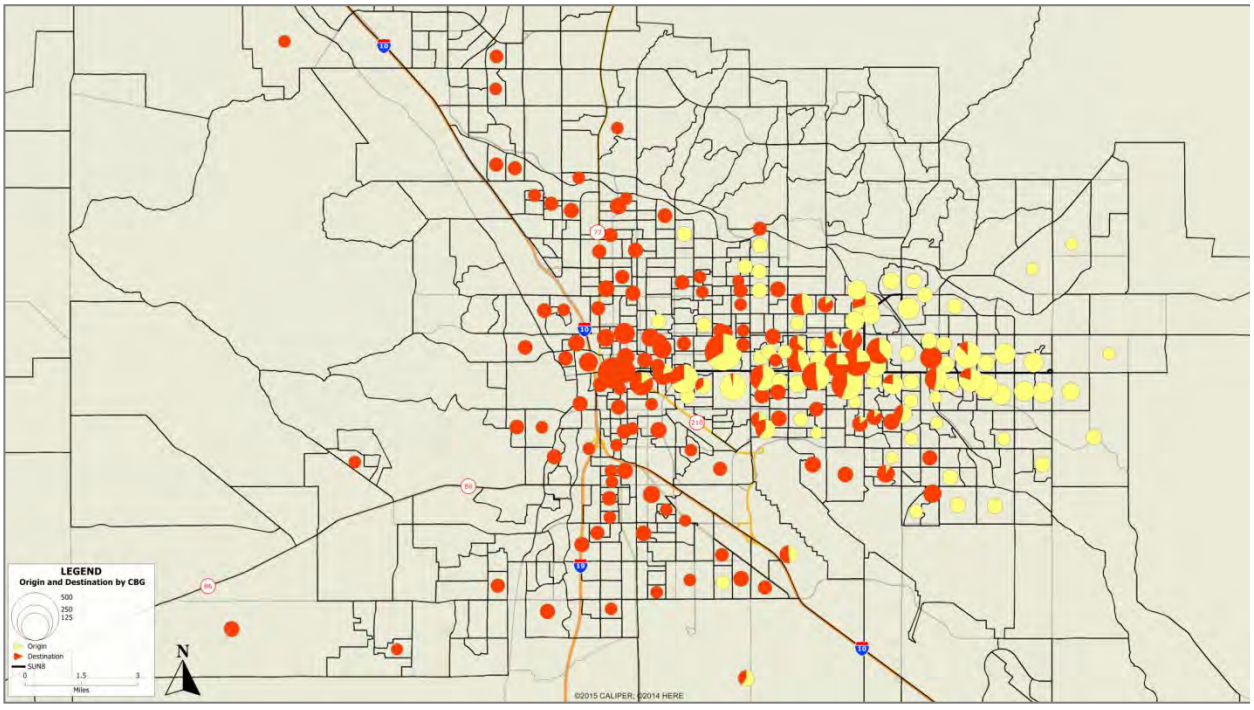
Origins and Destinations SunTran Route 7 Eastbound



Origins and Destinations SunTran Route 7 Westbound



Origins and Destinations SunTran Route 8 Eastbound



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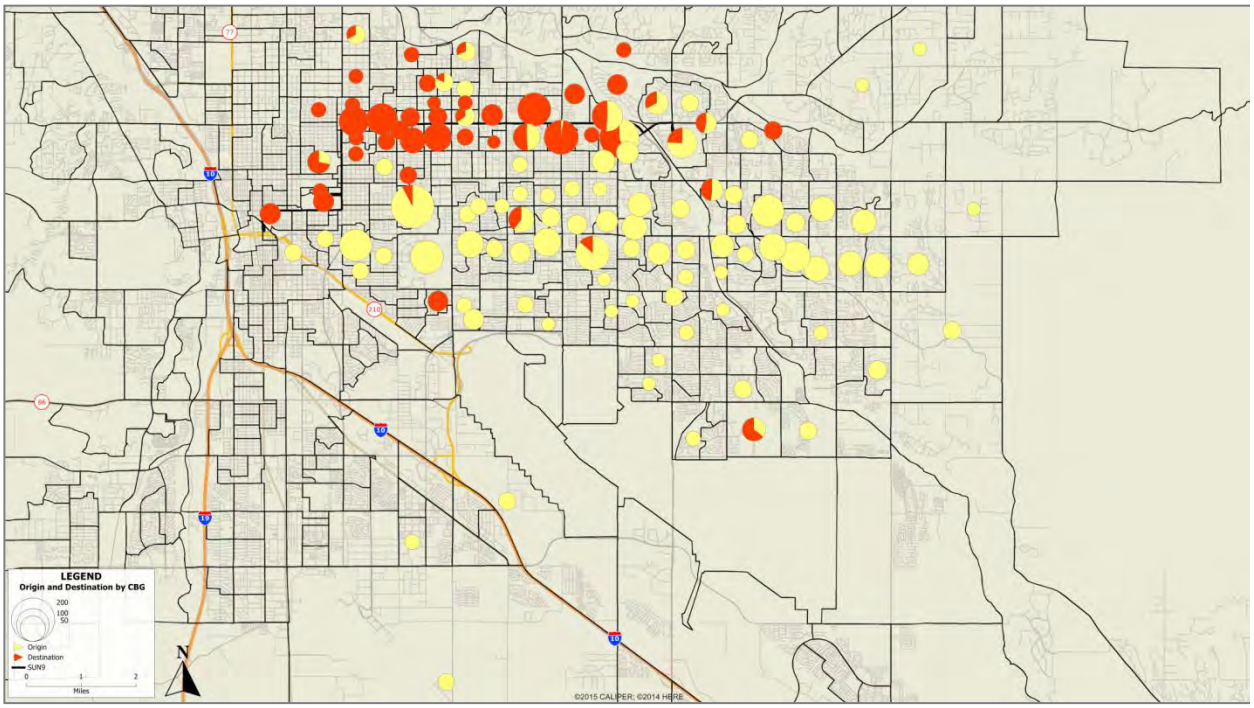
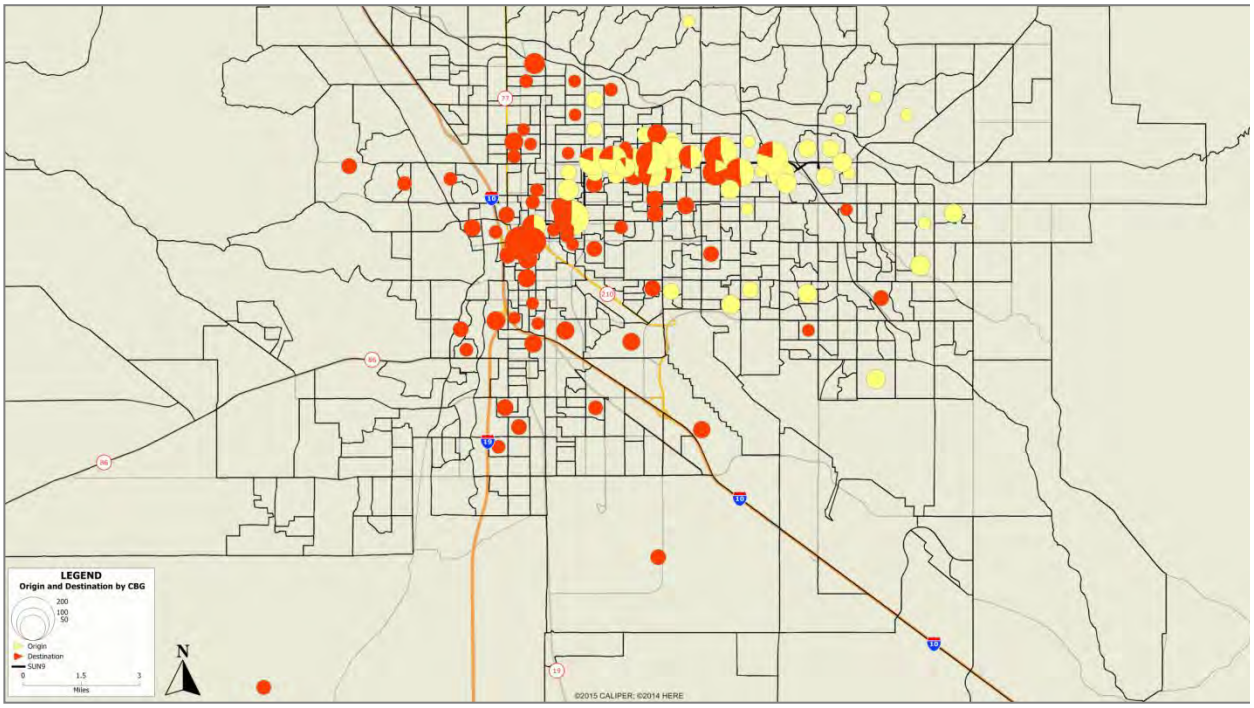
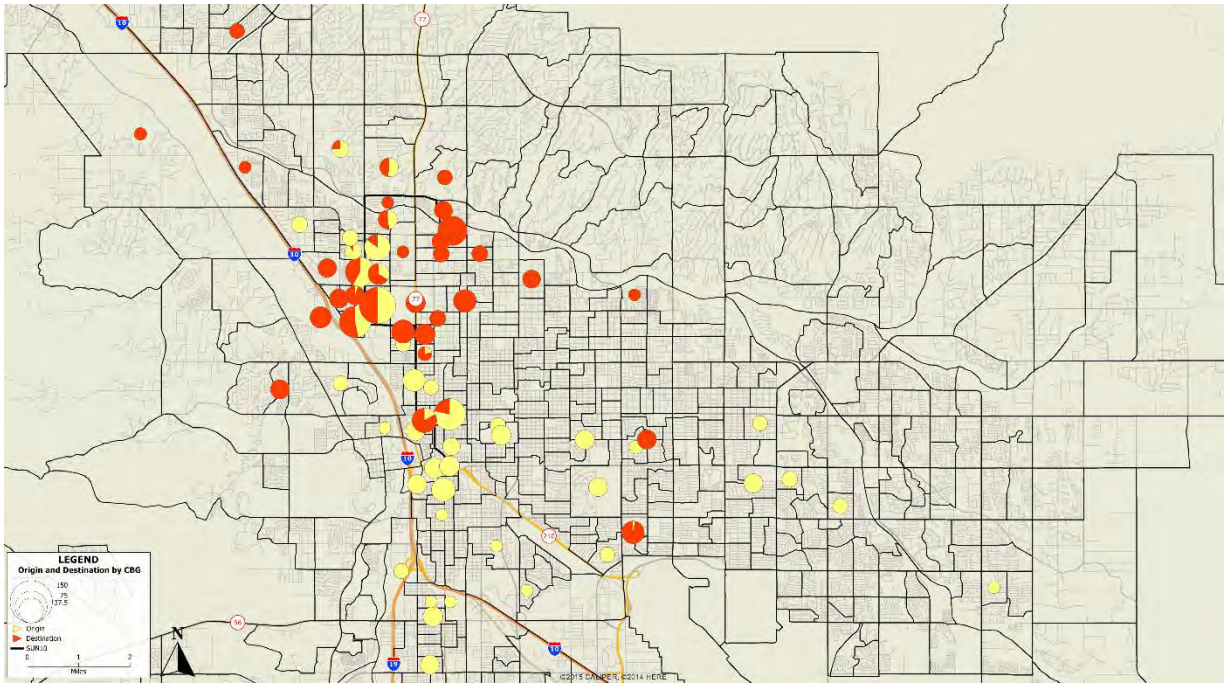


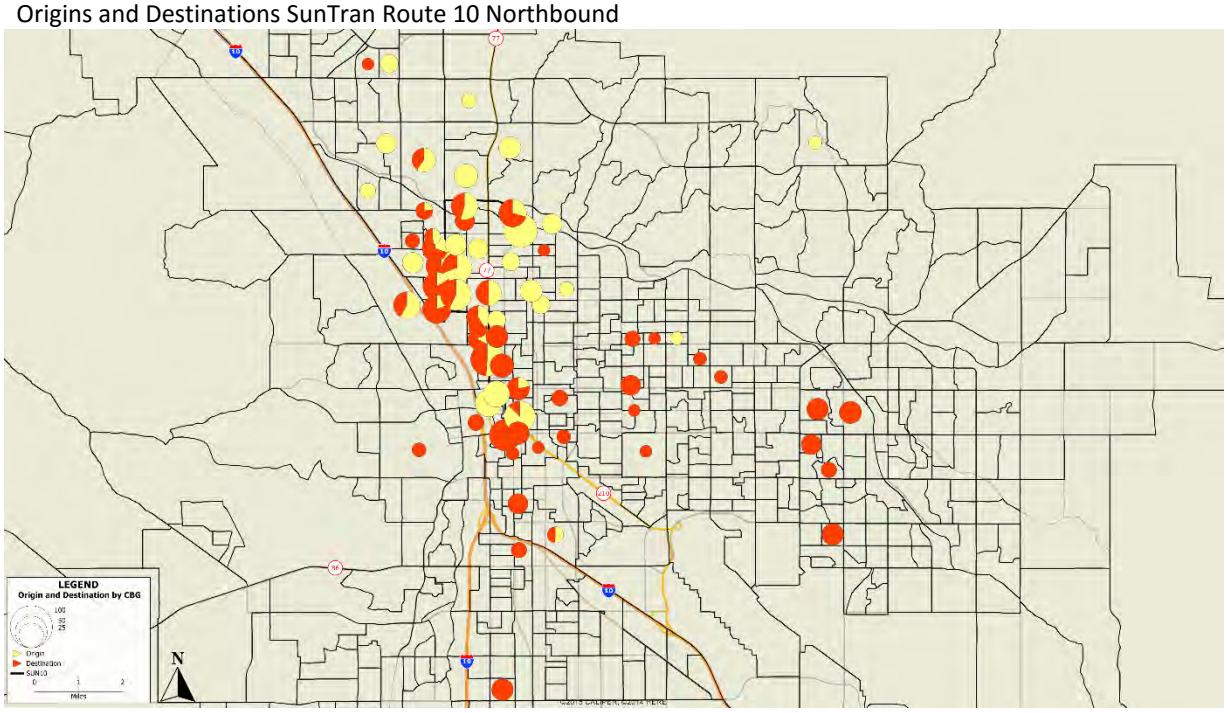
Origins and Destinations SunTran Route 9 Eastbound



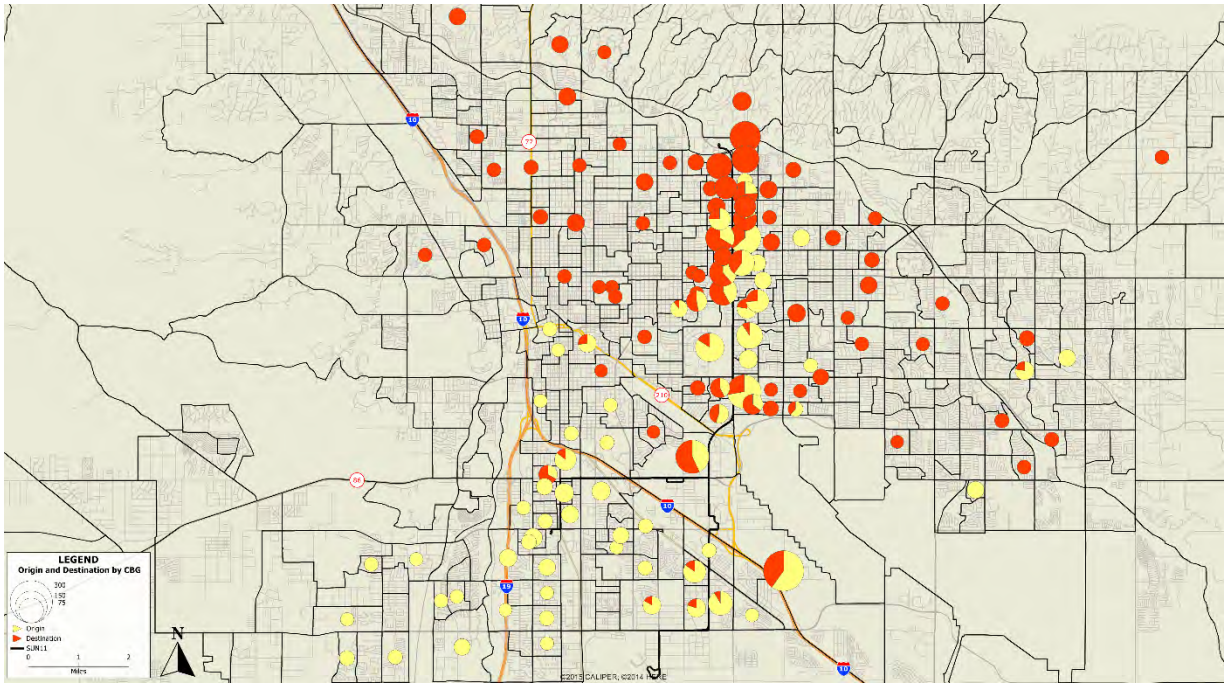
Origins and Destinations SunTran Route 9 Westbound



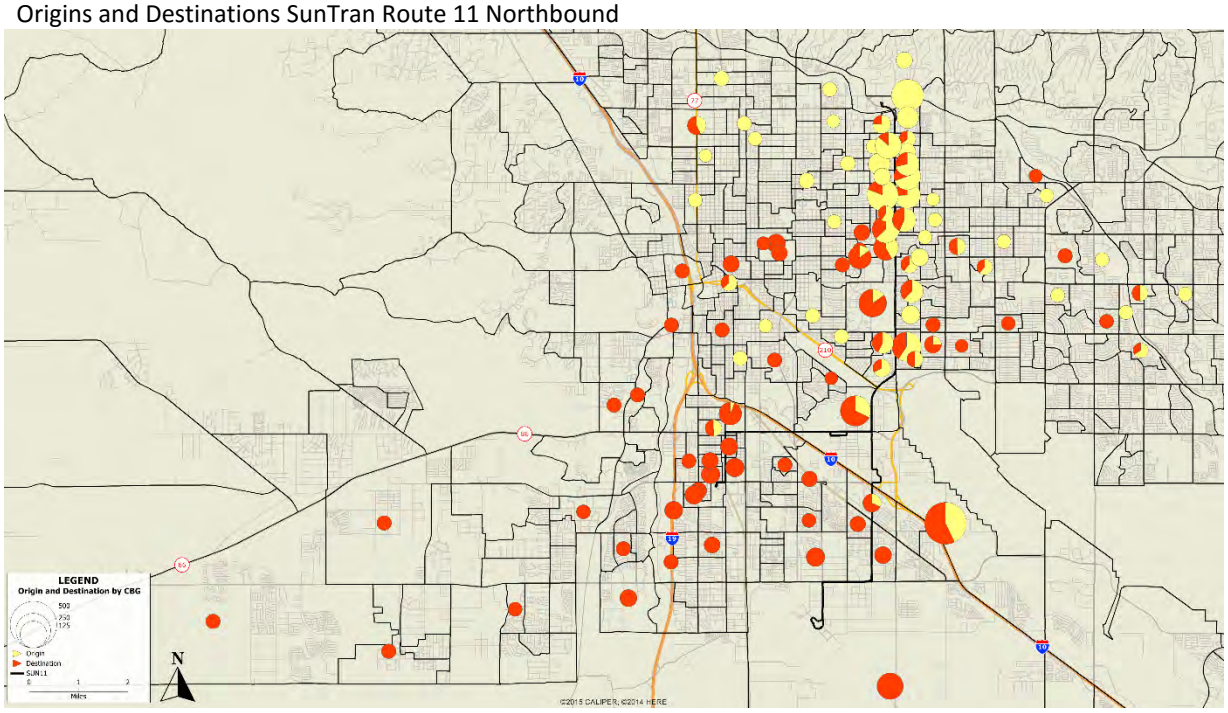
Origins and Destinations SunTran Route 10 Northbound



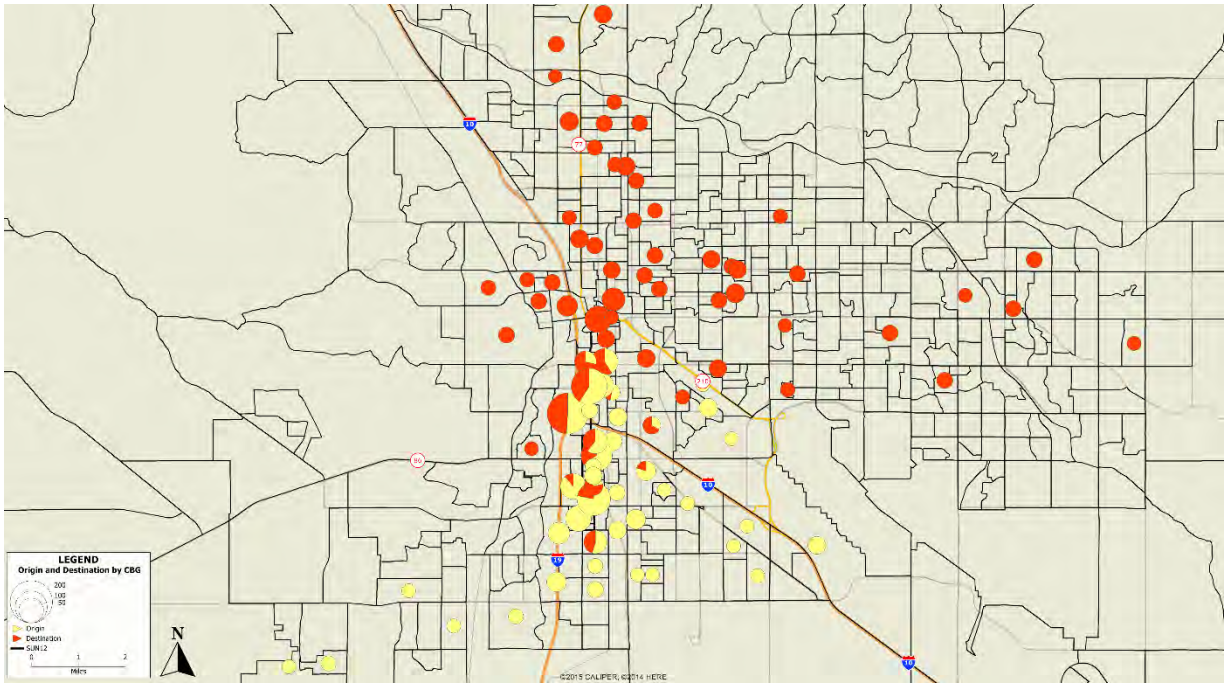
Origins and Destinations SunTran Route 10 Southbound



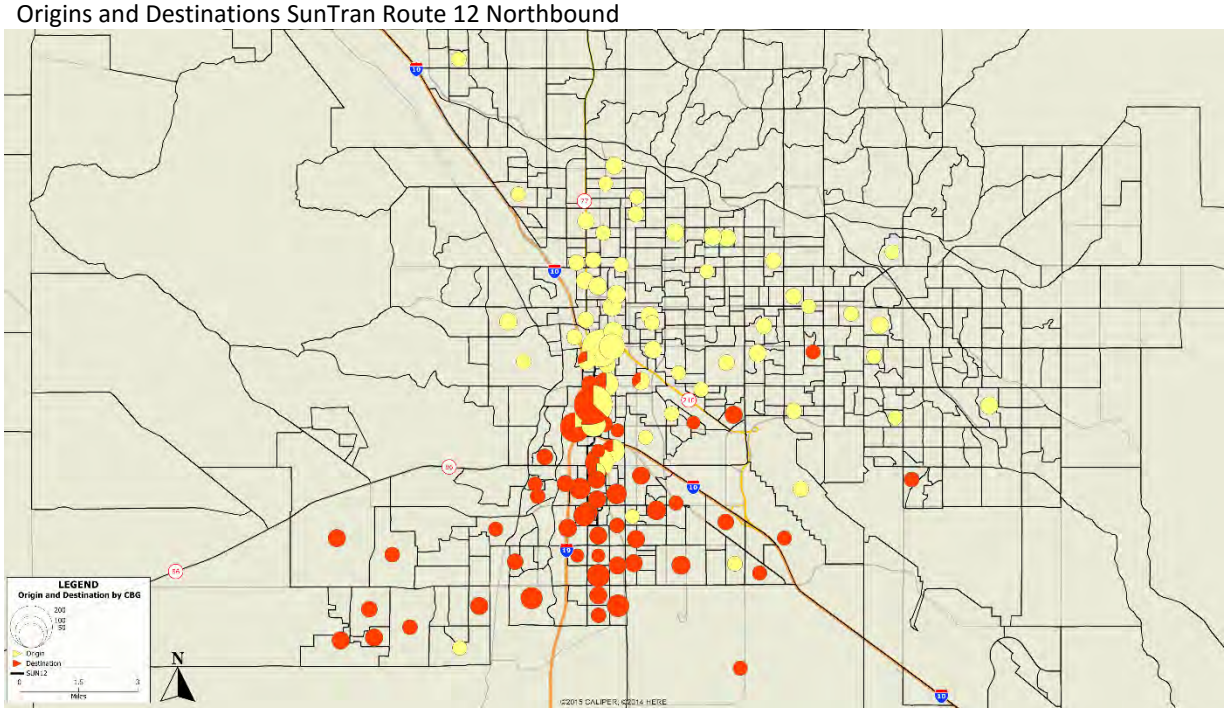
Origins and Destinations SunTran Route 11 Northbound



Origins and Destinations SunTran Route 11 Southbound



Origins and Destinations SunTran Route 12 Northbound



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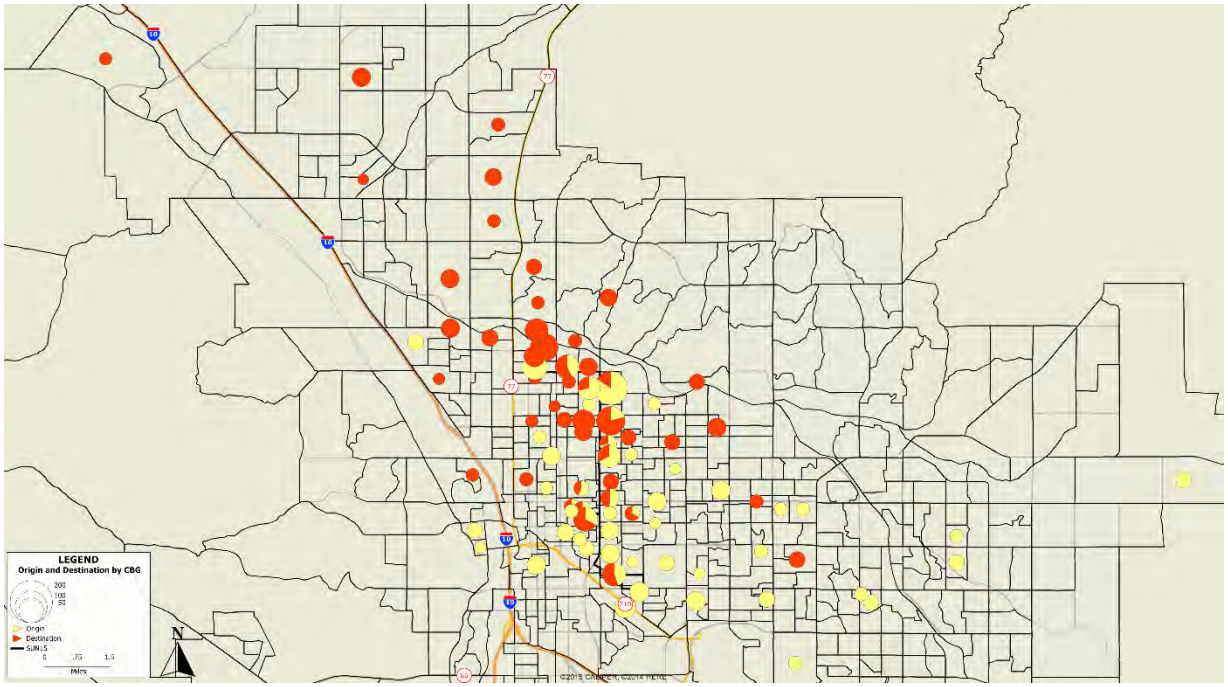

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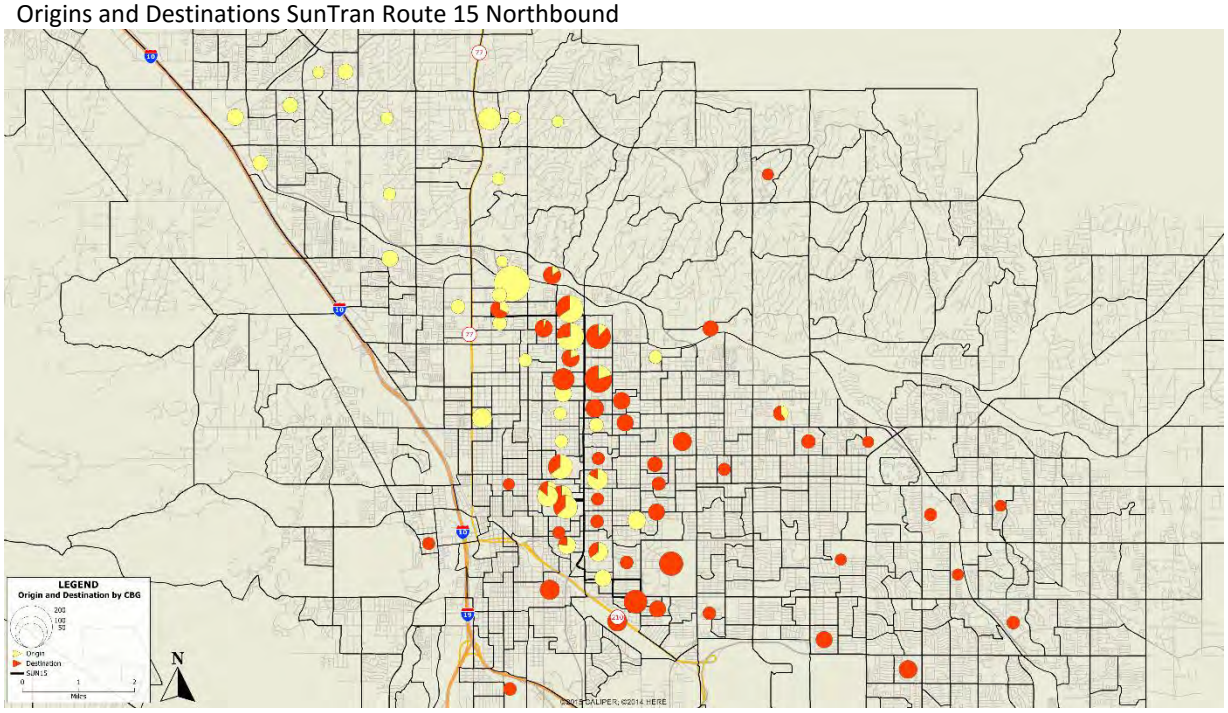

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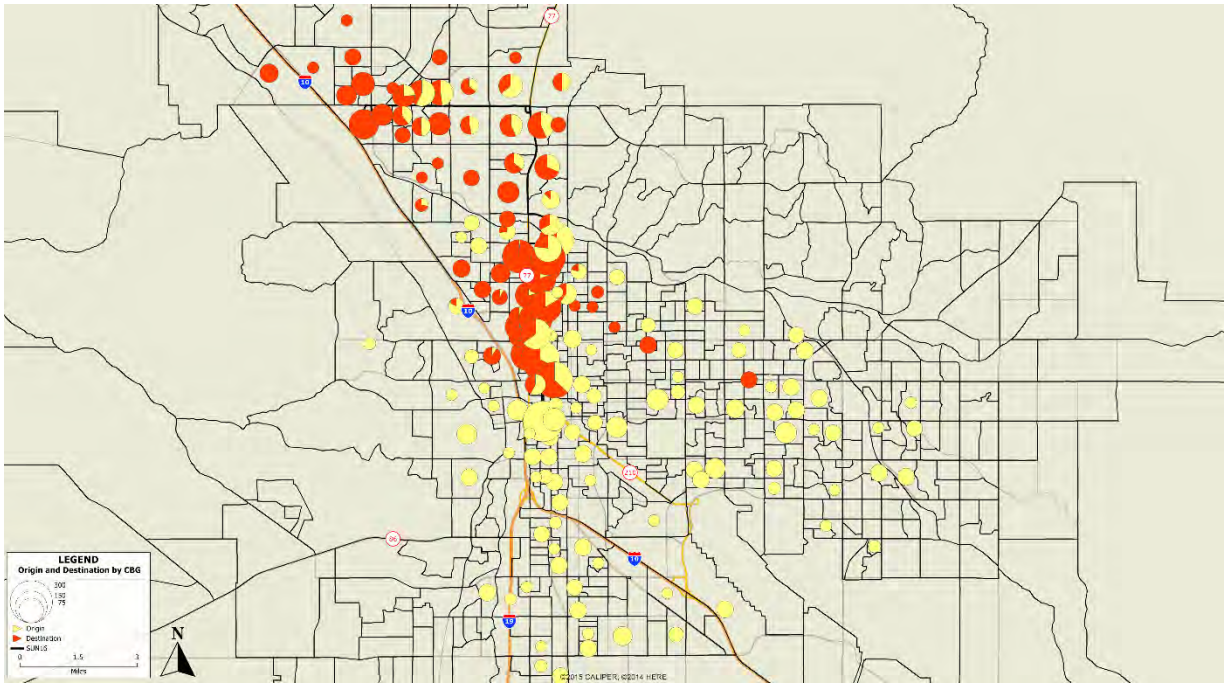

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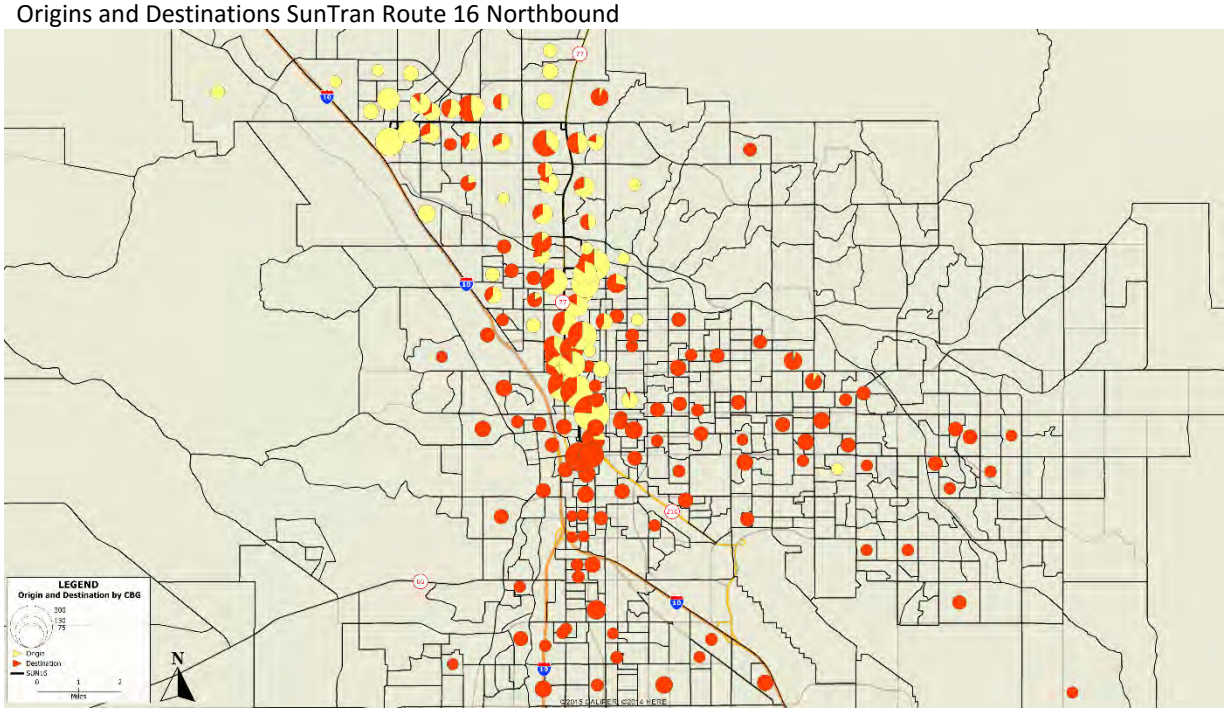
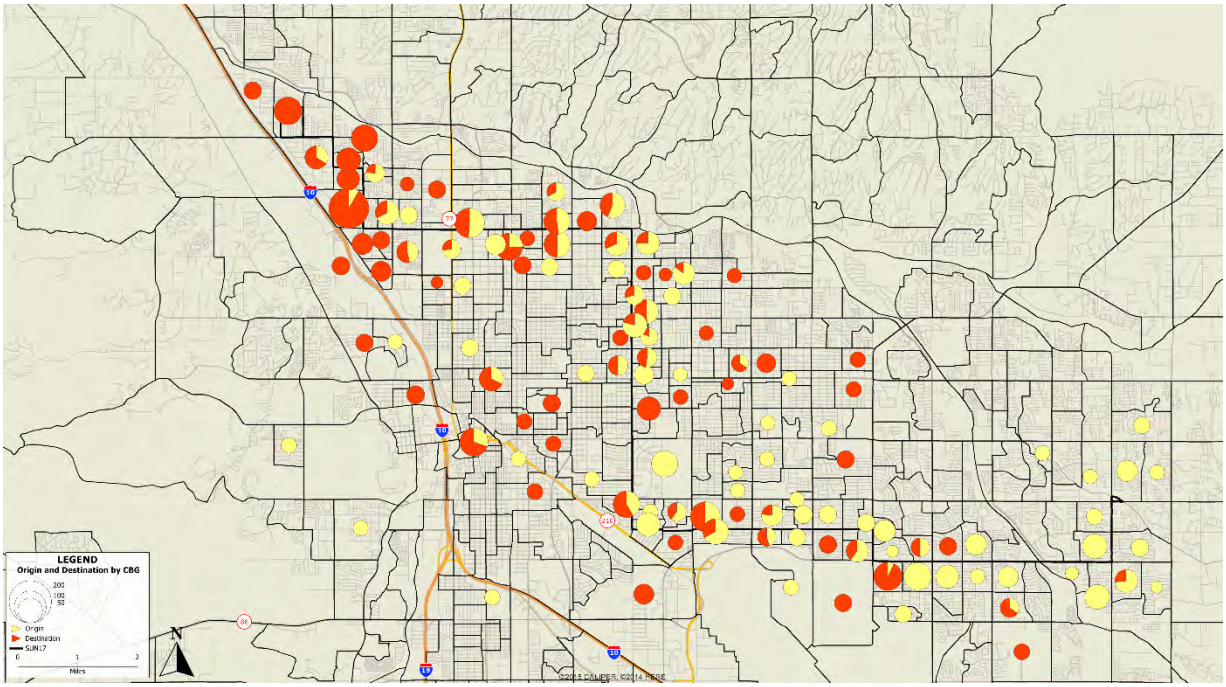


Origins and Destinations SunTran Route 16 Southbound



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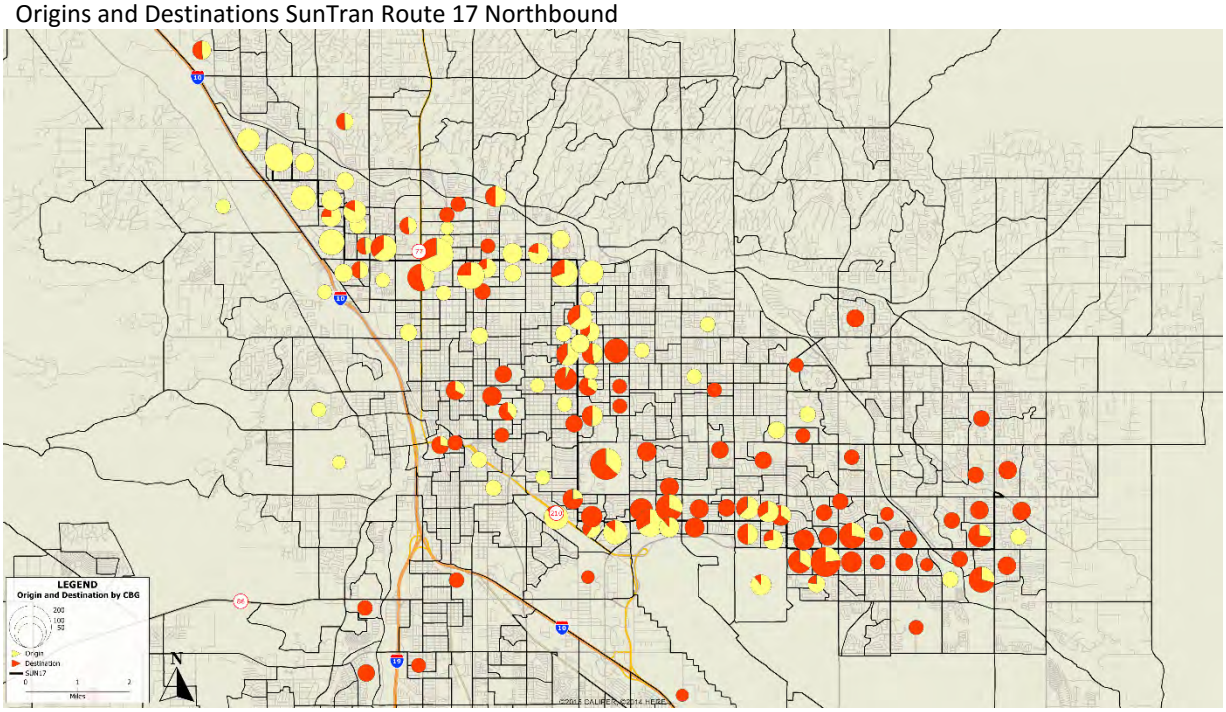
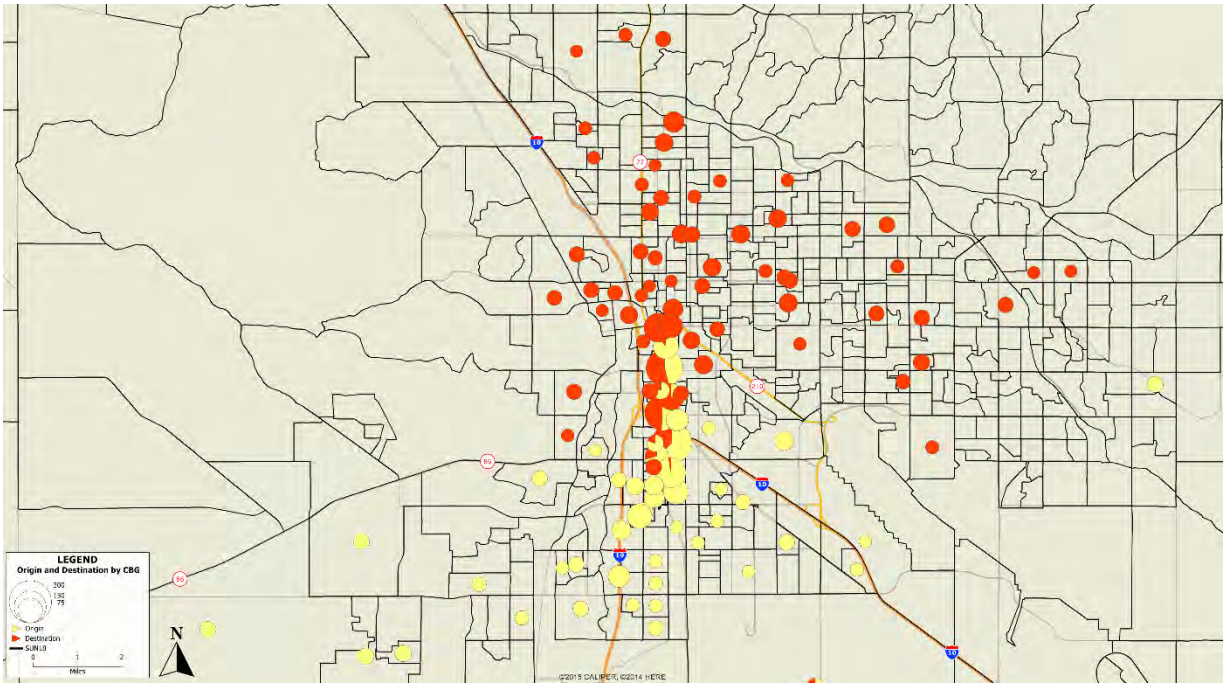


Origins and Destinations SunTran Route 17 Southbound



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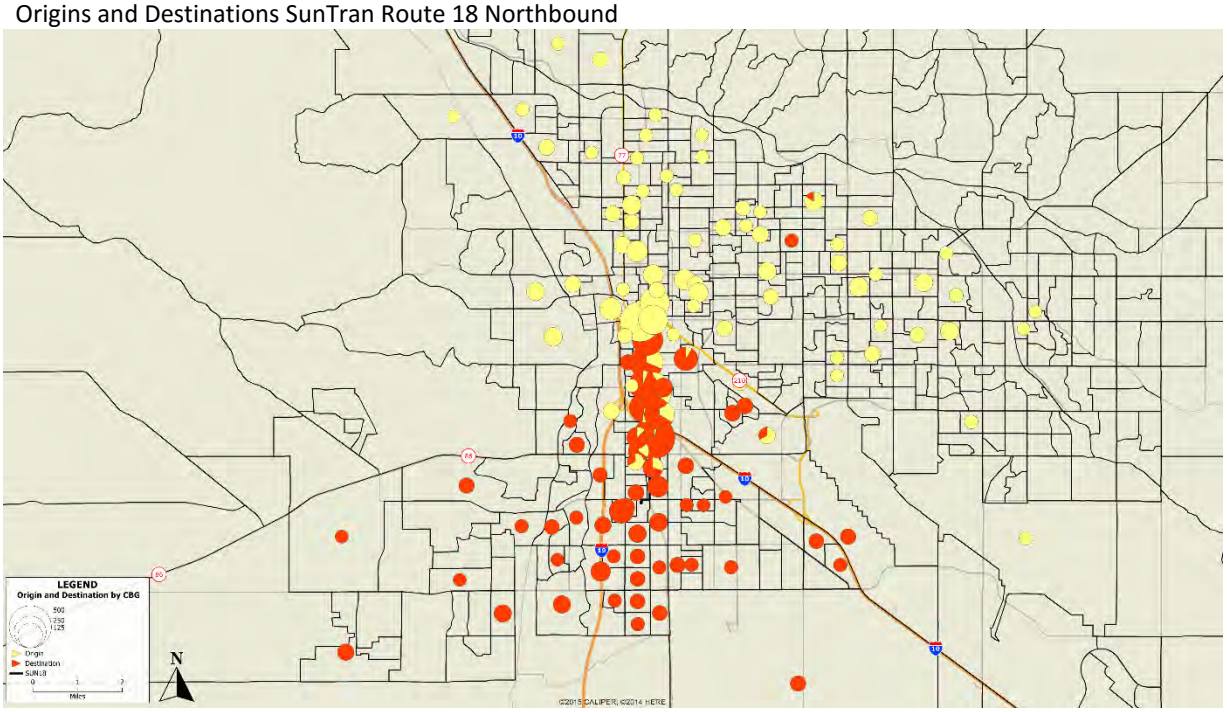
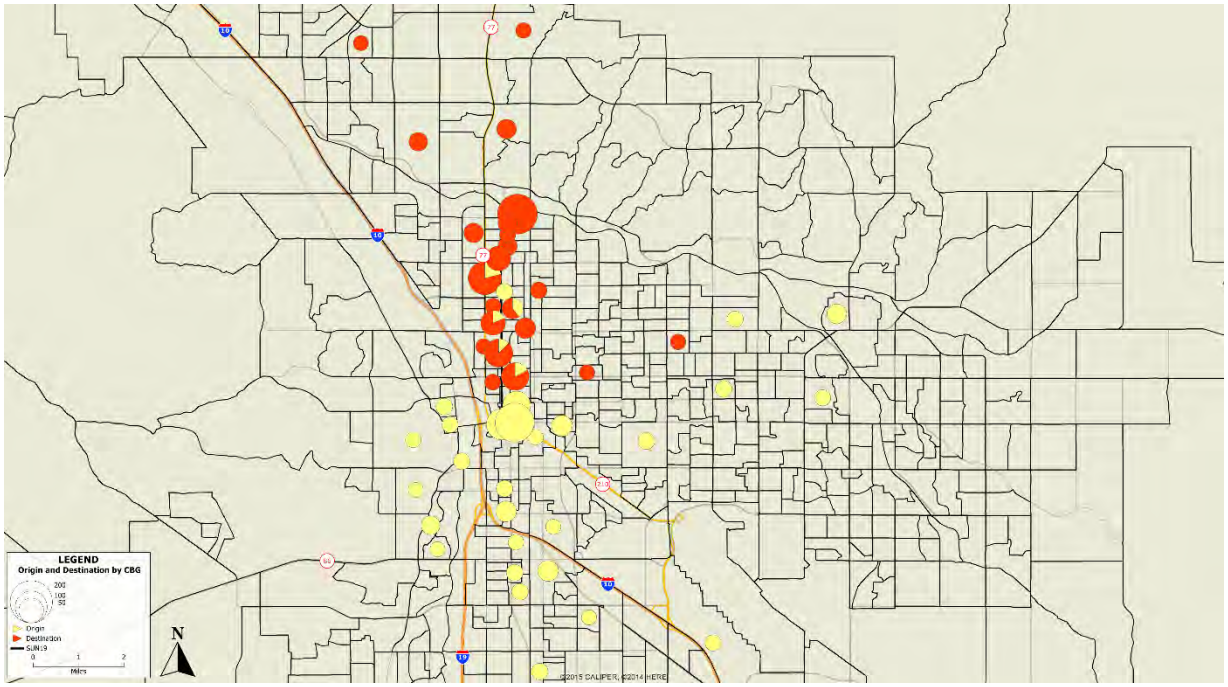


Origins and Destinations SunTran Route 18 Southbound



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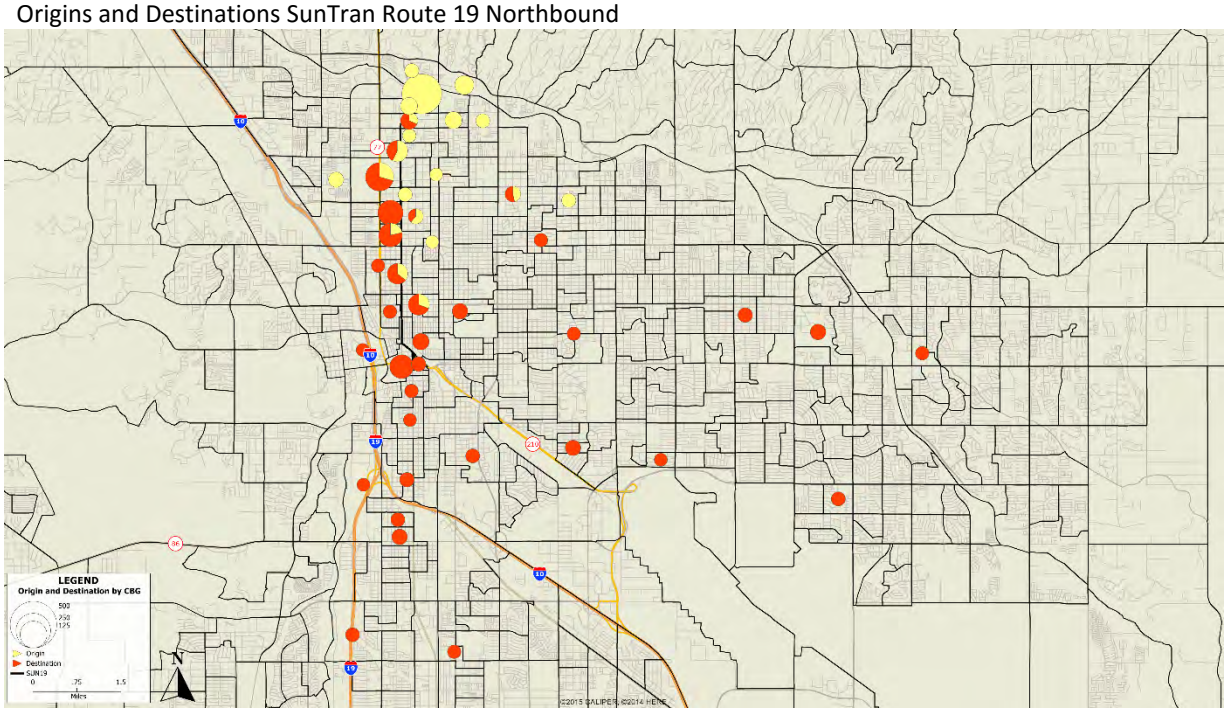
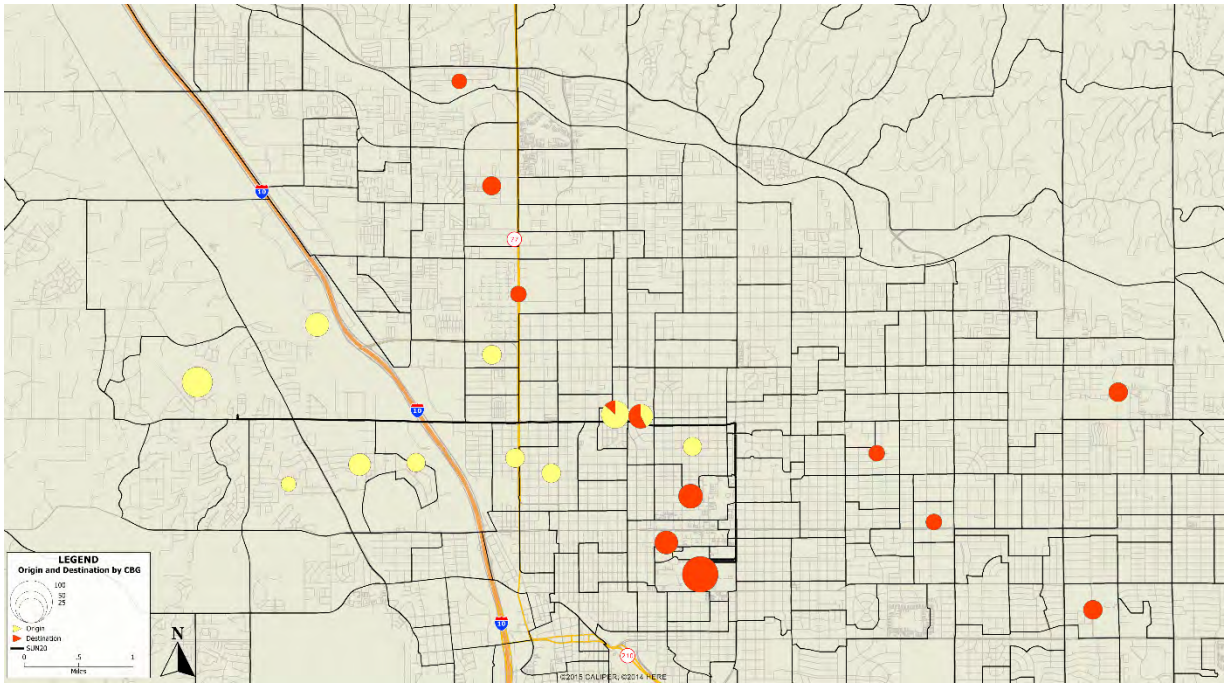


Origins and Destinations SunTran Route 19 Southbound



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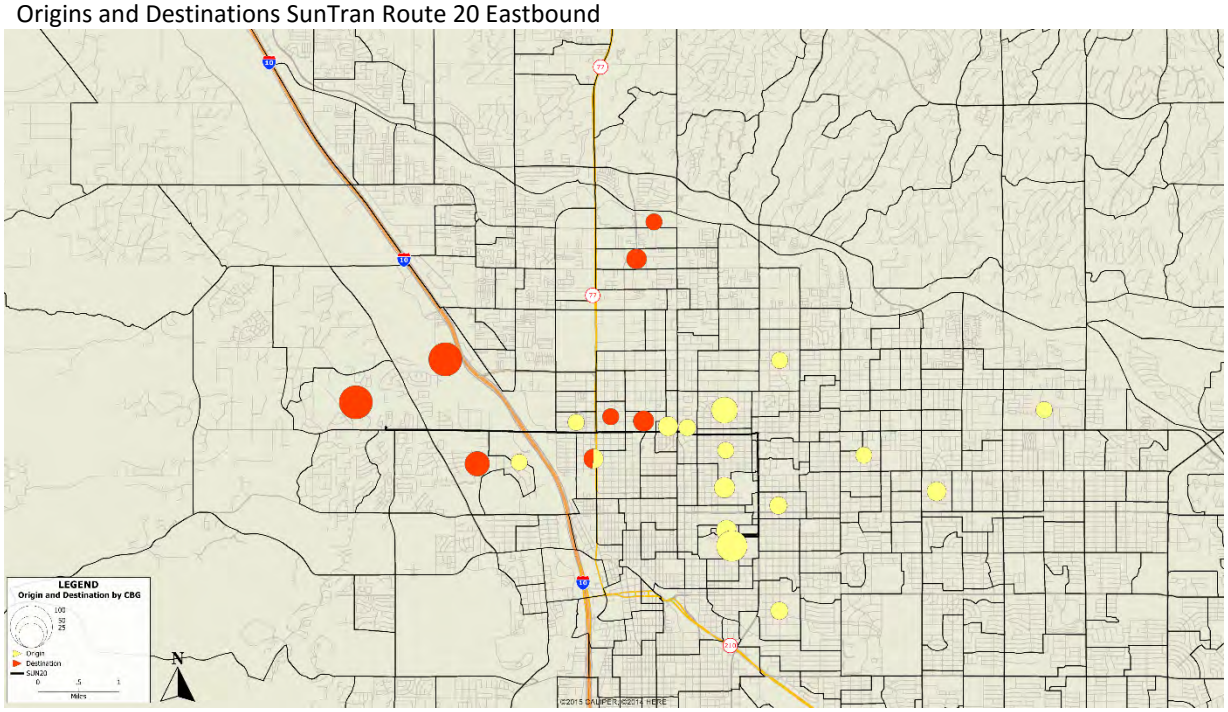
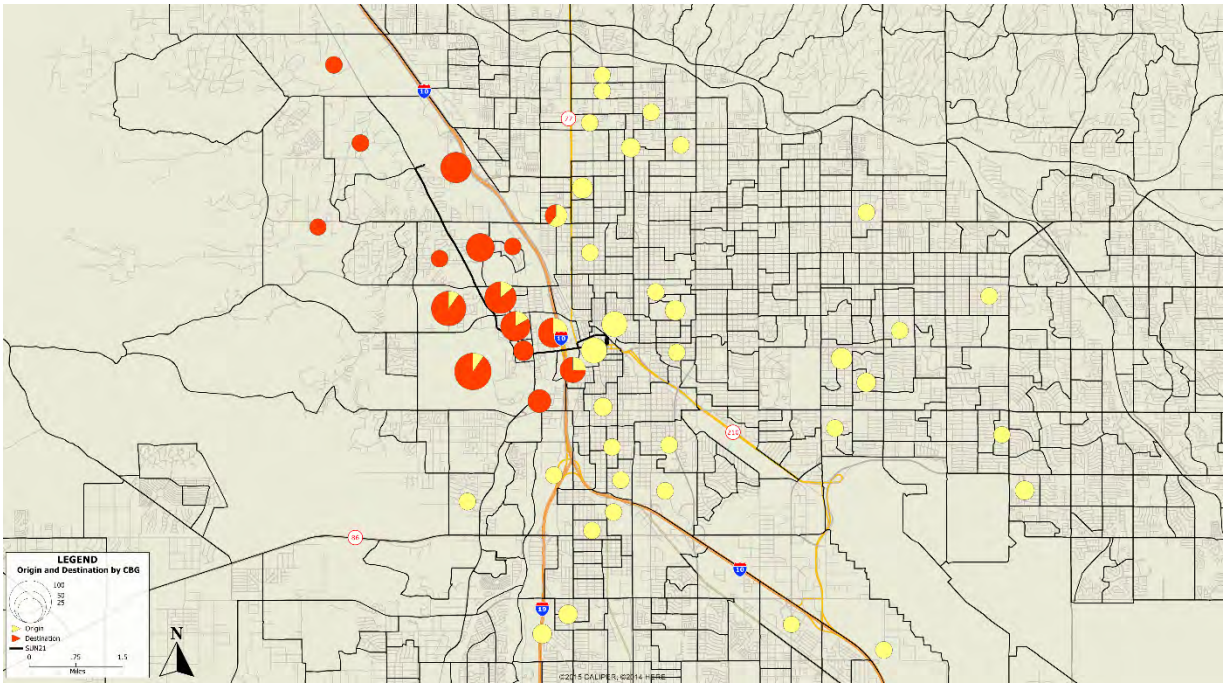
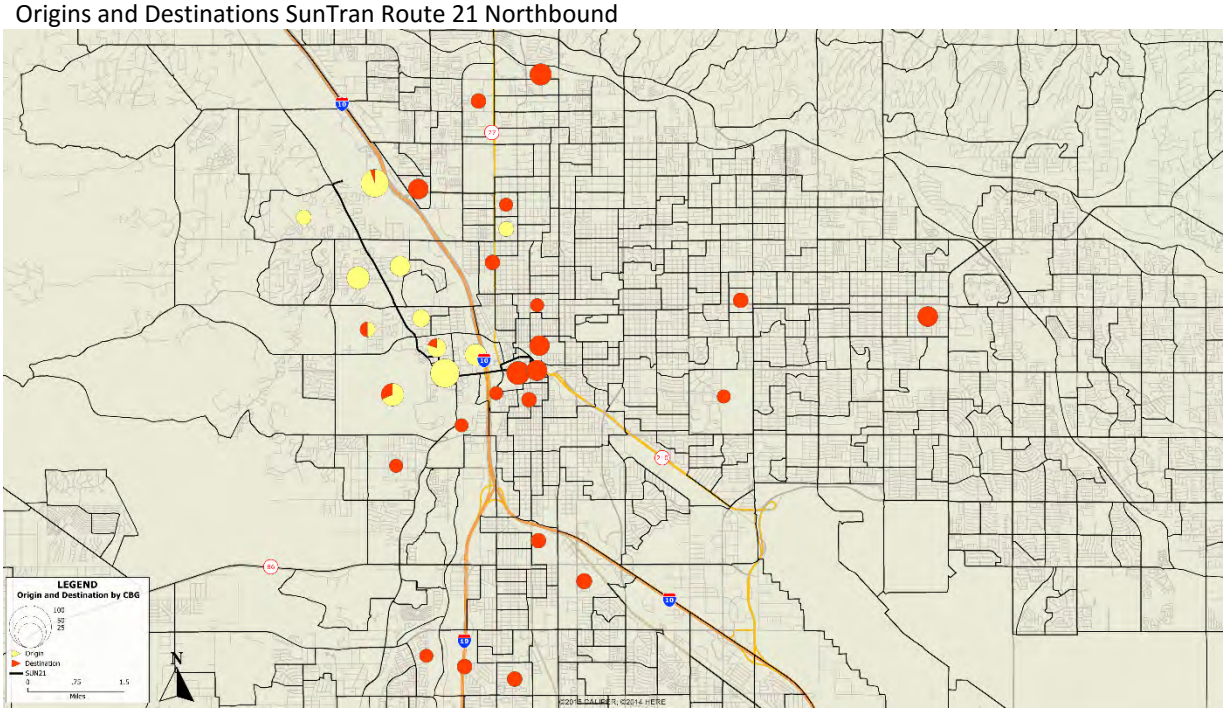


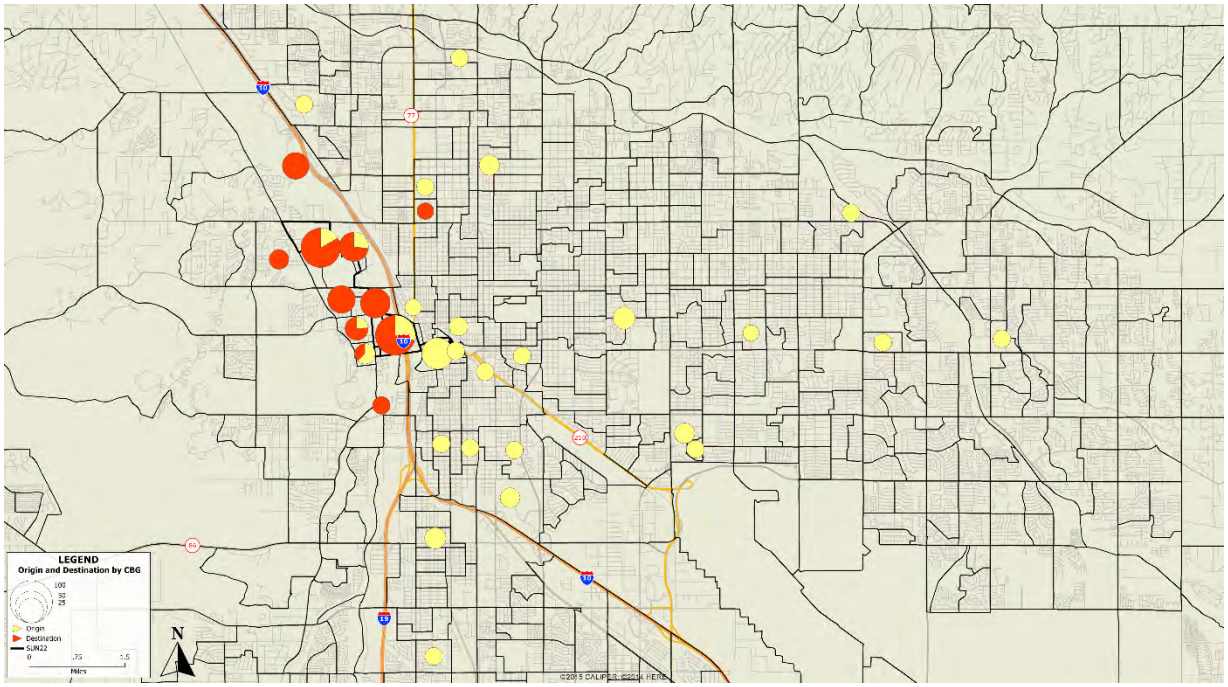
Origins and Destinations SunTran Route 20 Westbound



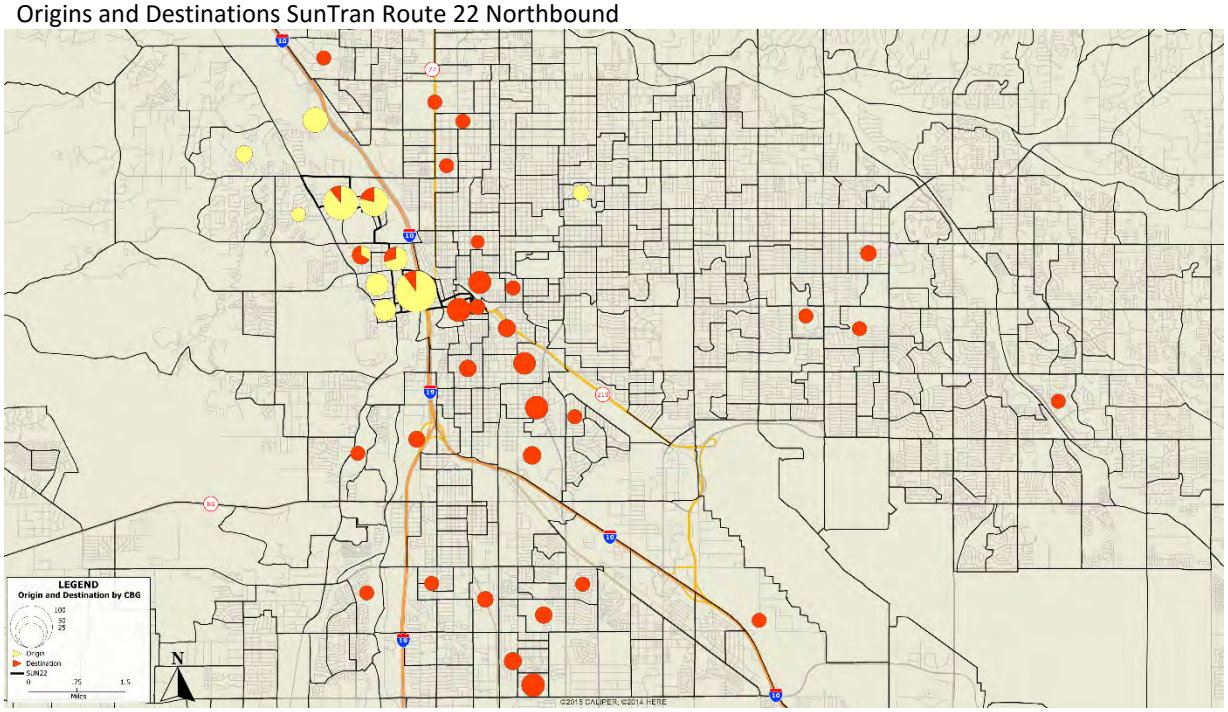
Origins and Destinations SunTran Route 21 Northbound



Origins and Destinations SunTran Route 21 Southbound



Origins and Destinations SunTran Route 22 Northbound



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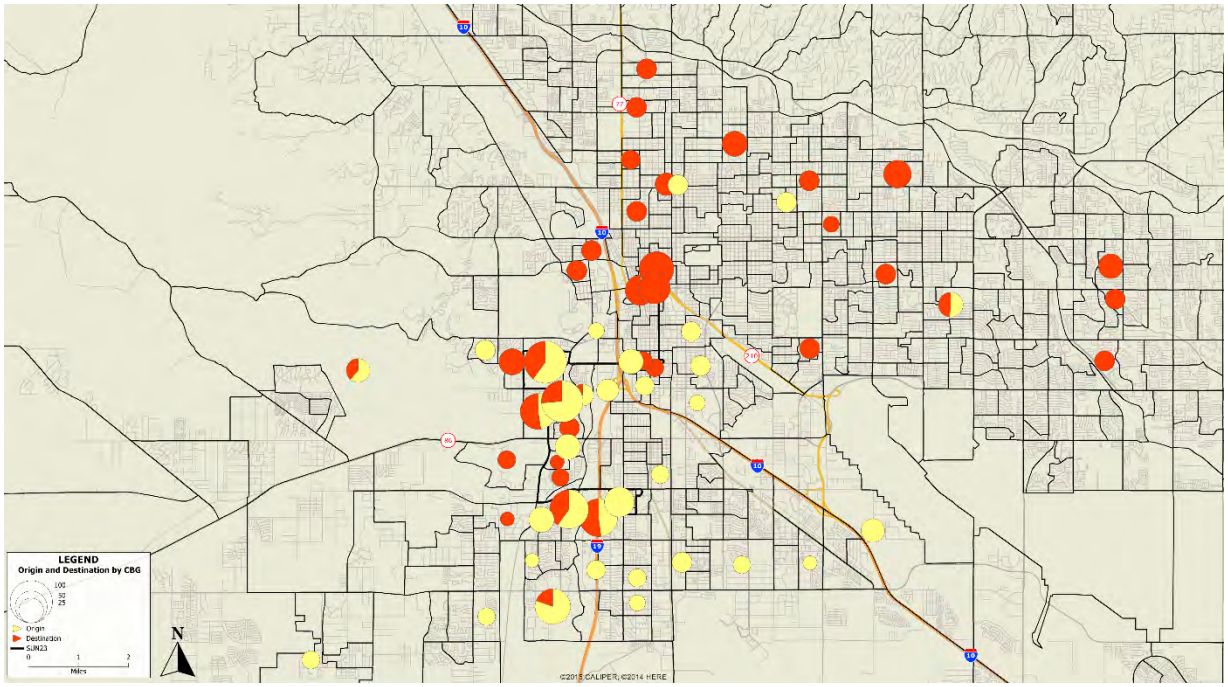

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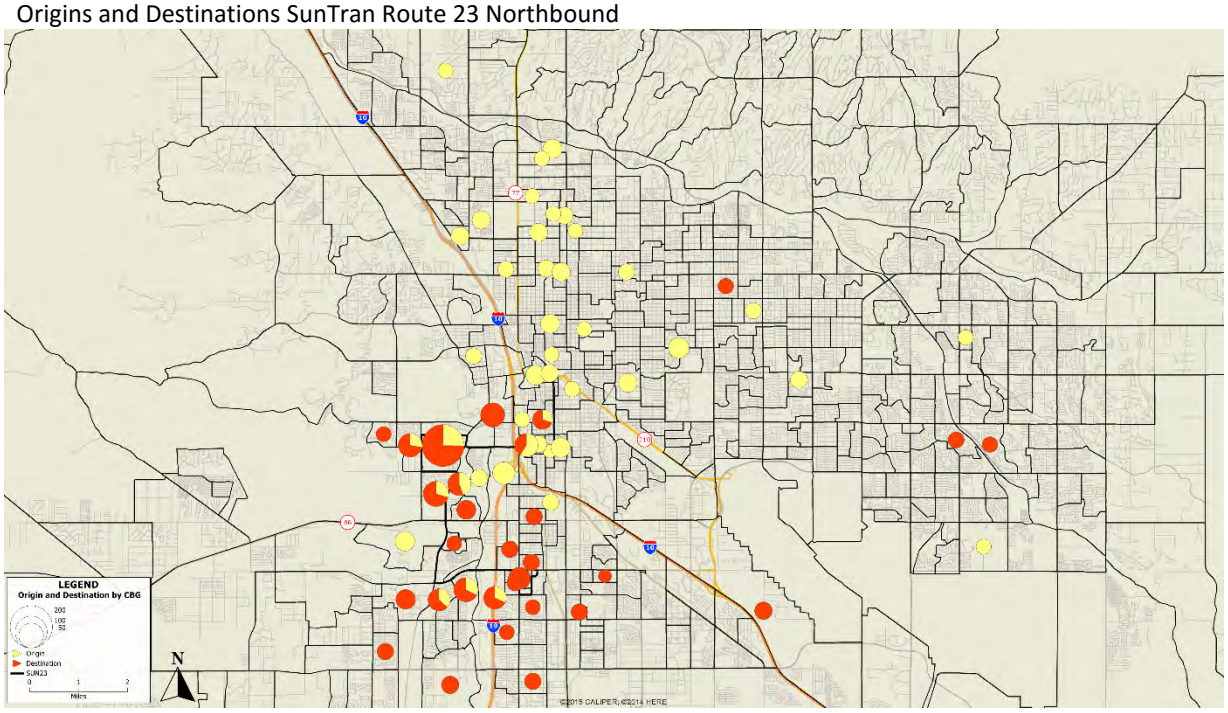
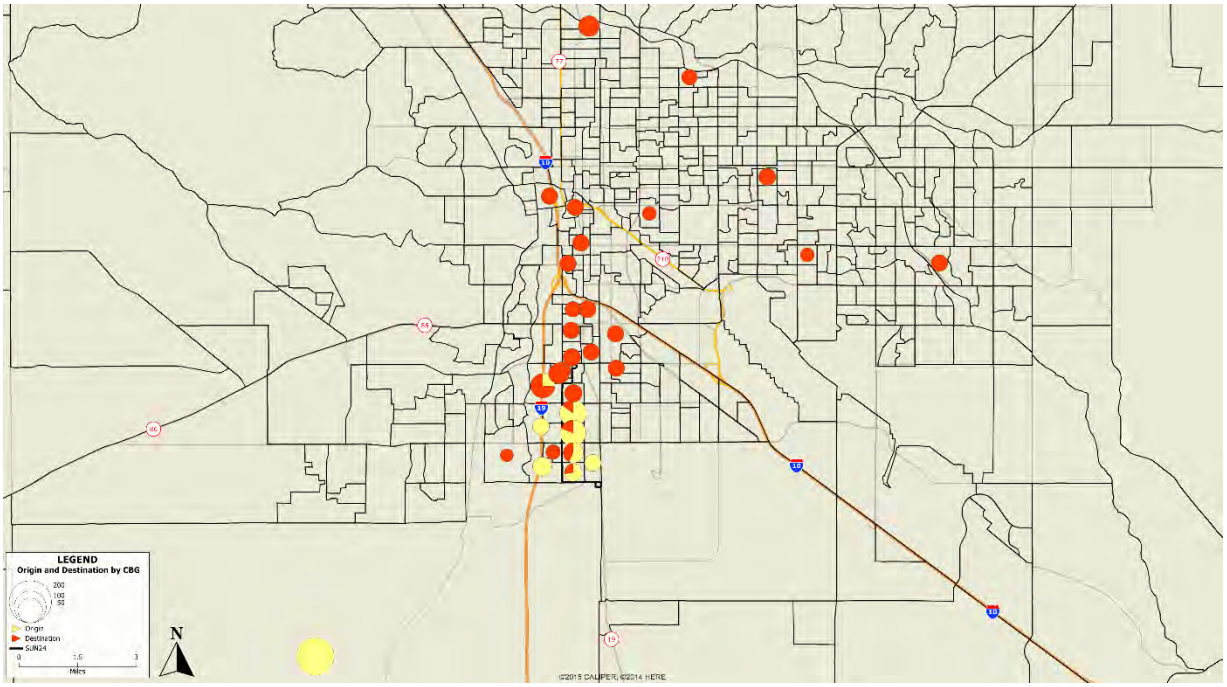
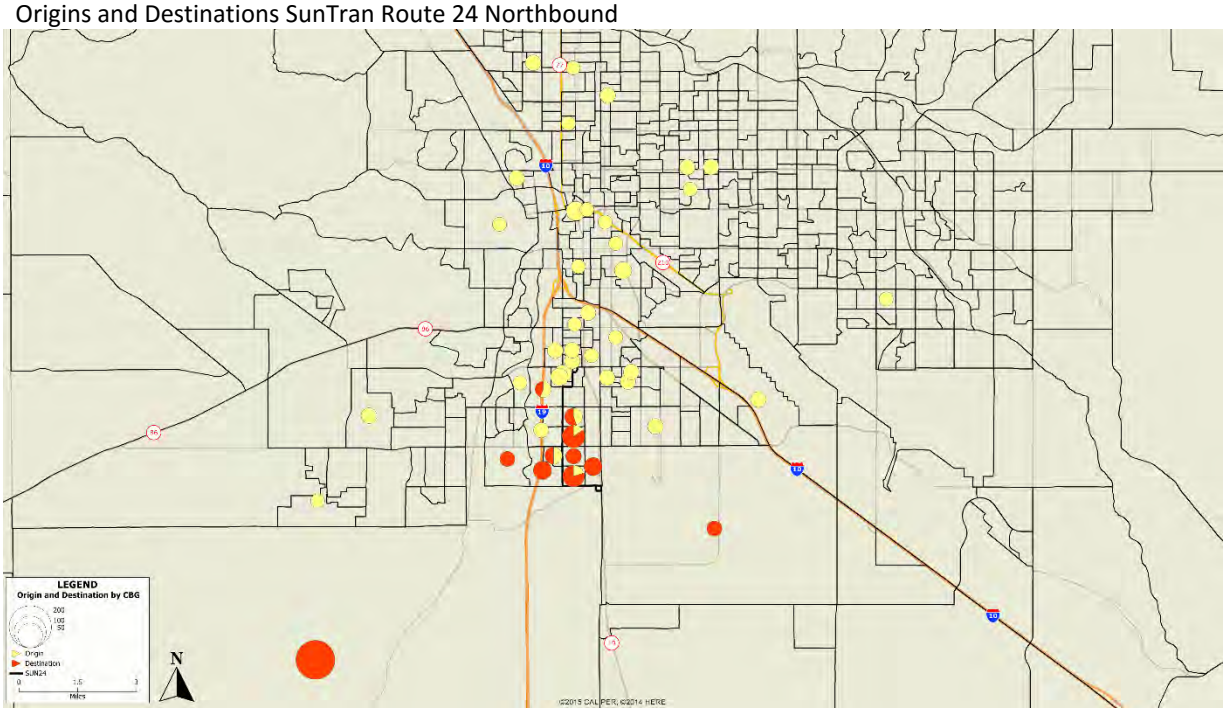


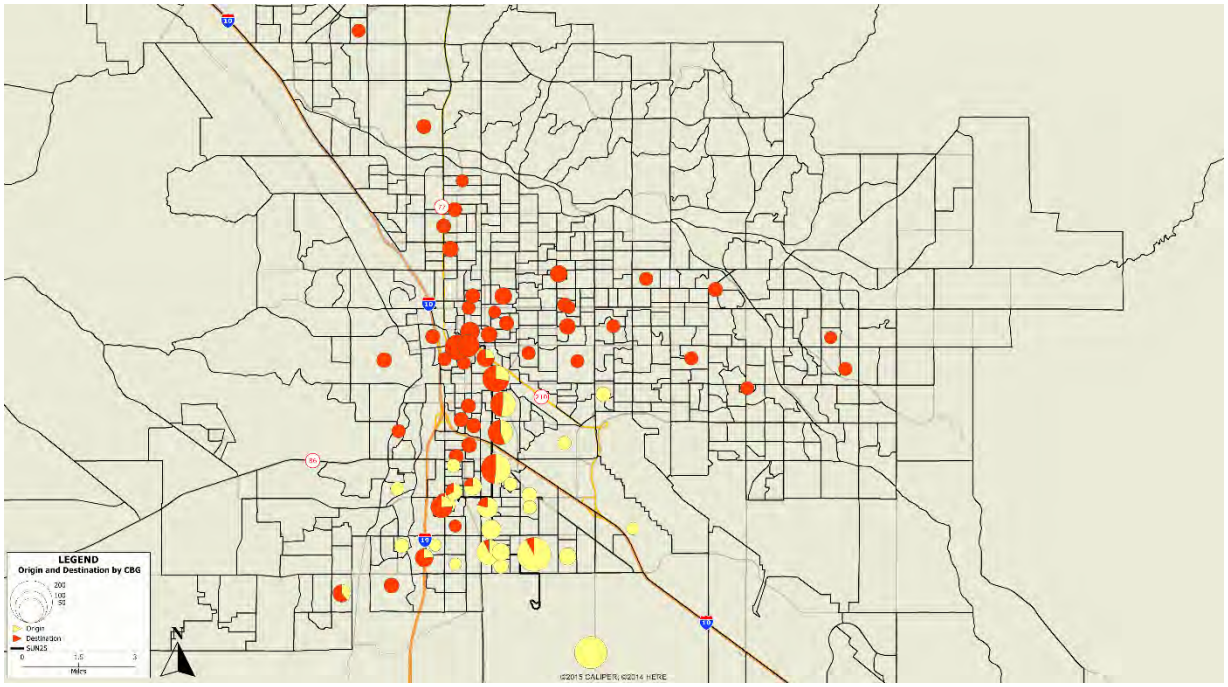
Origins and Destinations SunTran Route 23 Southbound



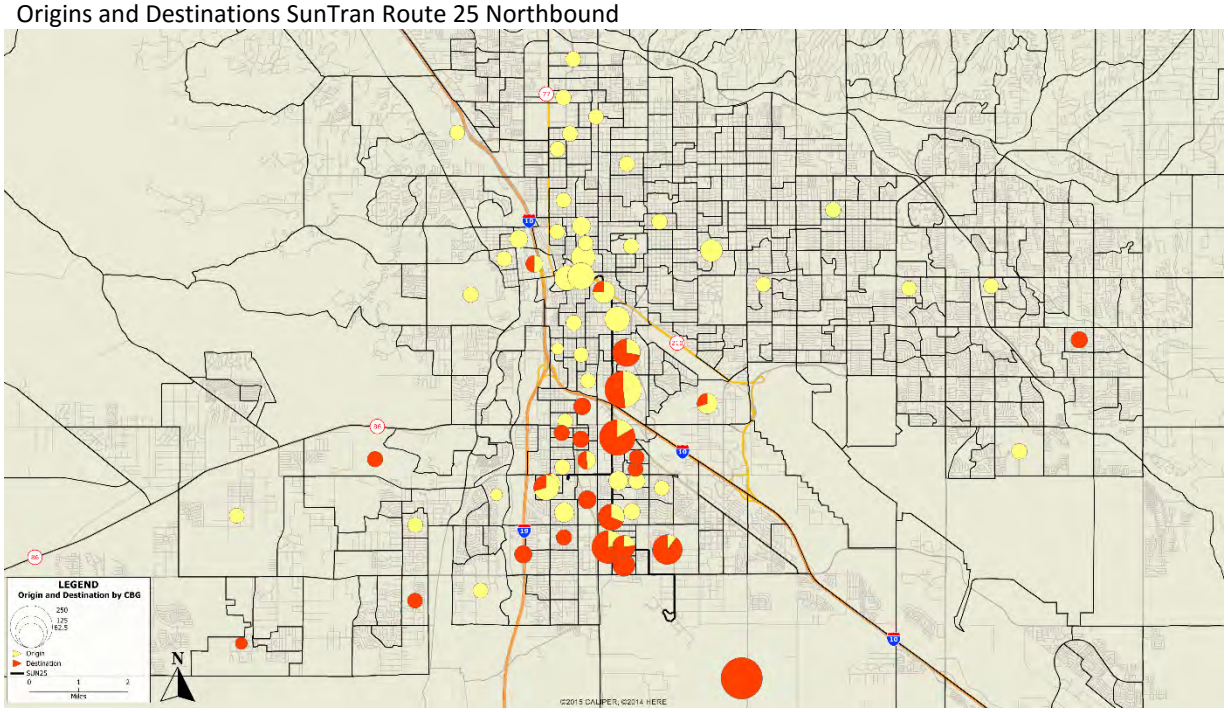
Origins and Destinations SunTran Route 24 Northbound



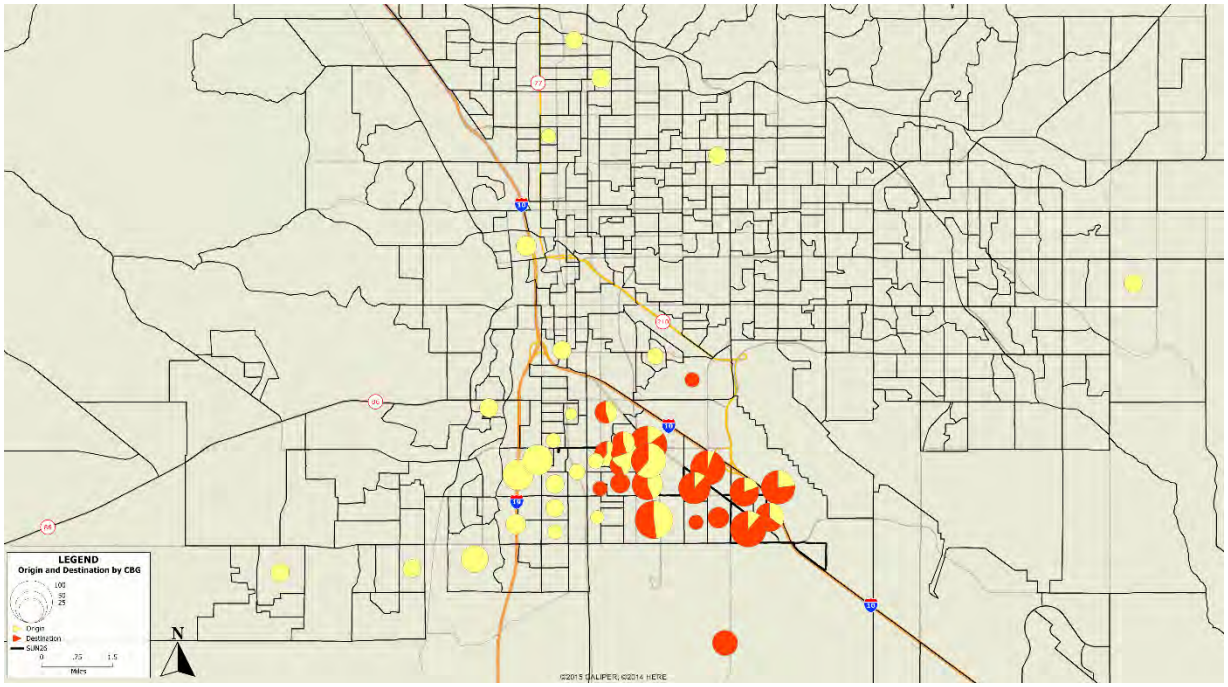
Origins and Destinations SunTran Route 24 Southbound



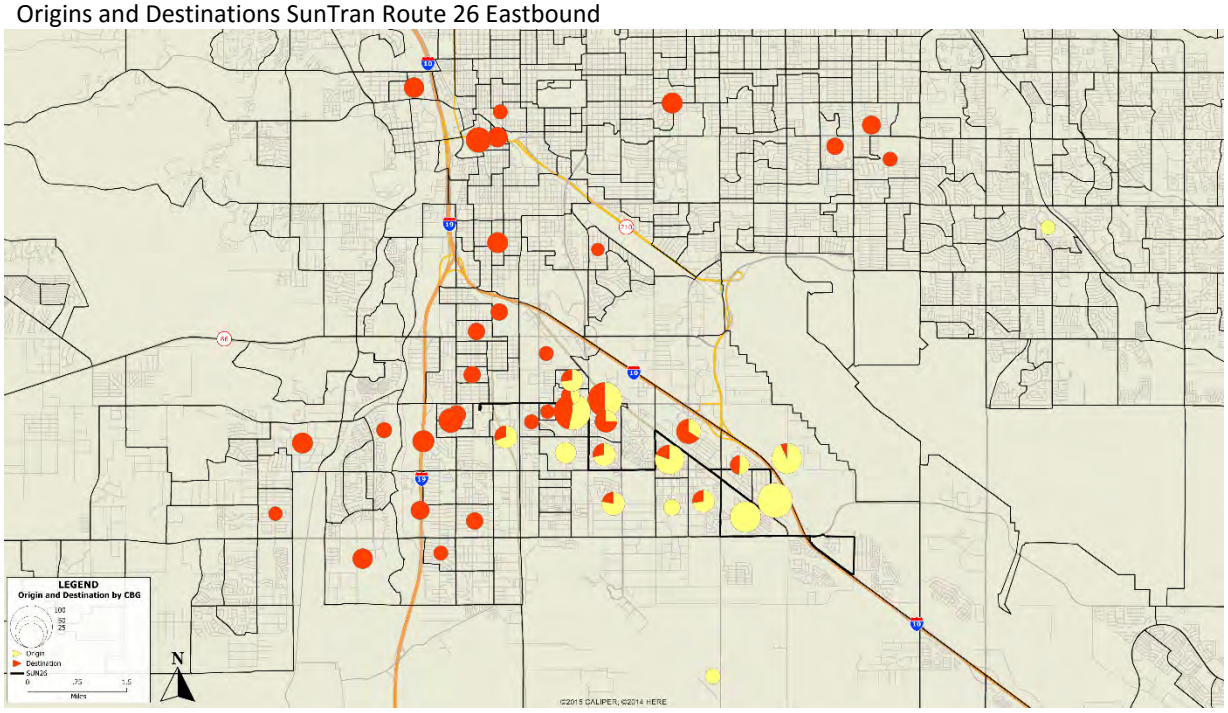
Origins and Destinations SunTran Route 25 Northbound



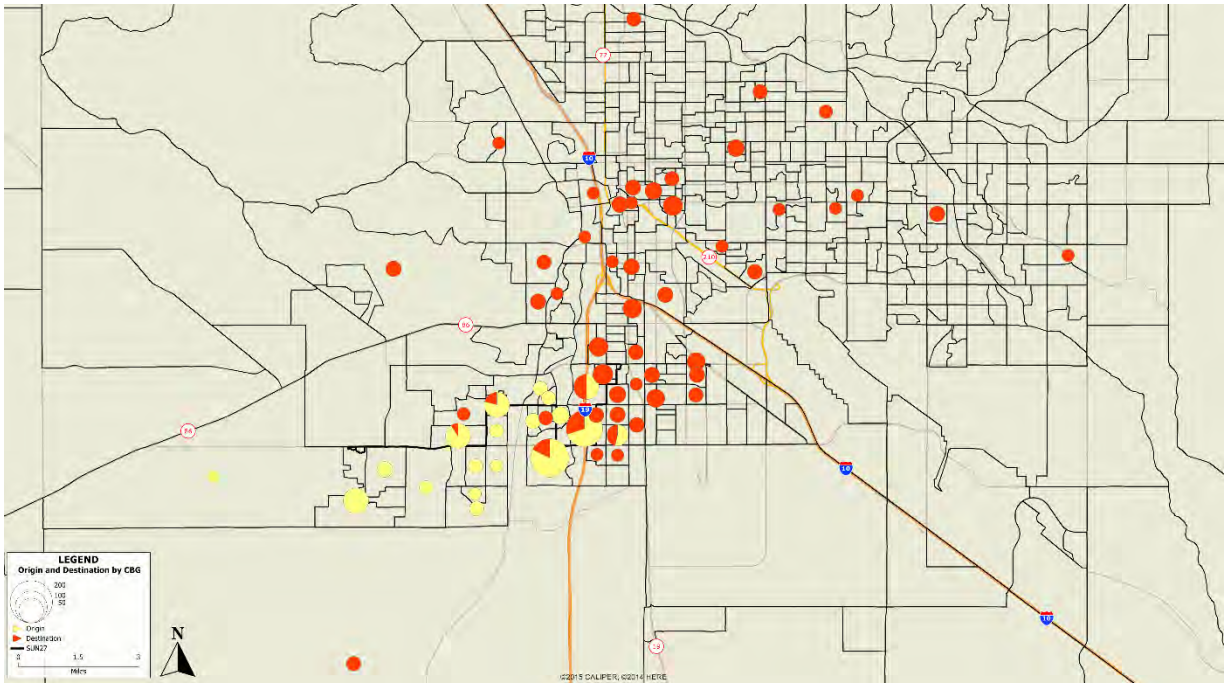
Origins and Destinations SunTran Route 25 Southbound



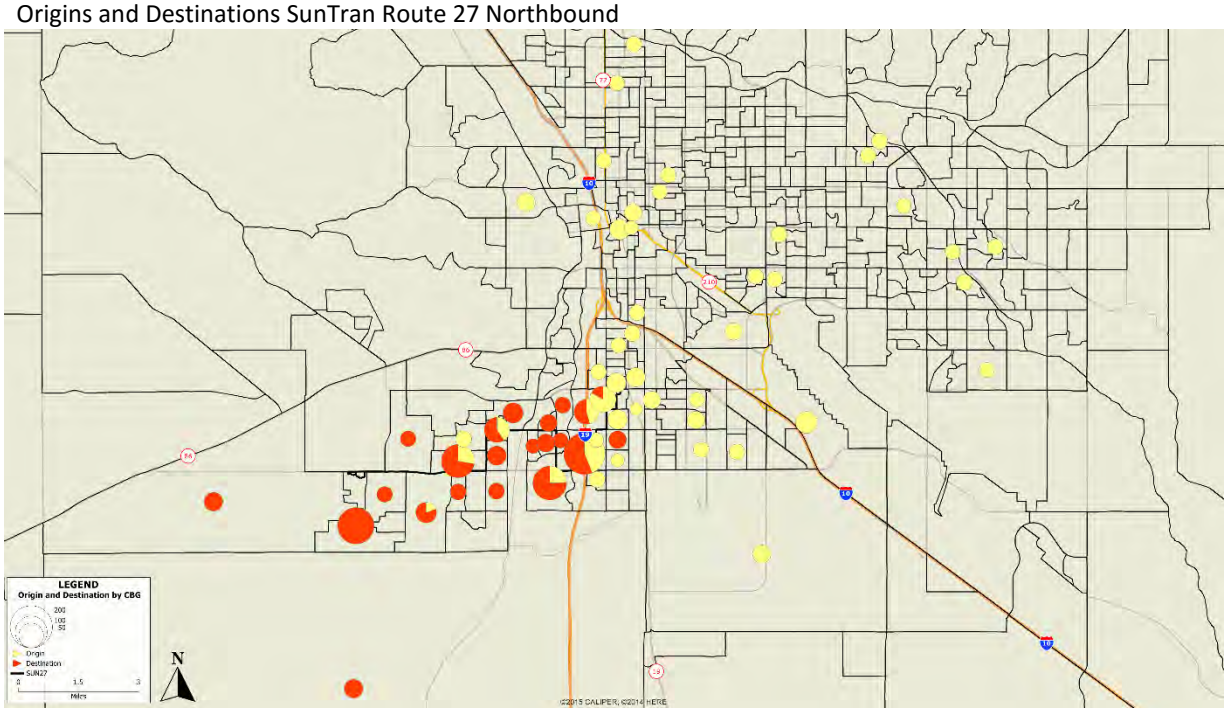
Origins and Destinations SunTran Route 26 Eastbound



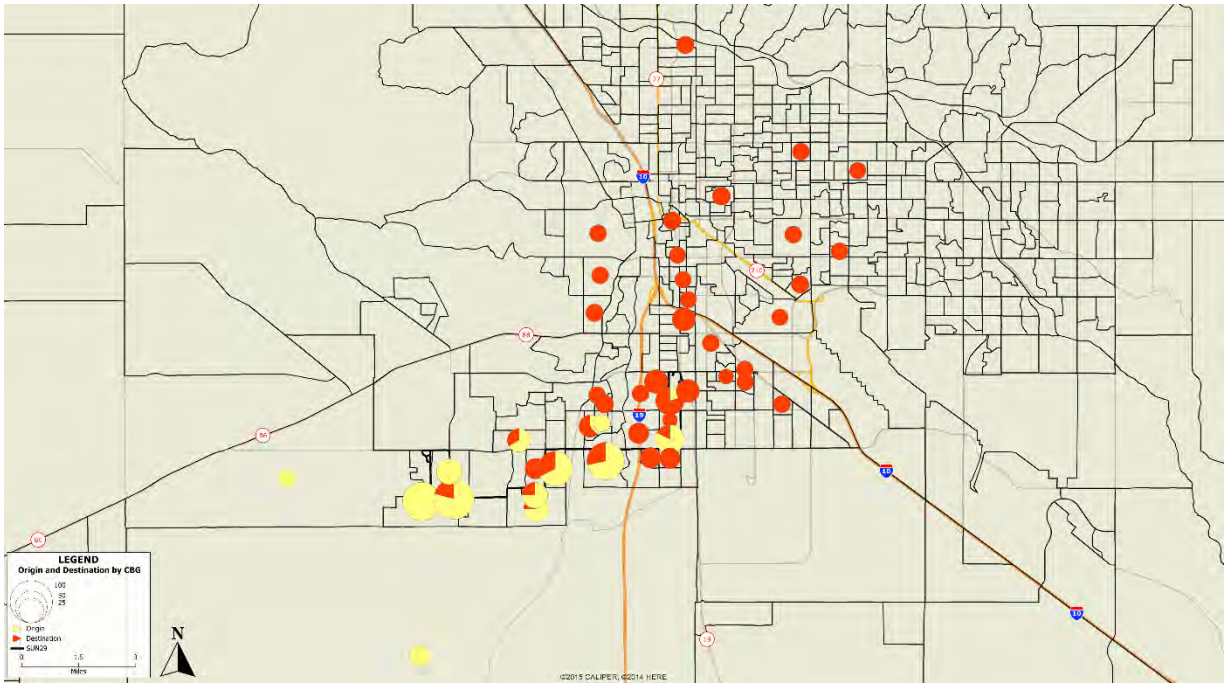
Origins and Destinations SunTran Route 26 Westbound



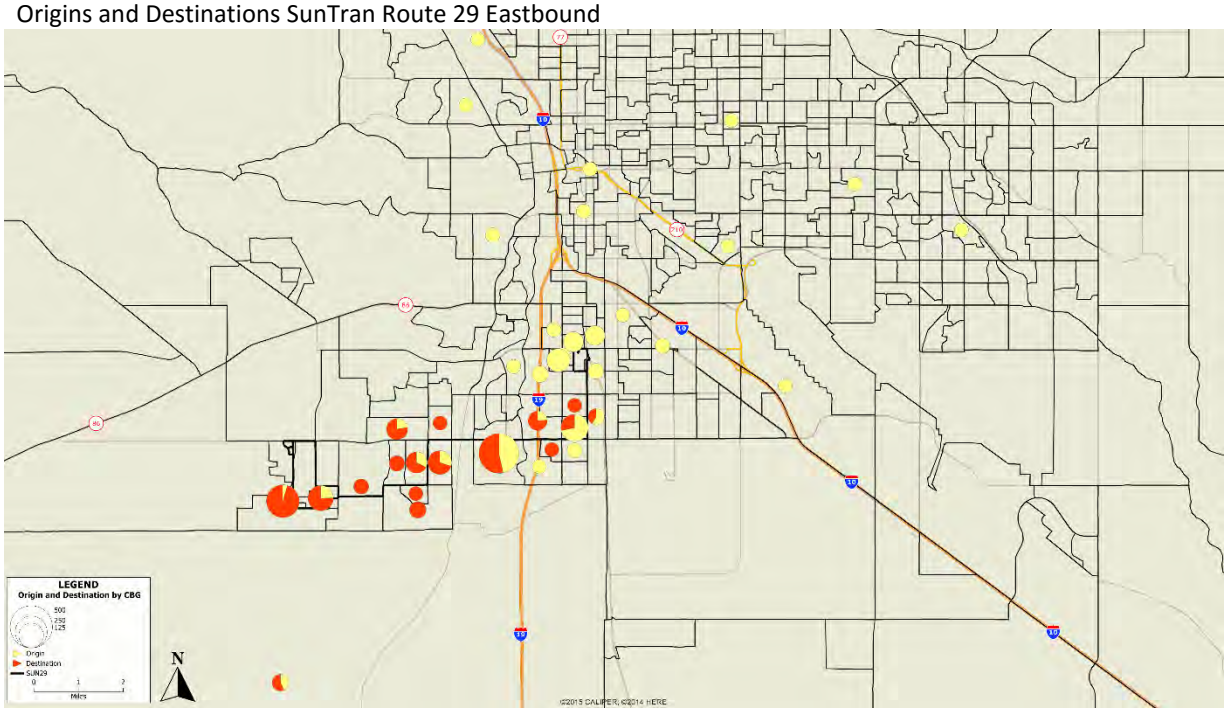
Origins and Destinations SunTran Route 27 Northbound



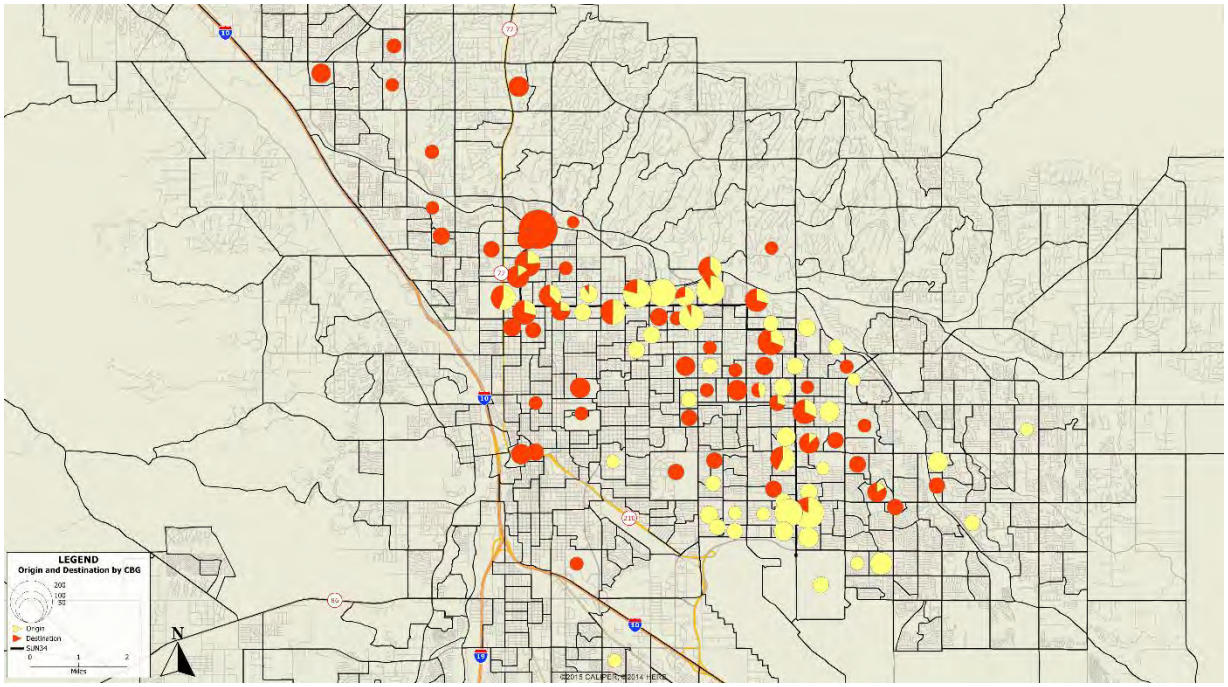
Origins and Destinations SunTran Route 27 Southbound



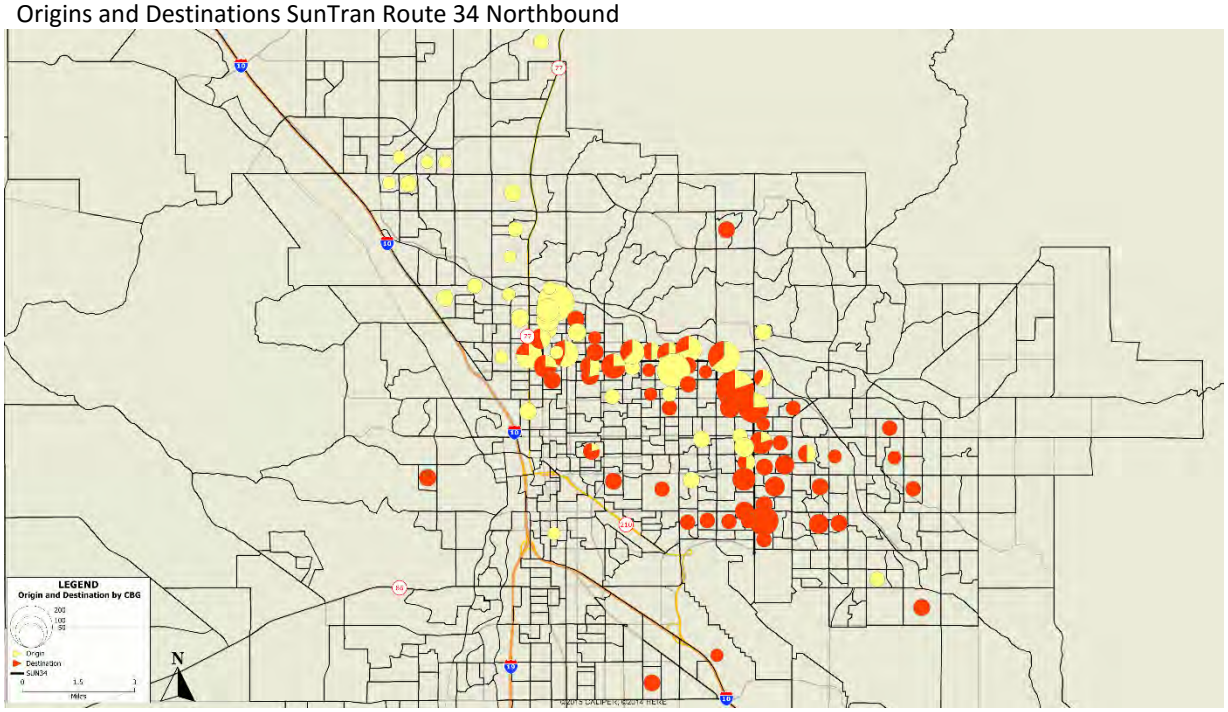
Origins and Destinations SunTran Route 29 Eastbound



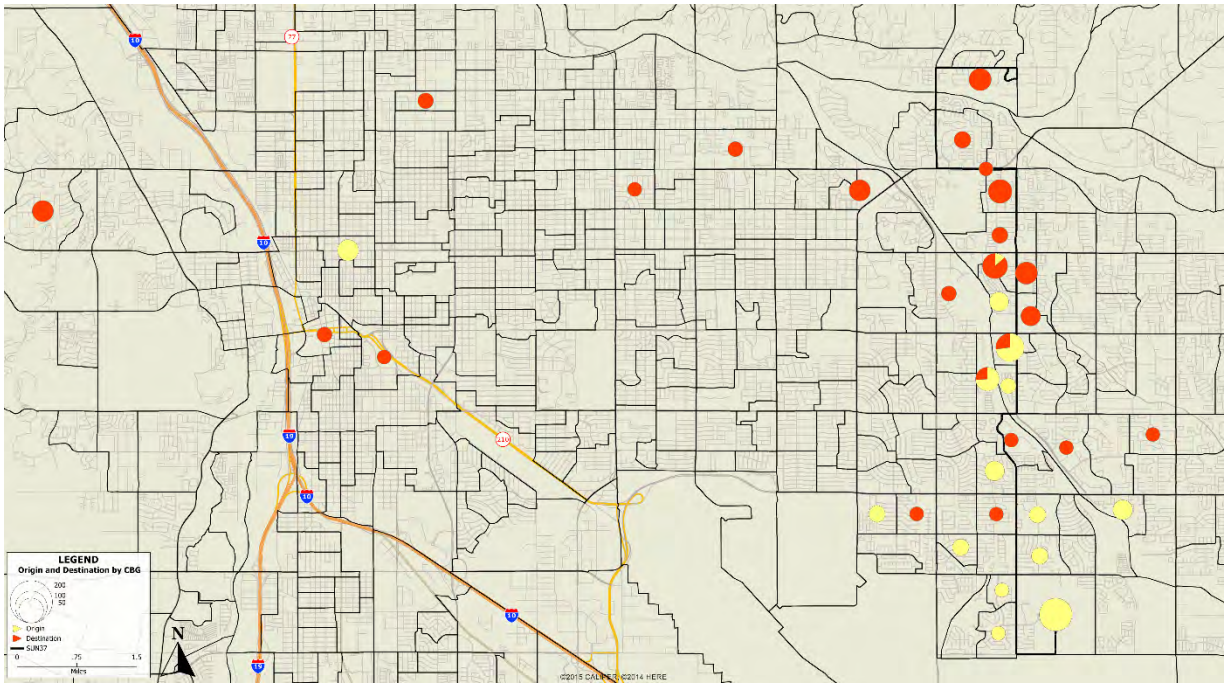
Origins and Destinations SunTran Route 29 Westbound



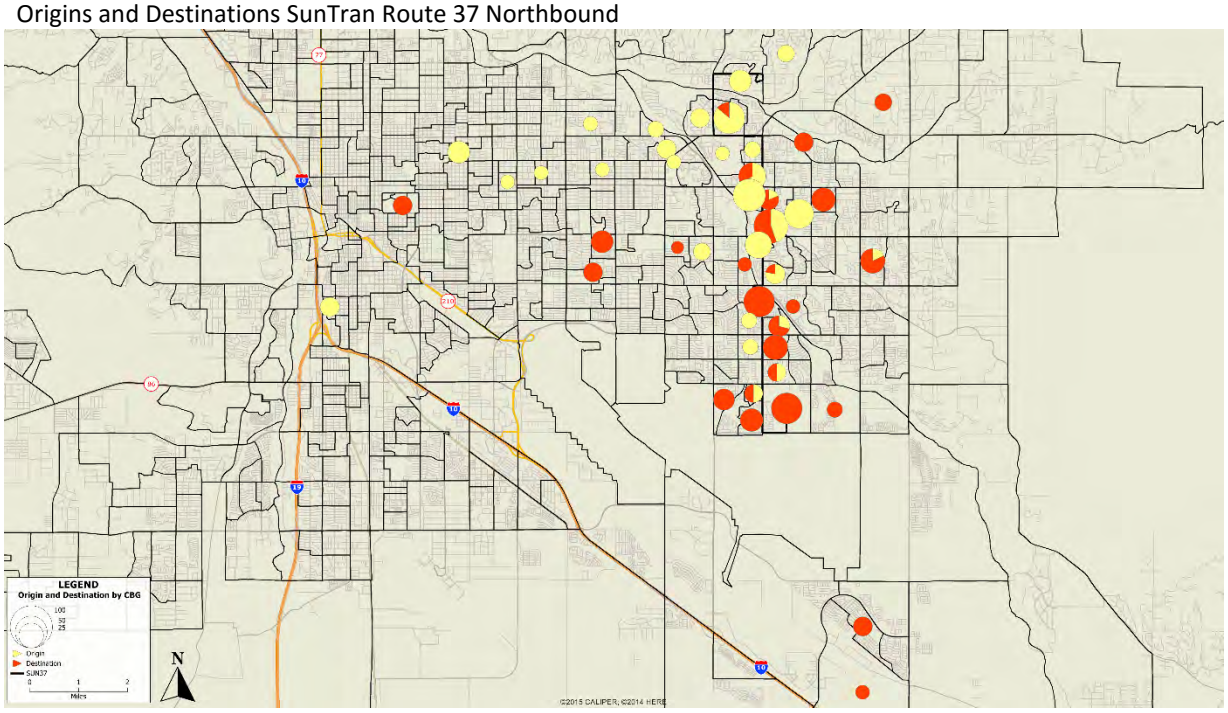
Origins and Destinations SunTran Route 34 Northbound



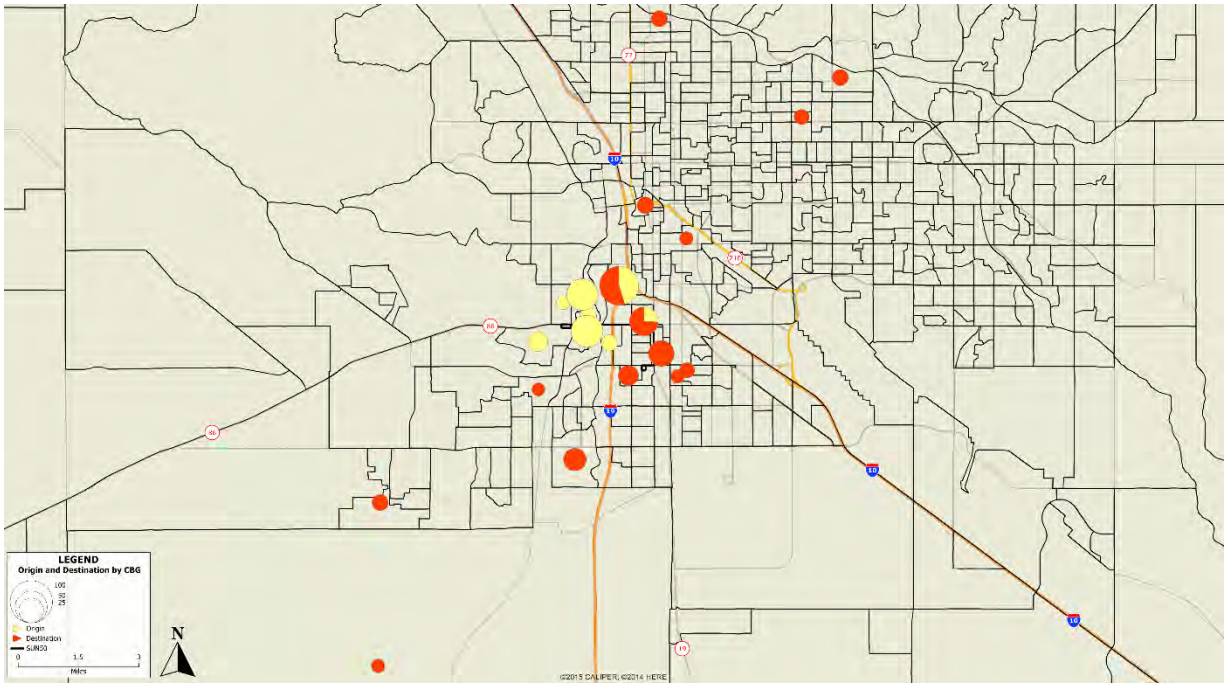
Origins and Destinations SunTran Route 34 Southbound



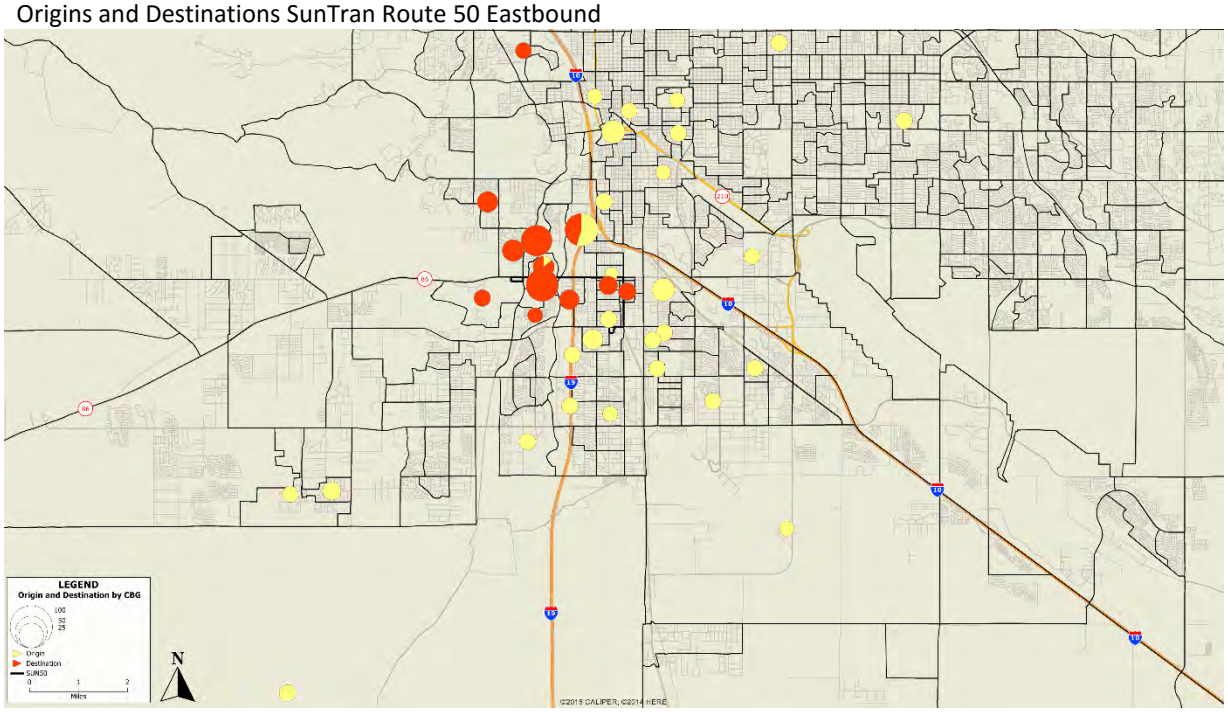
Origins and Destinations SunTran Route 37 Northbound



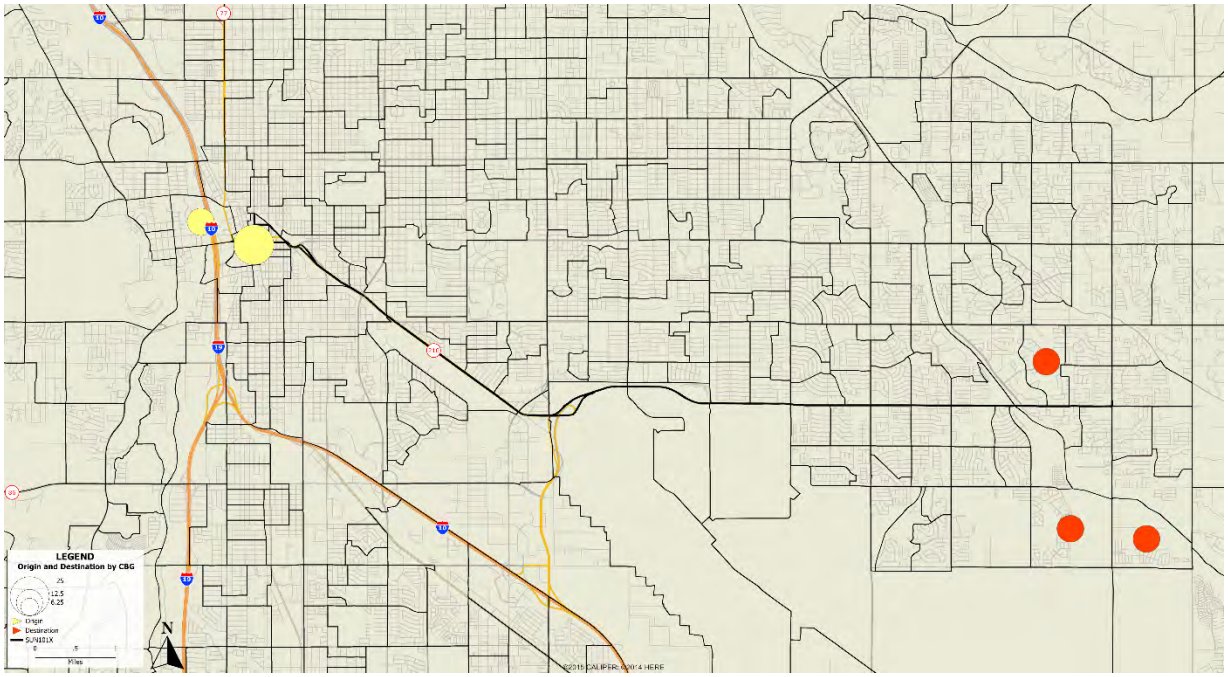
Origins and Destinations SunTran Route 37 Southbound



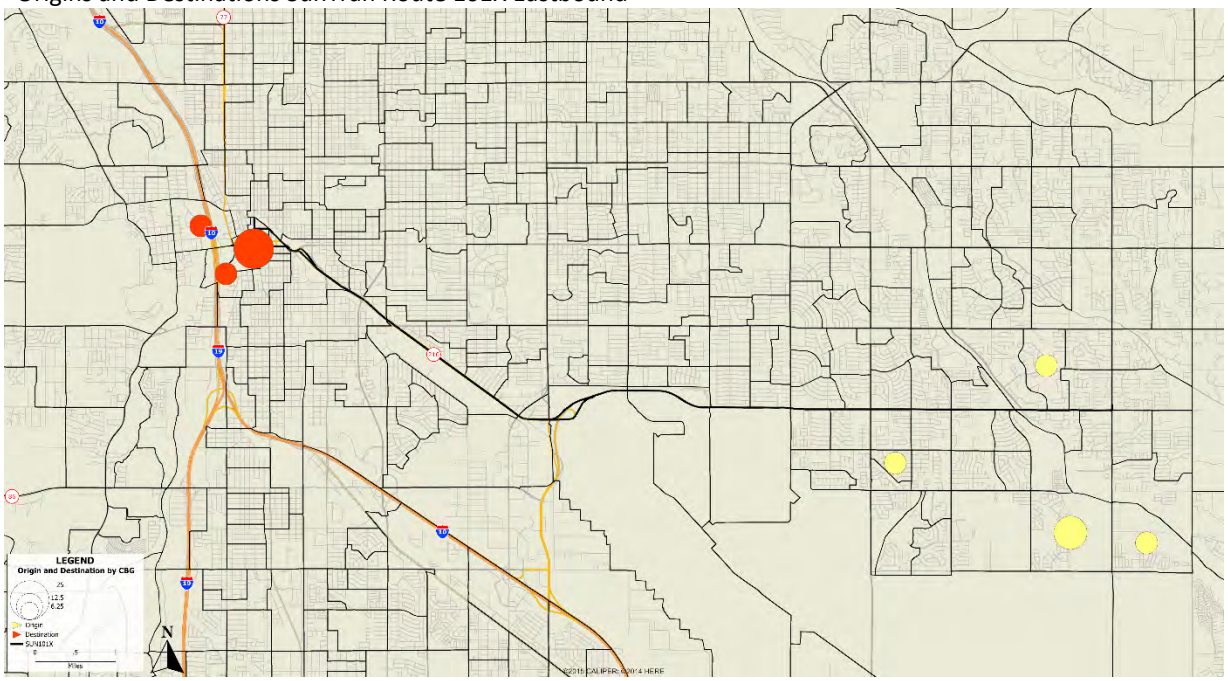
Origins and Destinations SunTran Route 50 Eastbound



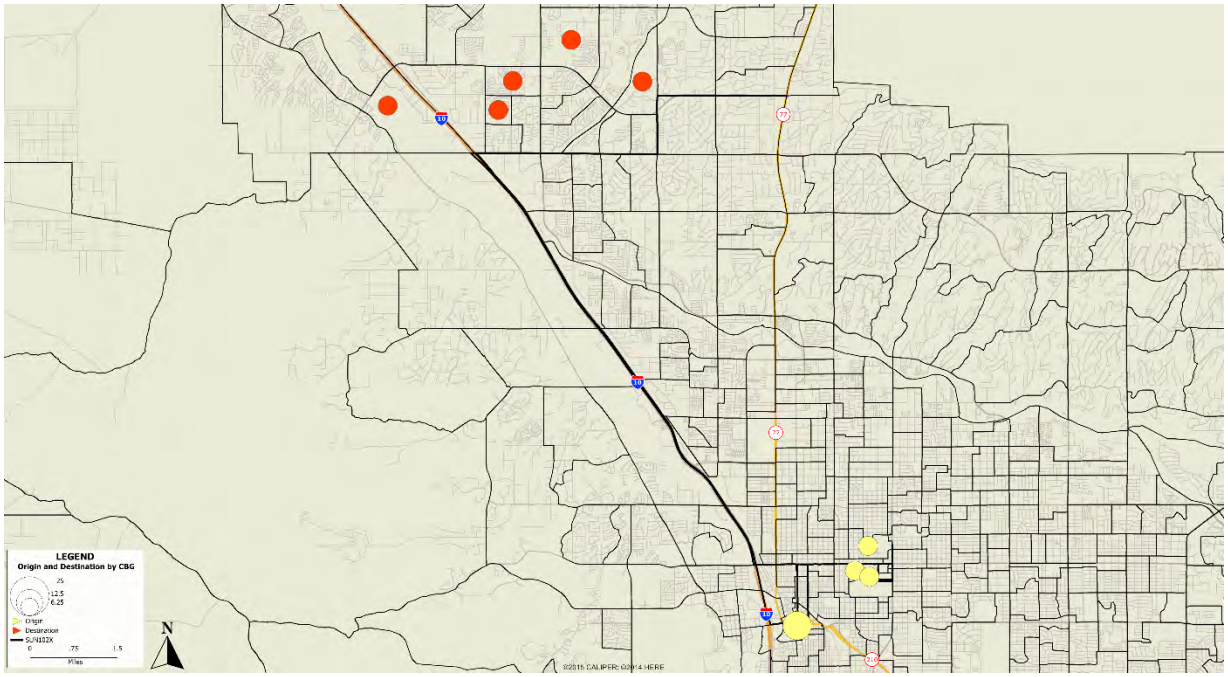
Origins and Destinations SunTran Route 50 Westbound



Origins and Destinations SunTran Route 101X Eastbound



Origins and Destinations SunTran Route 101X Westbound



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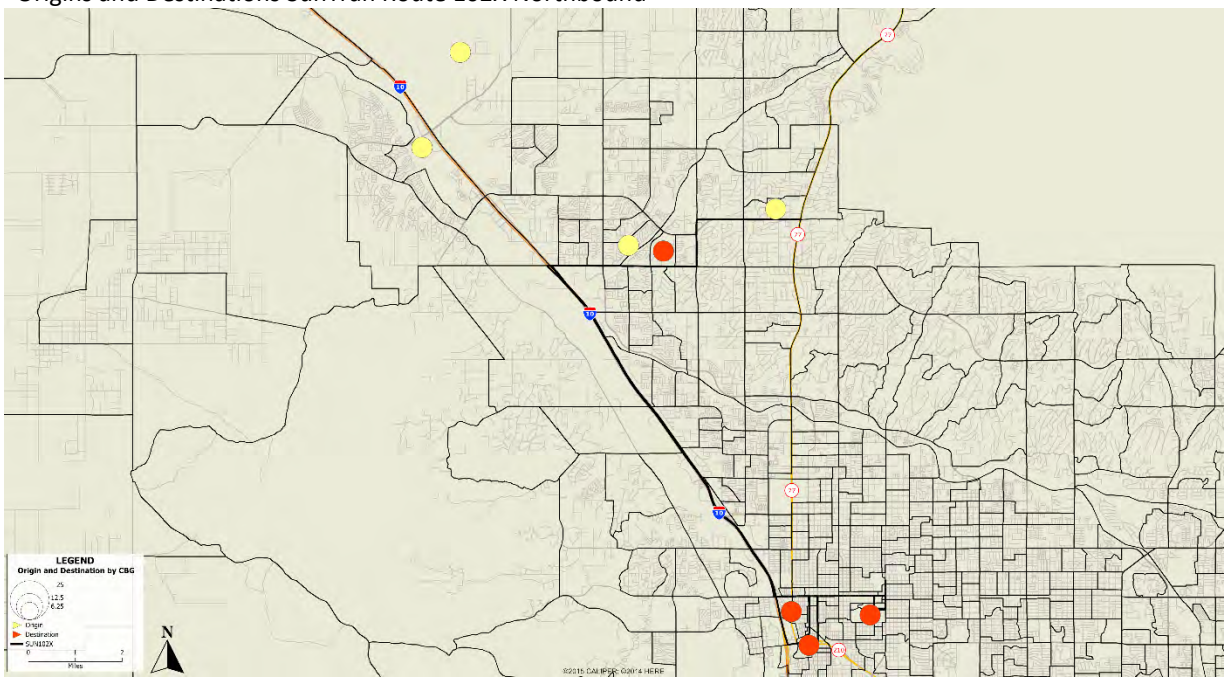
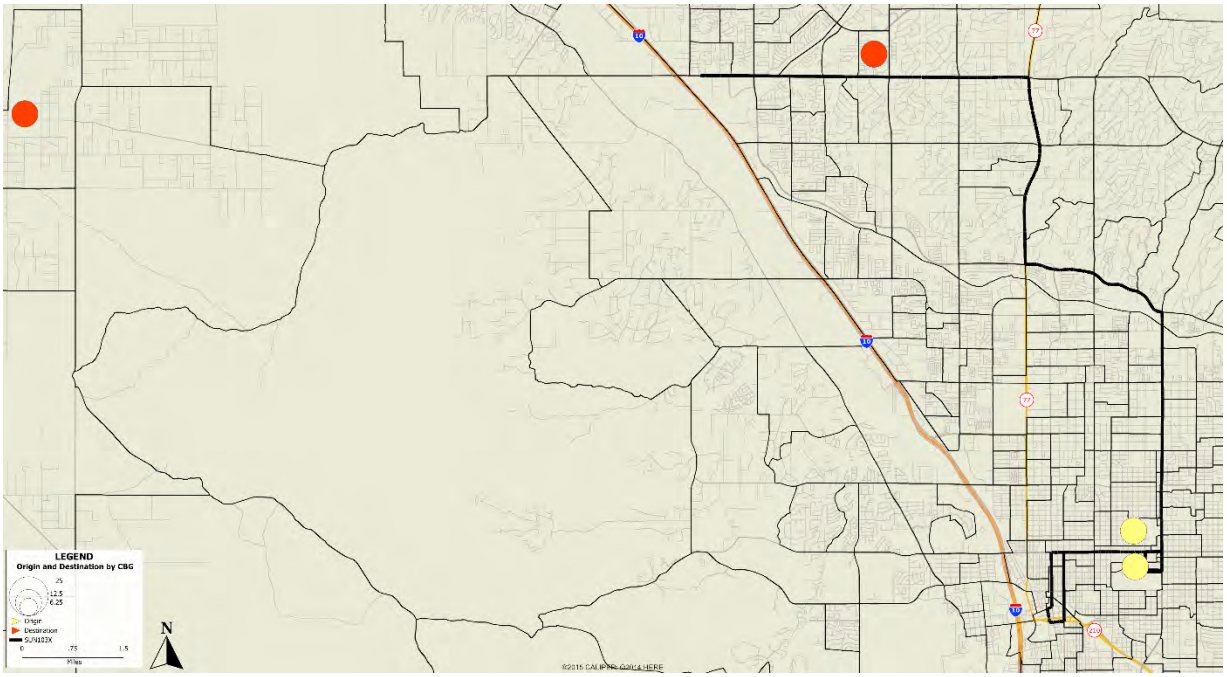


Origins and Destinations SunTran Route 102X Southbound



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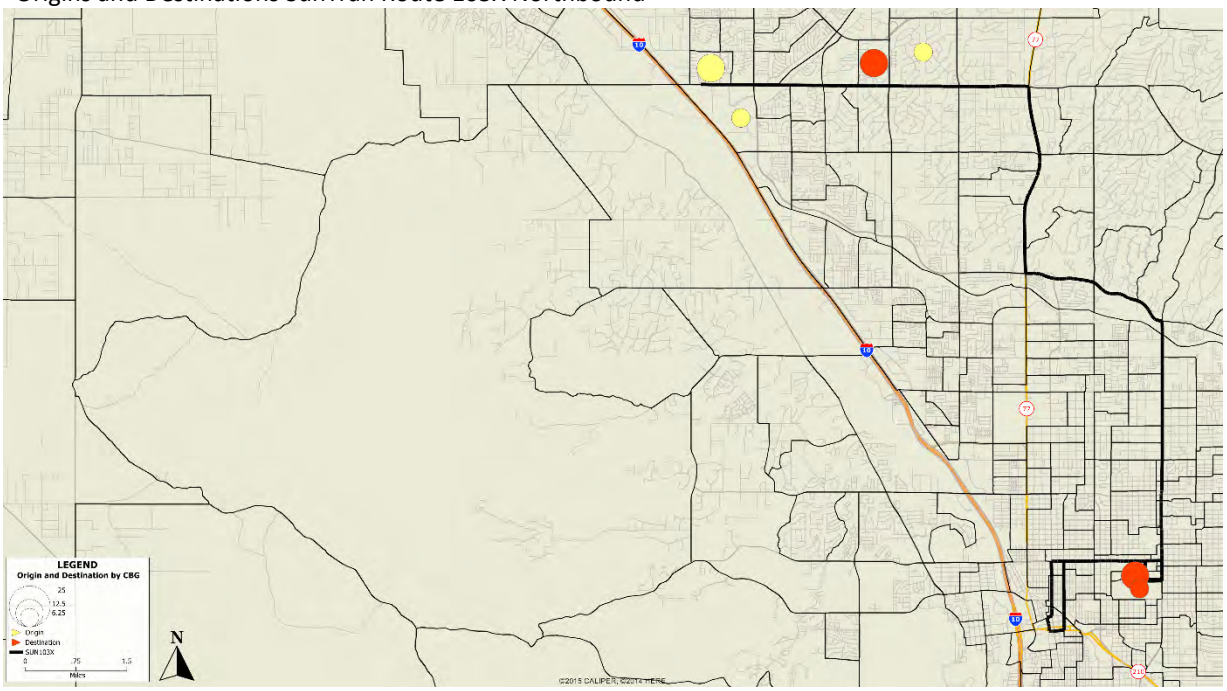

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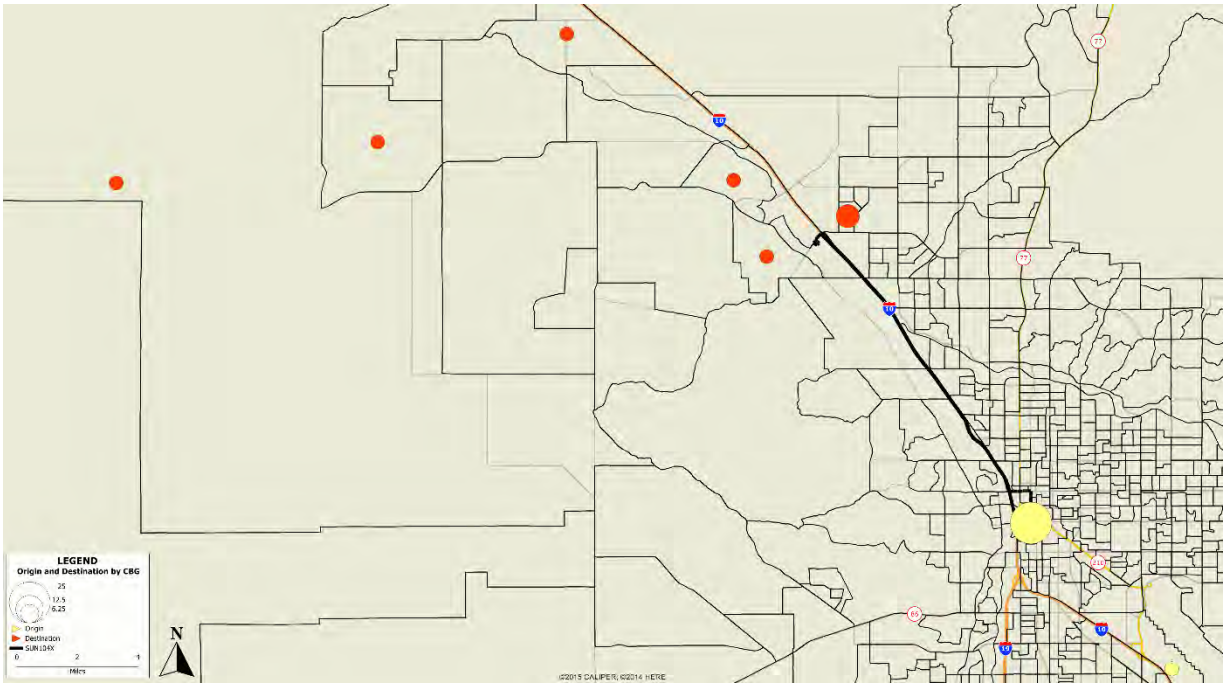
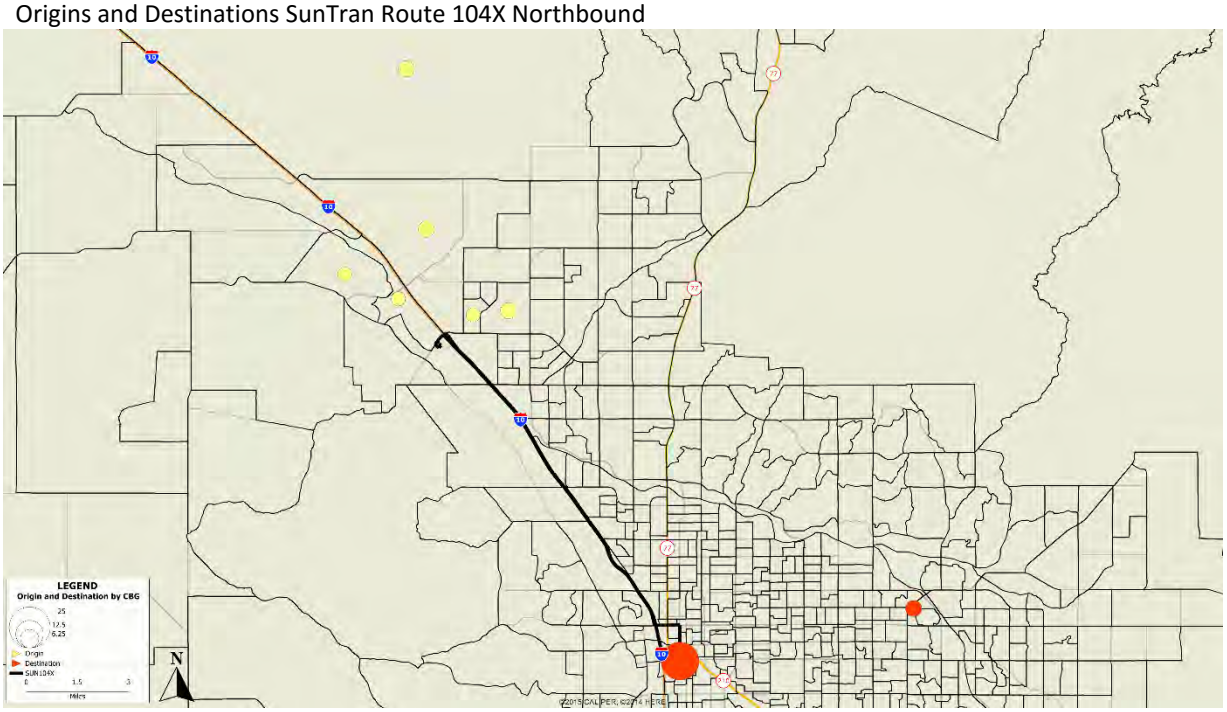


Origins and Destinations SunTran Route 104X Northbound



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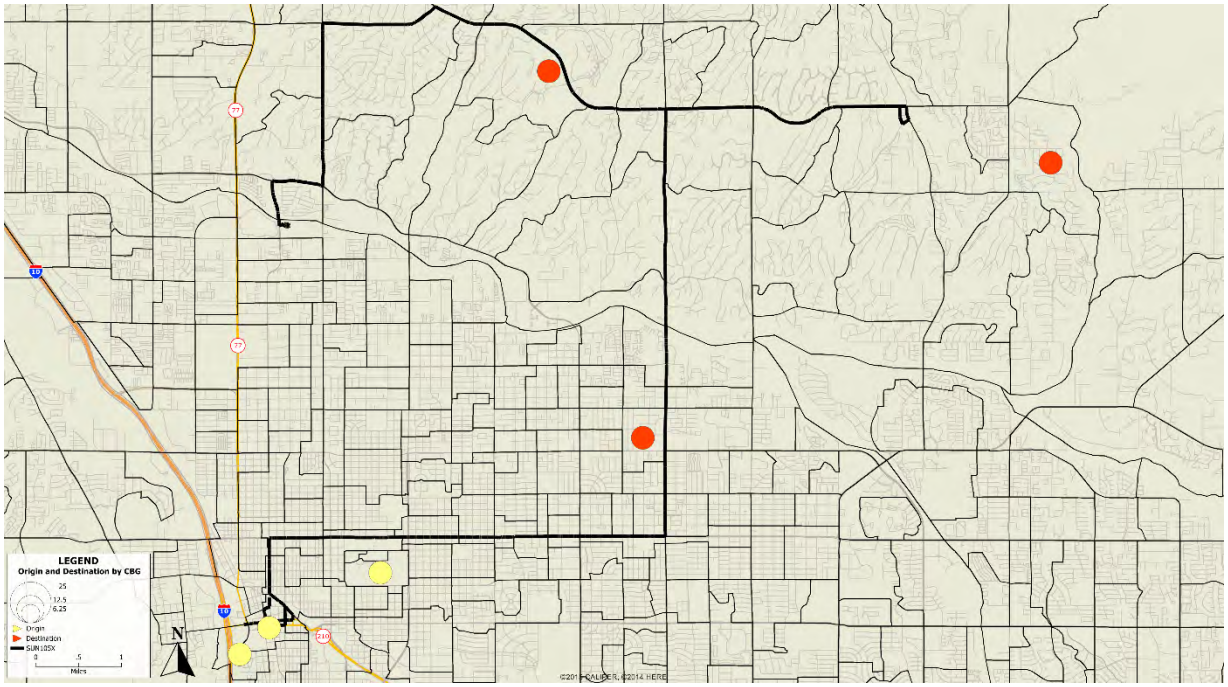
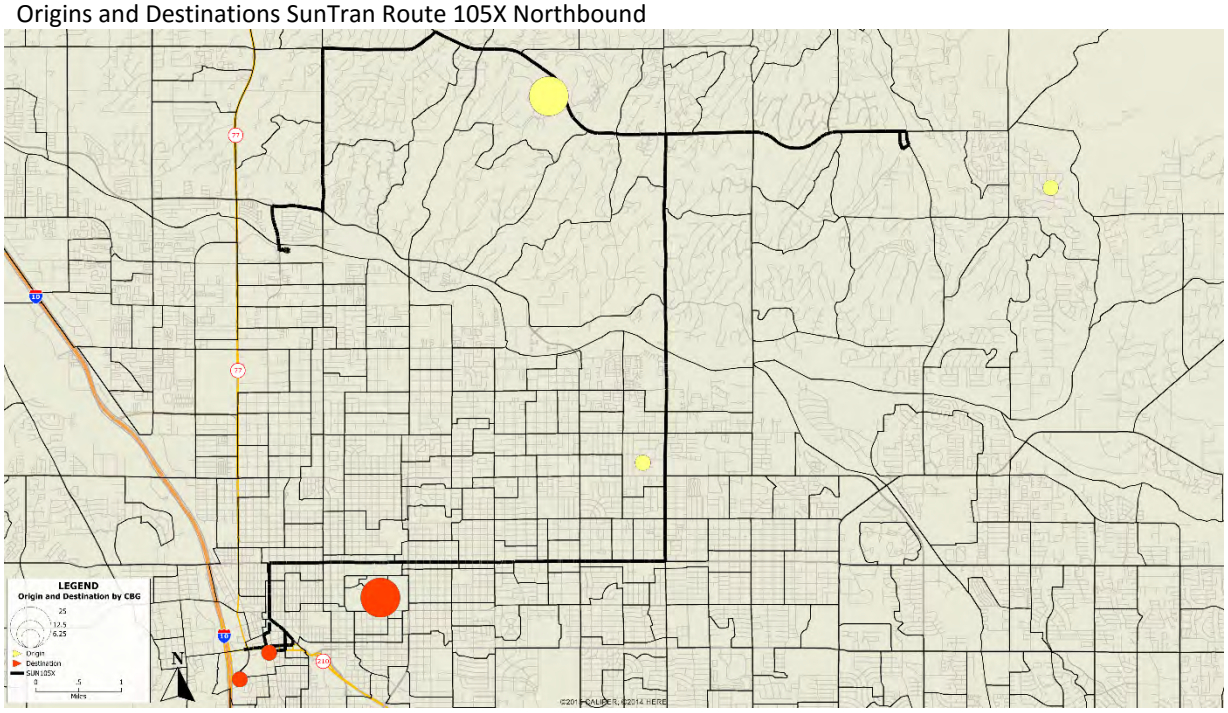


Origins and Destinations SunTran Route 105X Northbound



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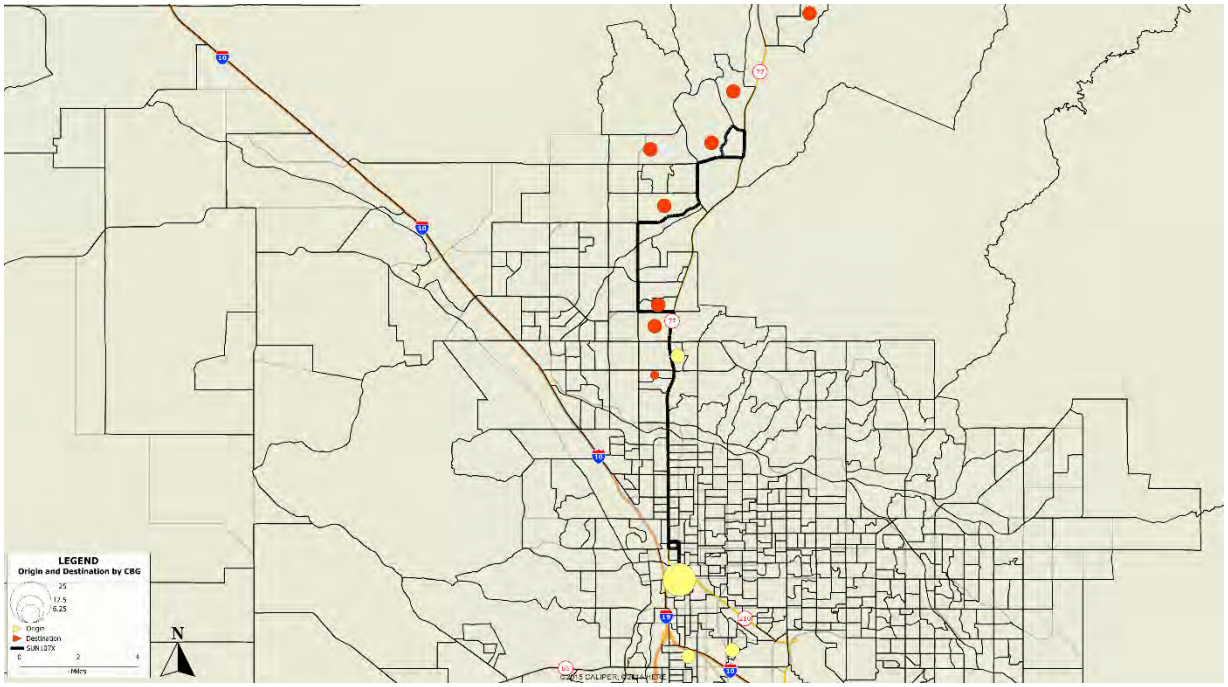
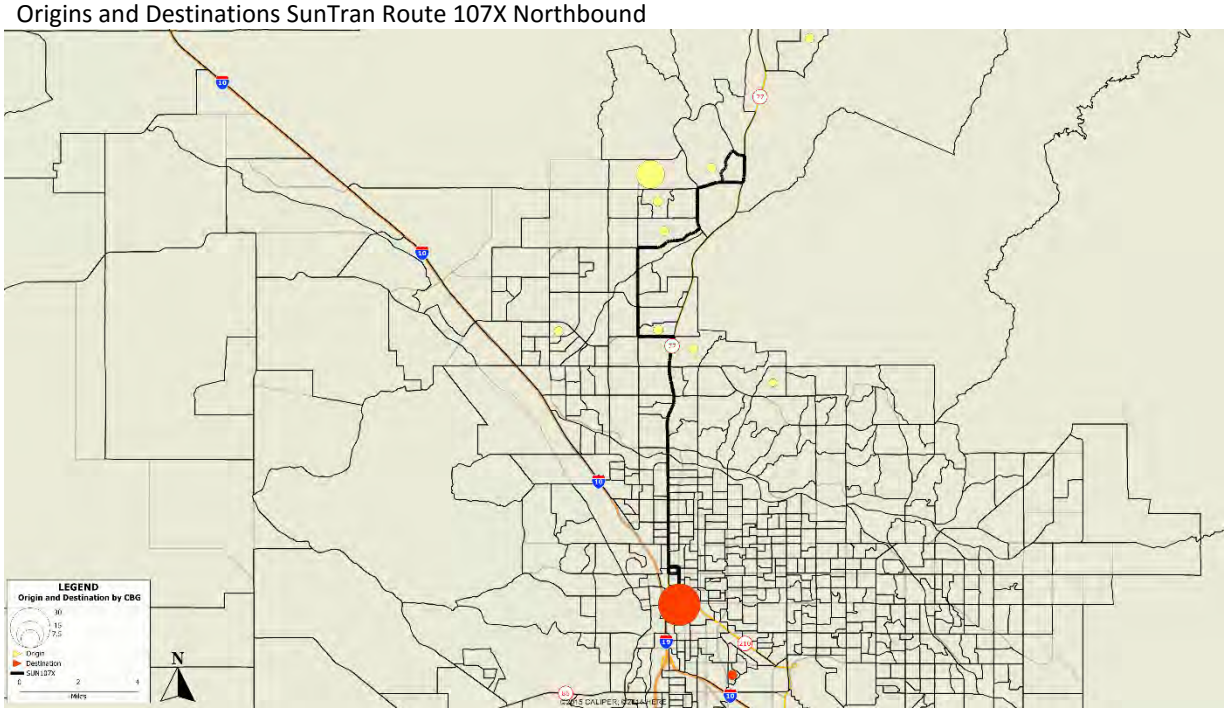
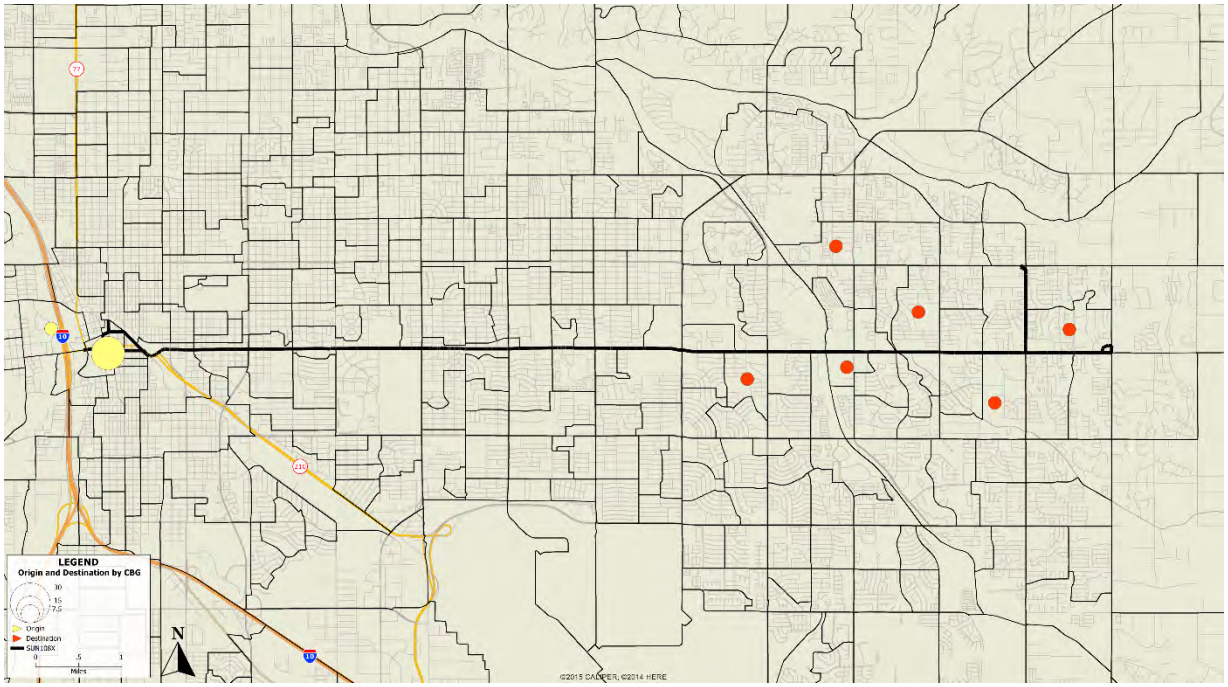


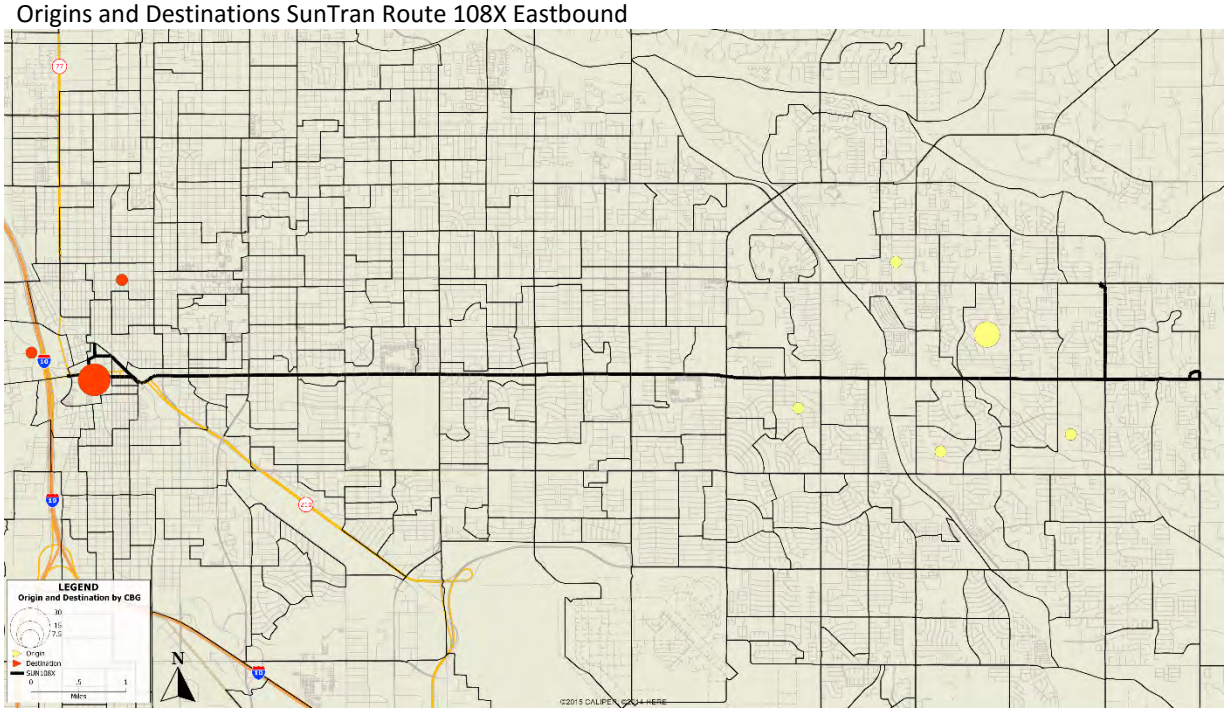
Origins and Destinations SunTran Route 107X Northbound



Origins and Destinations SunTran Route 107X Southbound



Origins and Destinations SunTran Route 108X Eastbound



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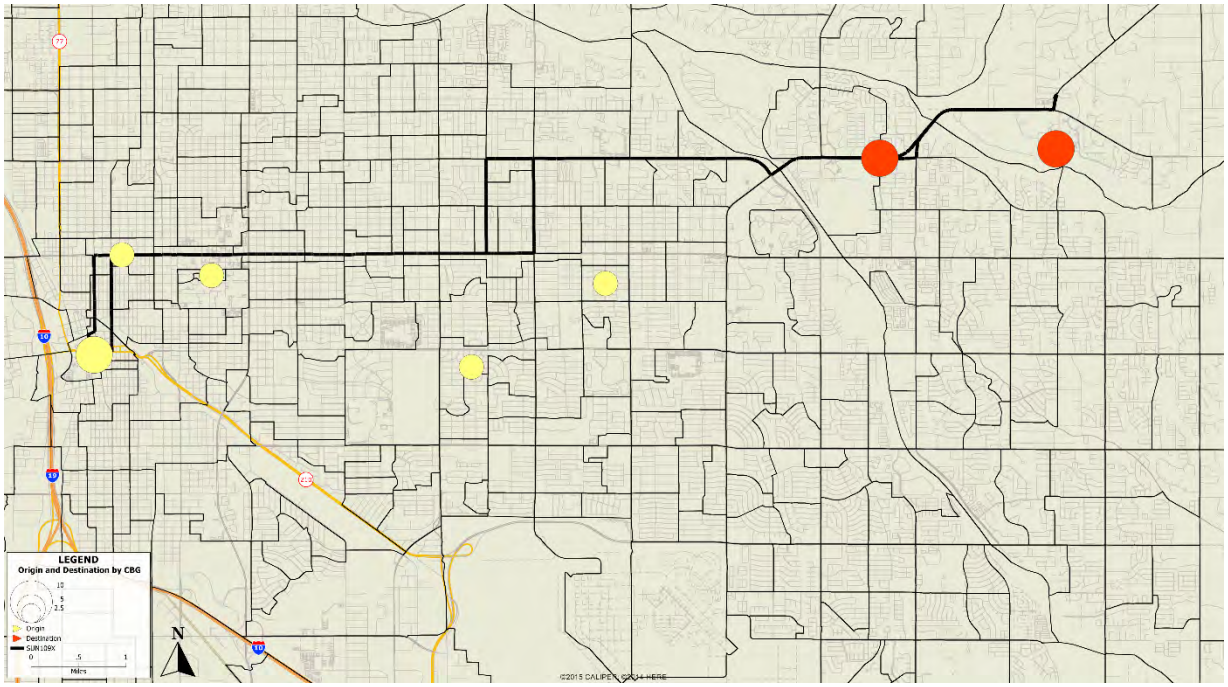
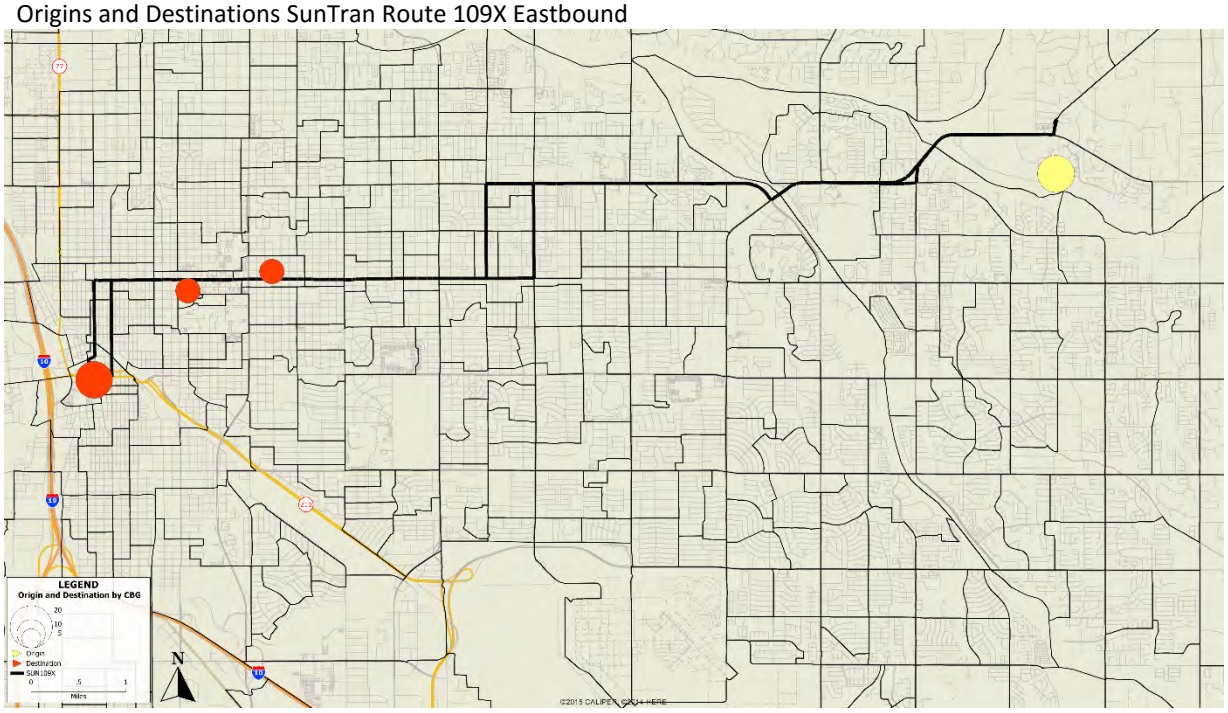


Origins and Destinations SunTran Route 109X Eastbound



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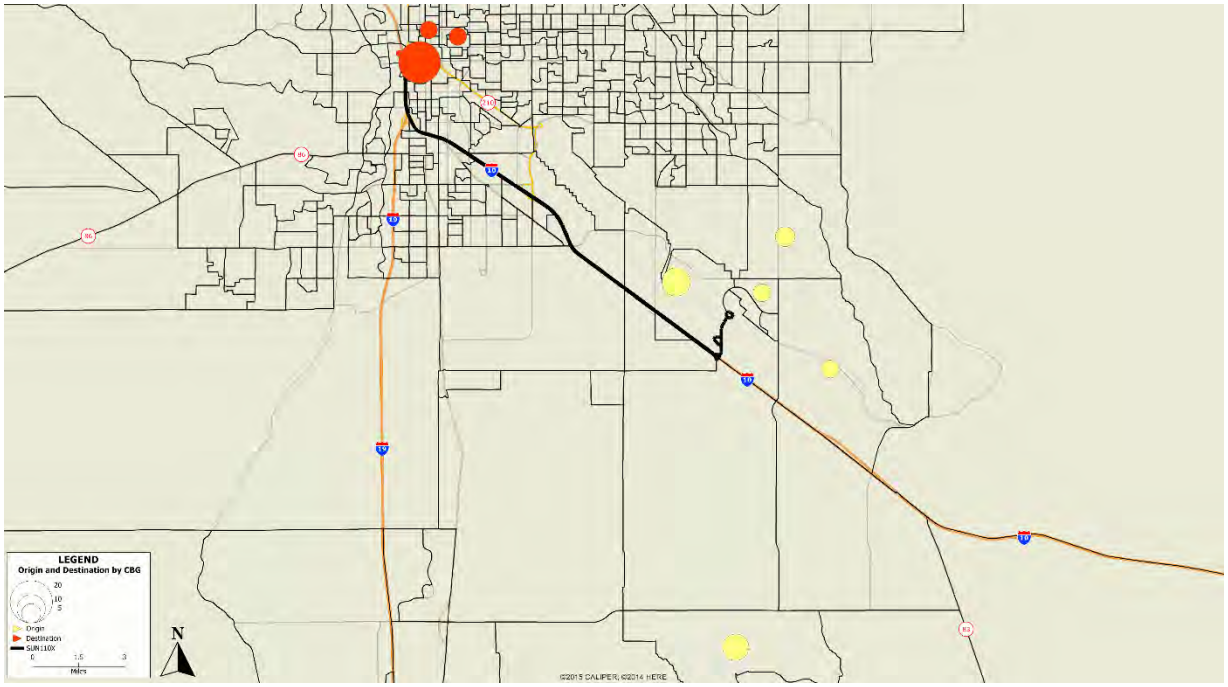

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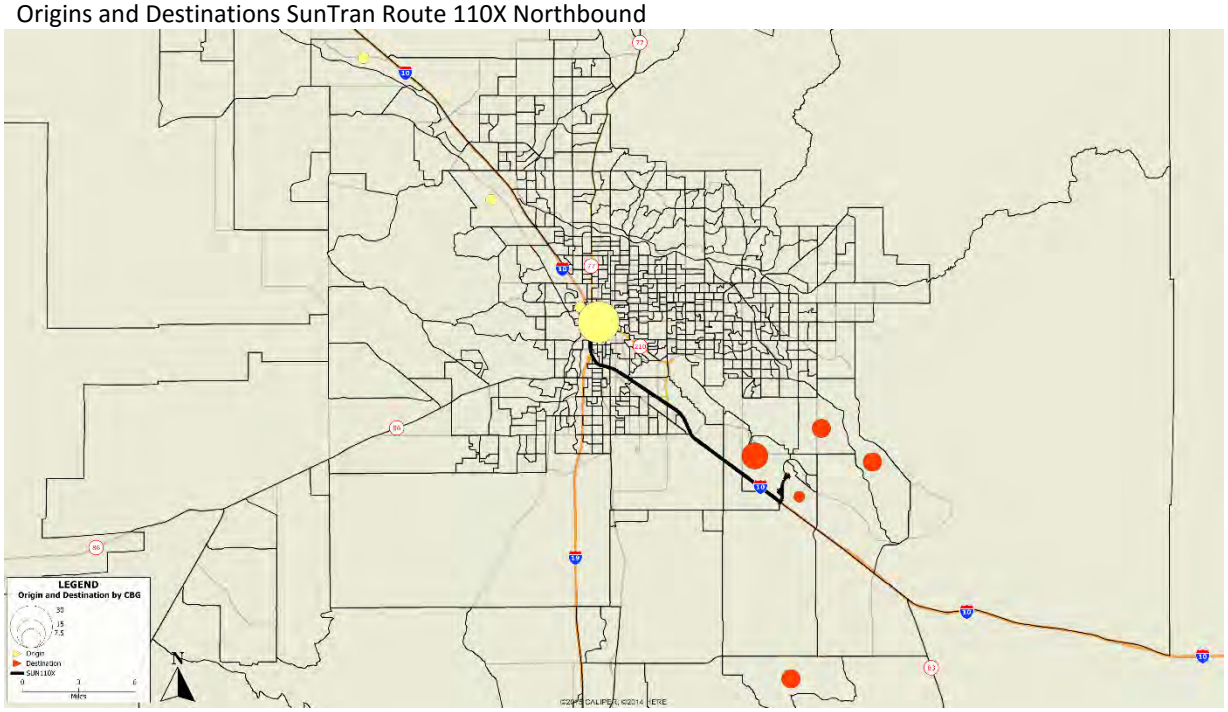

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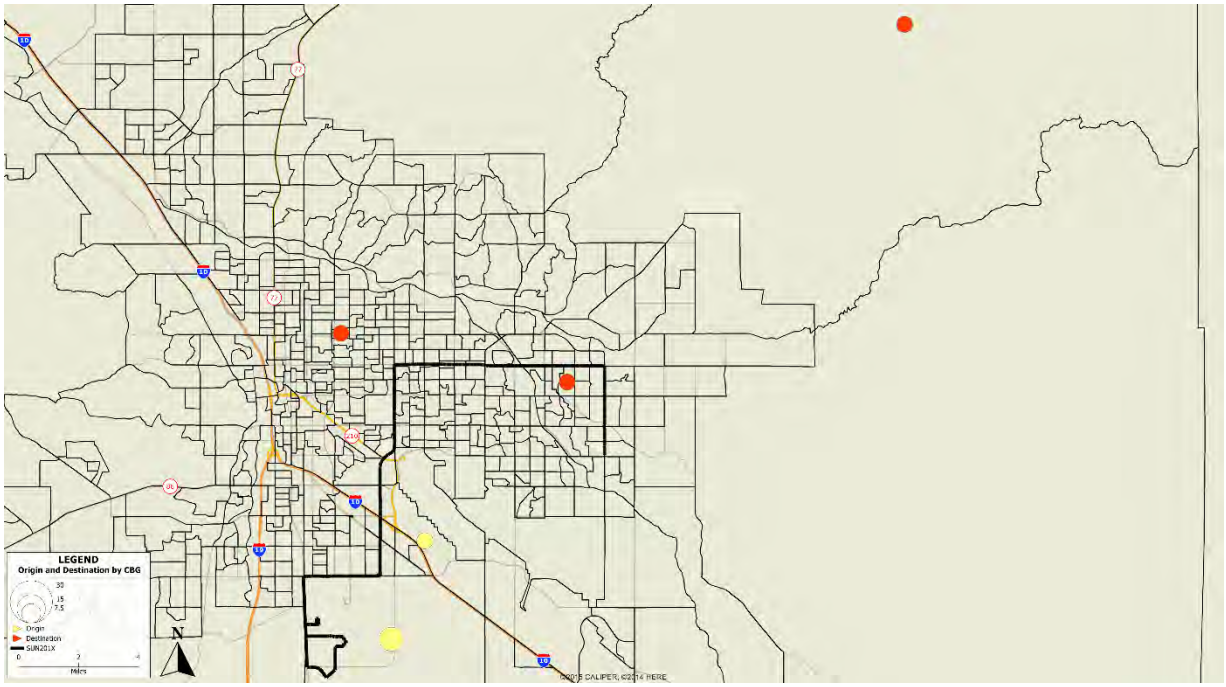
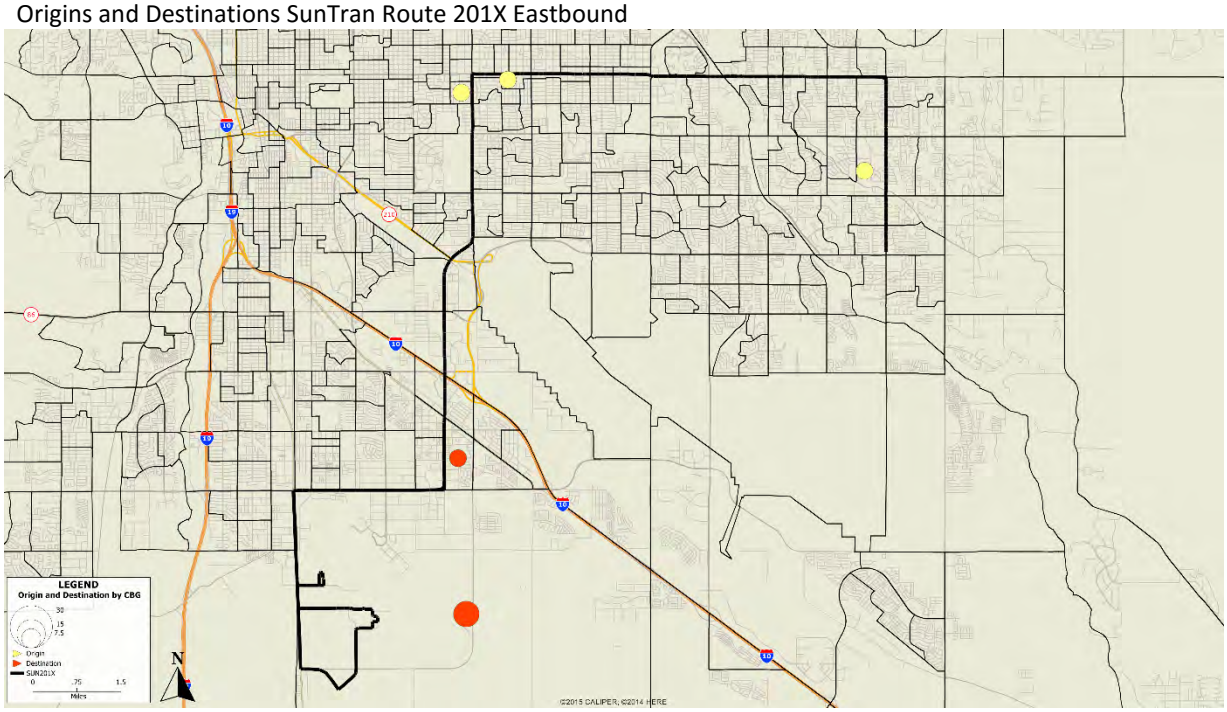
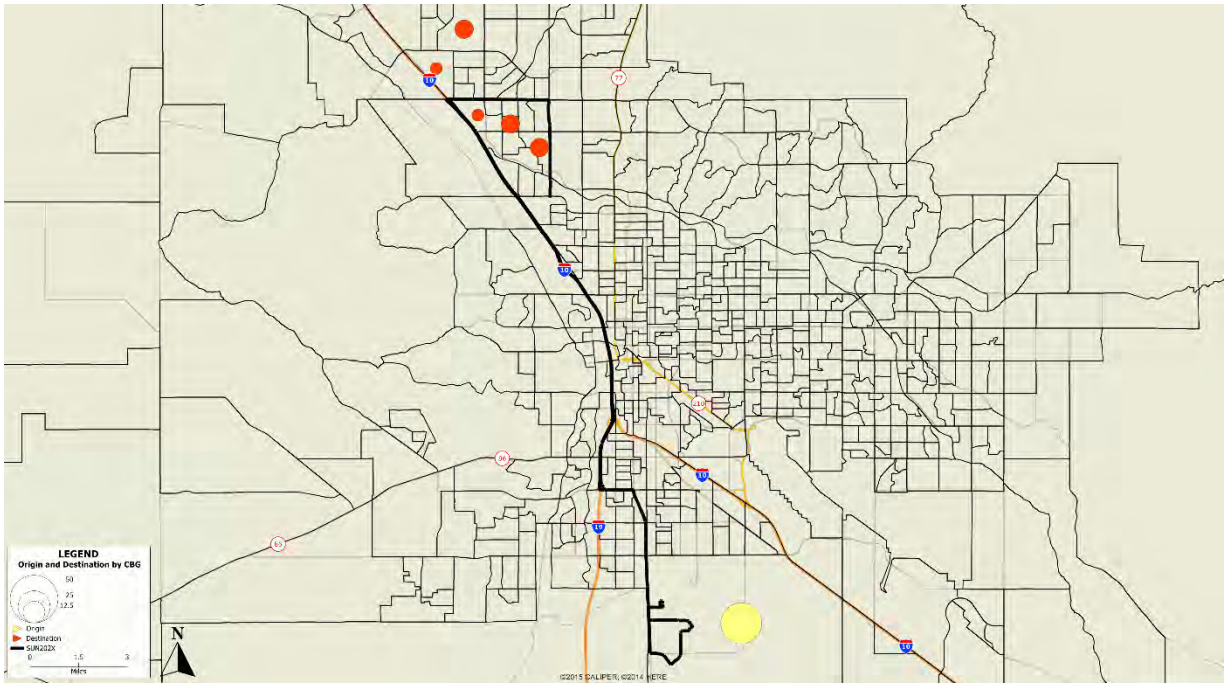


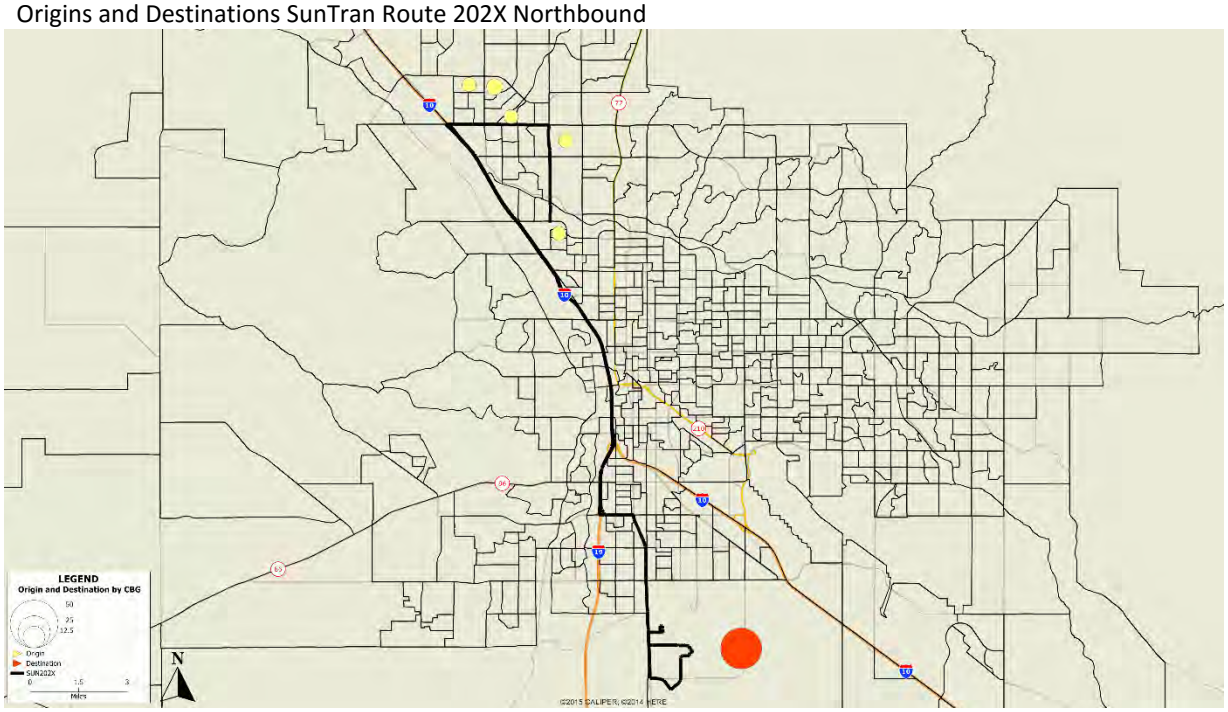
Origins and Destinations SunTran Route 201X Eastbound



Origins and Destinations SunTran Route 201X Westbound



Origins and Destinations SunTran Route 202X Northbound



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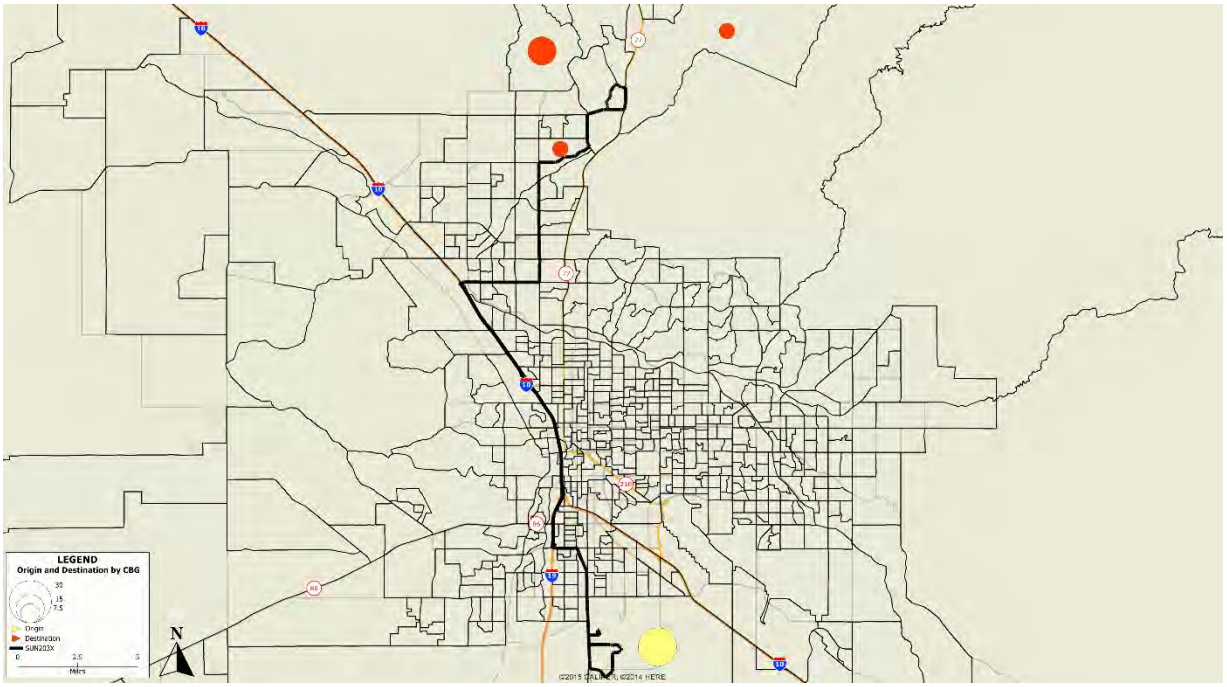

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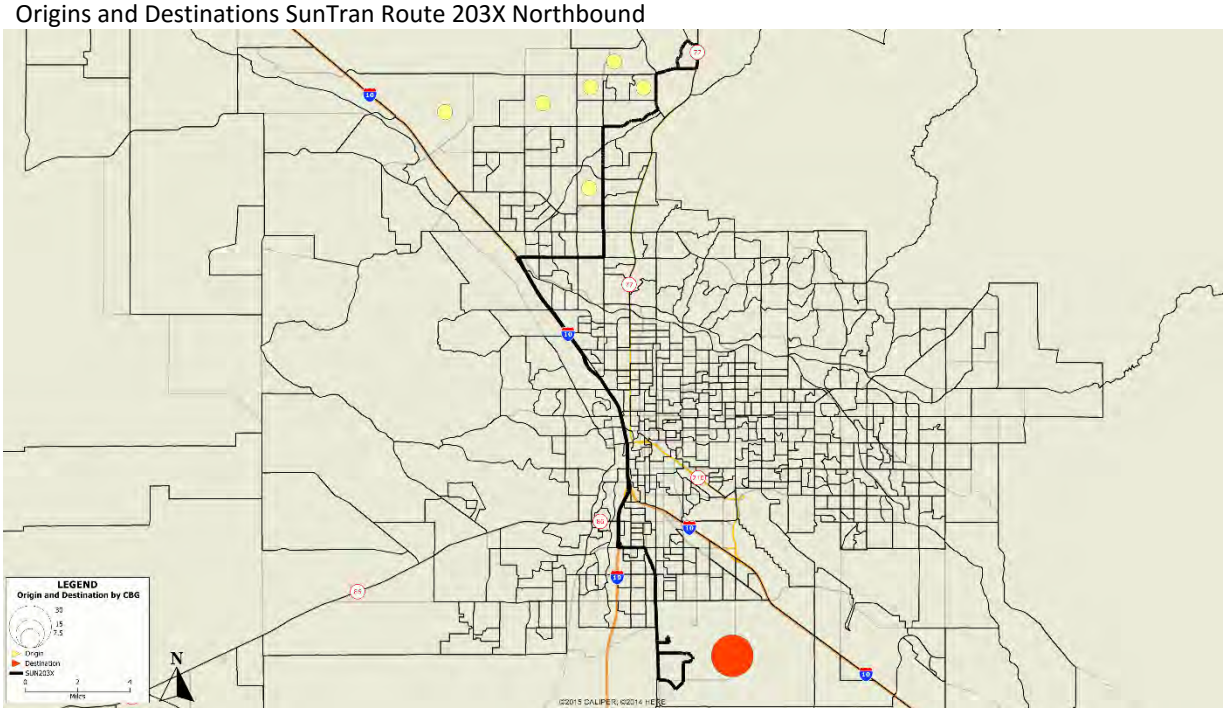
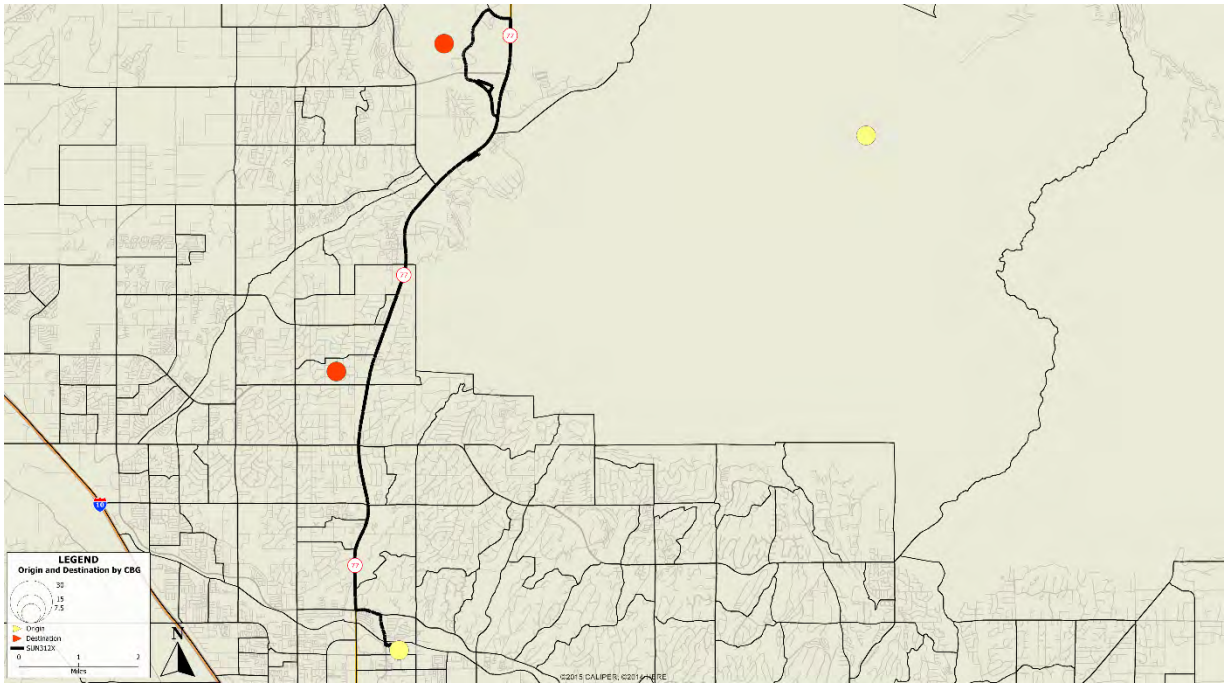
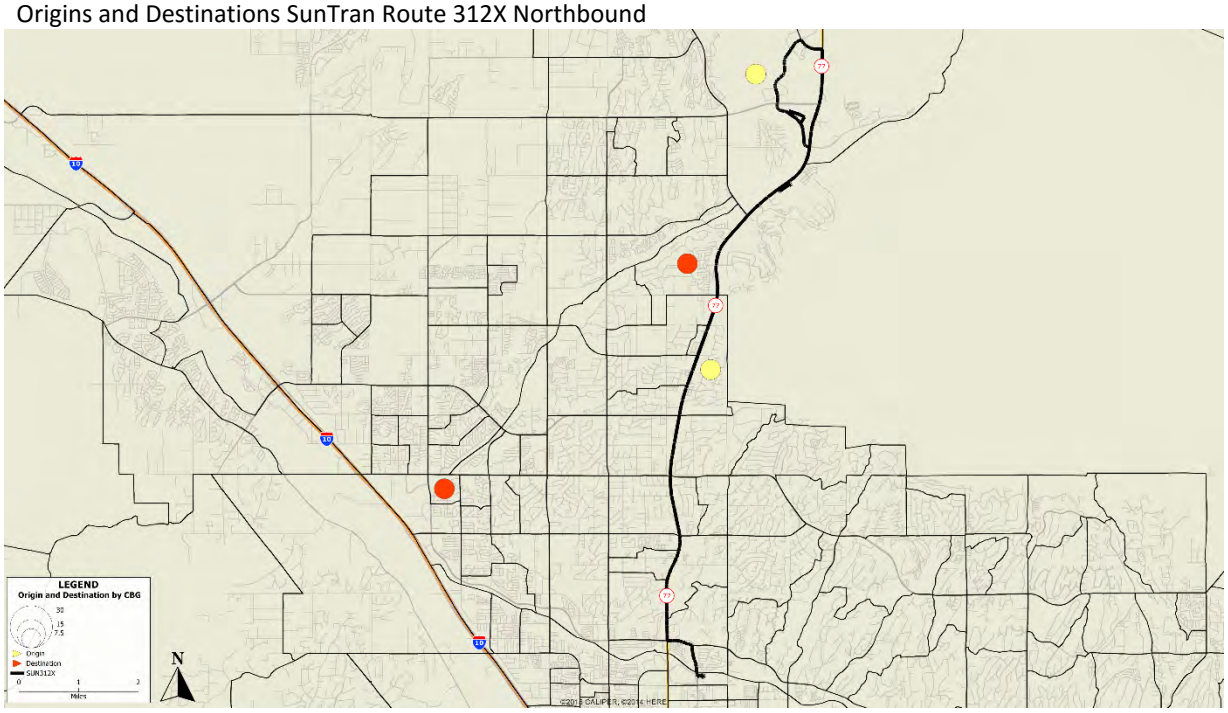


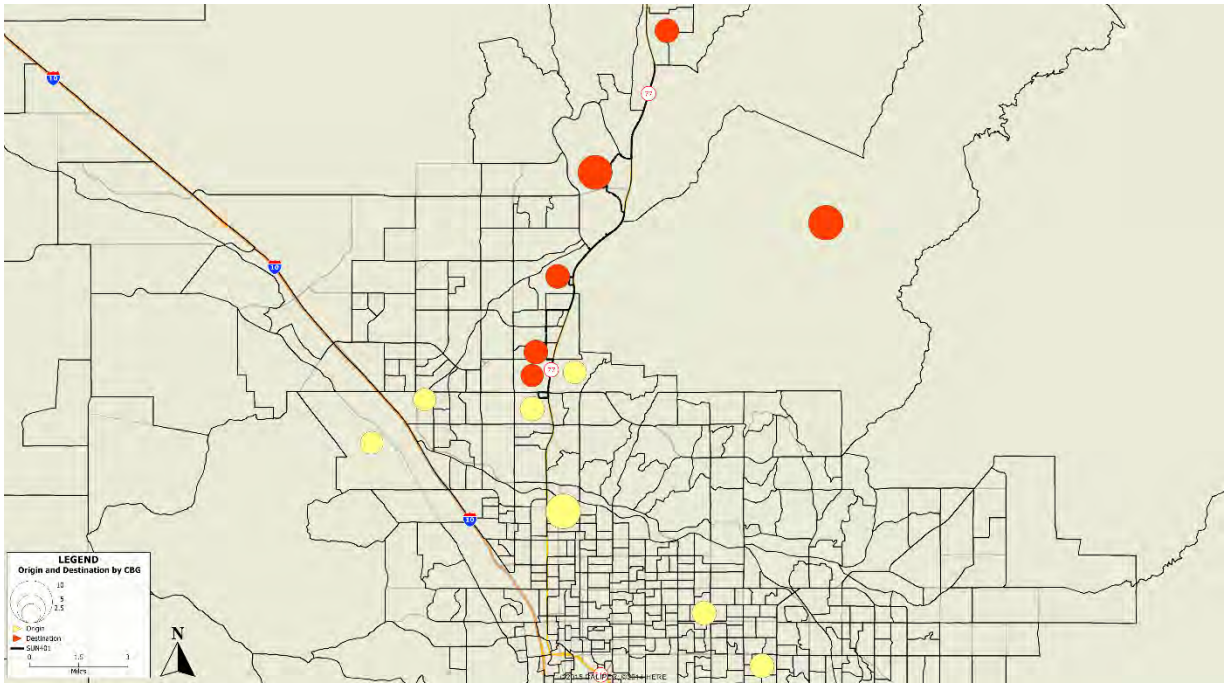
Origins and Destinations SunTran Route 203X Southbound



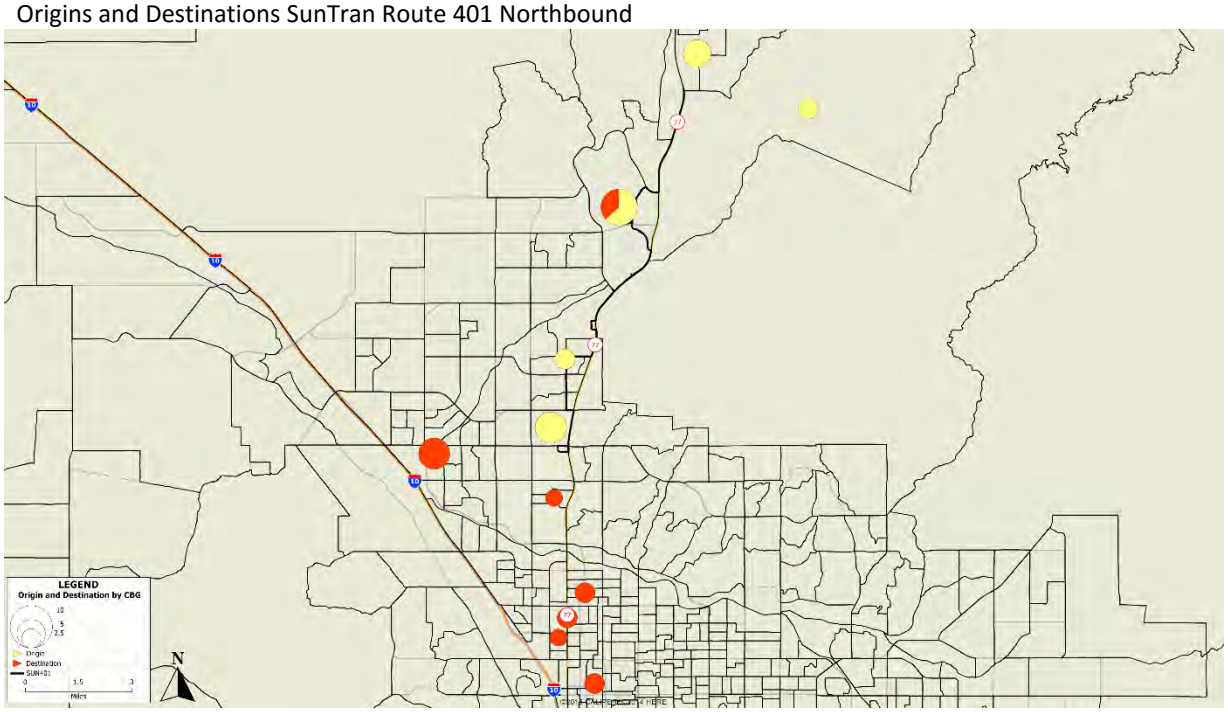
Origins and Destinations SunTran Route 312X Northbound



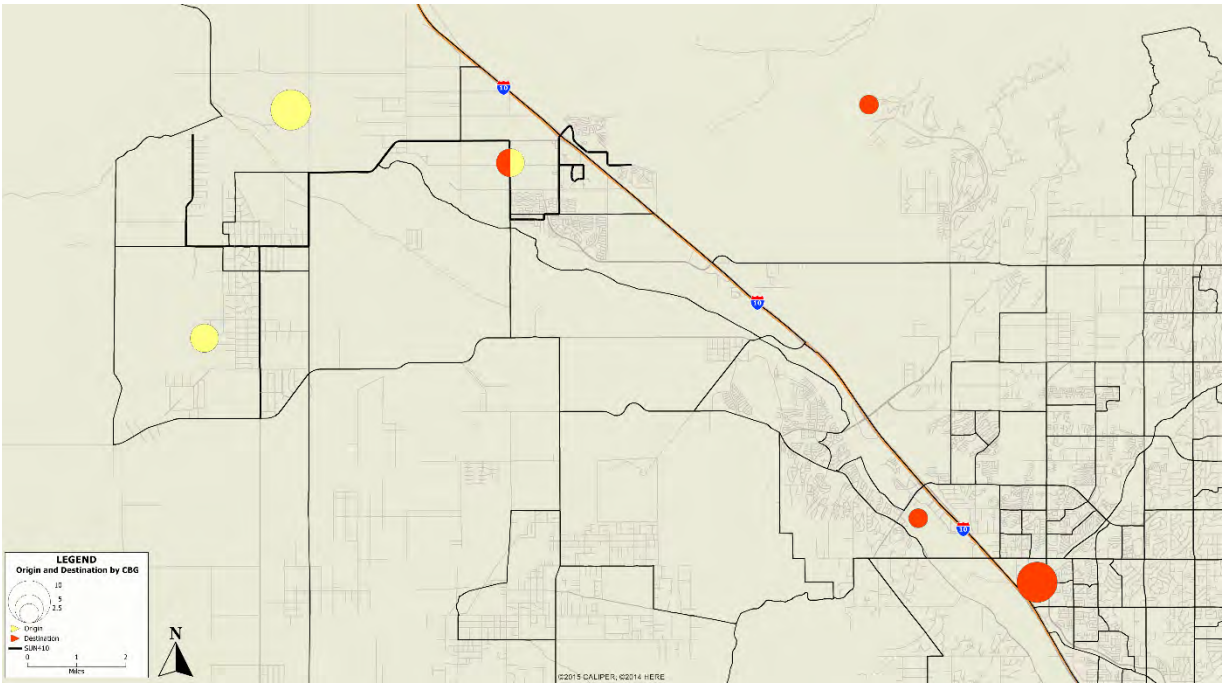
Origins and Destinations SunTran Route 312X Southbound



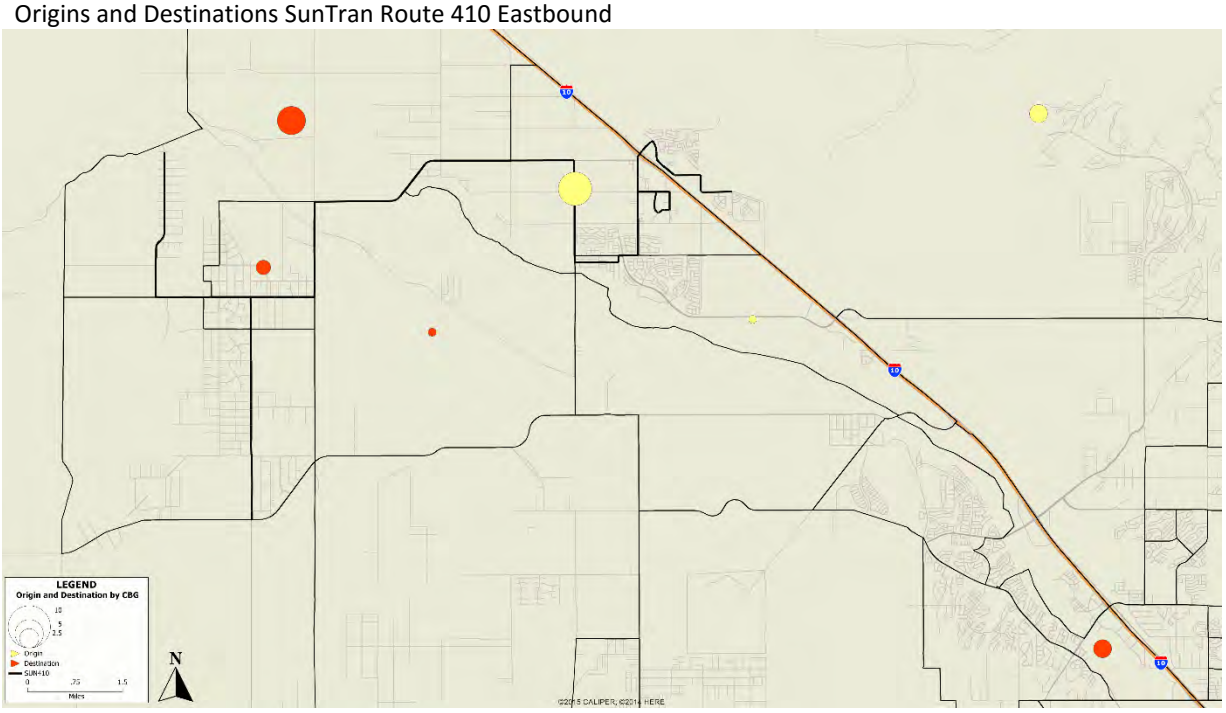
Origins and Destinations SunTran Route 401 Northbound



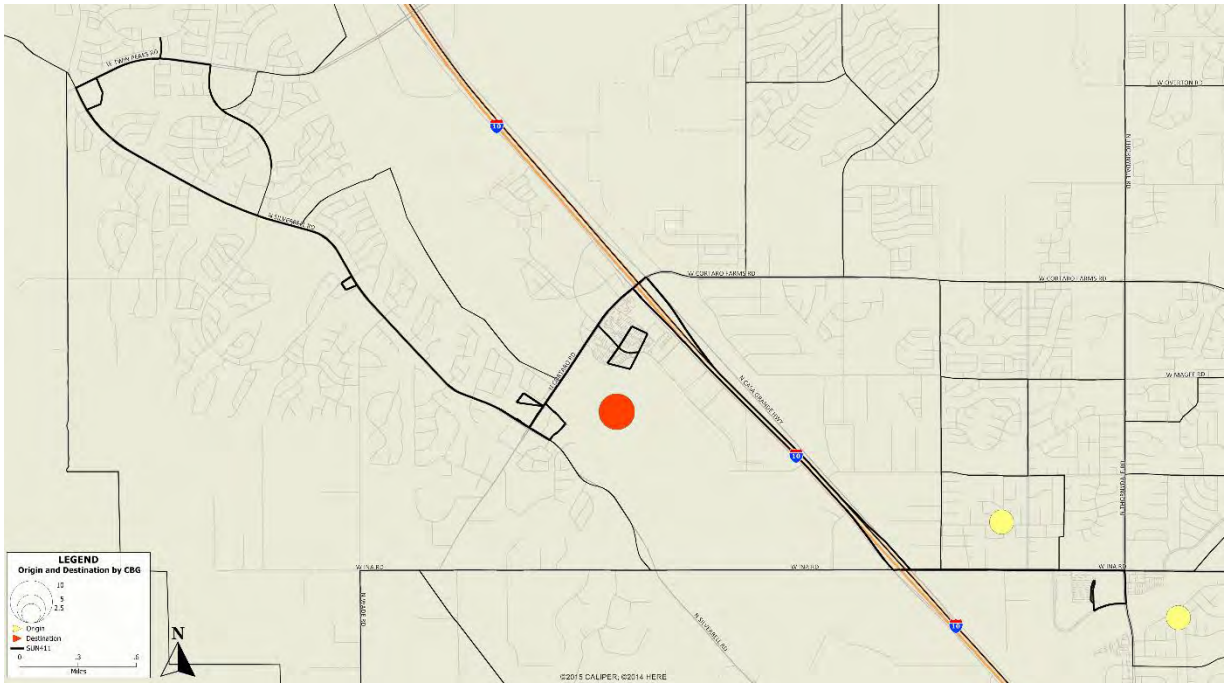
Origins and Destinations SunTran Route 401 Southbound



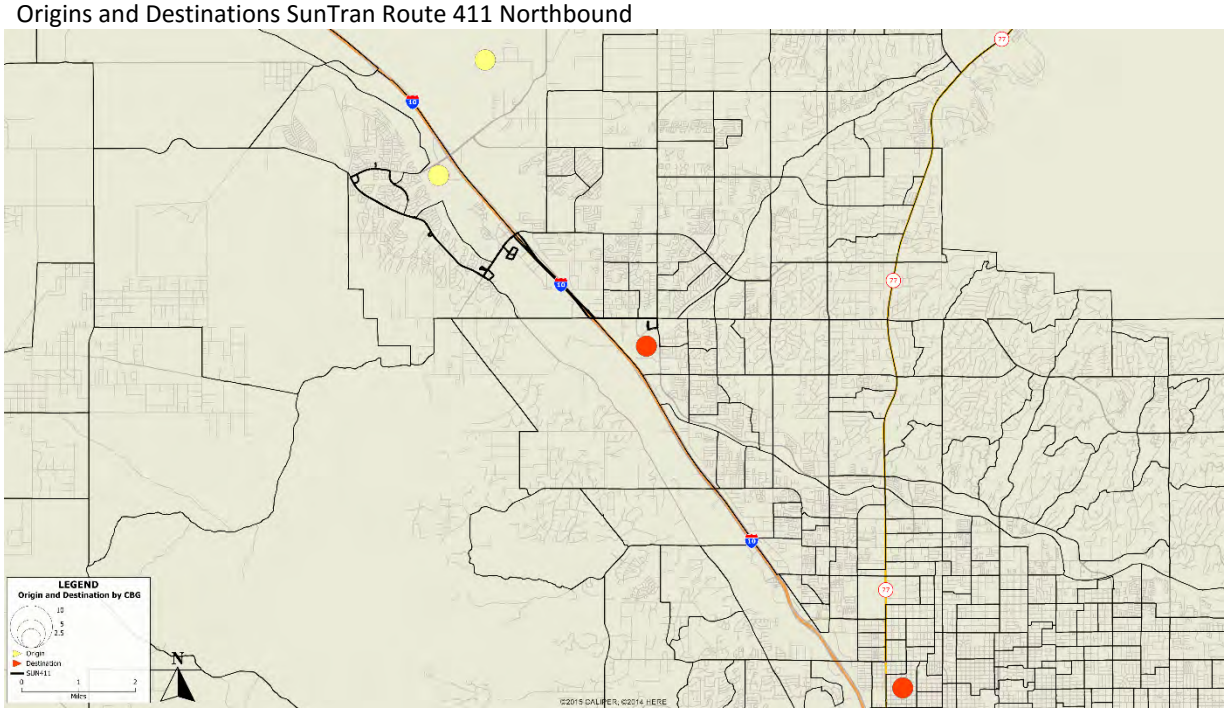
Origins and Destinations SunTran Route 410 Eastbound



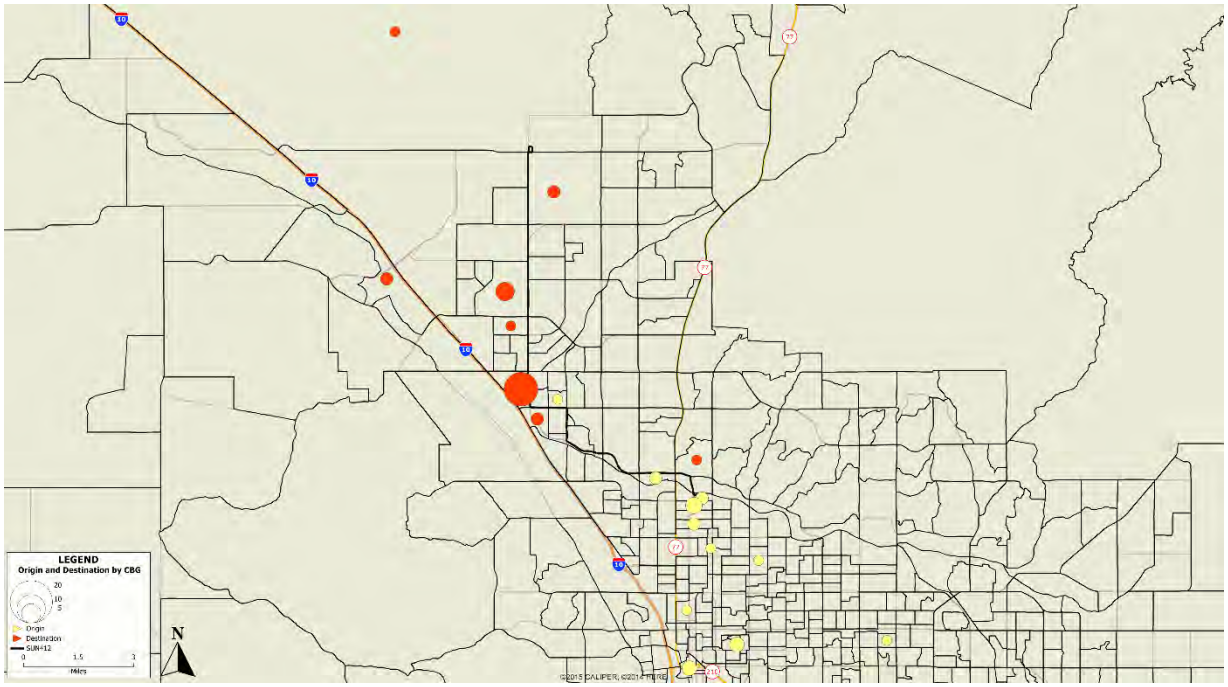
Origins and Destinations SunTran Route 410 Westbound



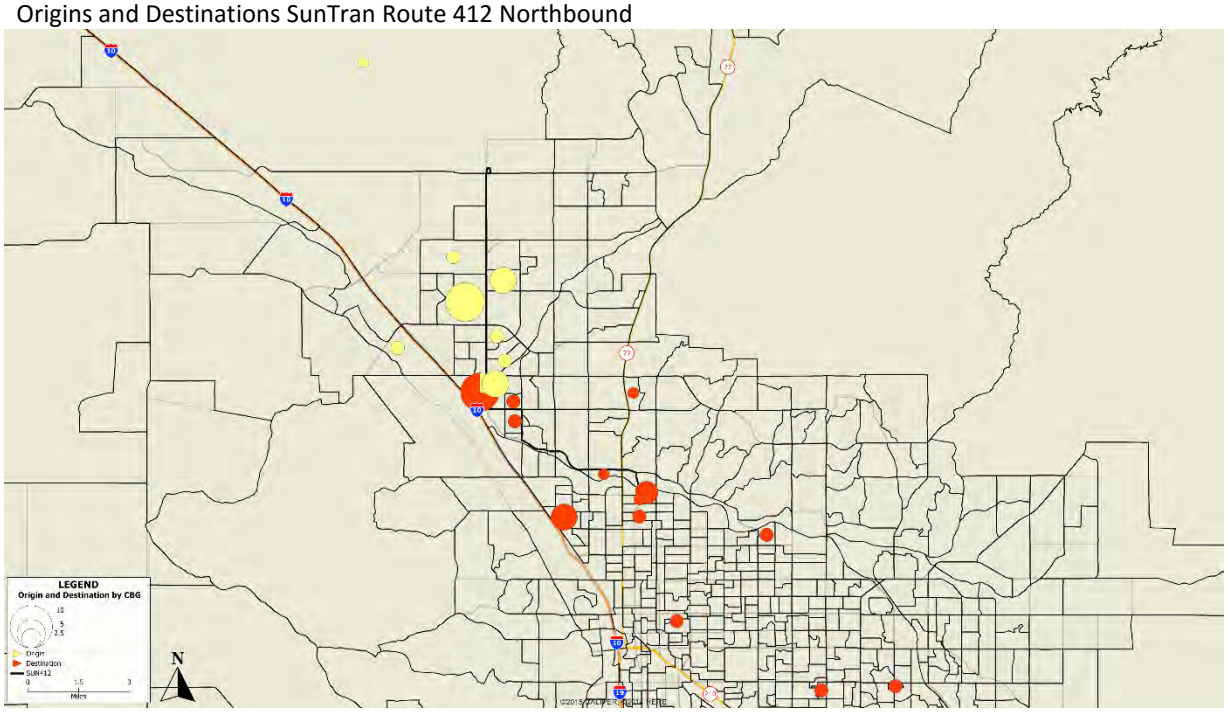
Origins and Destinations SunTran Route 411 Northbound



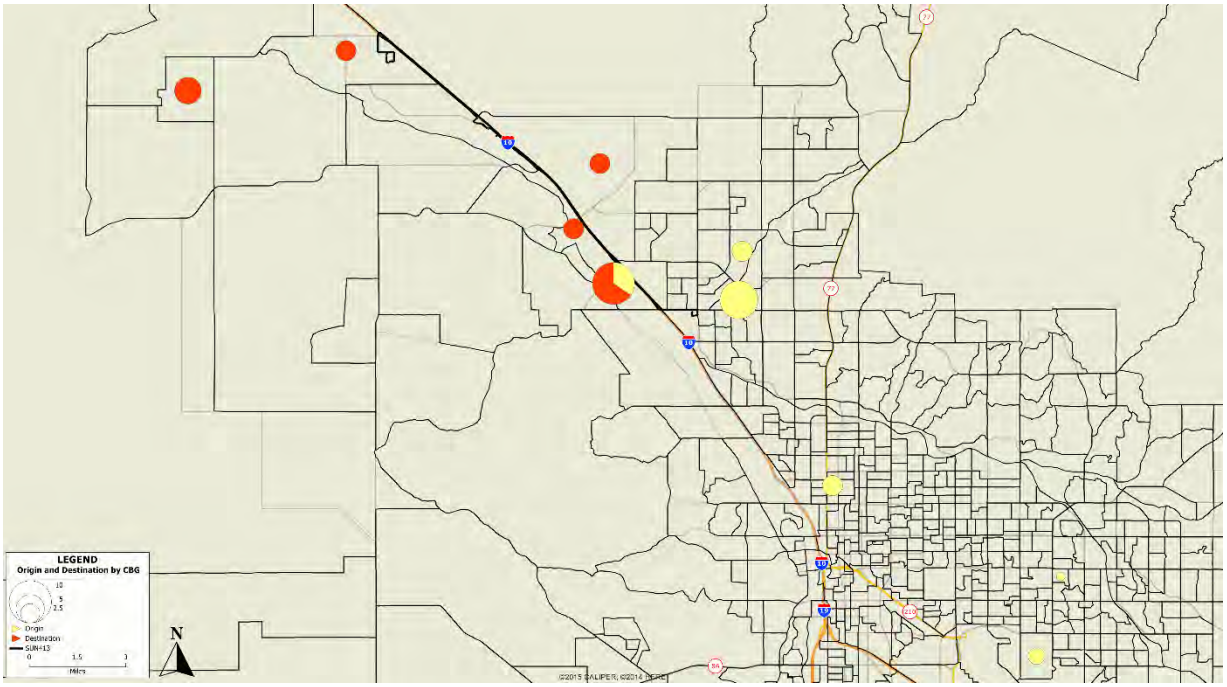
Origins and Destinations SunTran Route 411 Southbound



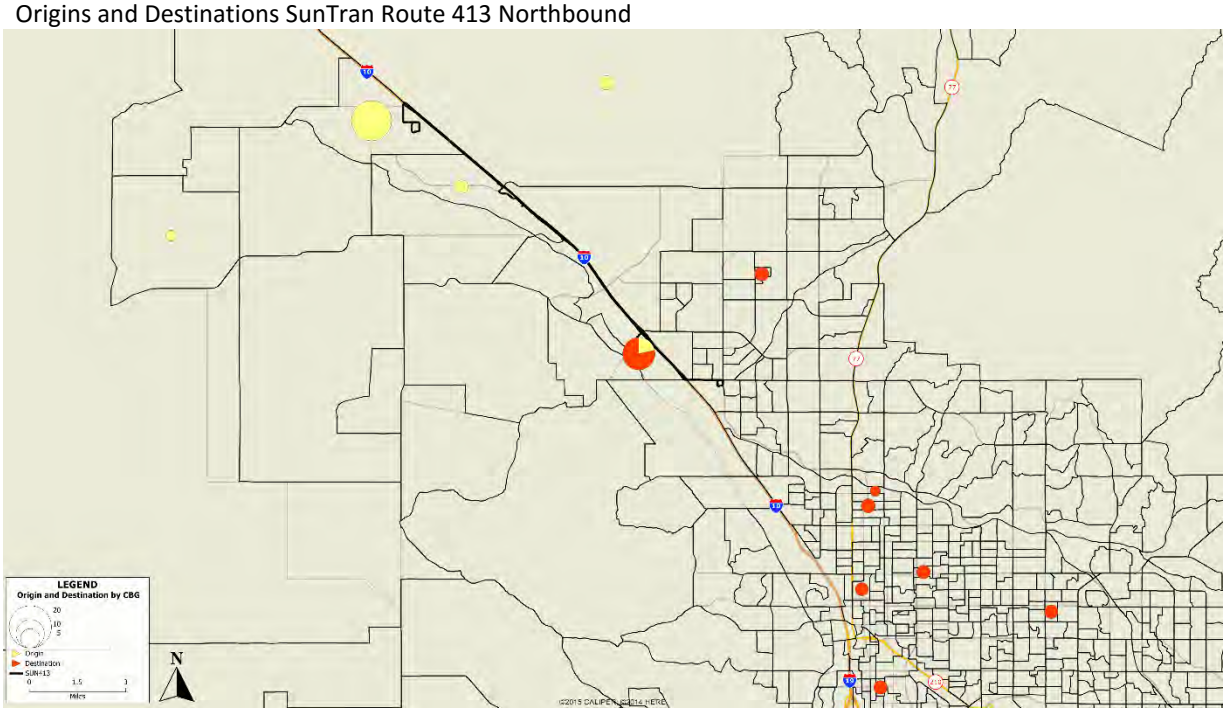
Origins and Destinations SunTran Route 412 Northbound



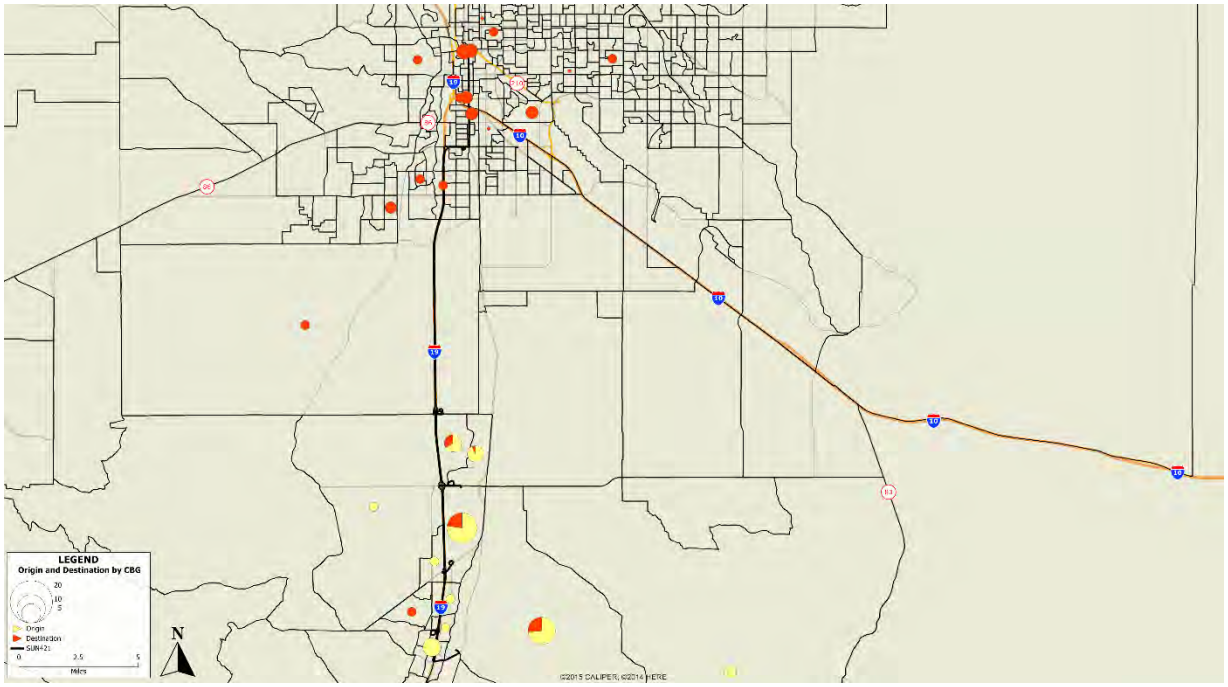
Origins and Destinations SunTran Route 412 Southbound



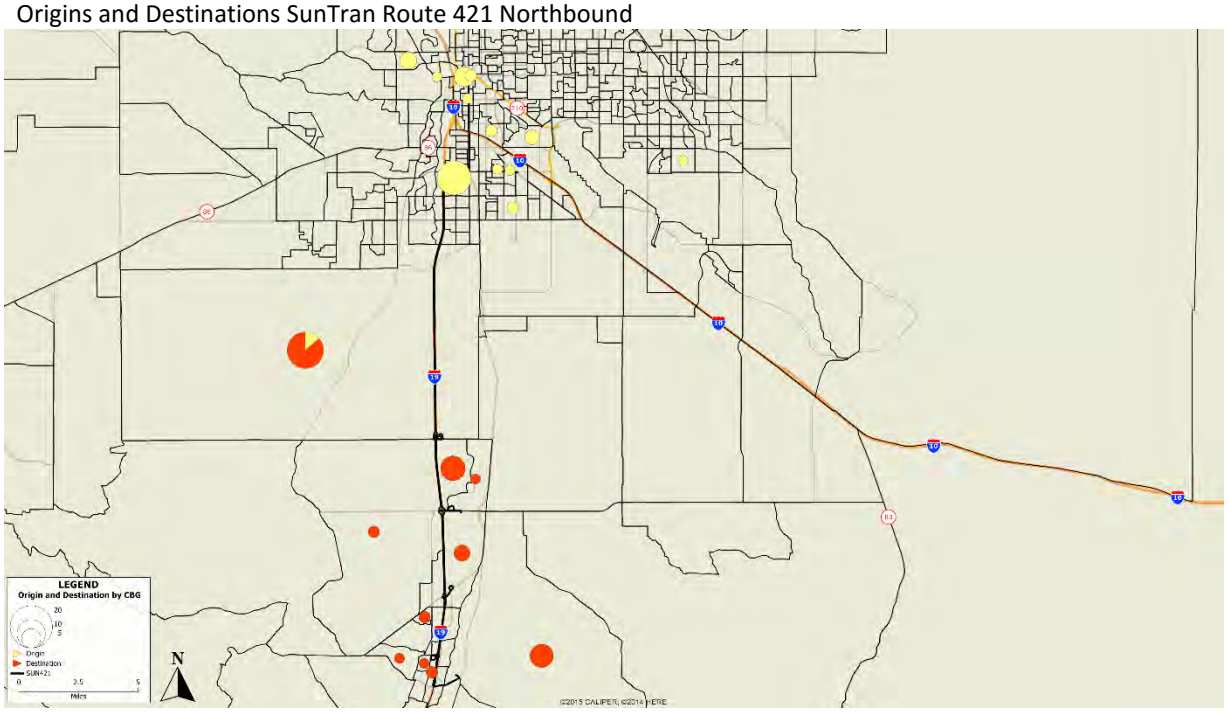
Origins and Destinations SunTran Route 413 Northbound



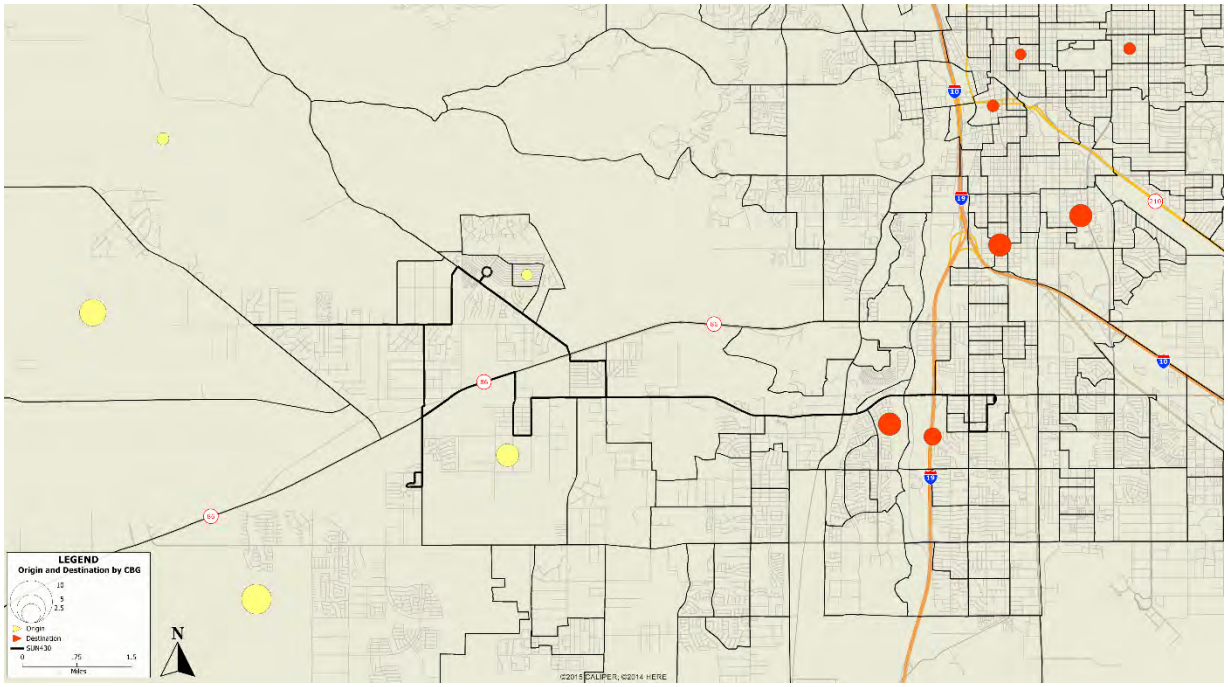
Origins and Destinations SunTran Route 413 Southbound



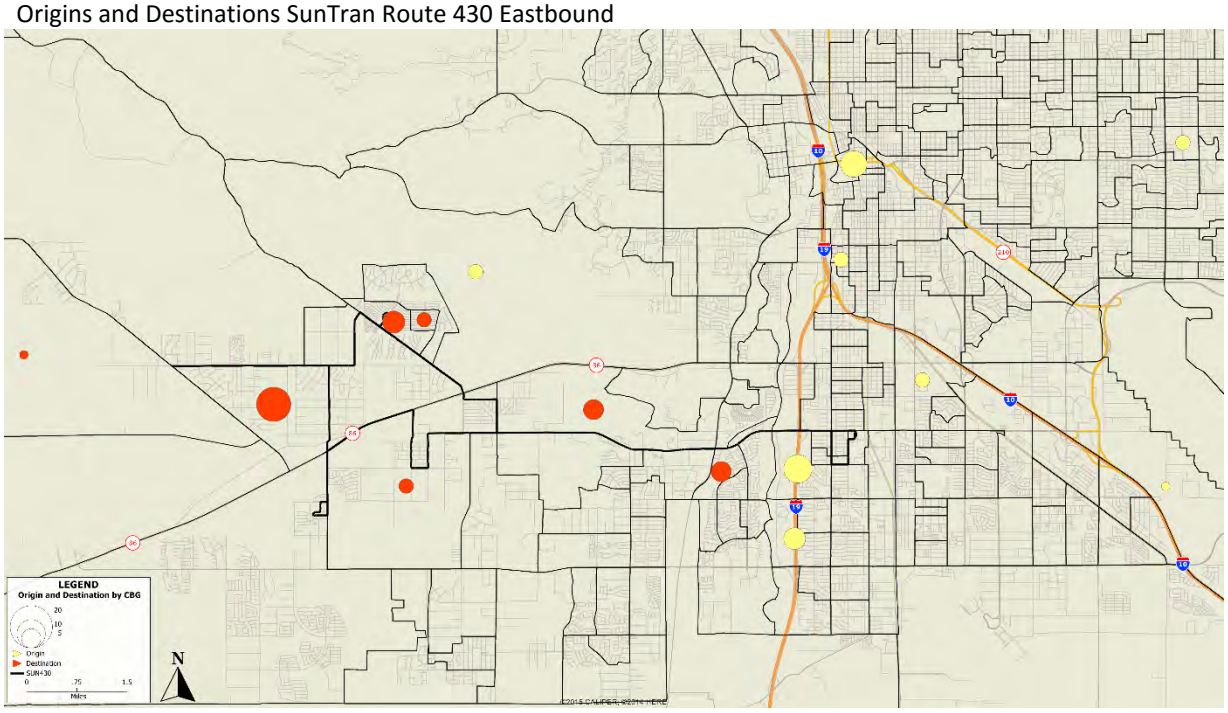
Origins and Destinations SunTran Route 421 Northbound



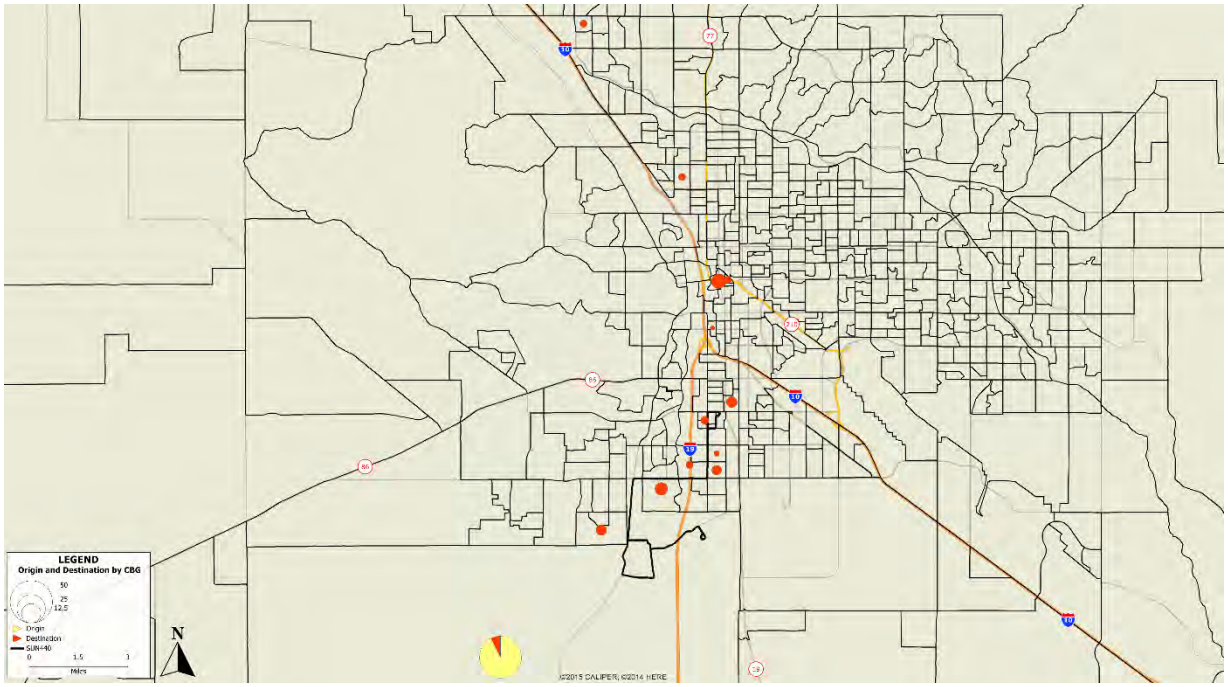
Origins and Destinations SunTran Route 421 Southbound



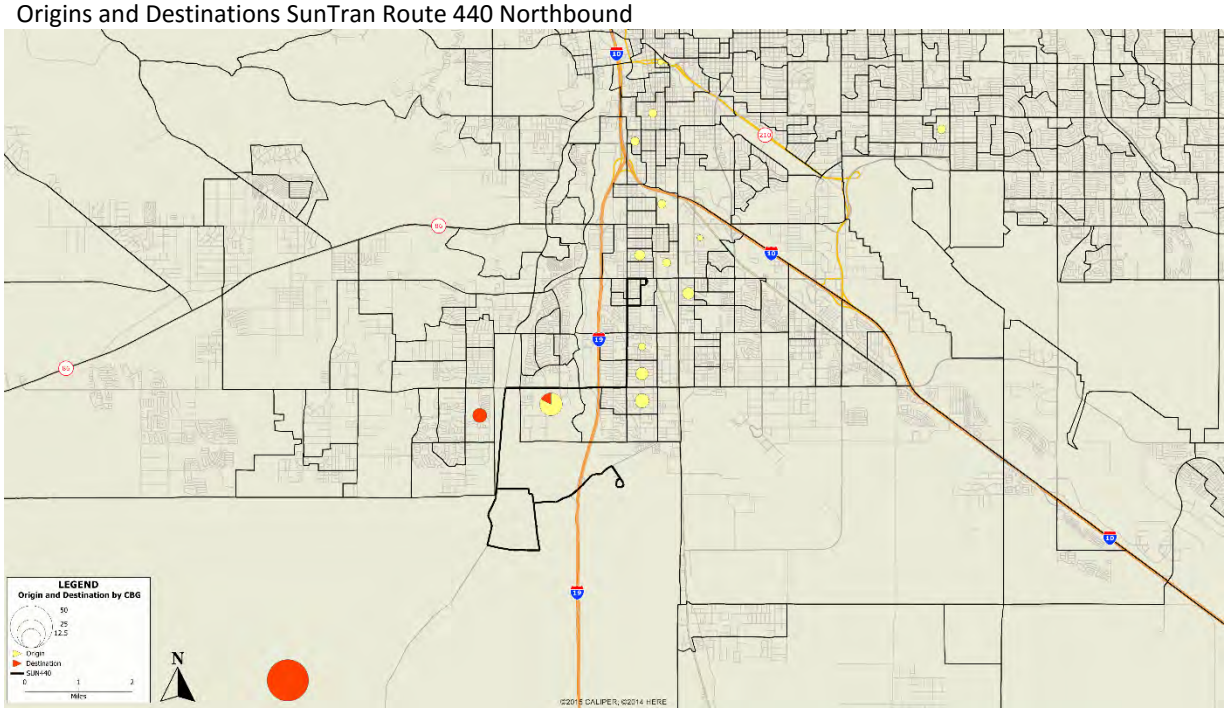
Origins and Destinations SunTran Route 430 Eastbound



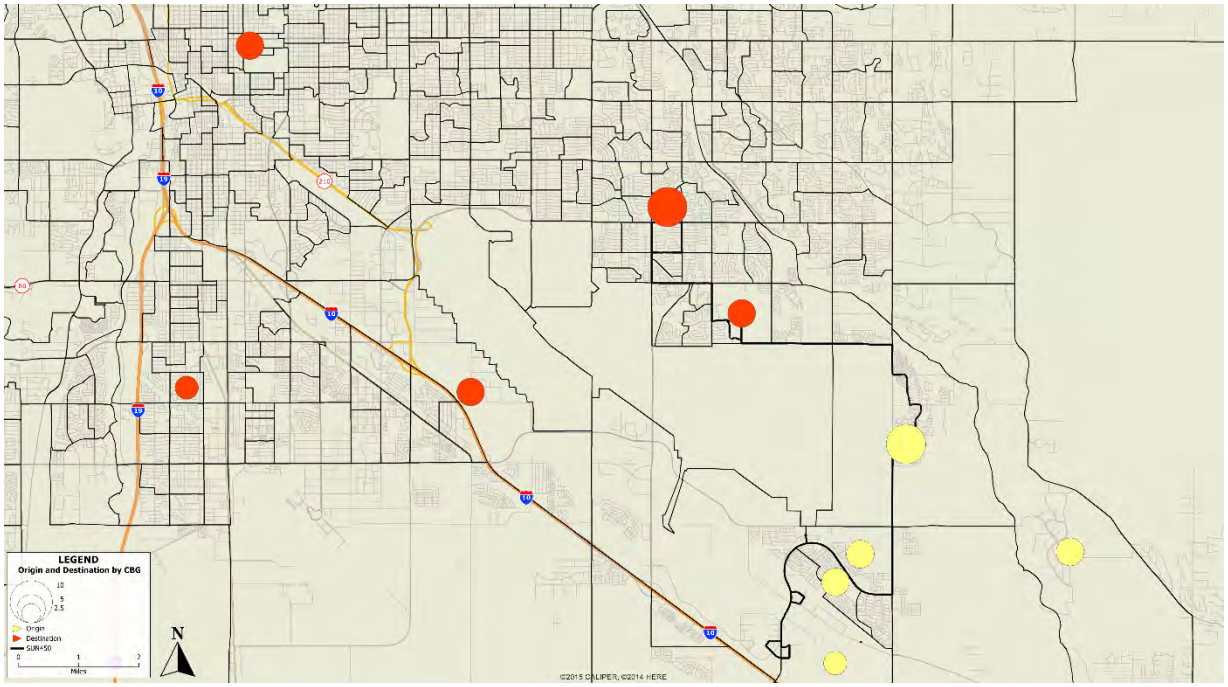
Origins and Destinations SunTran Route 430 Westbound



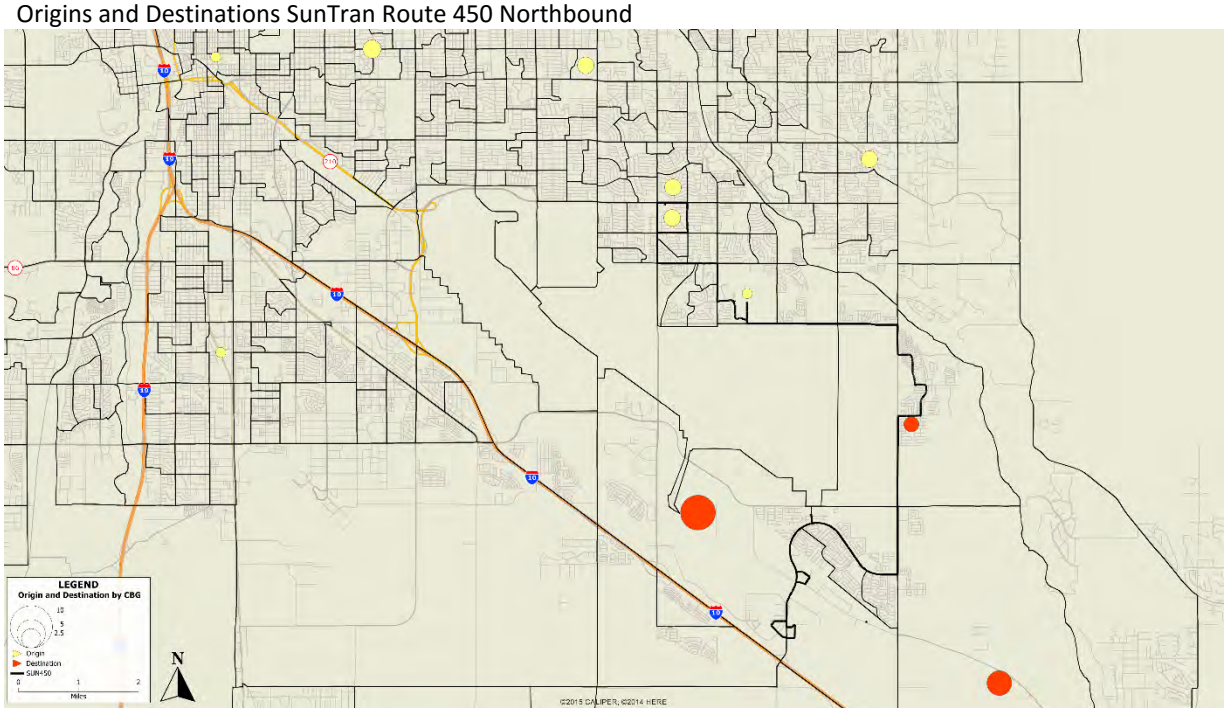
Origins and Destinations SunTran Route 440 Northbound



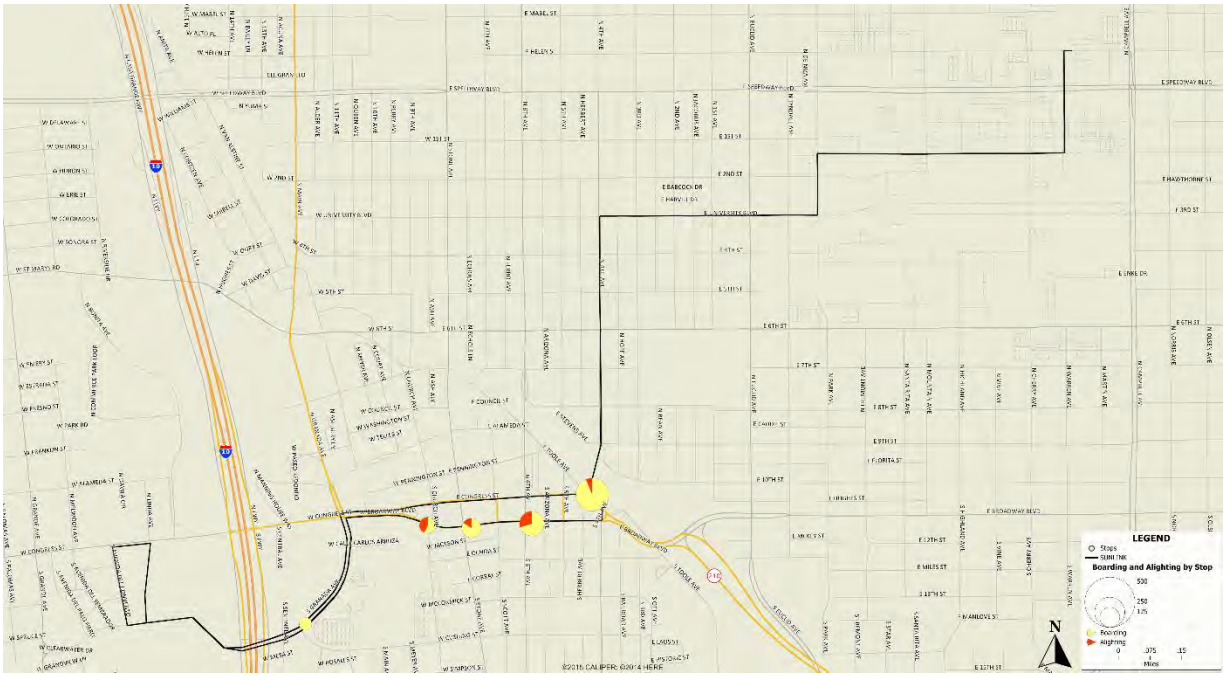
Origins and Destinations SunTran Route 440 Southbound



Origins and Destinations SunTran Route 450 Northbound

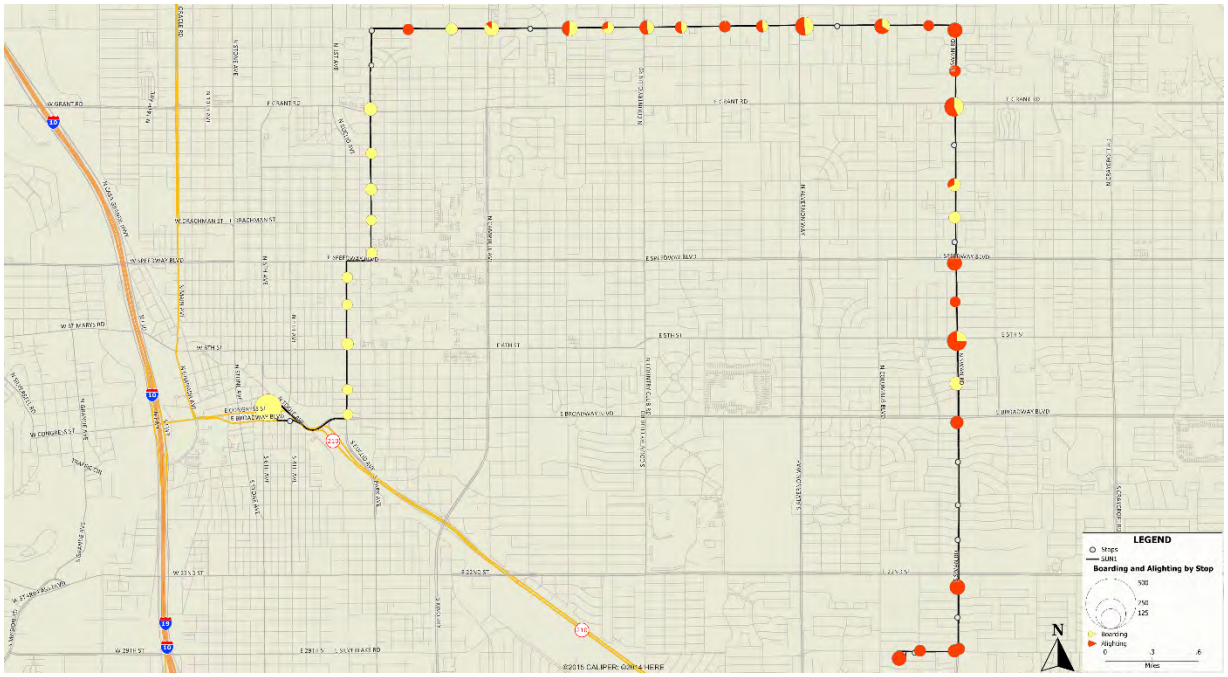


Origins and Destinations SunTran Route 450 Southbound

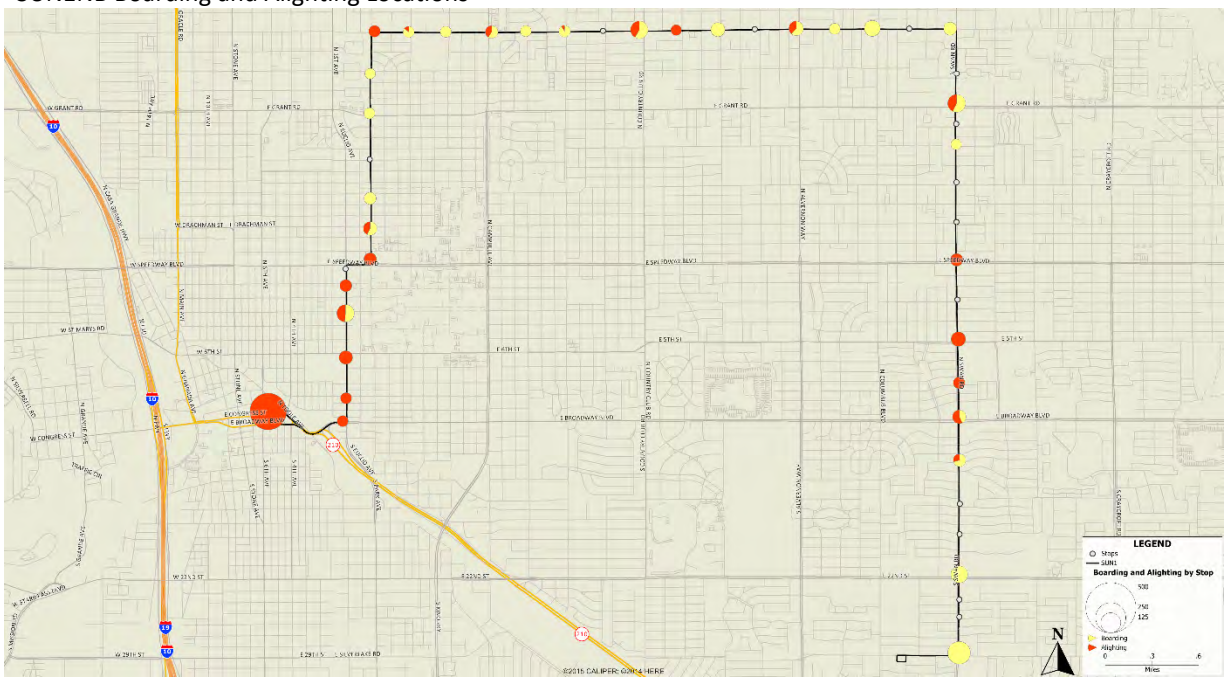


Boarding and Alighting SunTran Route LINKEB

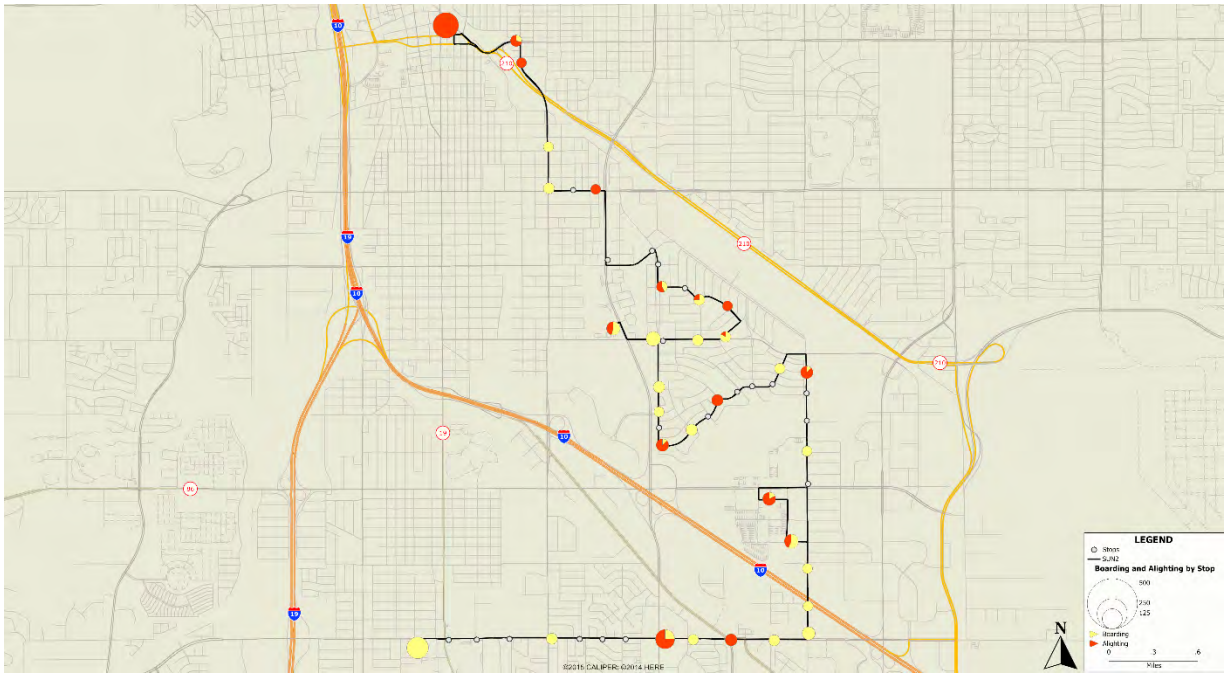
Boarding and Alighting SunTran Route LINKWB



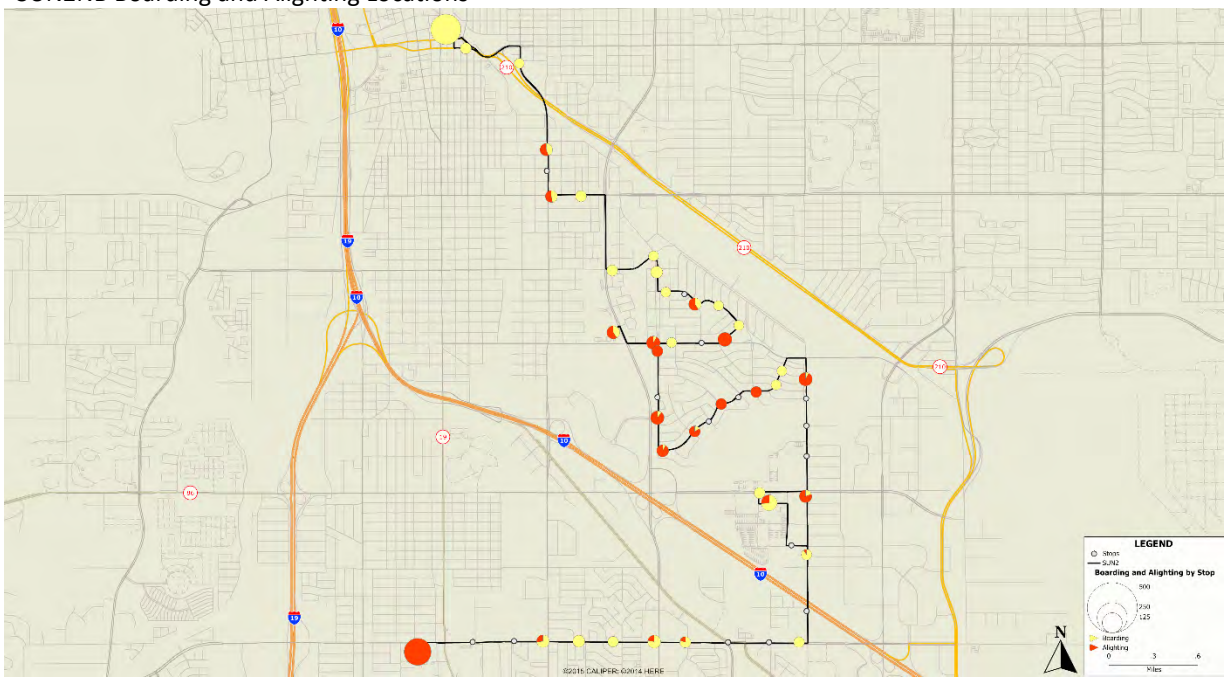
SUN1NB Boarding and Alighting Locations



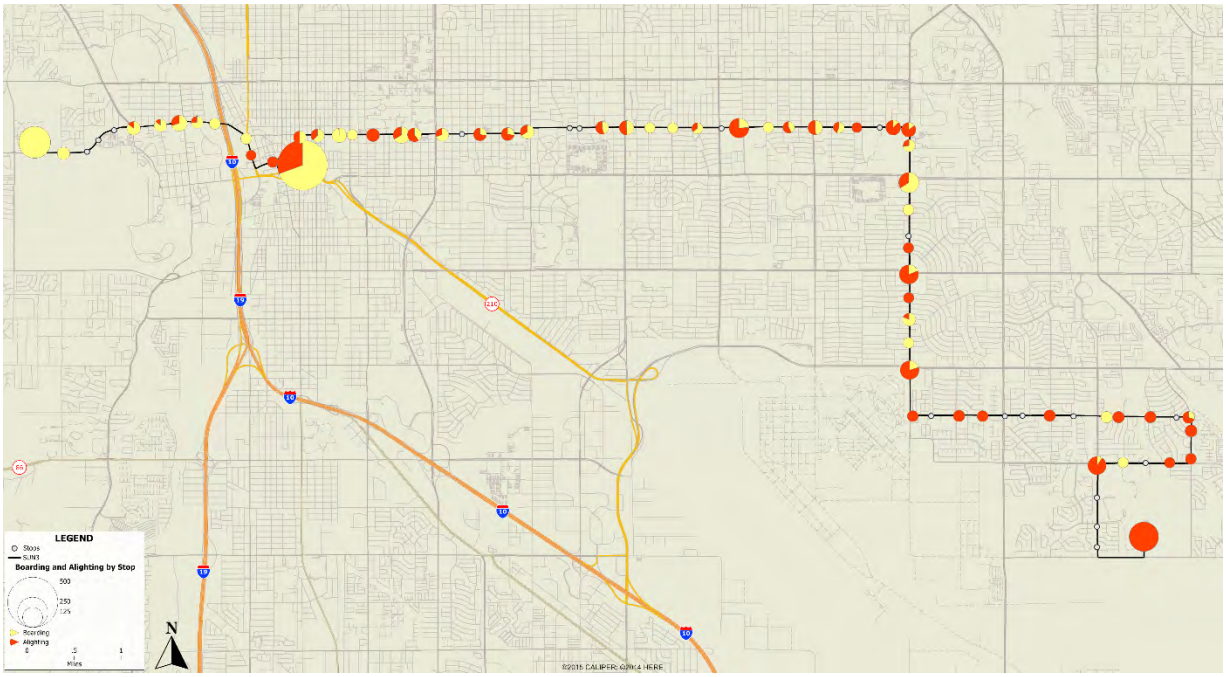
SUN1SB Boarding and Alighting Locations



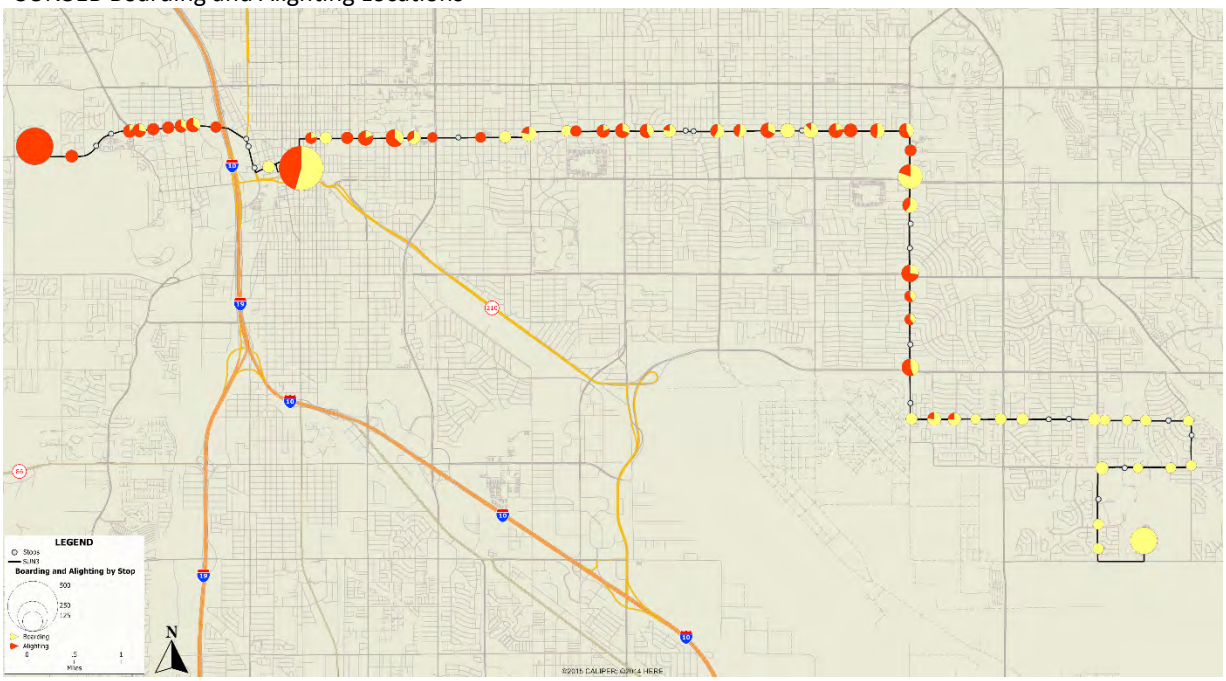
SUN2NB Boarding and Alighting Locations



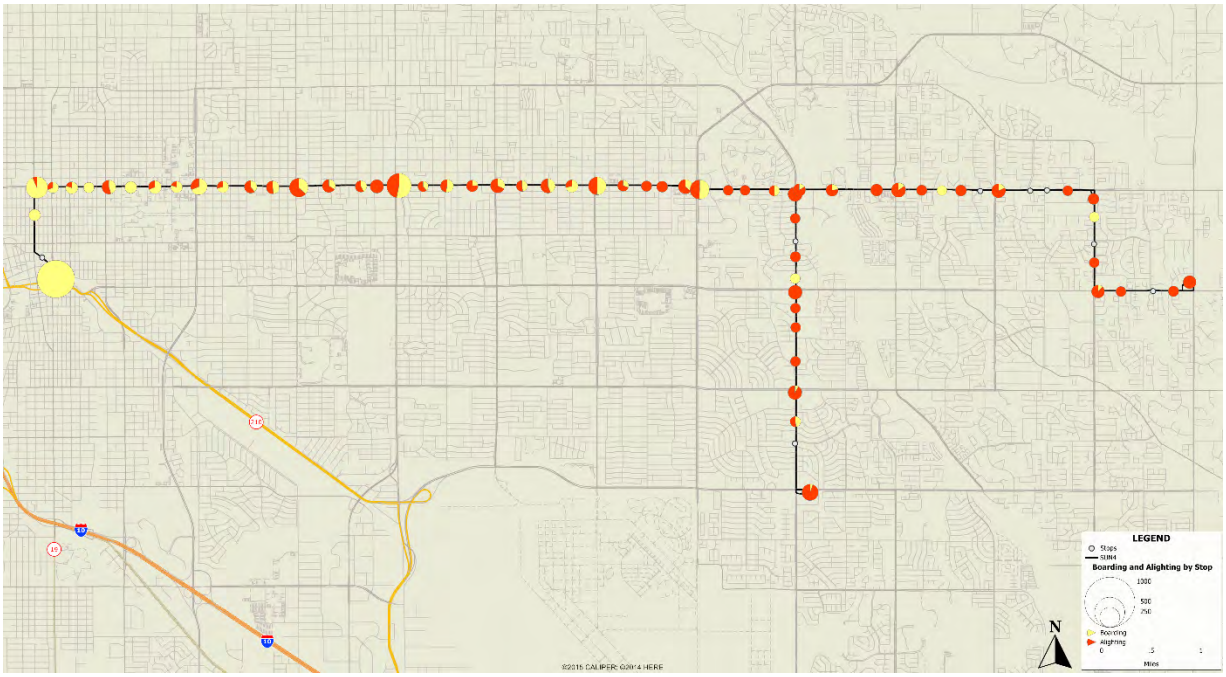
SUN2SB Boarding and Alighting Locations



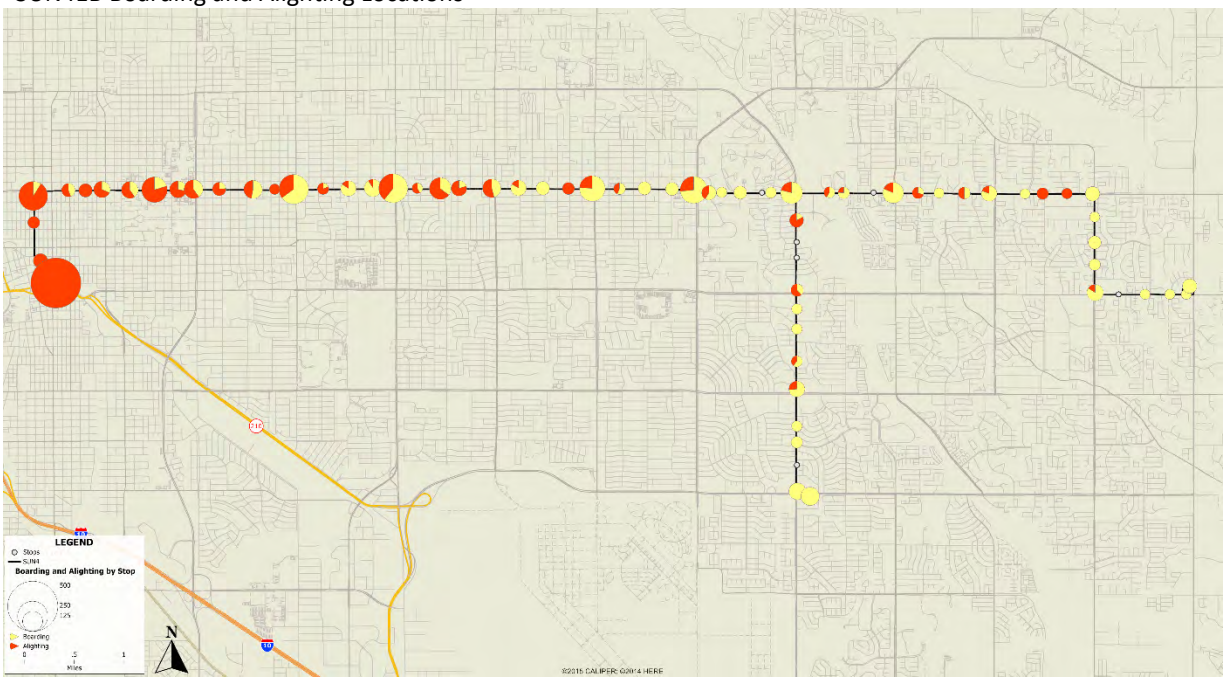
SUN3EB Boarding and Alighting Locations



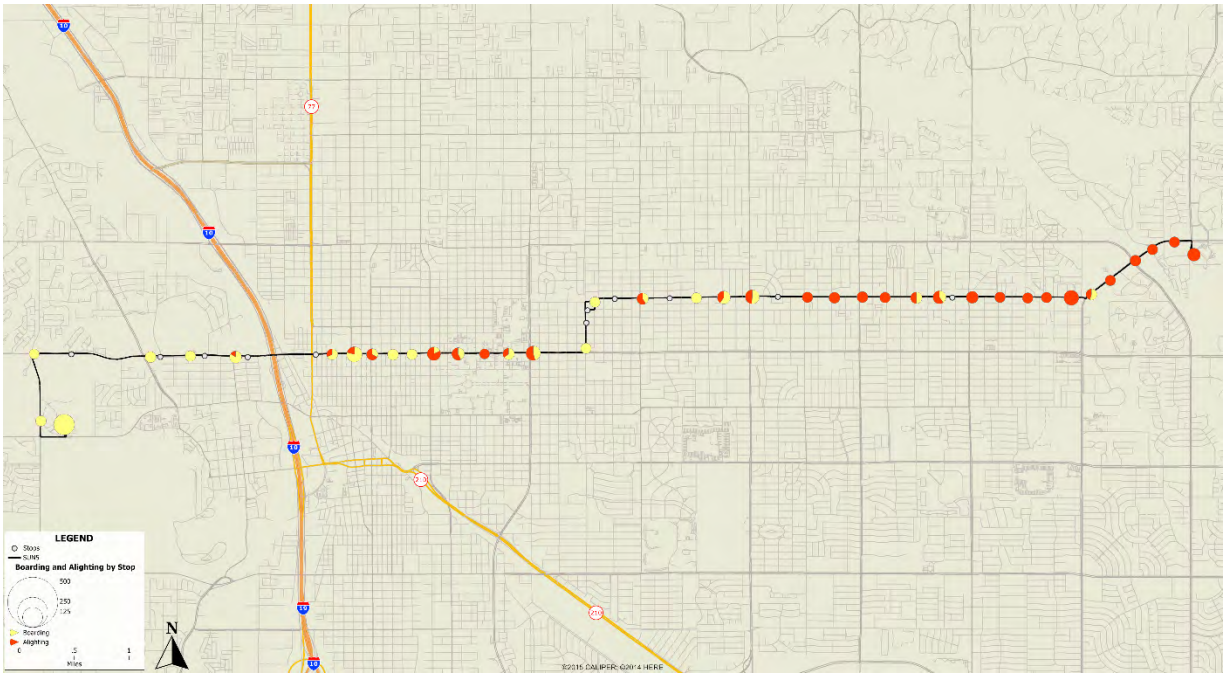
SUN3WB Boarding and Alighting Locations



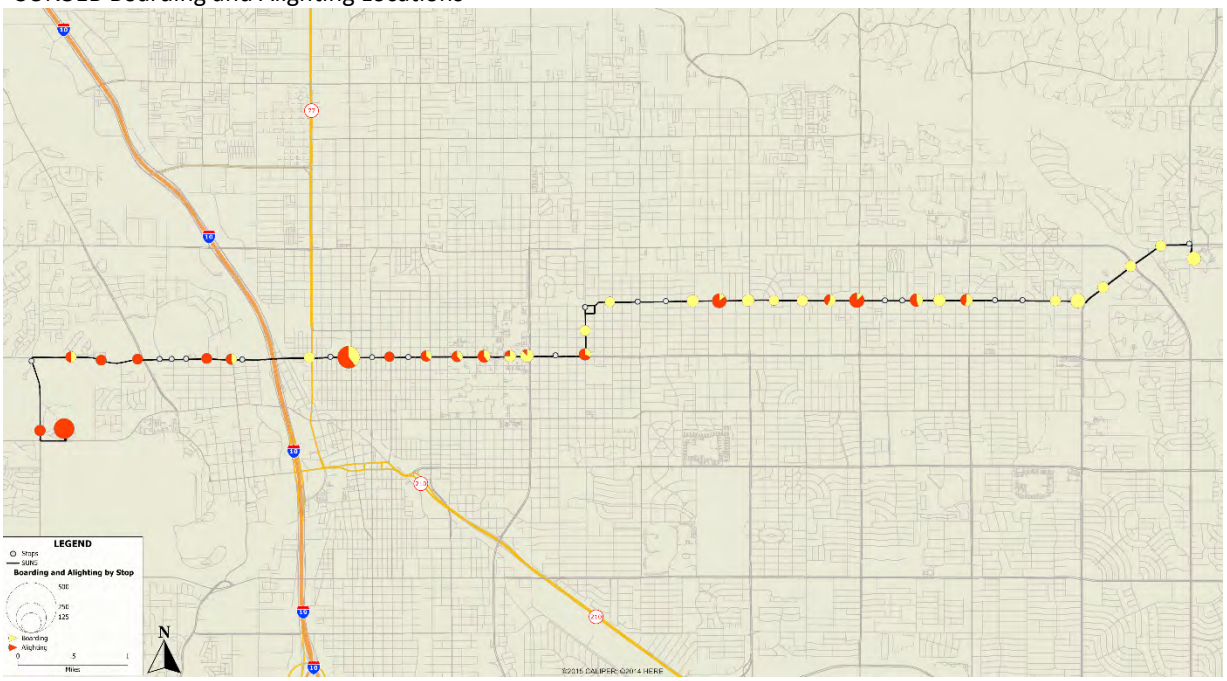
SUN4EB Boarding and Alighting Locations



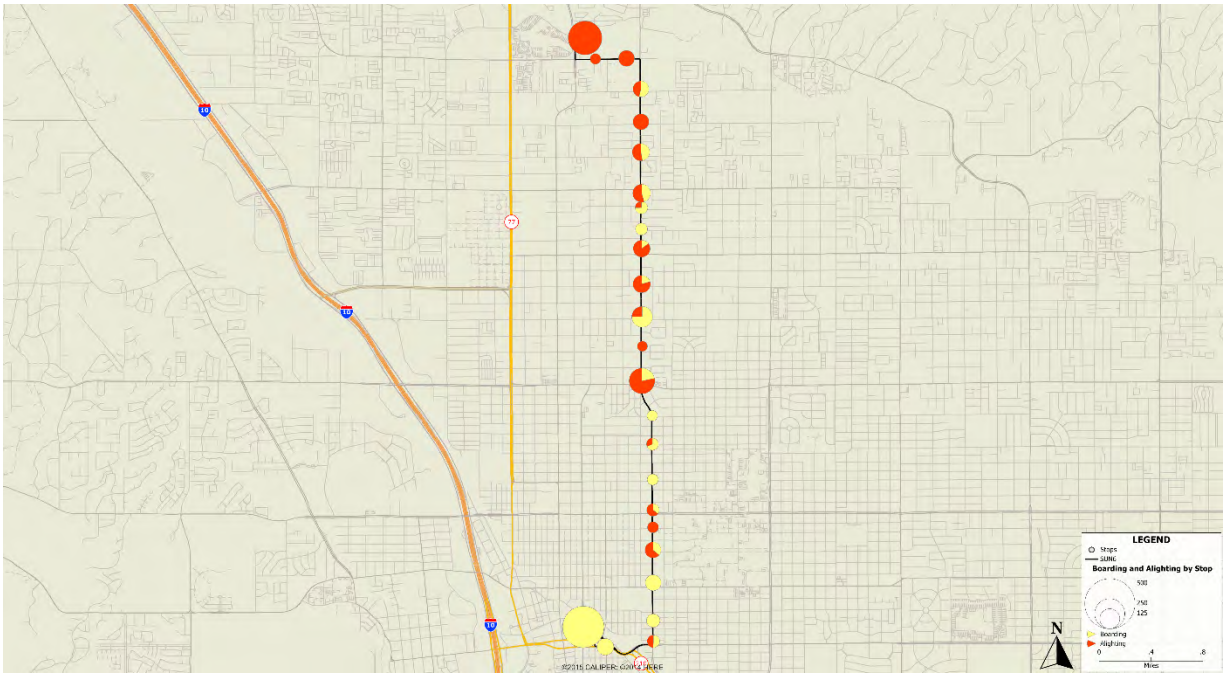
SUN4WB Boarding and Alighting Locations



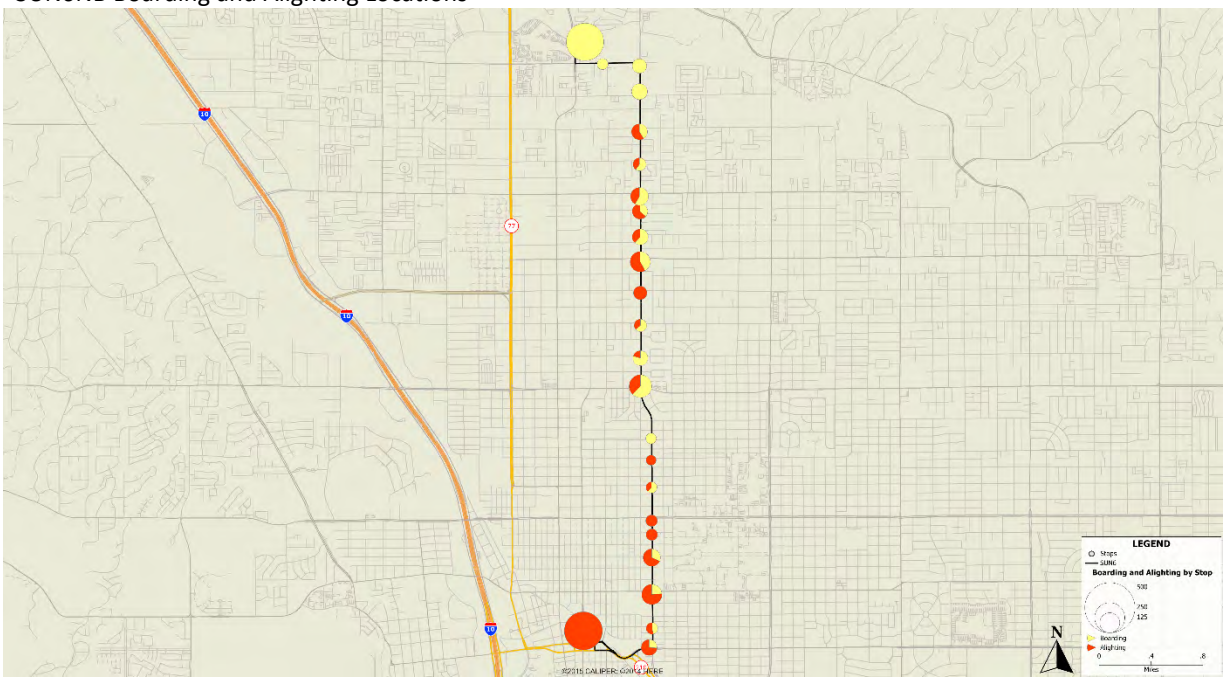
SUN5EB Boarding and Alighting Locations



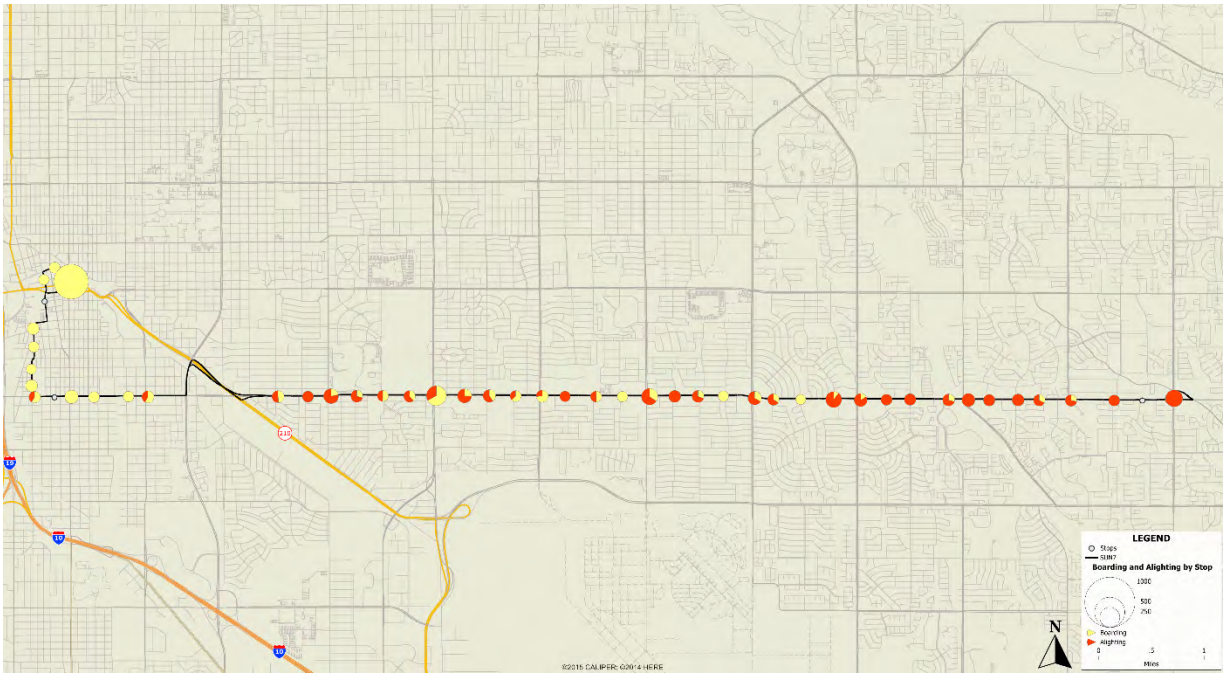
SUN5WB Boarding and Alighting Locations



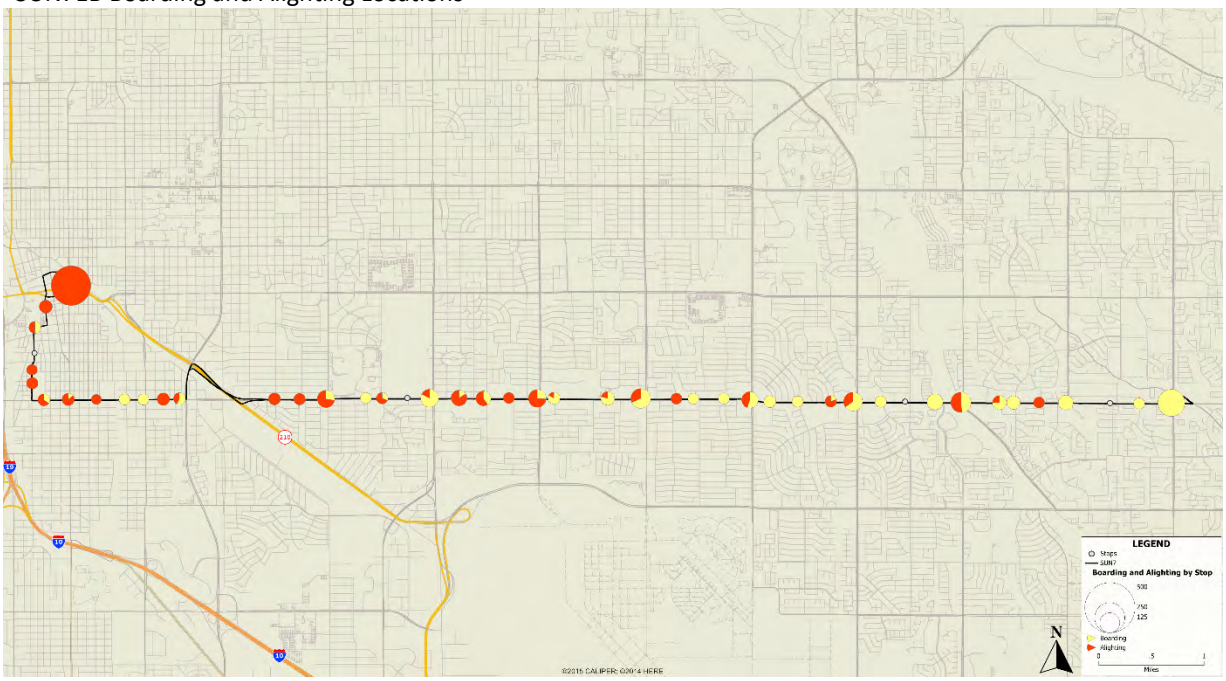
SUN6NB Boarding and Alighting Locations



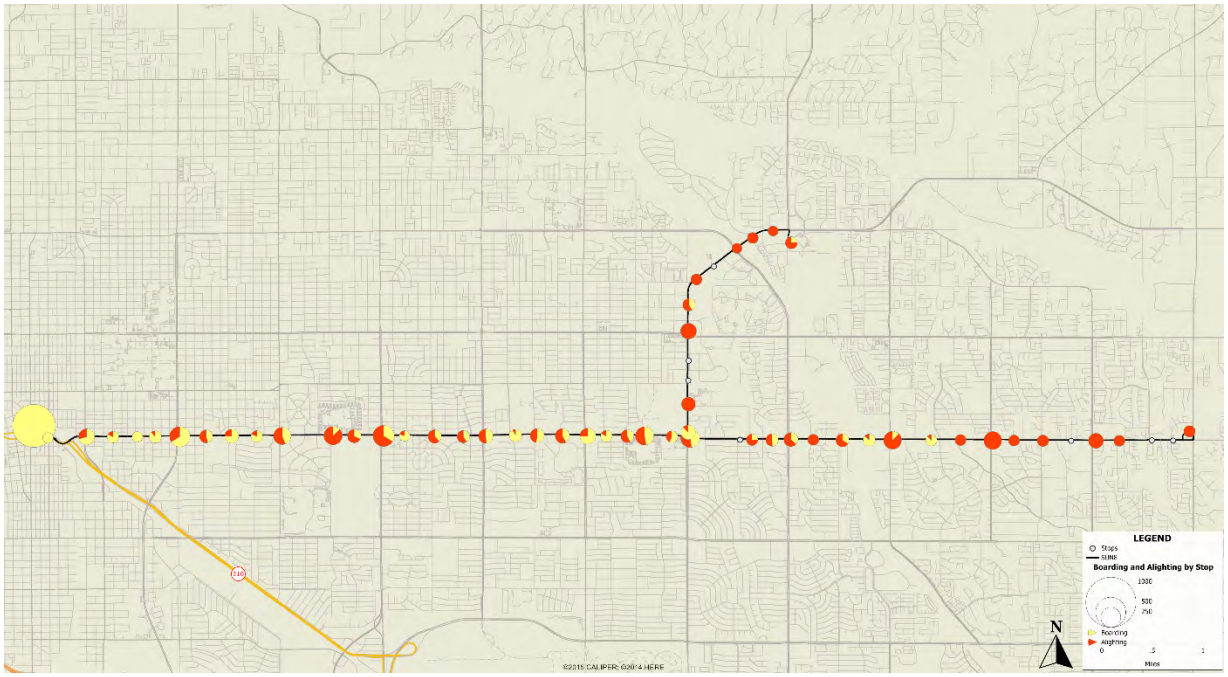
SUN6SB Boarding and Alighting Locations



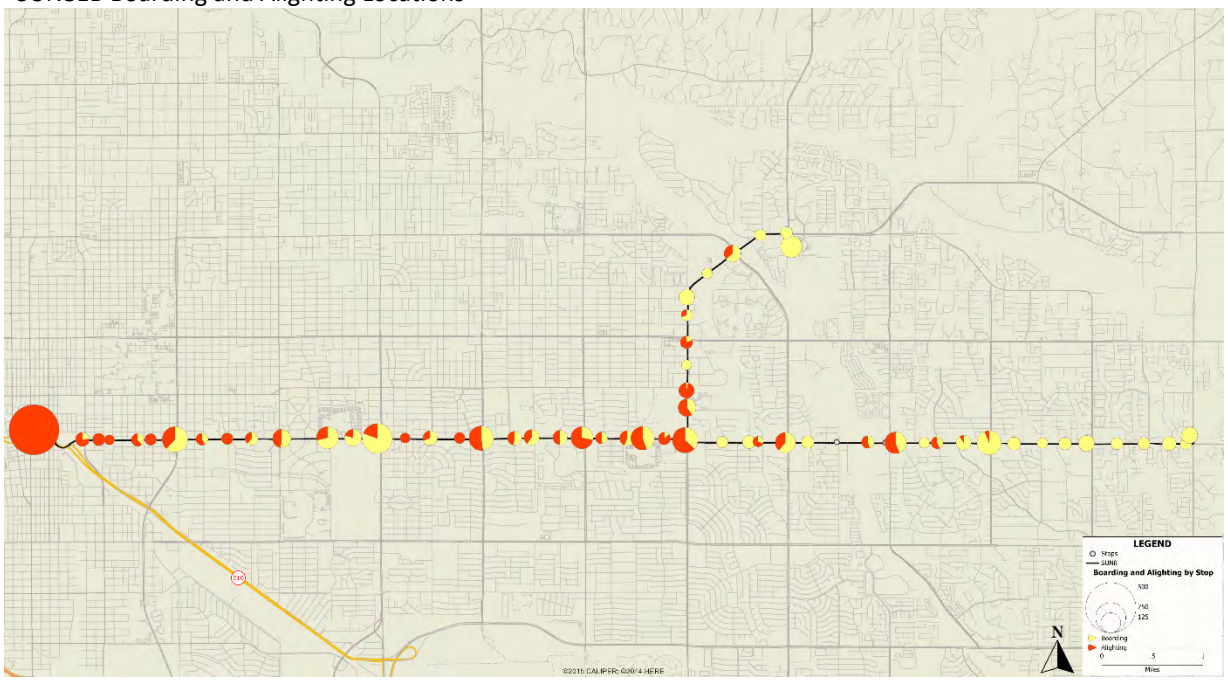
SUN7EB Boarding and Alighting Locations



SUN7WB Boarding and Alighting Locations

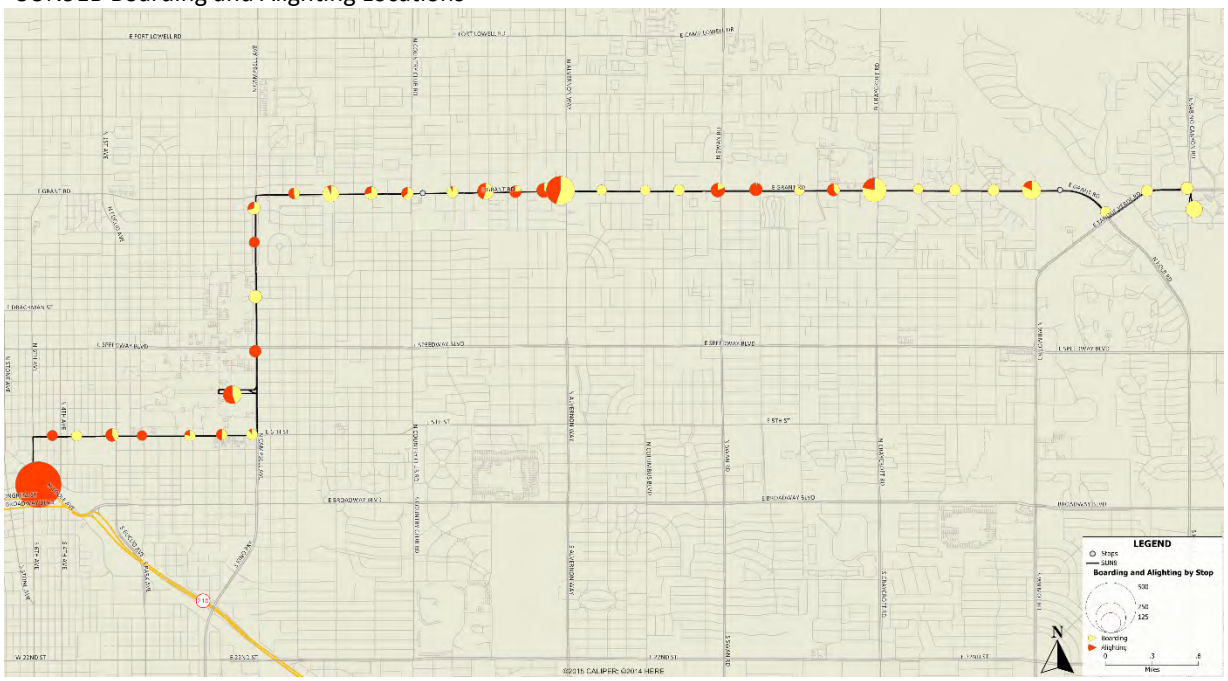


SUN8EB Boarding and Alighting Locations

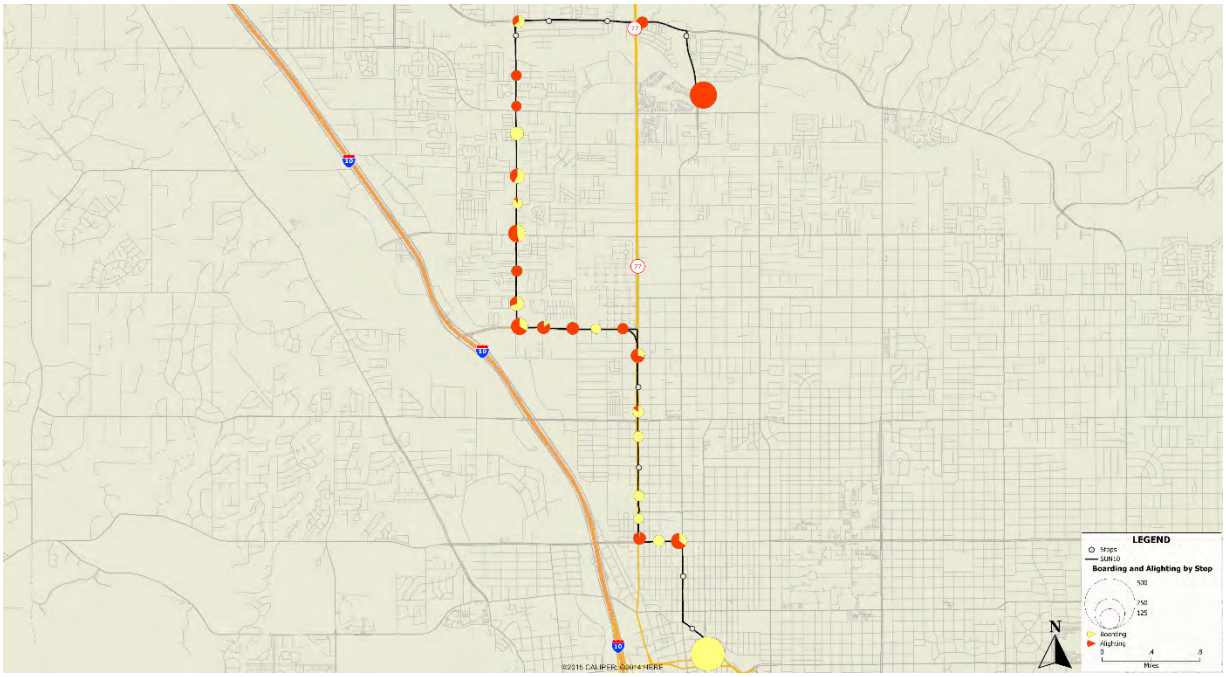


SUN8WB Boarding and Alighting Locations

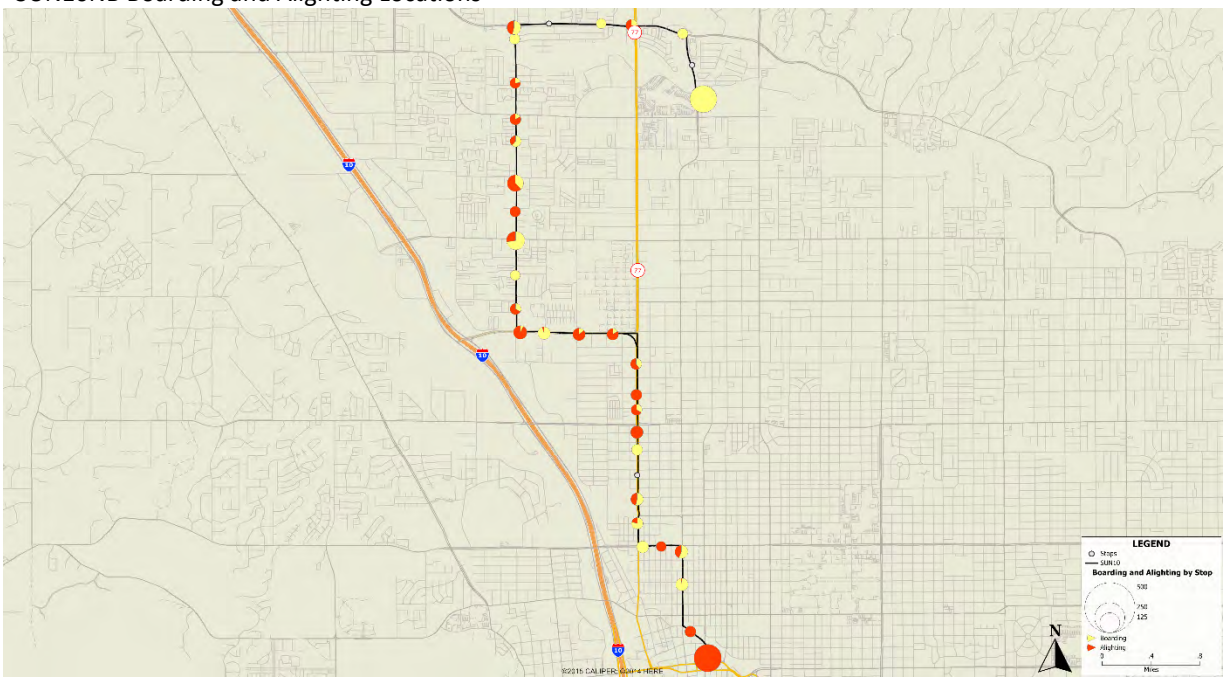
SUN9EB Boarding and Alighting Locations



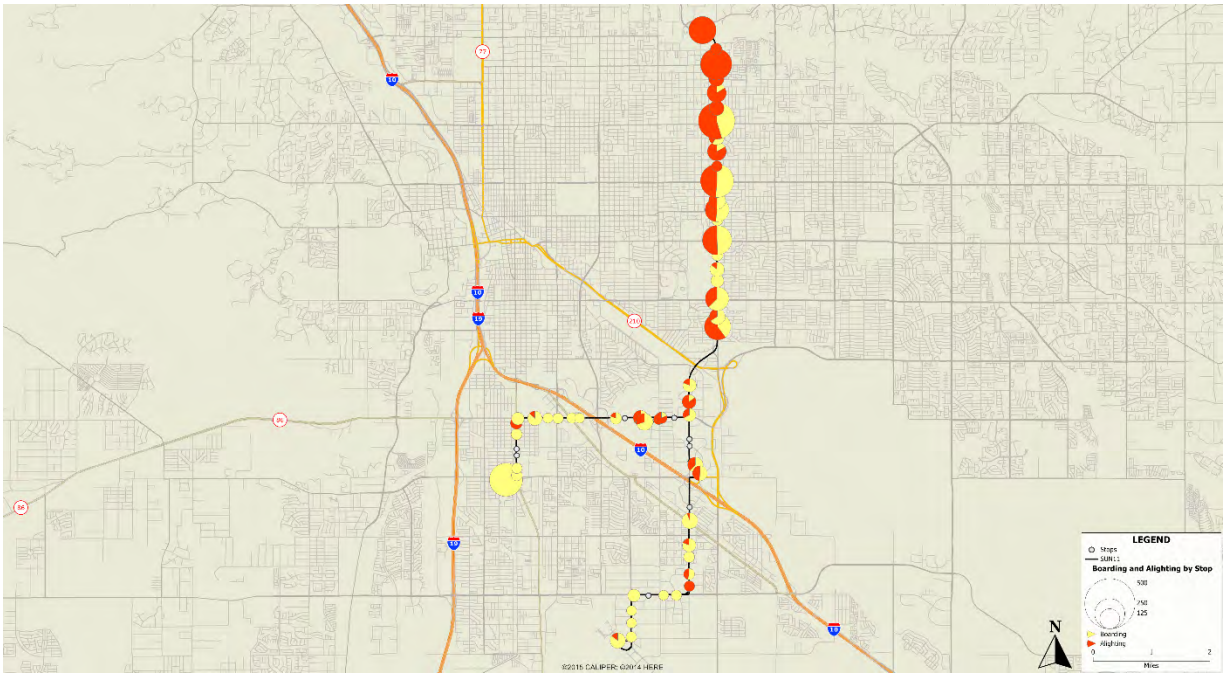
SUN9WB Boarding and Alighting Locations



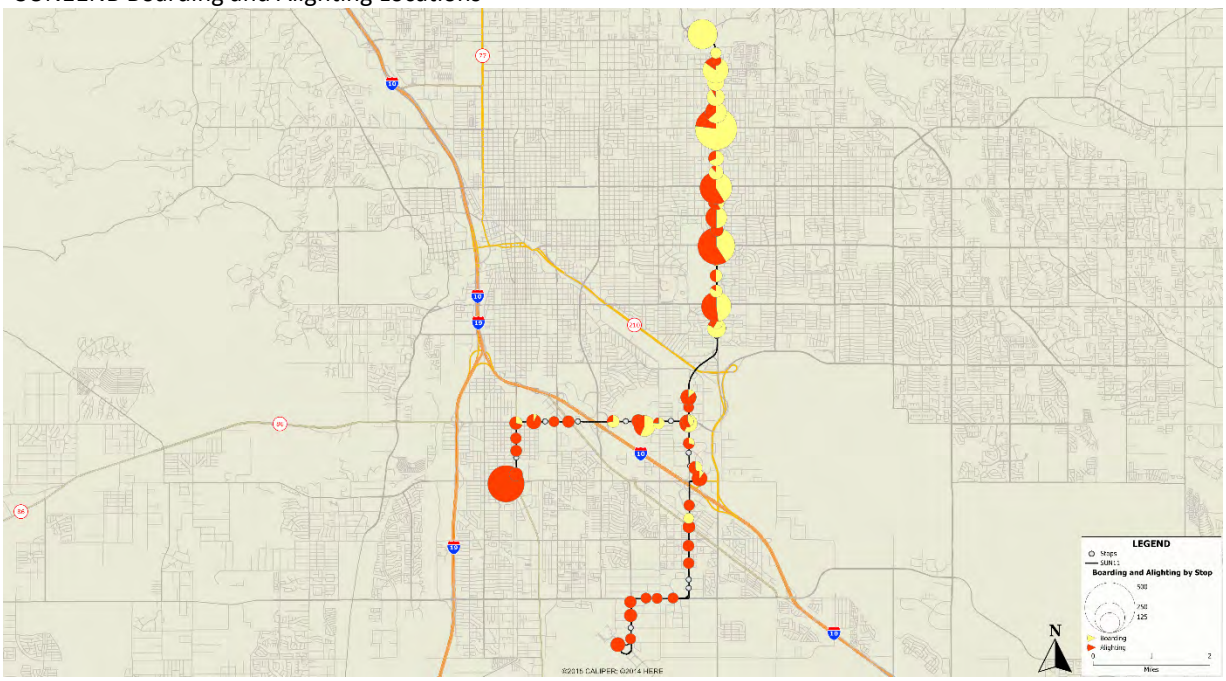
SUN10NB Boarding and Alighting Locations



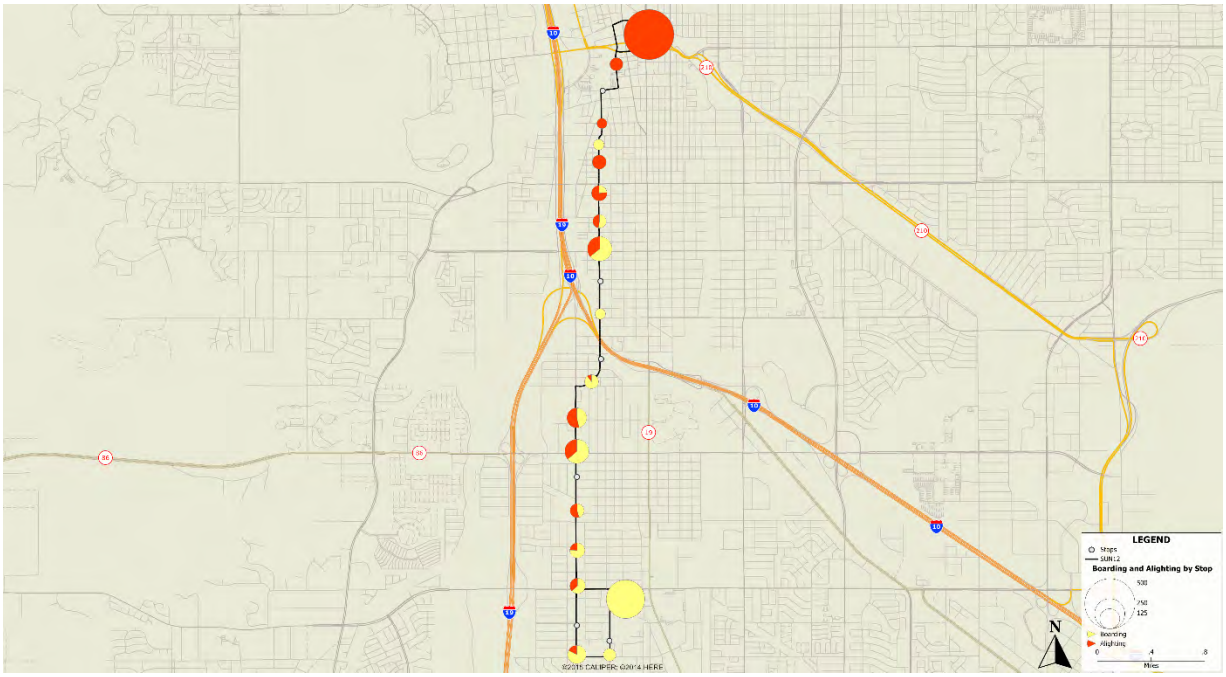
SUN10SB Boarding and Alighting Locations



SUN11NB Boarding and Alighting Locations



SUN11SB Boarding and Alighting Locations



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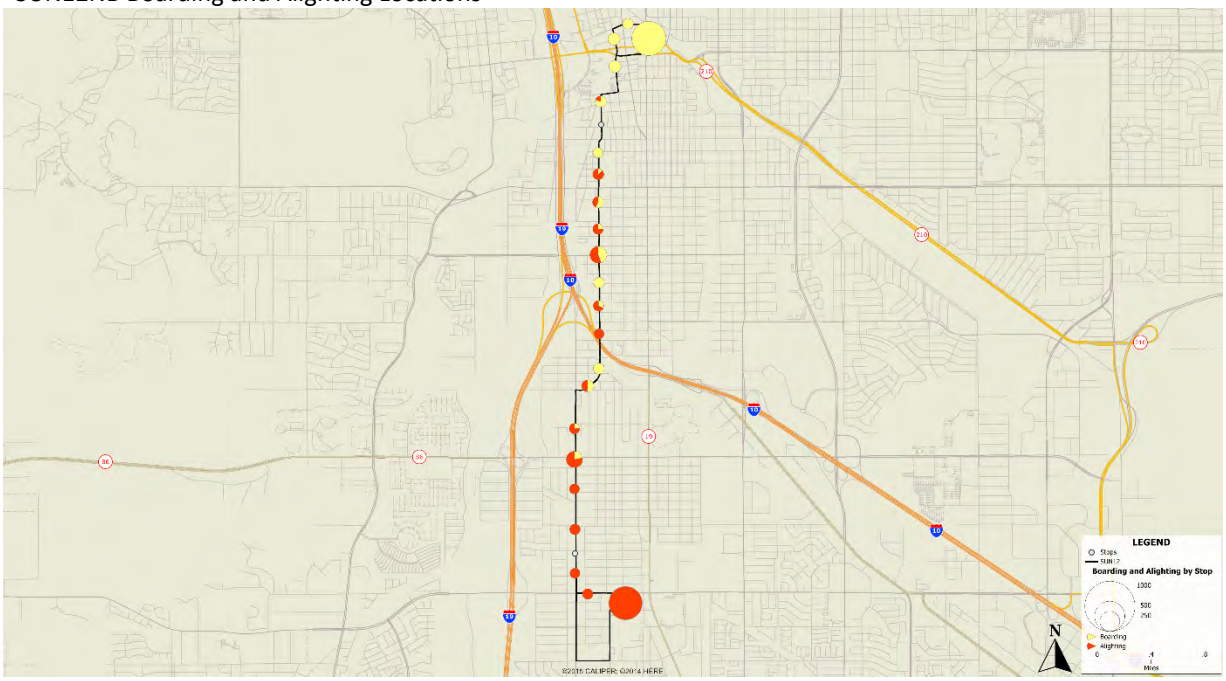
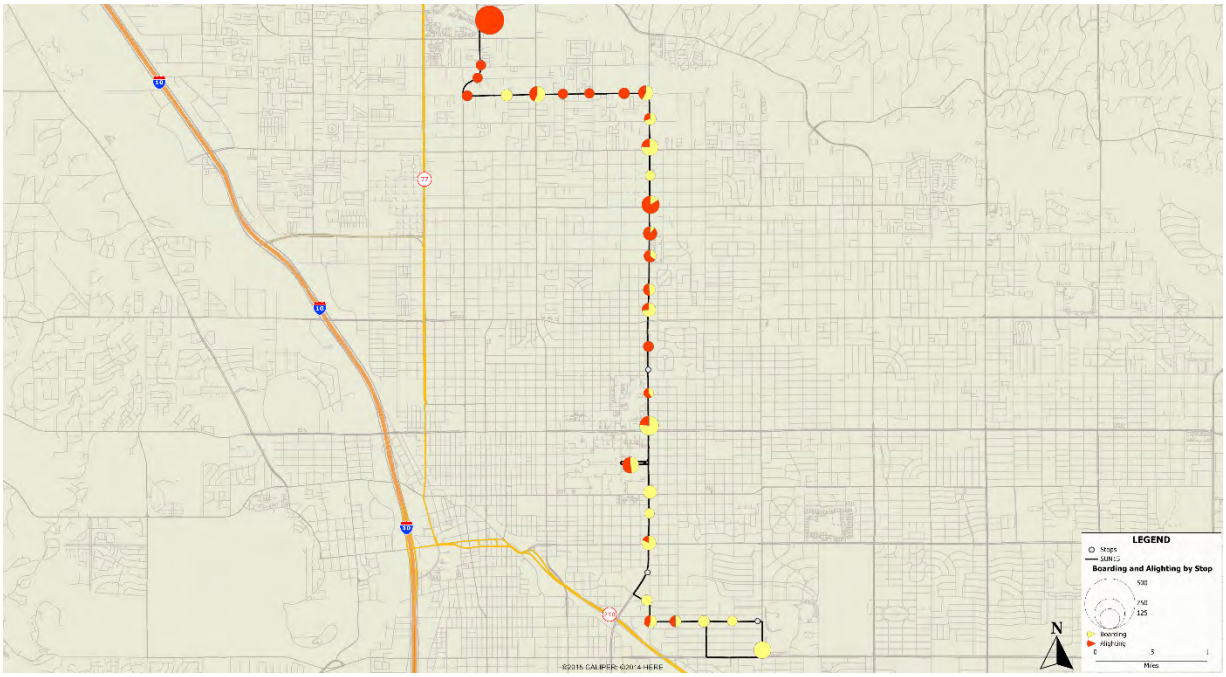


SUN12SB Boarding and Alighting Locations



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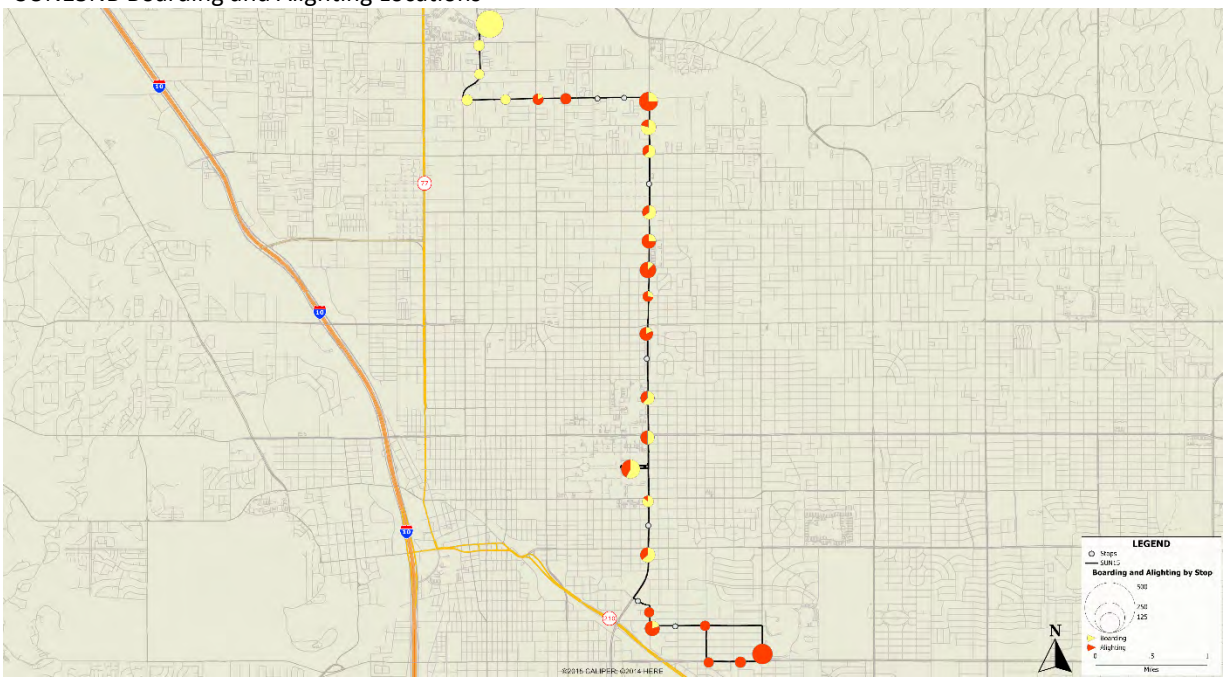
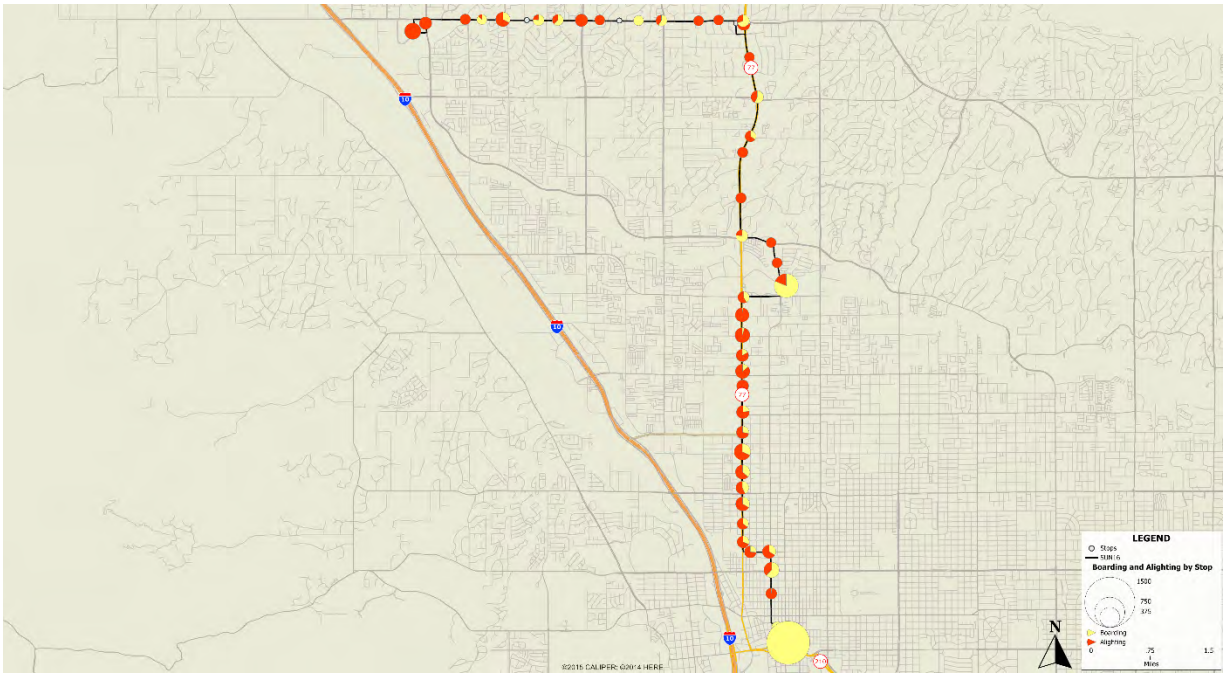
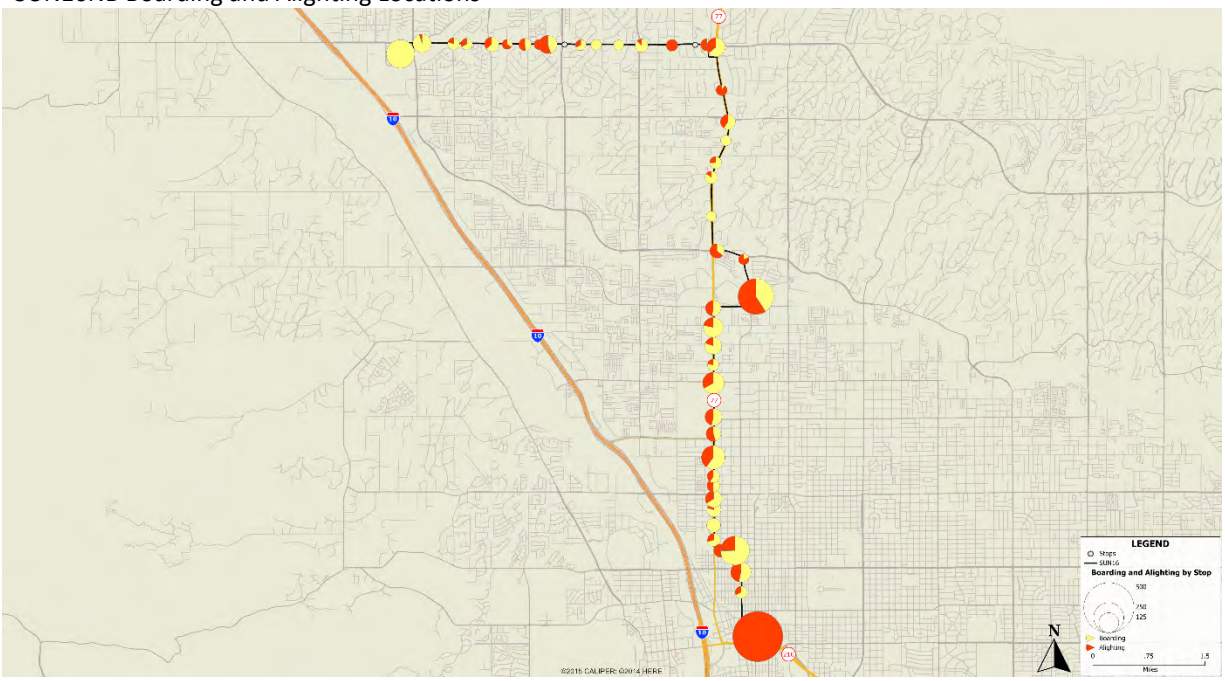


SUN15SB Boarding and Alighting Locations



SUN16NB Boarding and Alighting Locations



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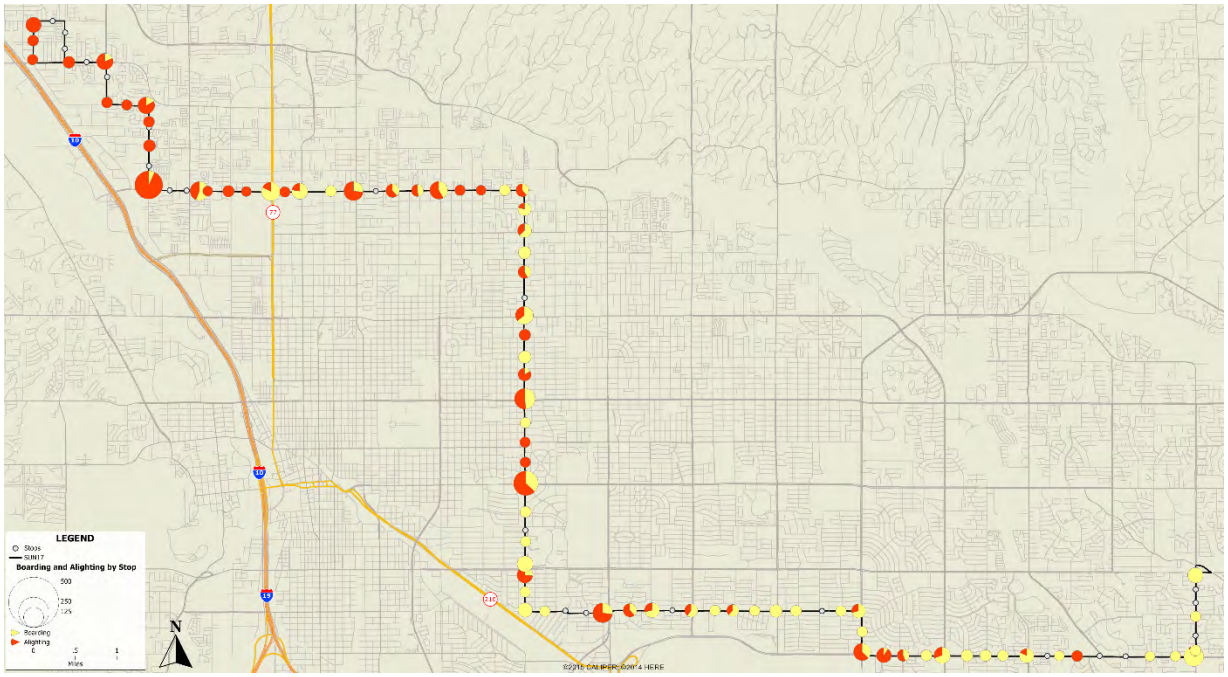

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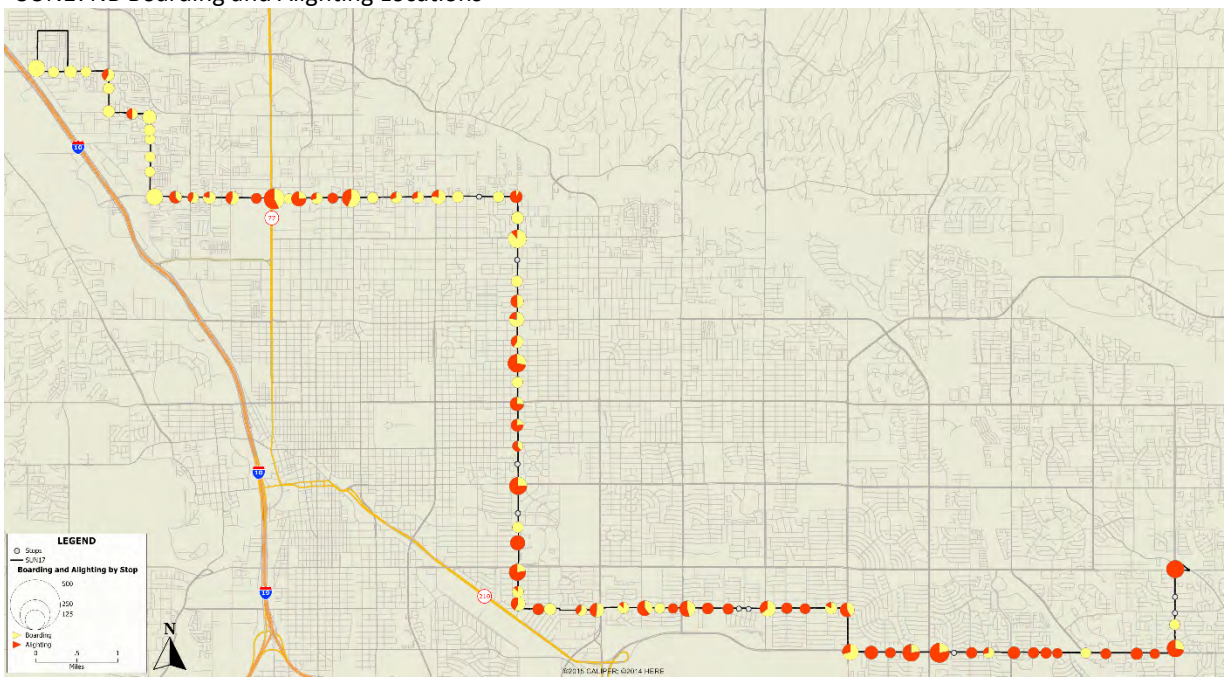

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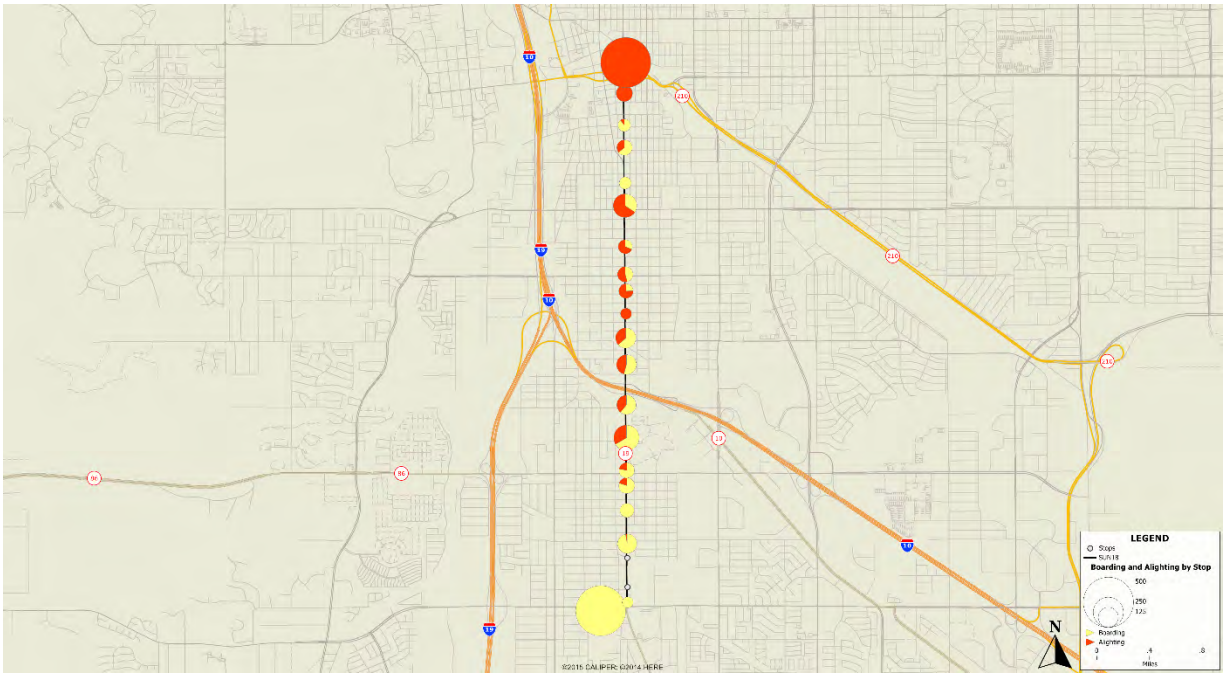

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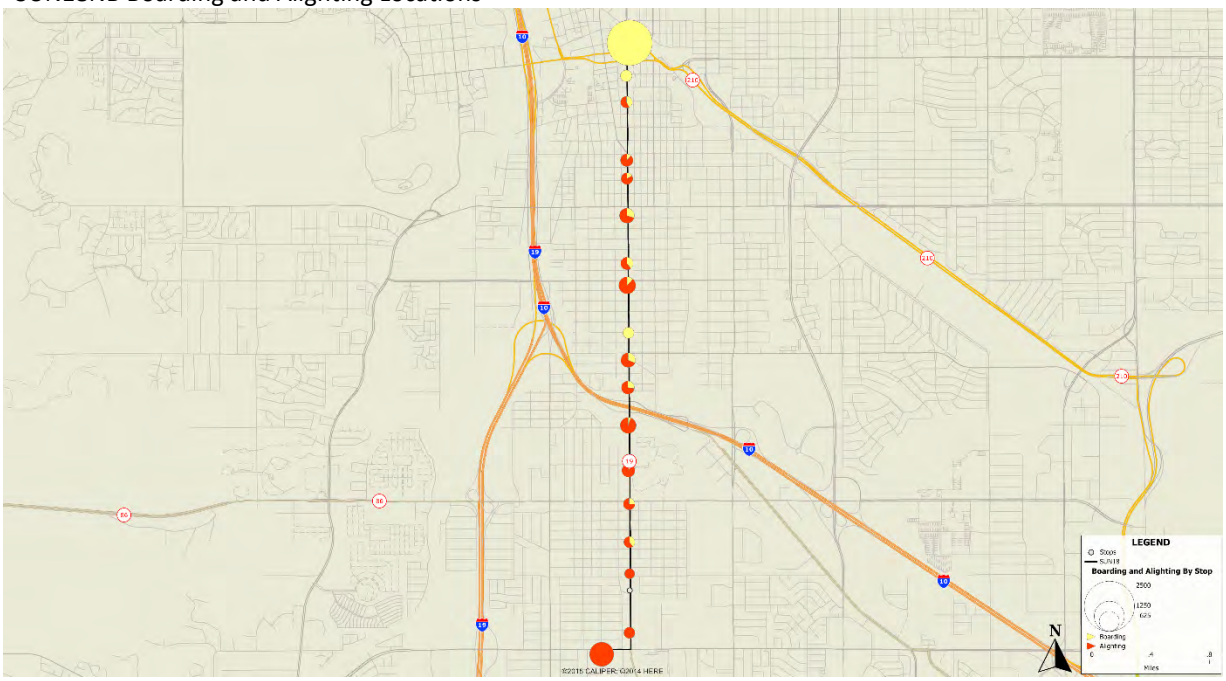
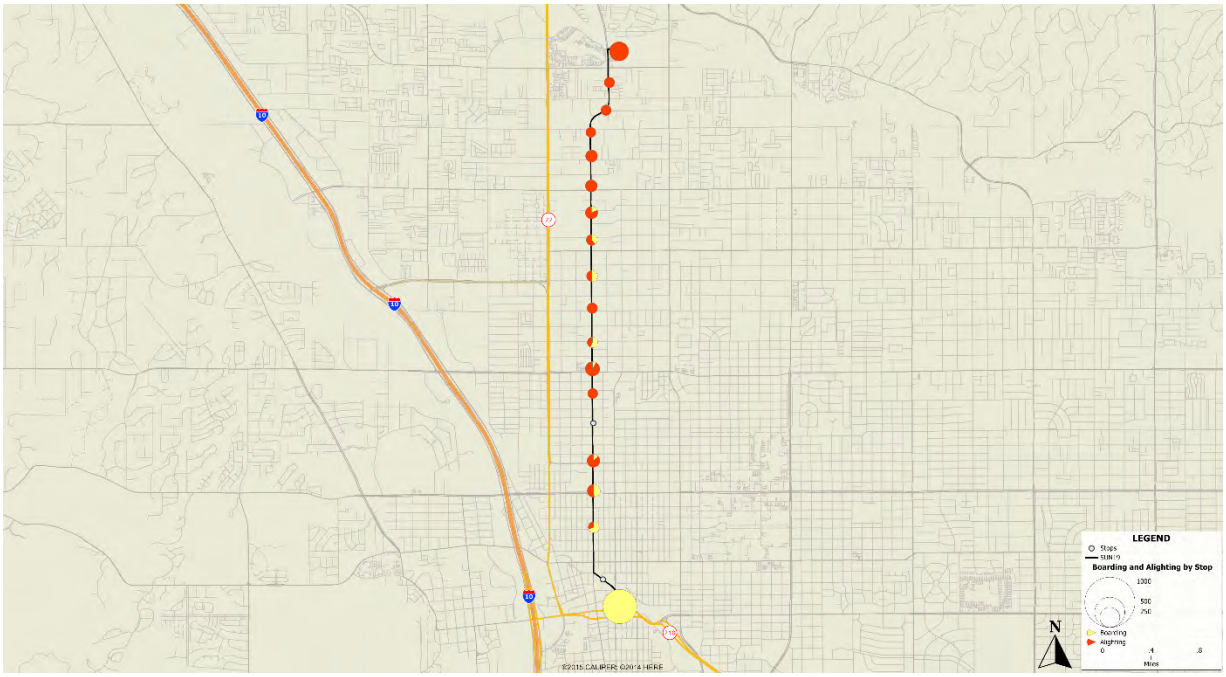
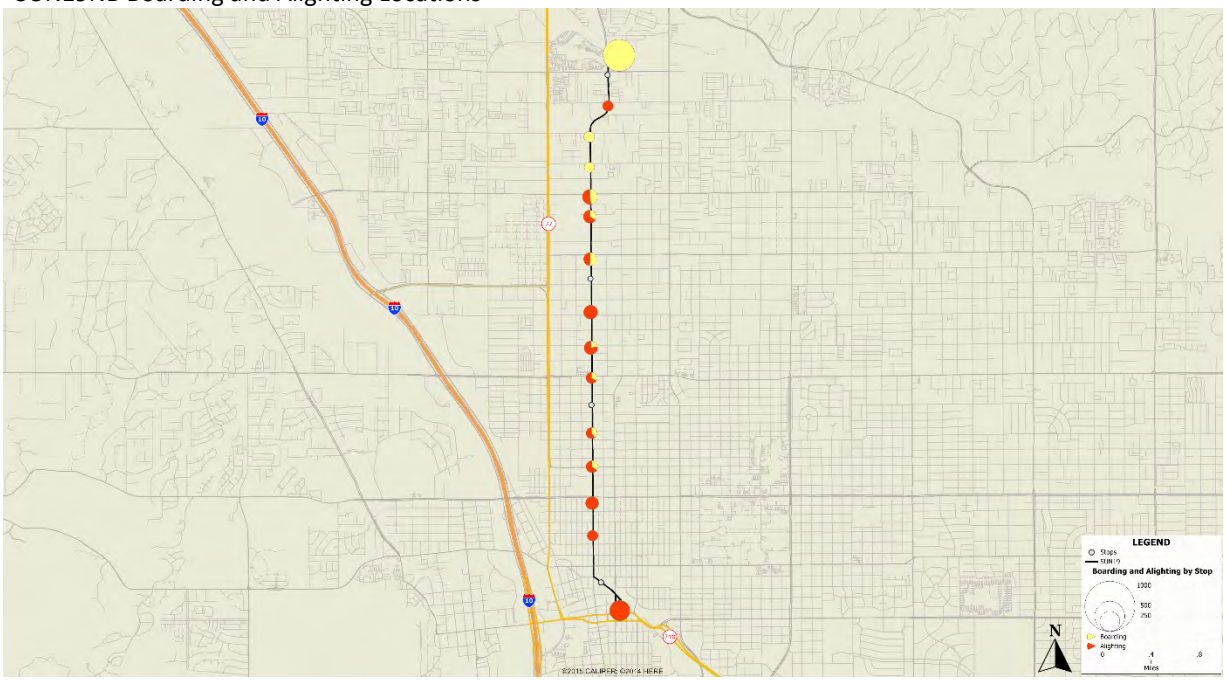


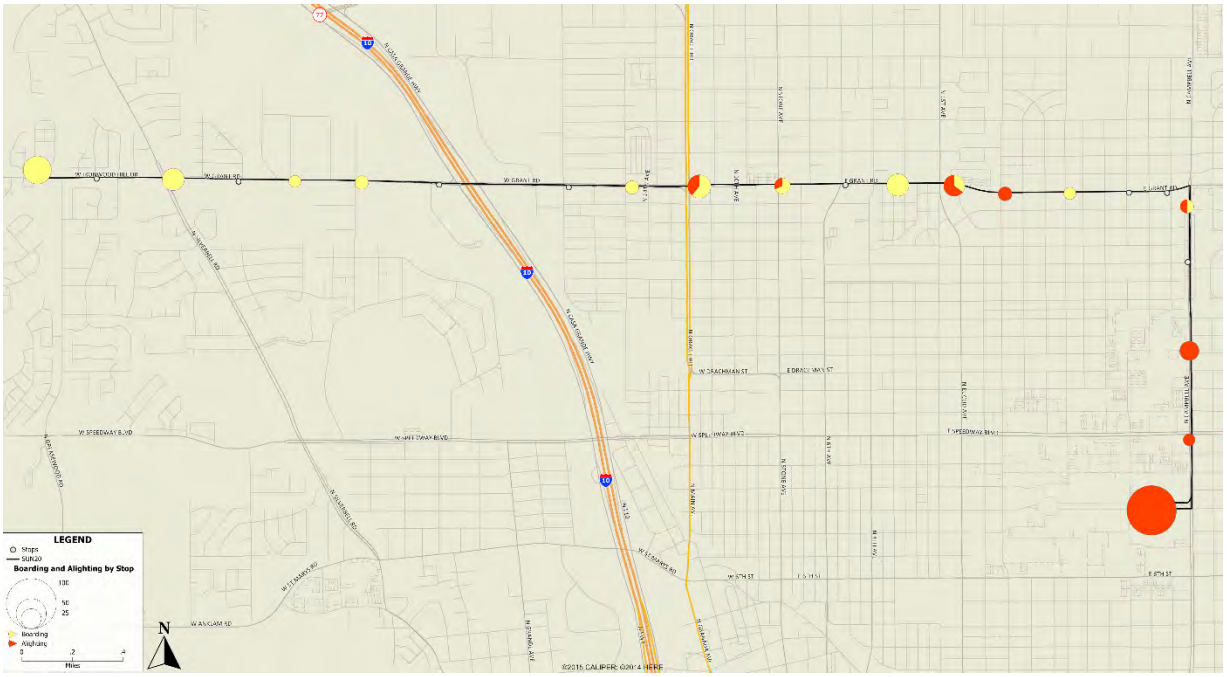
SUN18SB Boarding and Alighting Locations



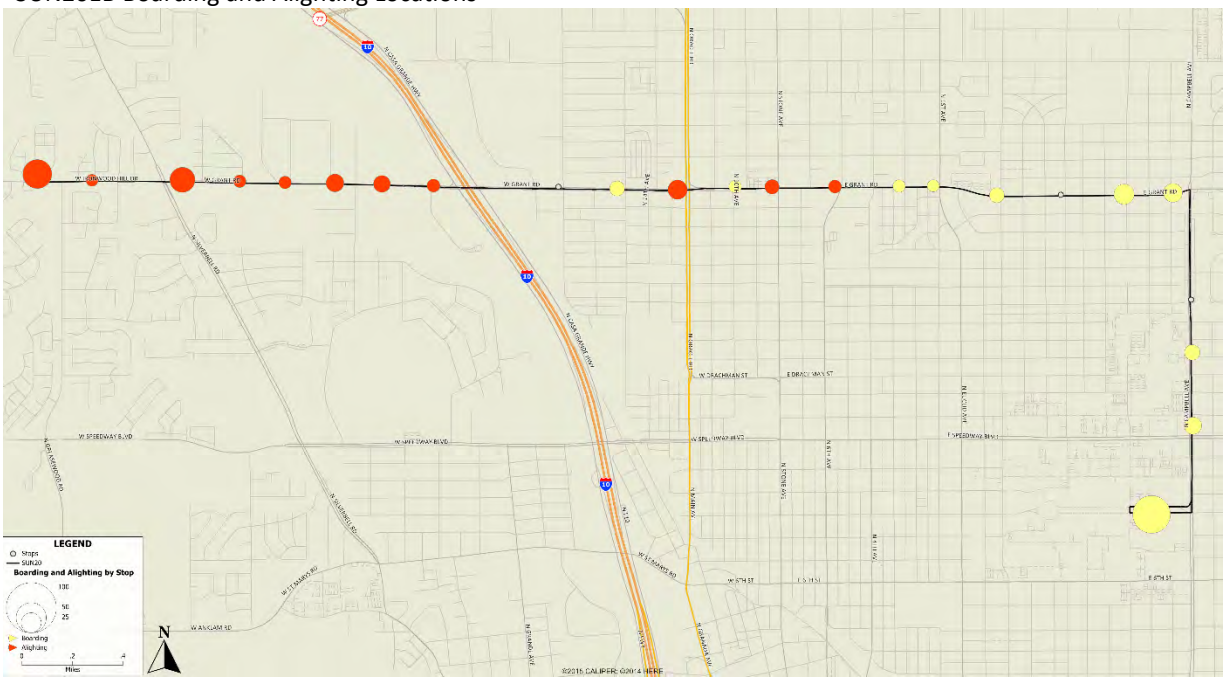
SUN19NB Boarding and Alighting Locations



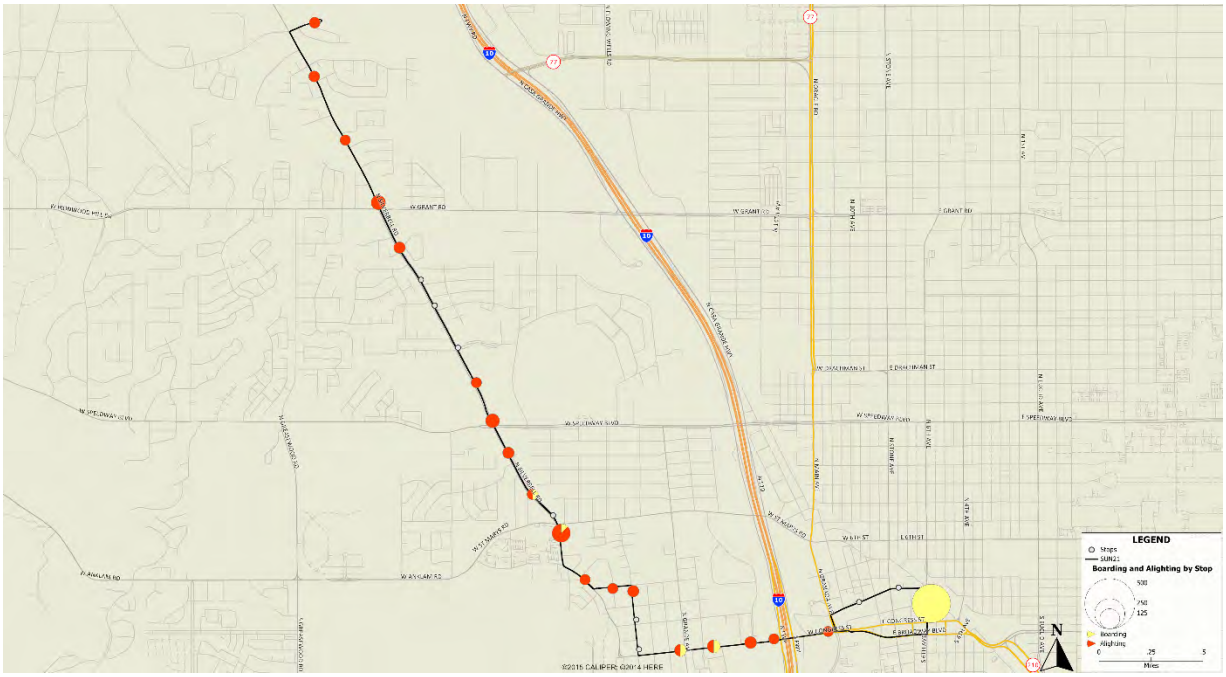
SUN19SB Boarding and Alighting Locations



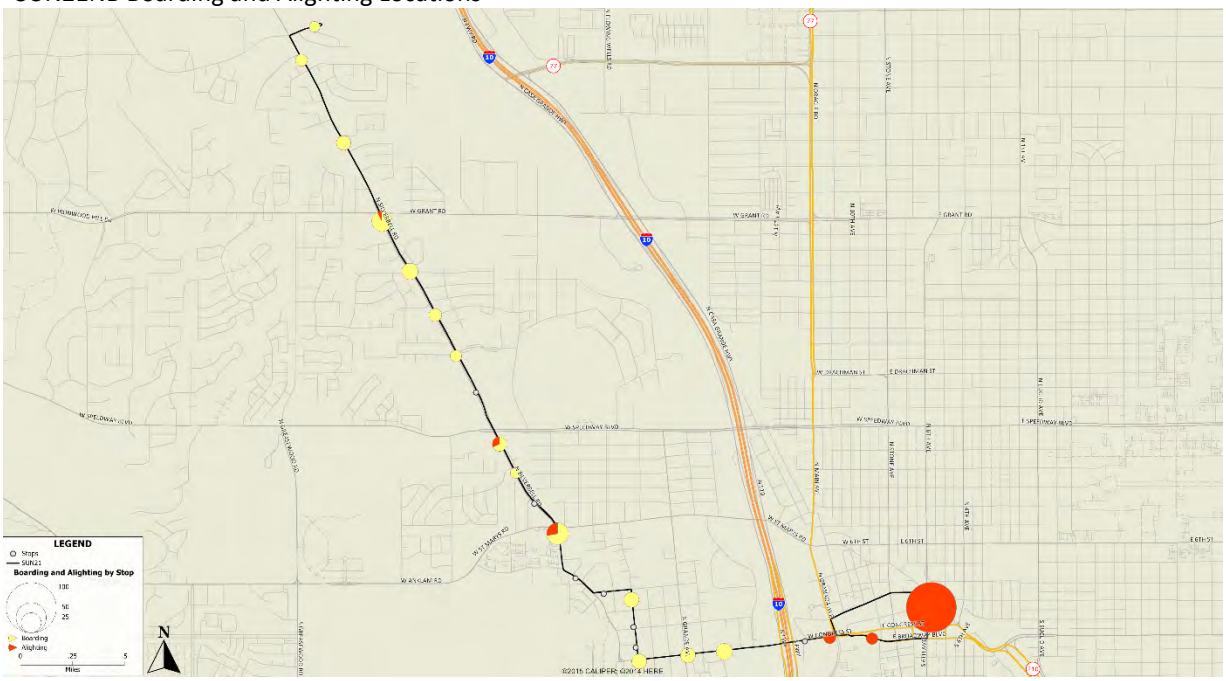
SUN20EB Boarding and Alighting Locations



SUN20WB Boarding and Alighting Locations

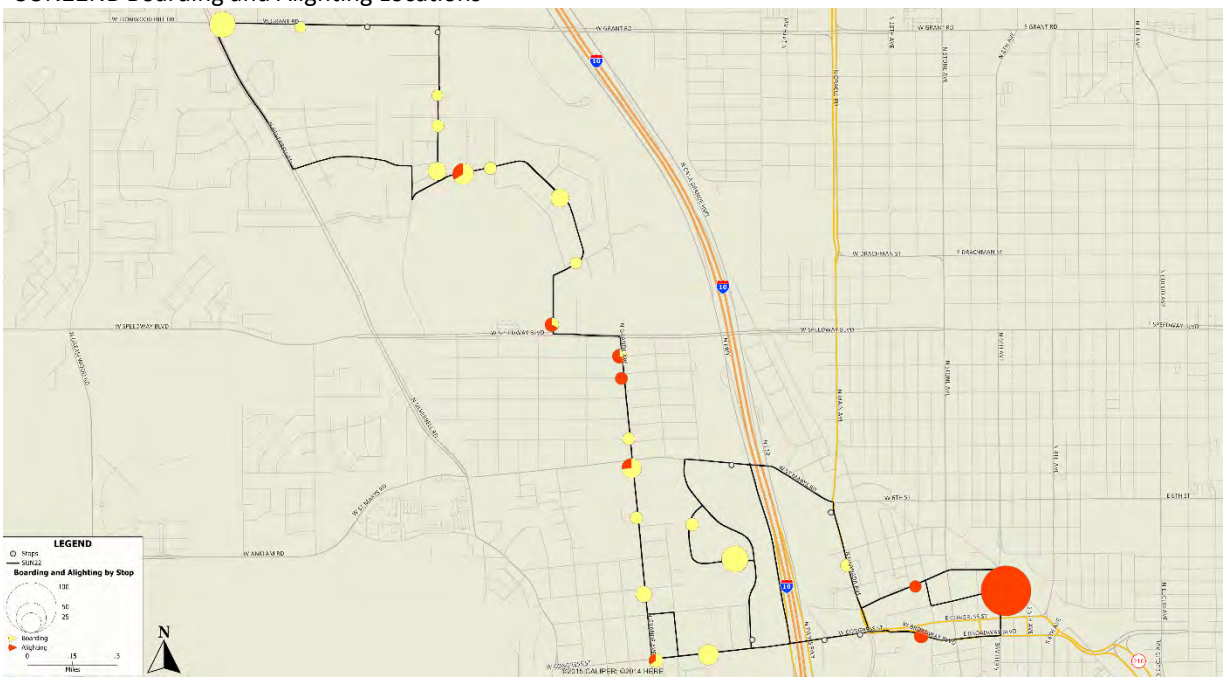


SUN21NB Boarding and Alighting Locations



SUN21SB Boarding and Alighting Locations

SUN22NB Boarding and Alighting Locations



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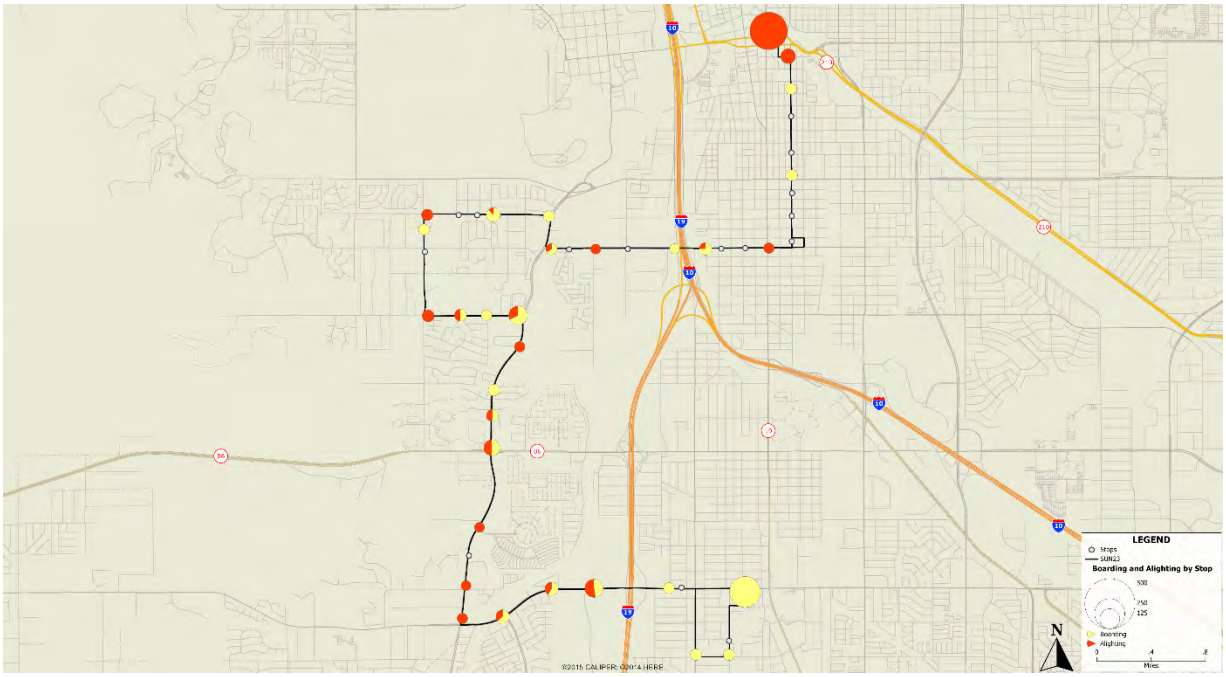
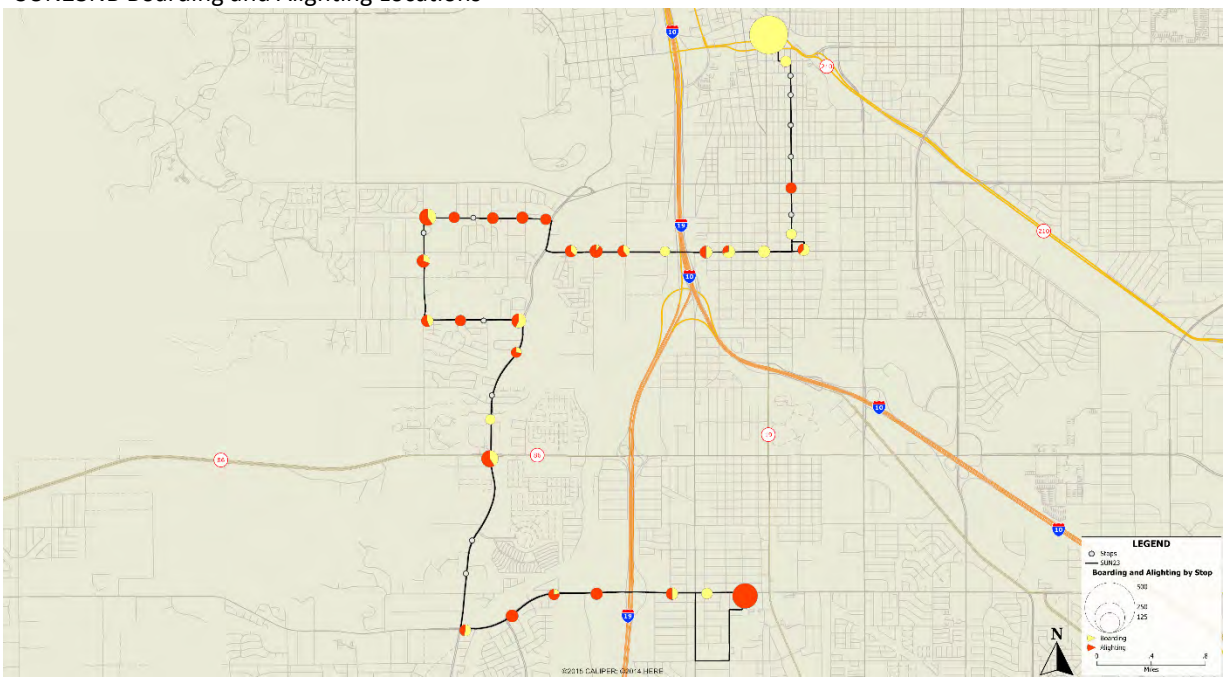
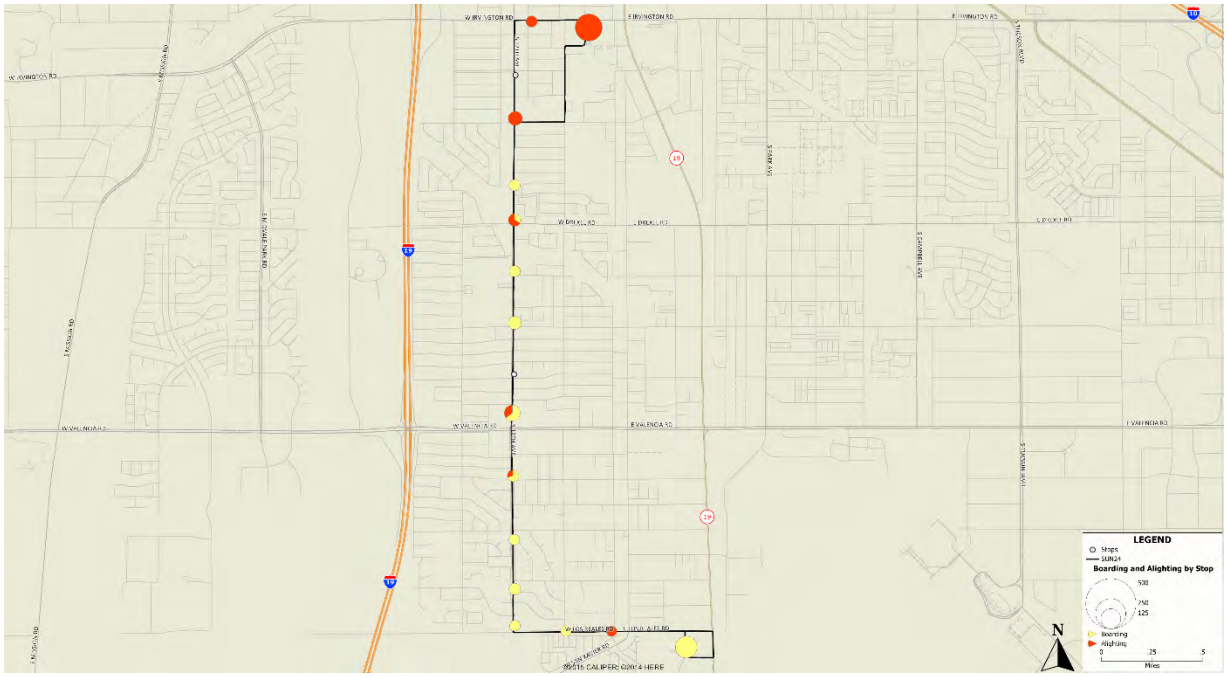


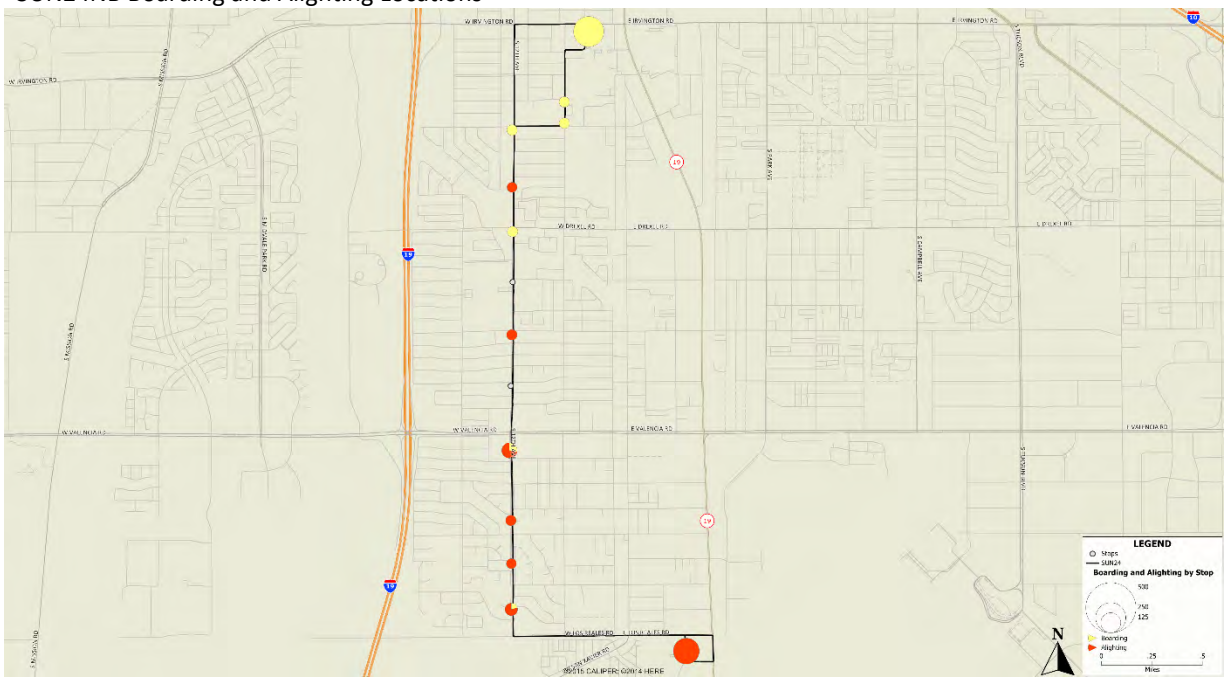
SUN23NB Boarding and Alighting Locations



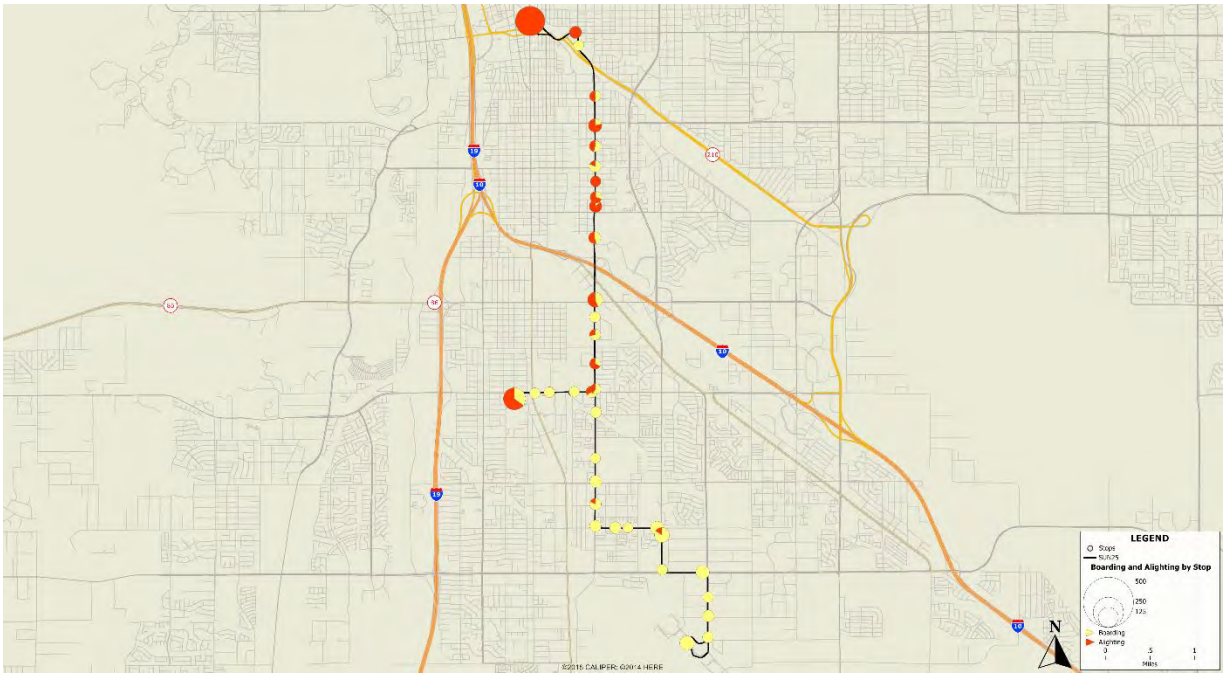
SUN23SB Boarding and Alighting Locations



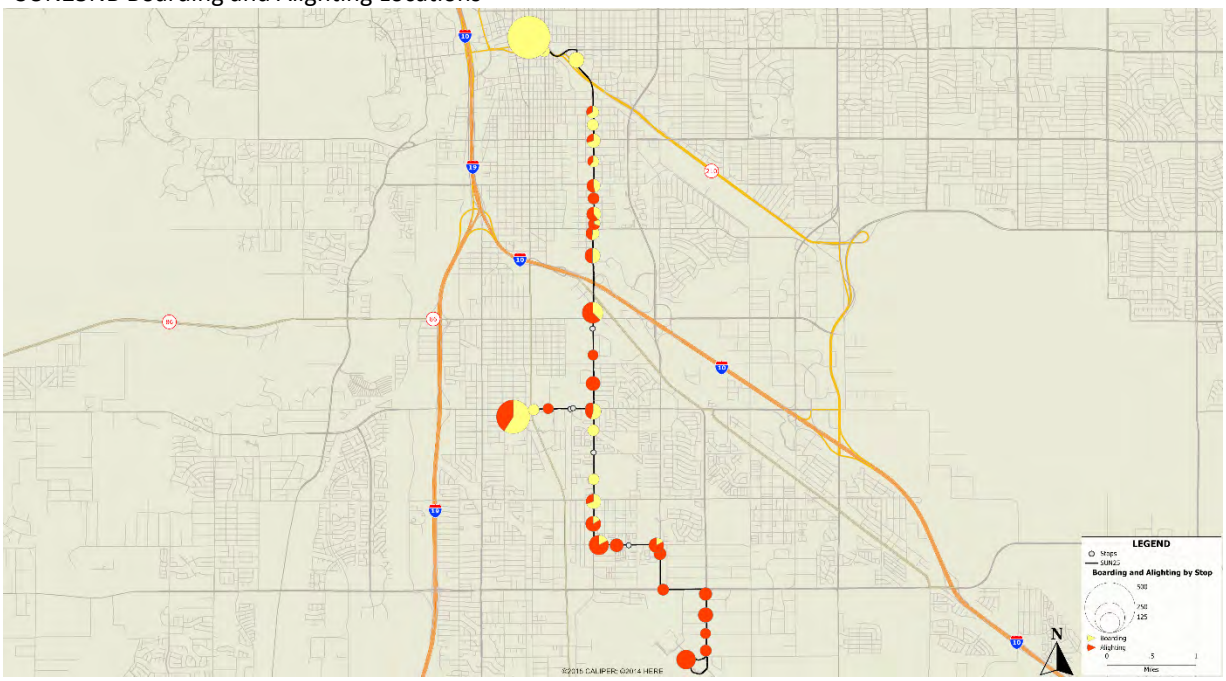
SUN24NB Boarding and Alighting Locations



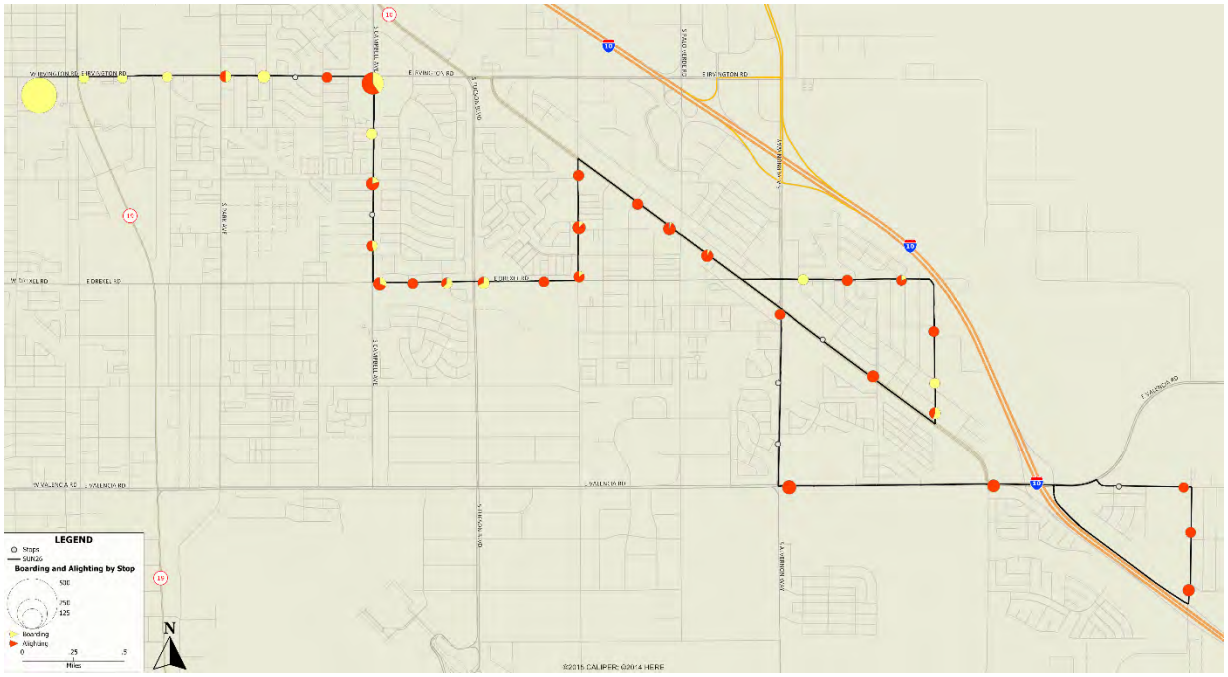
SUN24SB Boarding and Alighting Locations



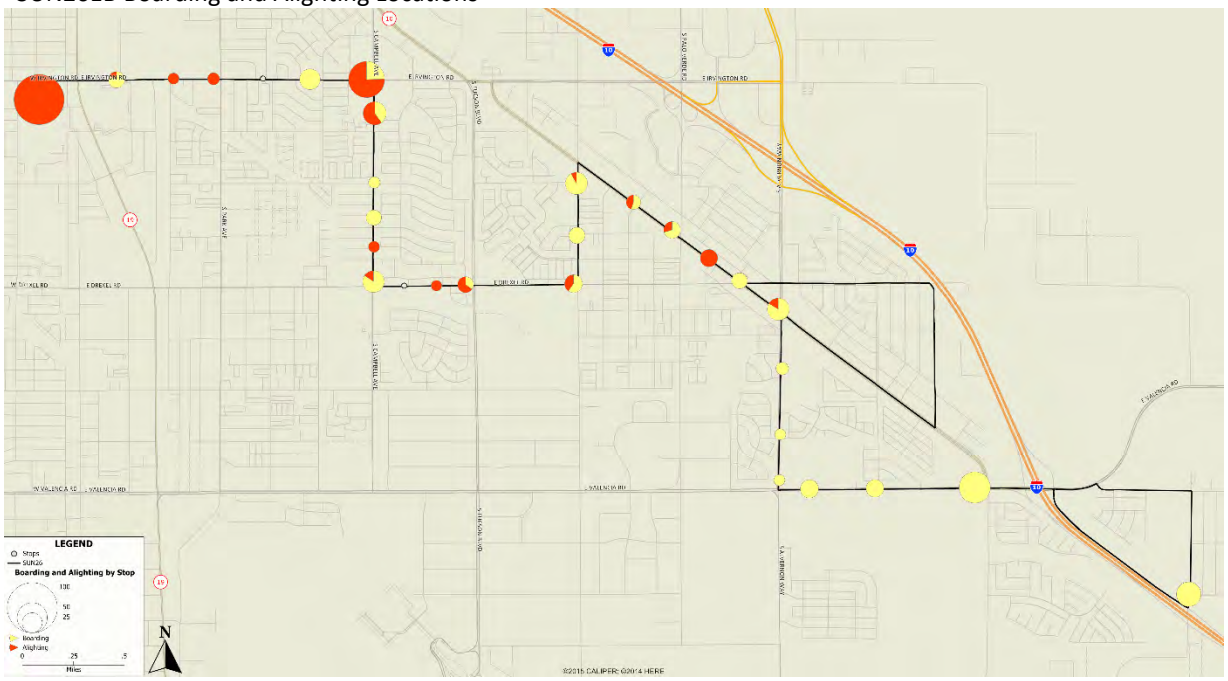
SUN25NB Boarding and Alighting Locations



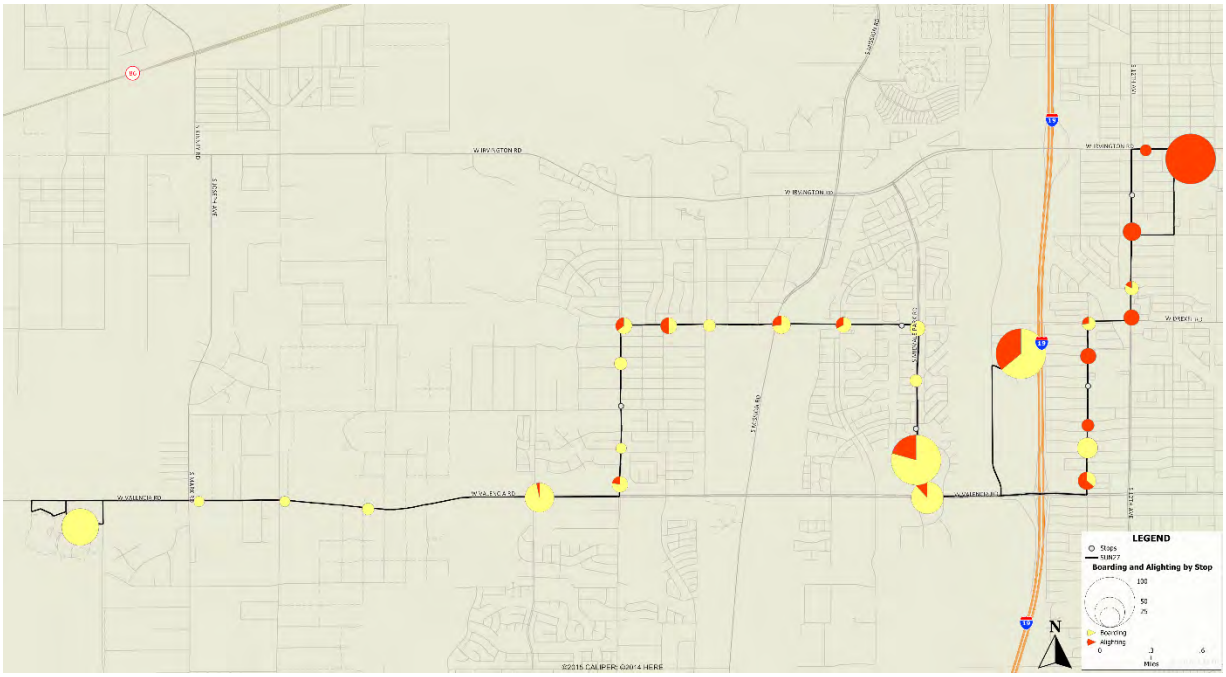
SUN25SB Boarding and Alighting Locations



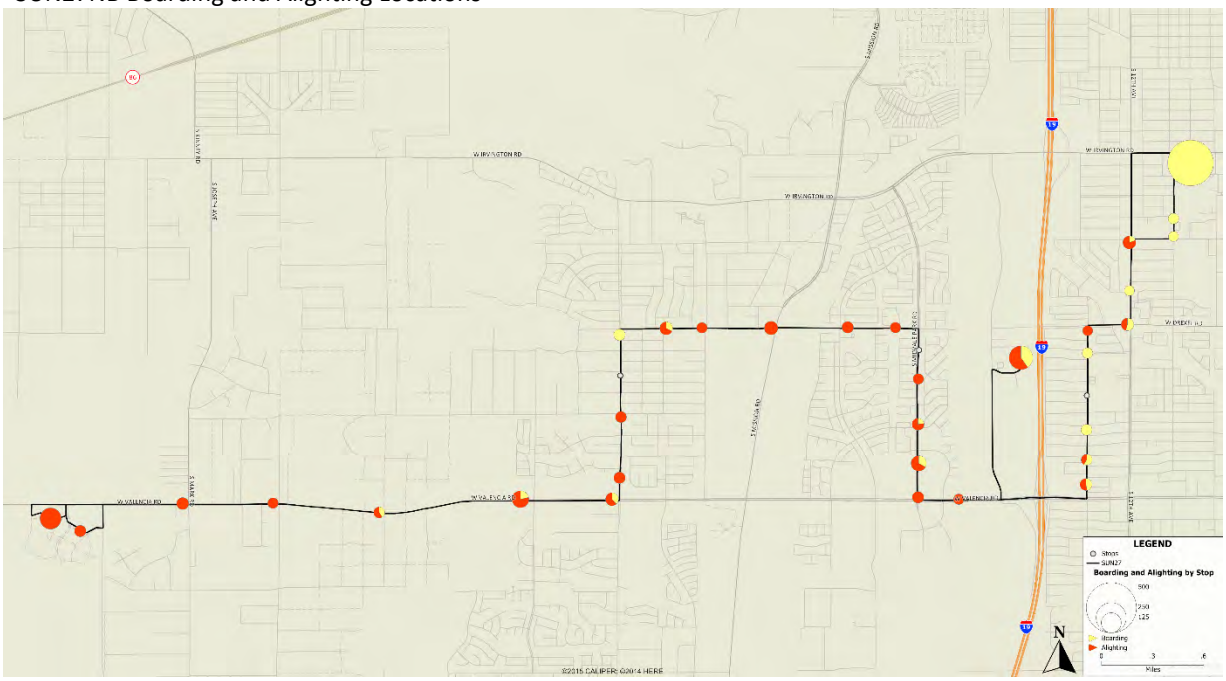
SUN26EB Boarding and Alighting Locations



SUN26WB Boarding and Alighting Locations

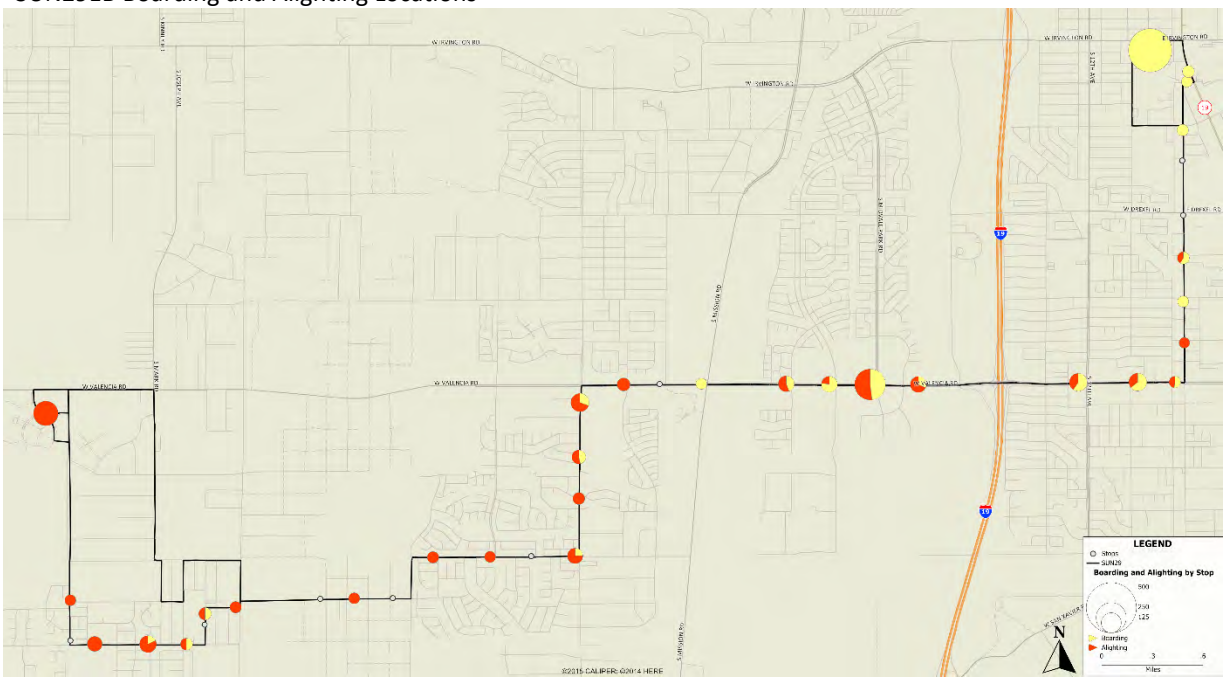


SUN27NB Boarding and Alighting Locations

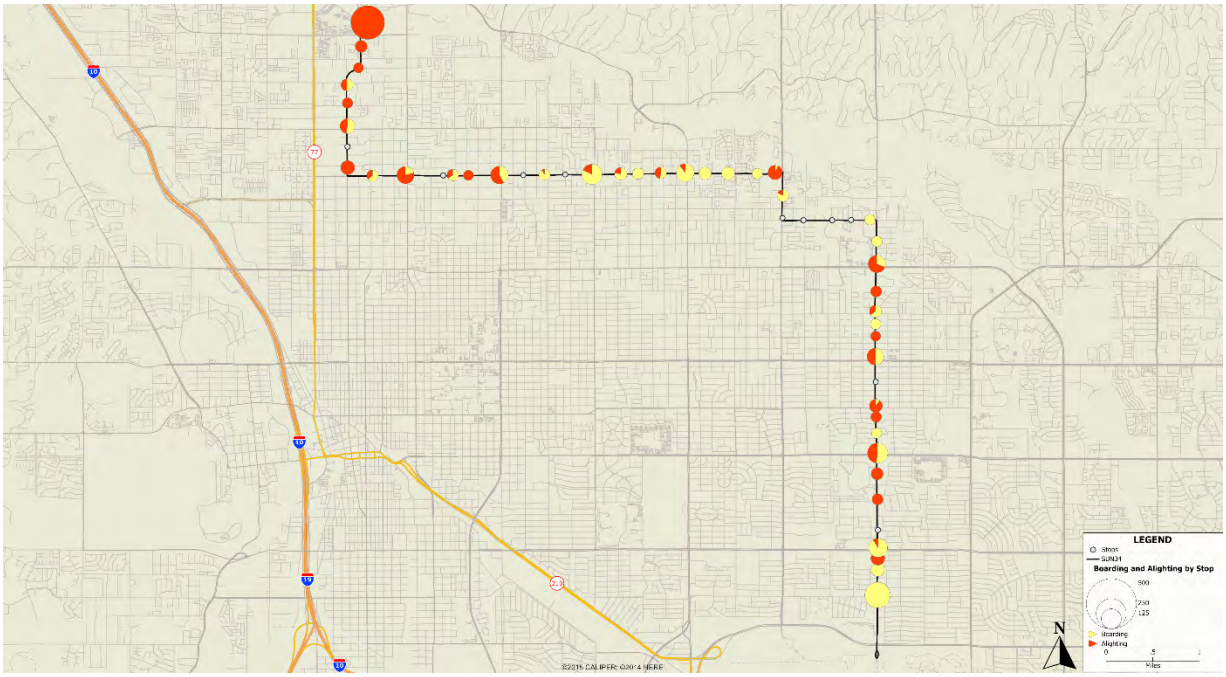


SUN27SB Boarding and Alighting Locations

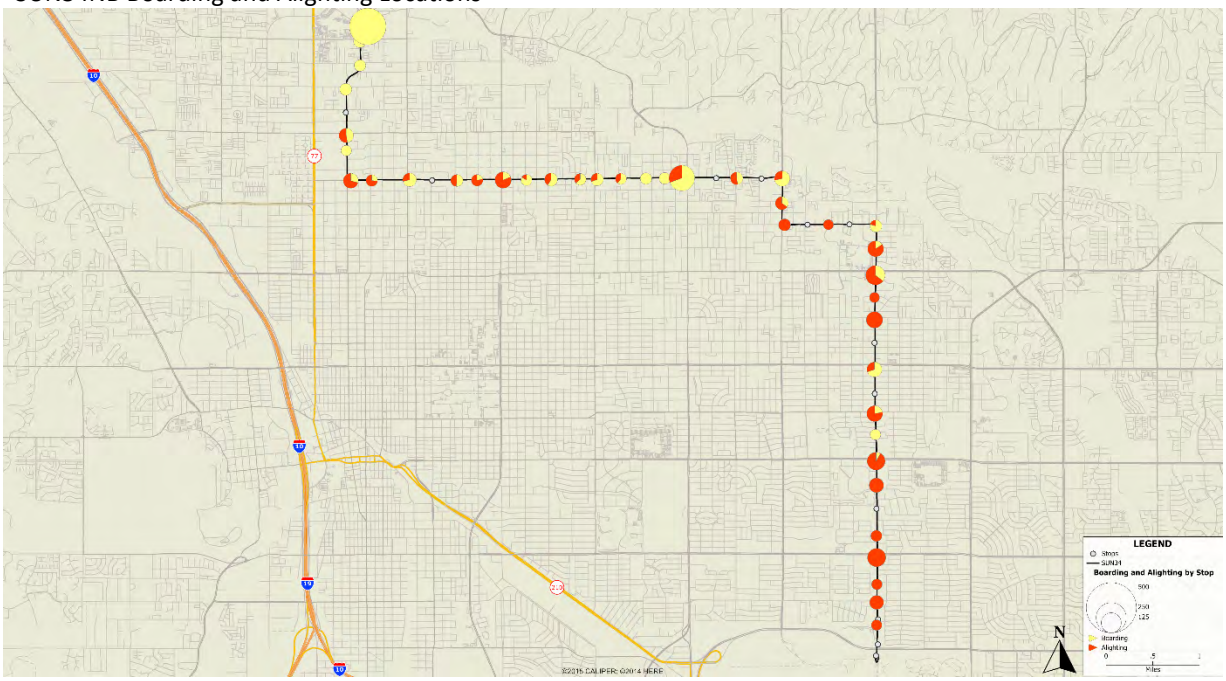
SUN29EB Boarding and Alighting Locations



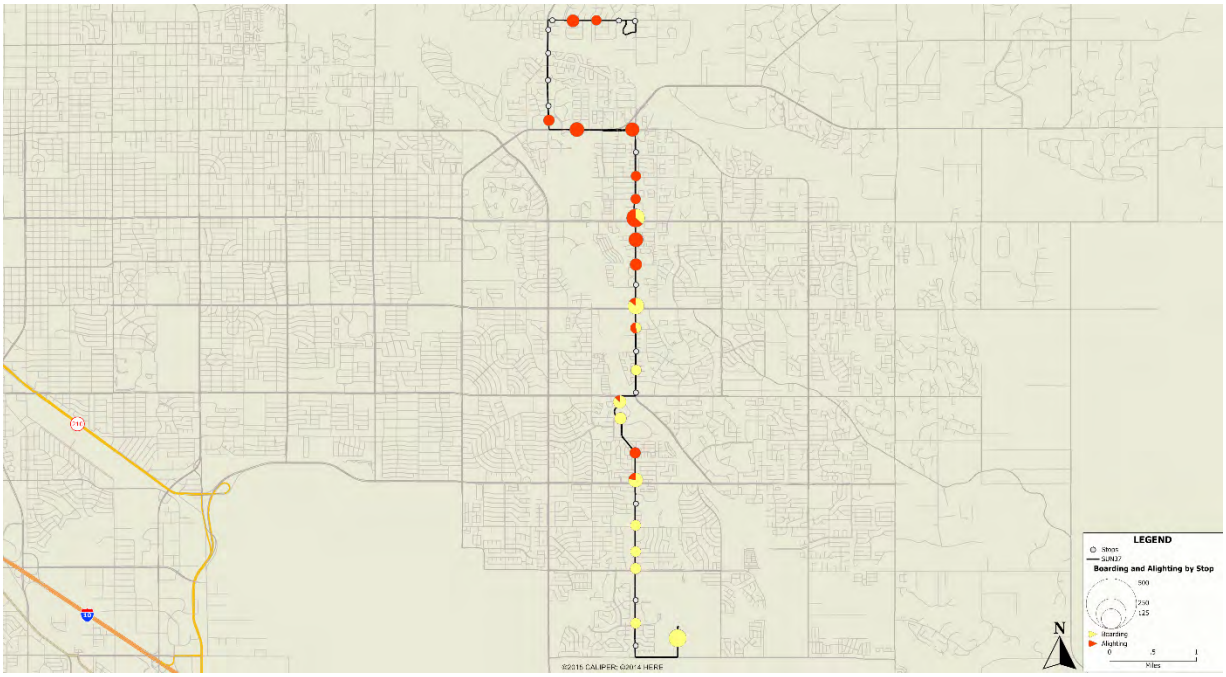
SUN29WB Boarding and Alighting Locations



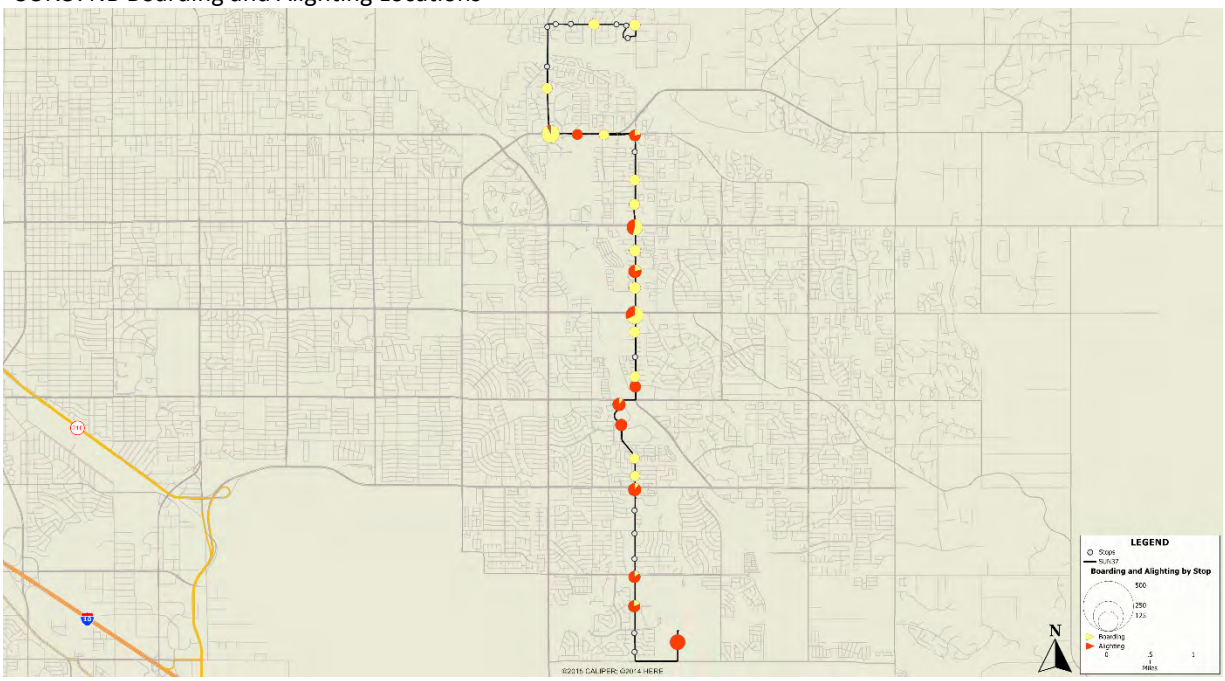
SUN34NB Boarding and Alighting Locations



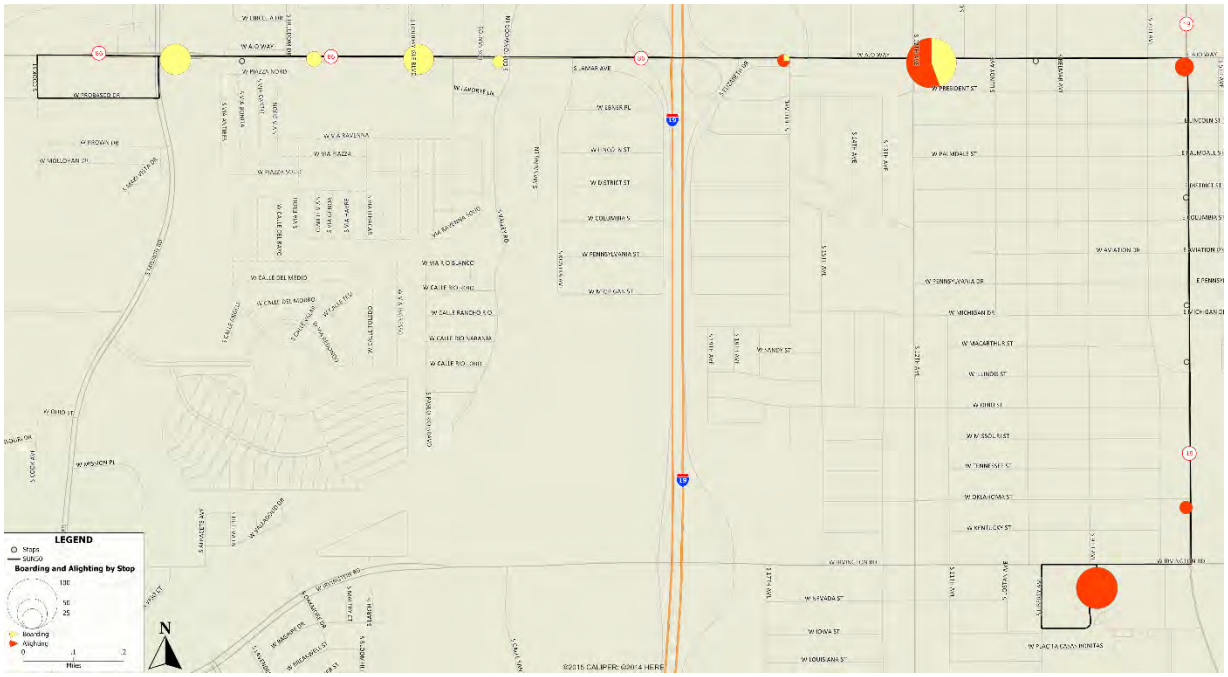
SUN34SB Boarding and Alighting Locations



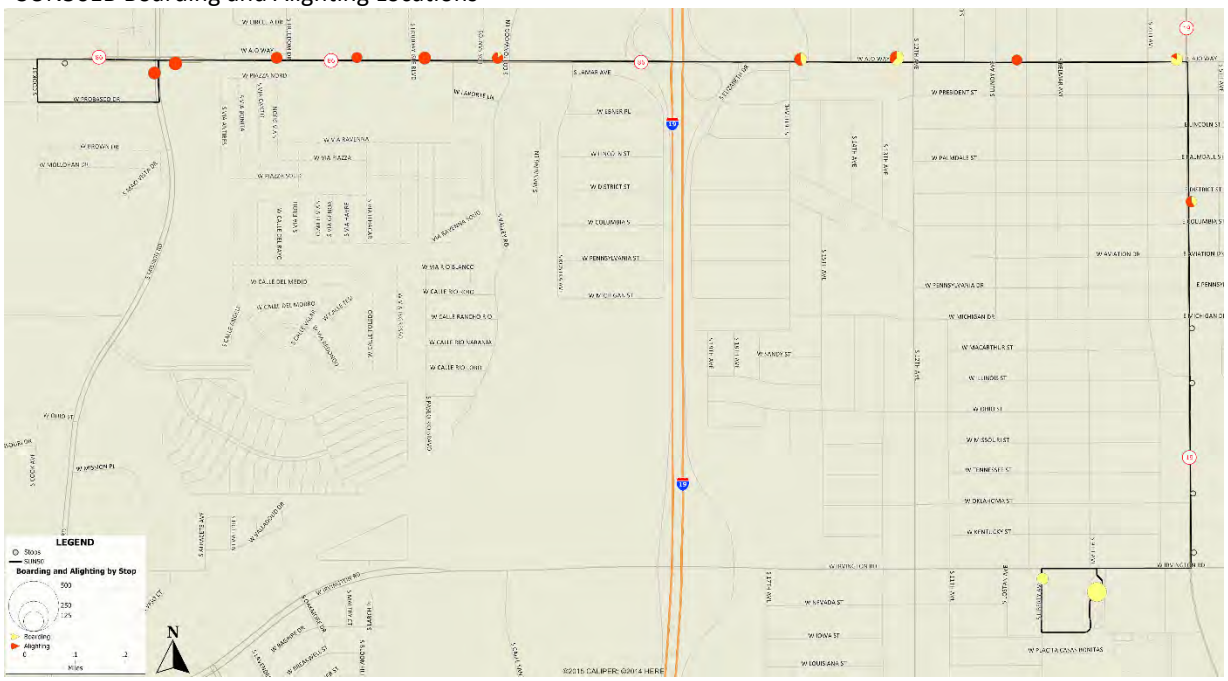
SUN37NB Boarding and Alighting Locations



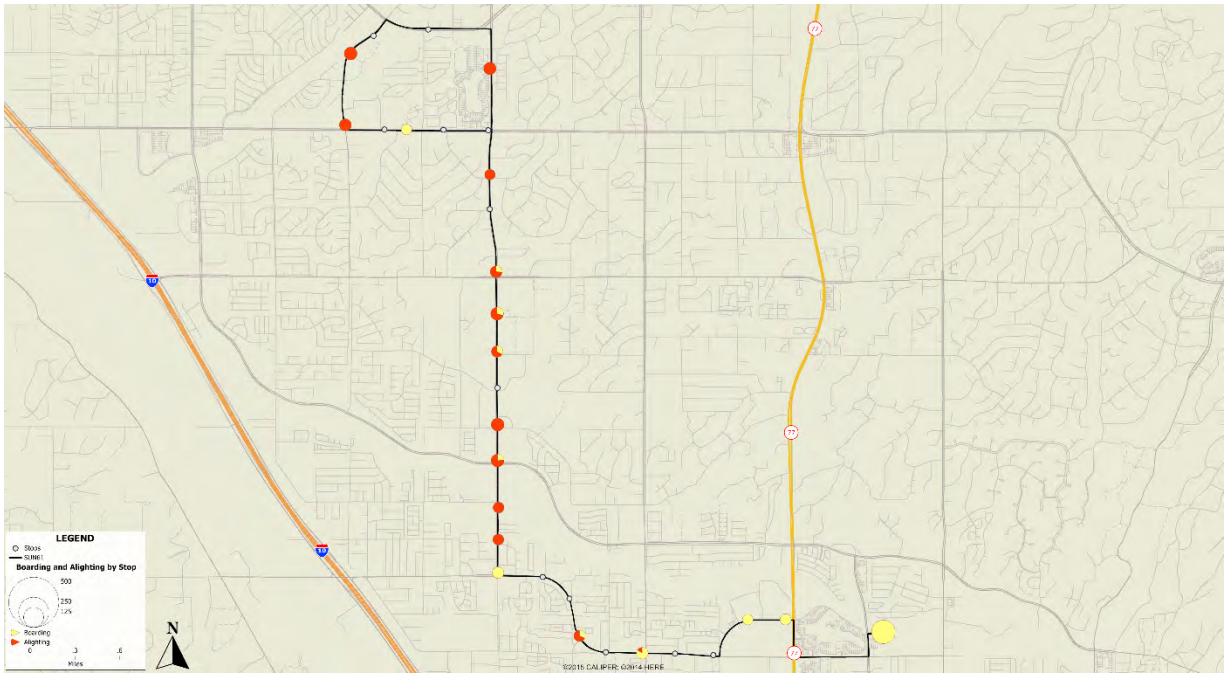
SUN37SB Boarding and Alighting Locations



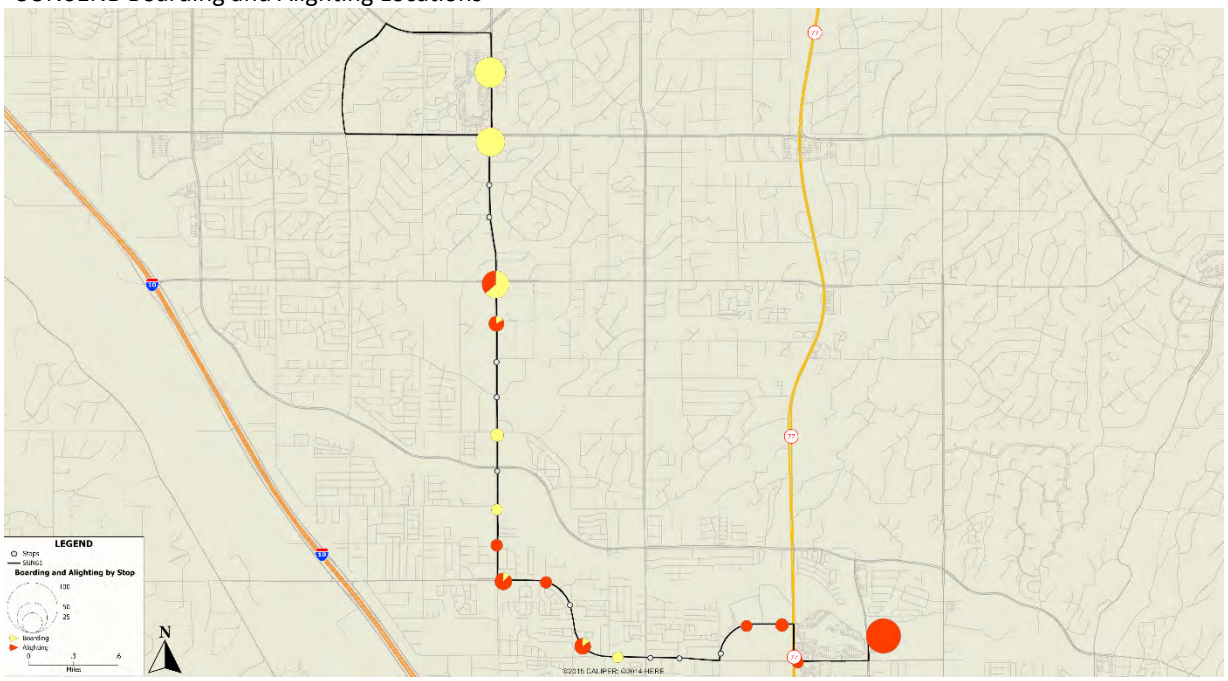
SUN50EB Boarding and Alighting Locations



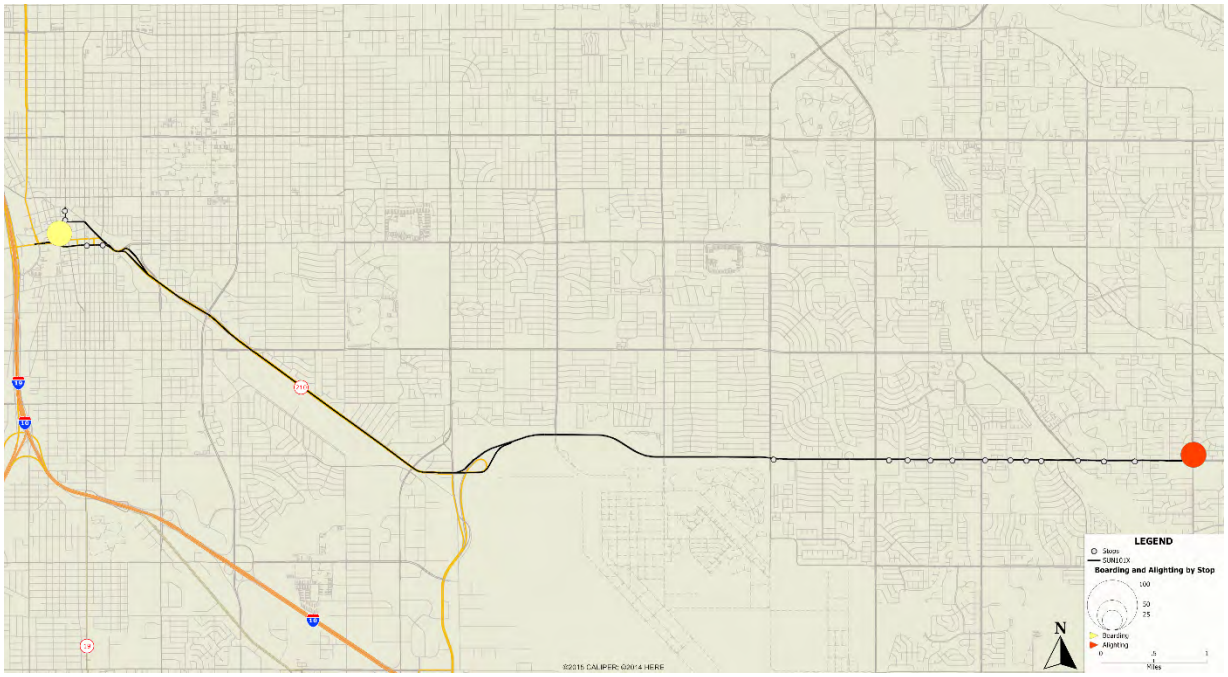
SUN50WB Boarding and Alighting Locations



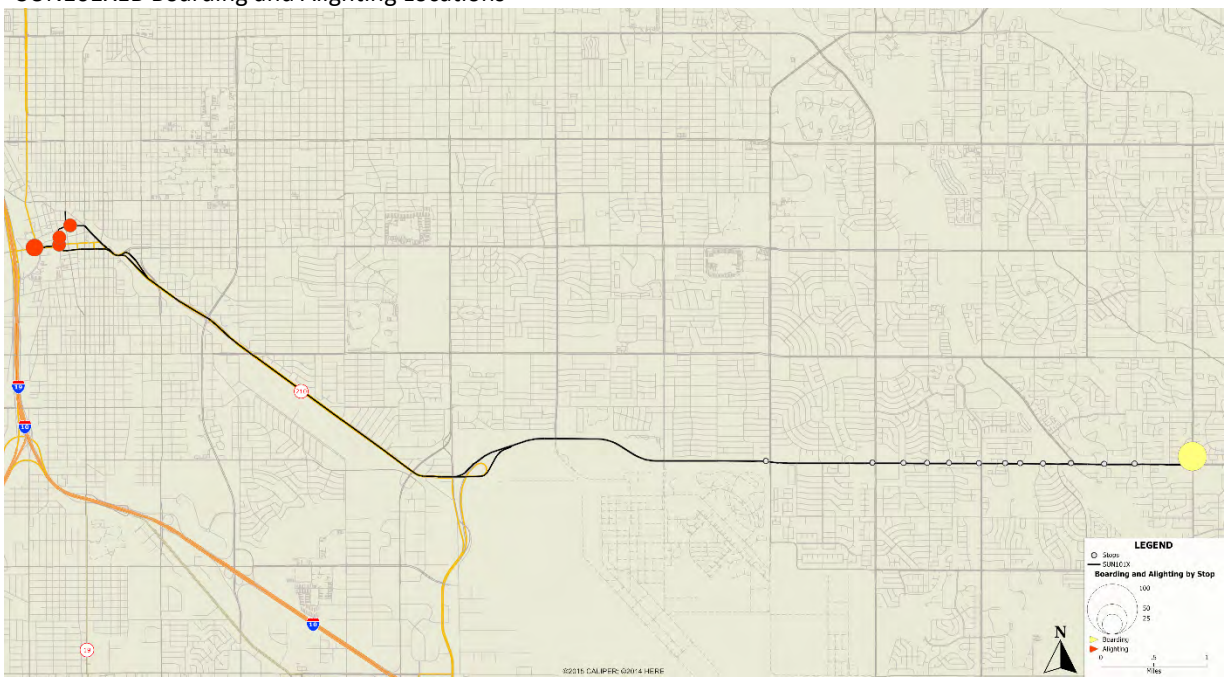
SUN61NB Boarding and Alighting Locations



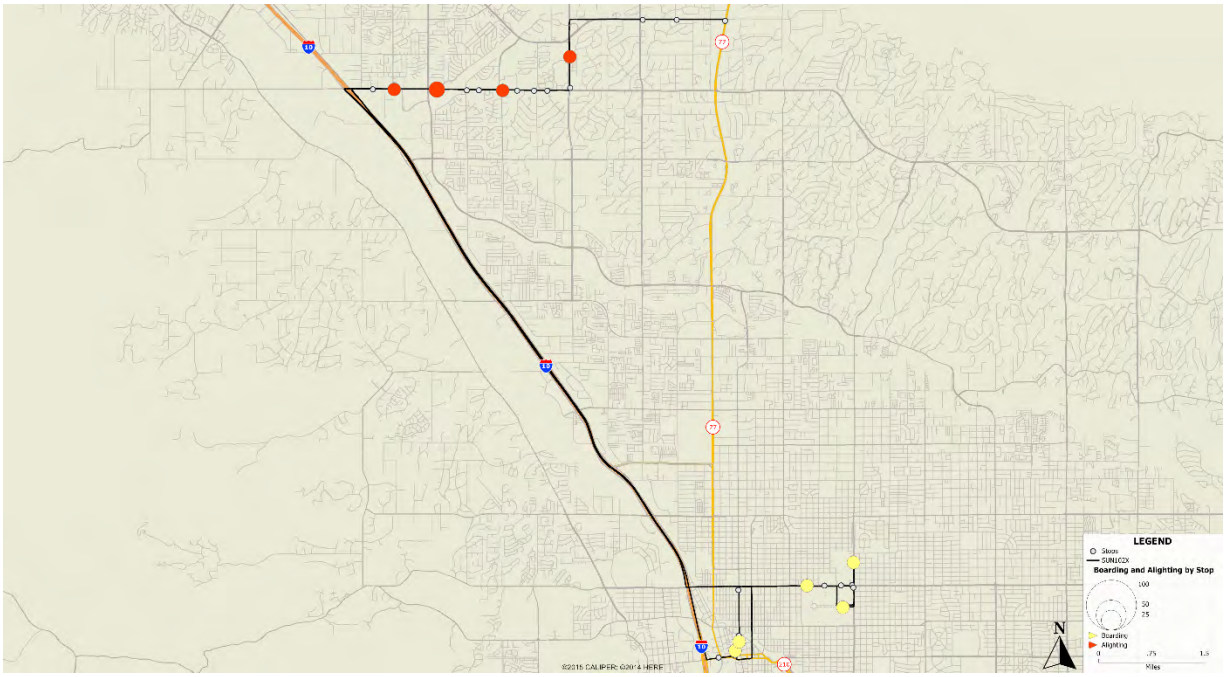
SUN61SB Boarding and Alighting Locations



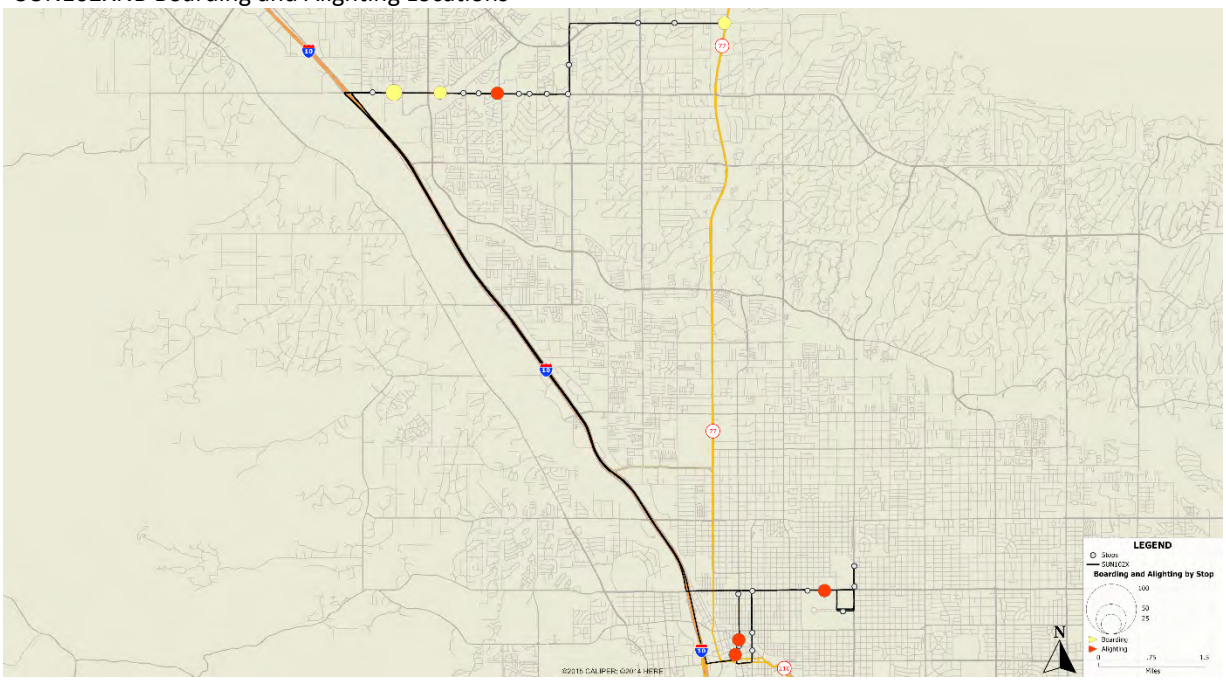
SUN101XEB Boarding and Alighting Locations



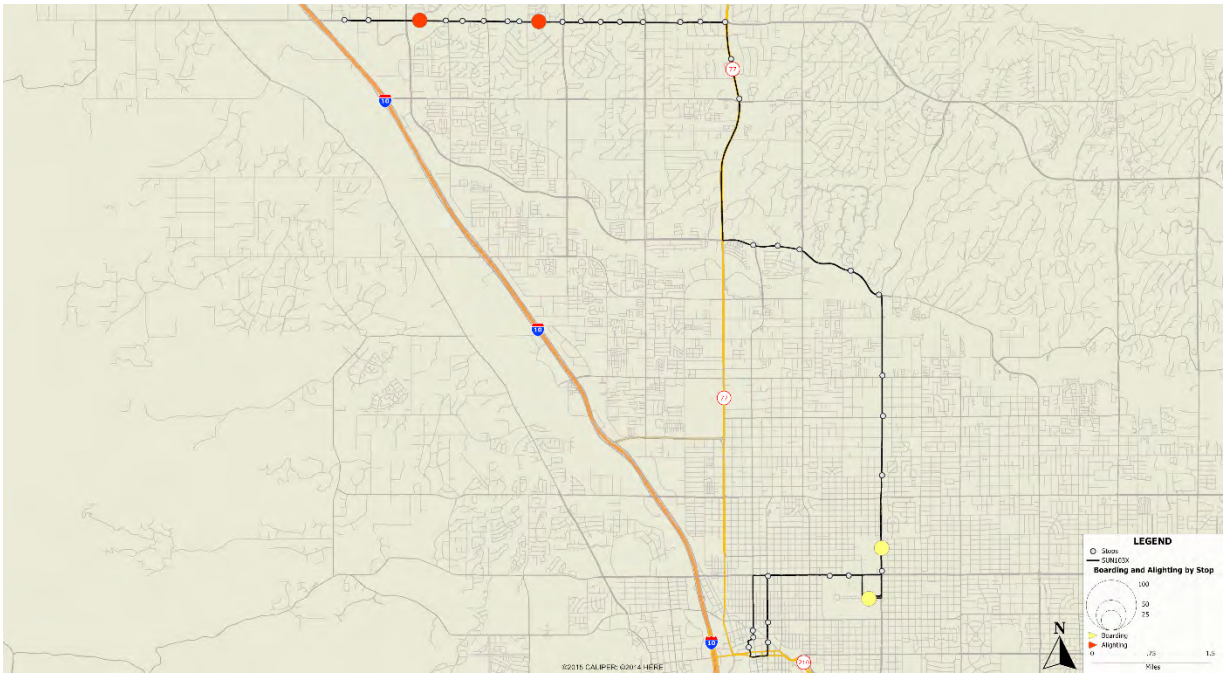
SUN101XWB Boarding and Alighting Locations



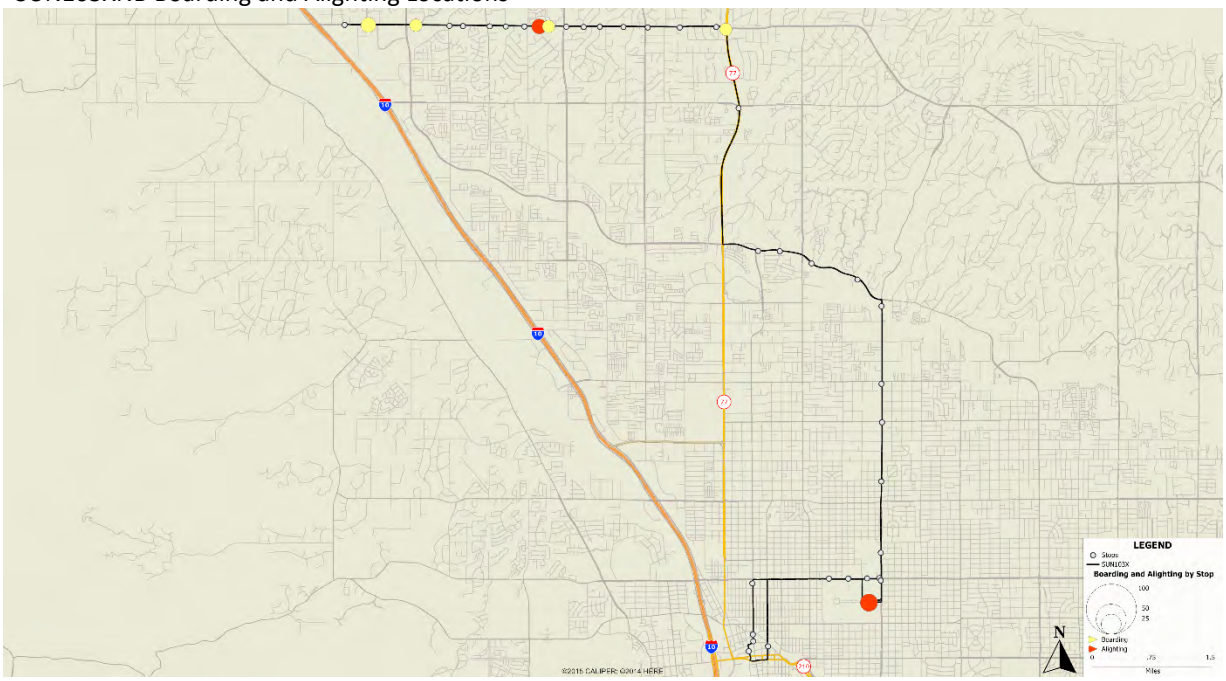
SUN102XNB Boarding and Alighting Locations



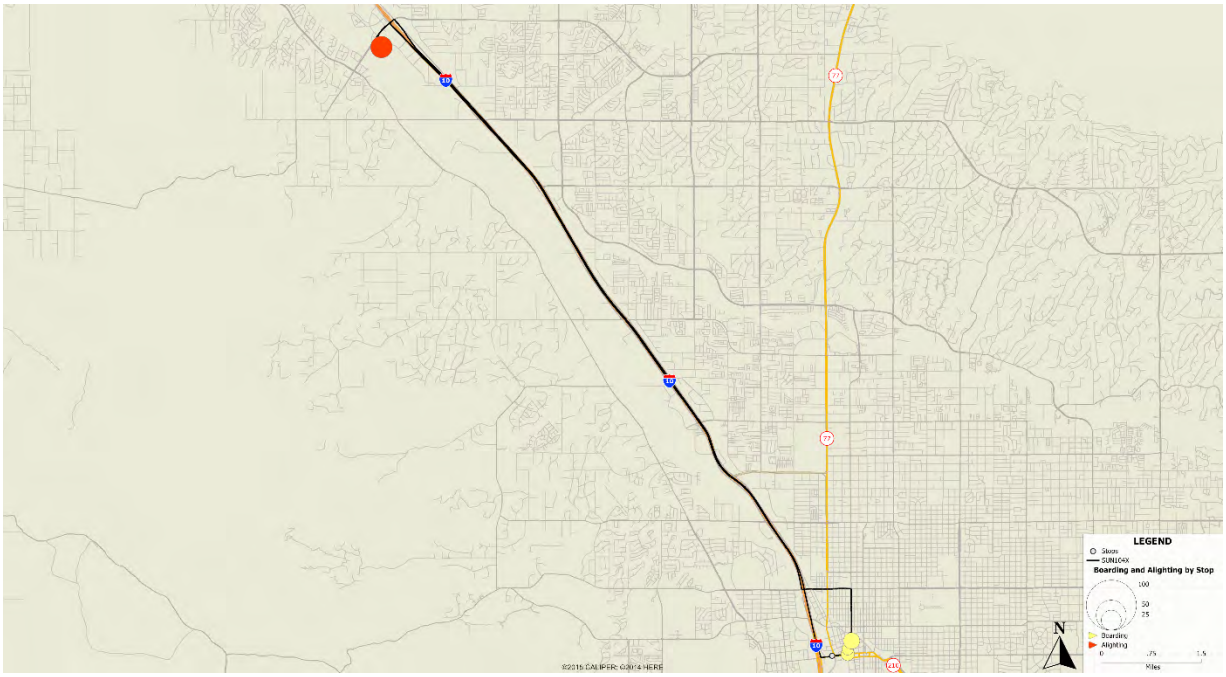
SUN102XSB Boarding and Alighting Locations



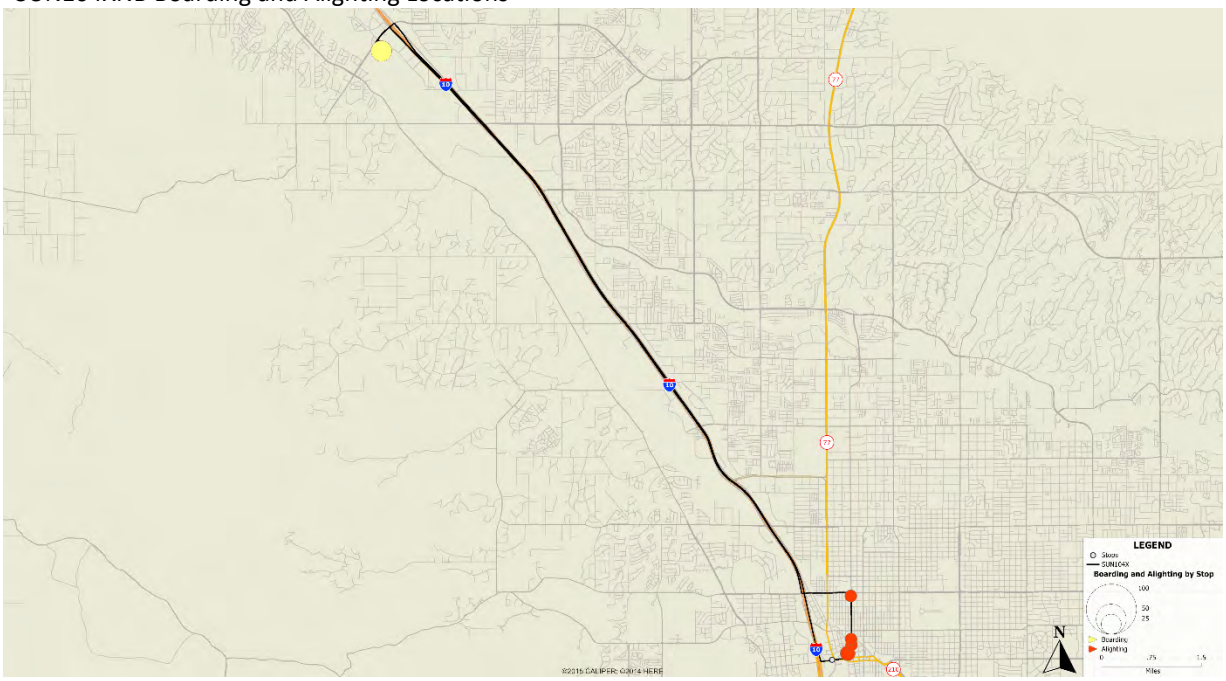
SUN103XNB Boarding and Alighting Locations



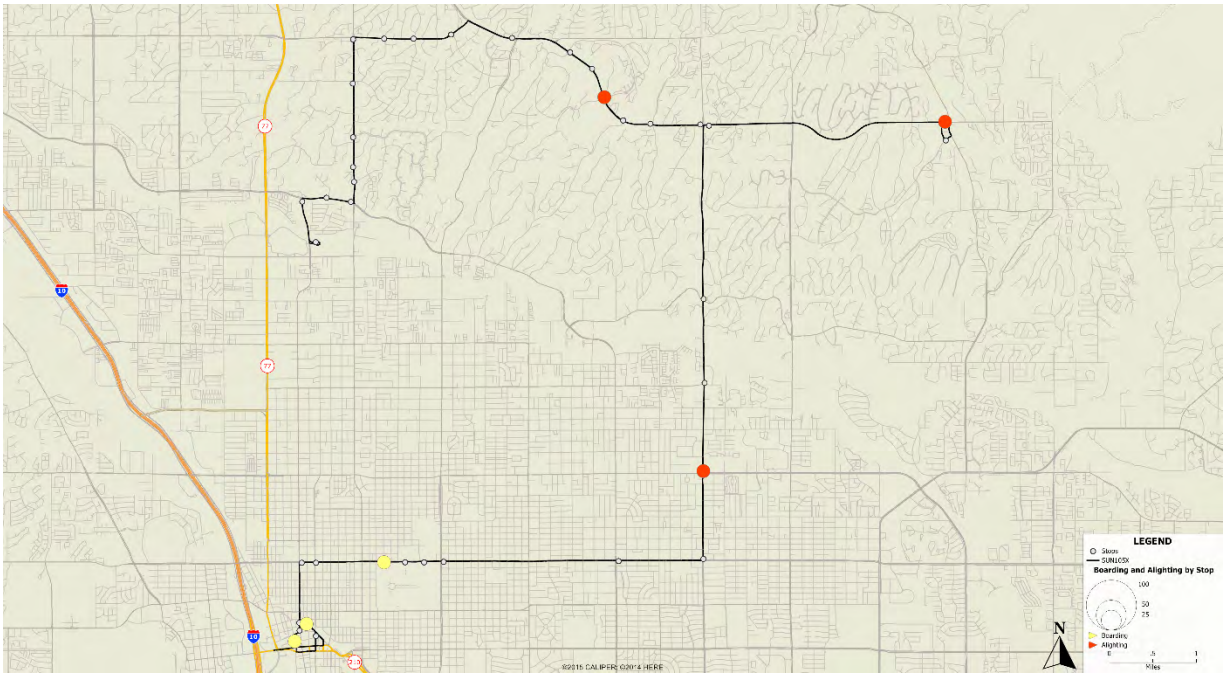
SUN103XSB Boarding and Alighting Locations



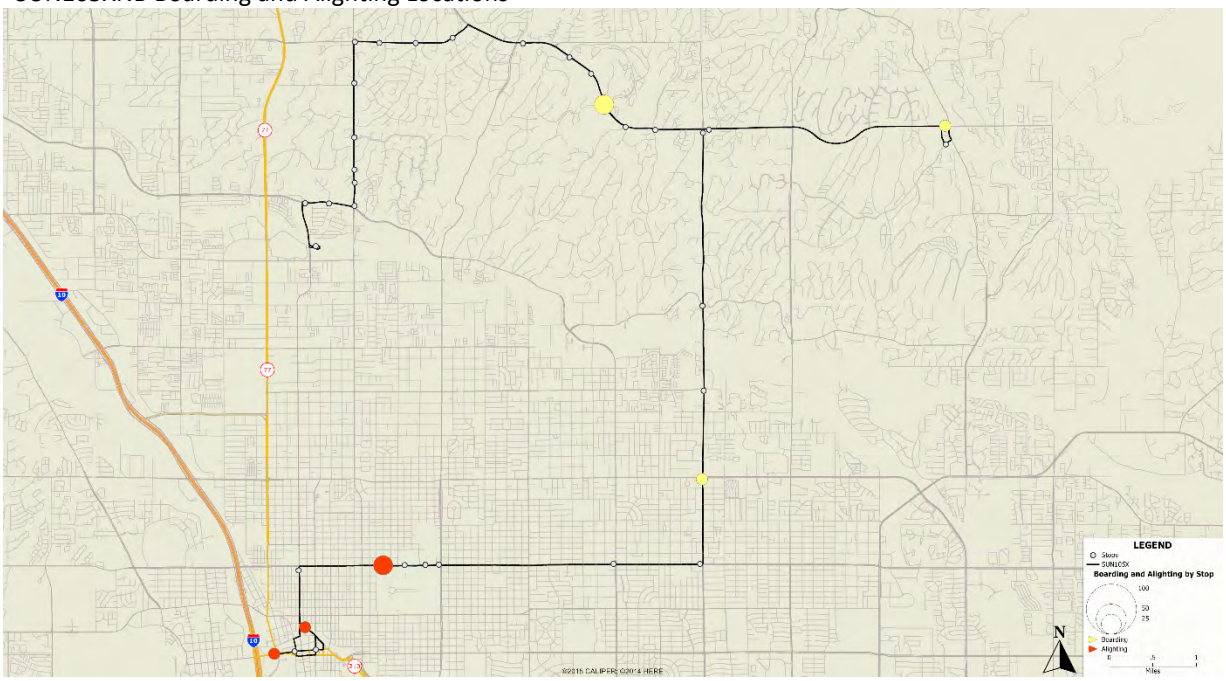
SUN104XNB Boarding and Alighting Locations



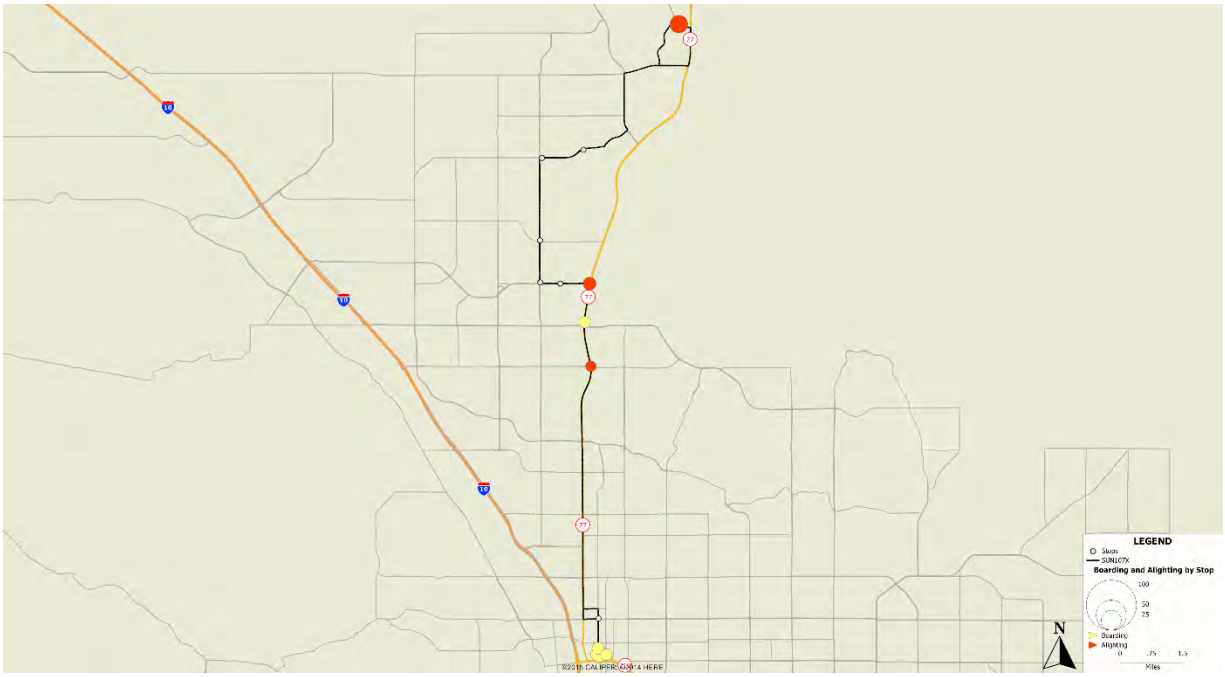
SUN104XSB Boarding and Alighting Locations



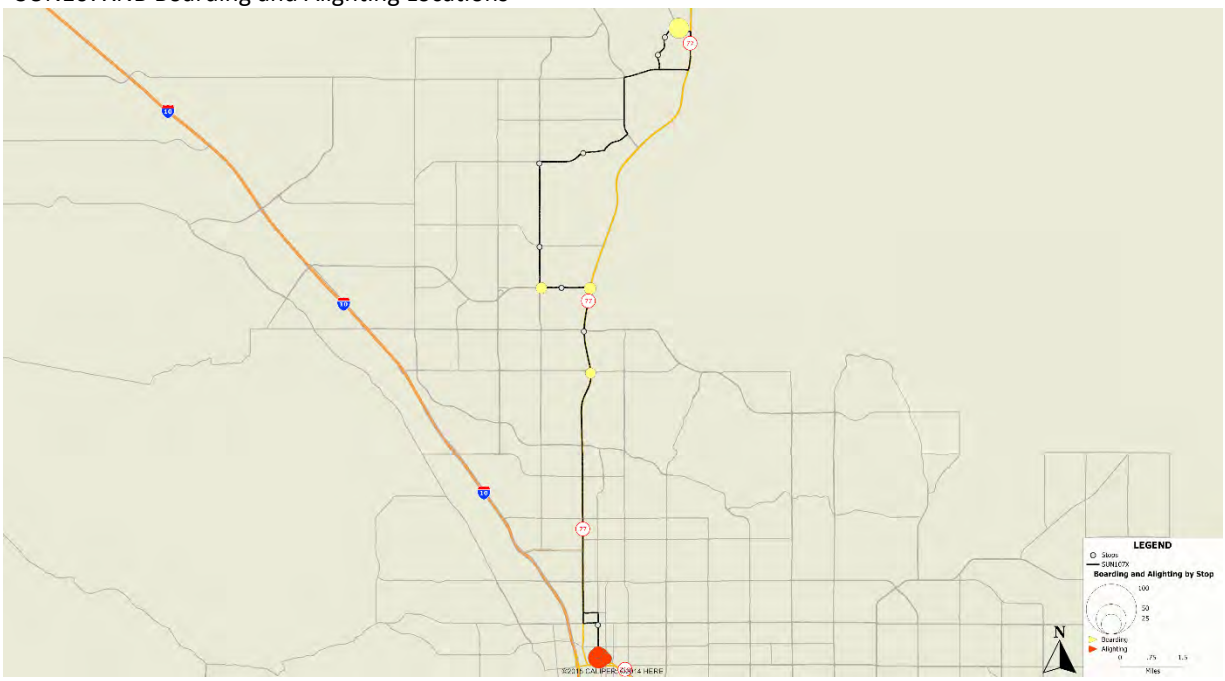
SUN105XNB Boarding and Alighting Locations



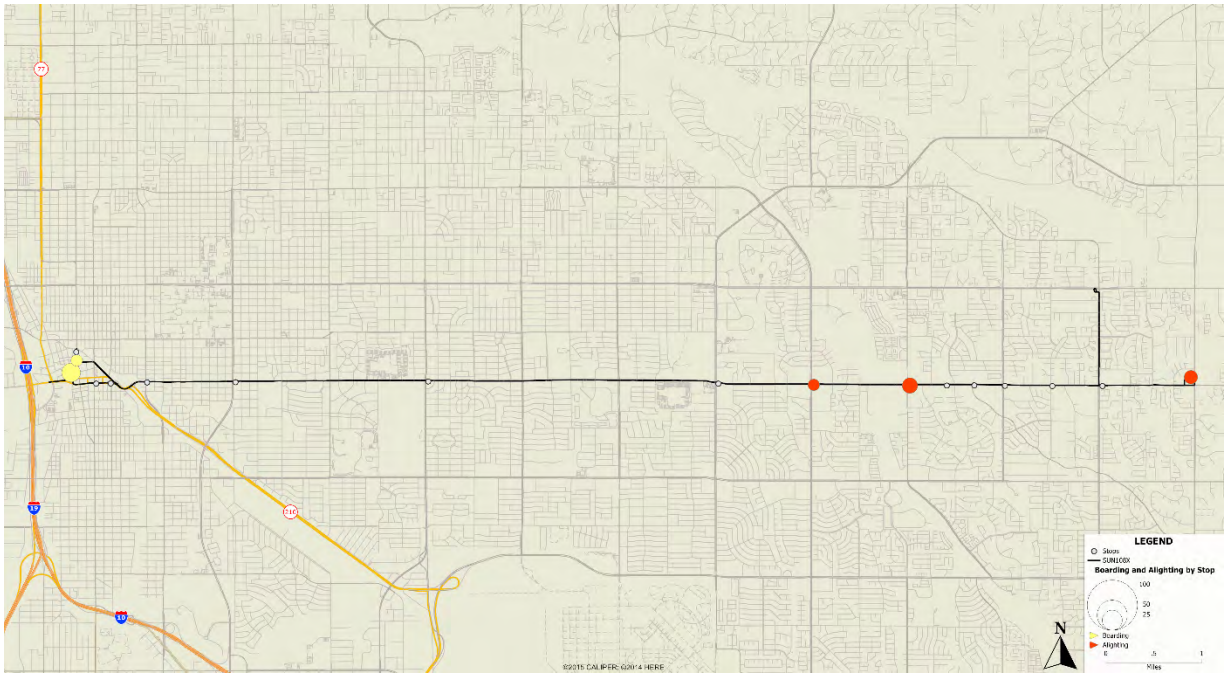
SUN105XSB Boarding and Alighting Locations



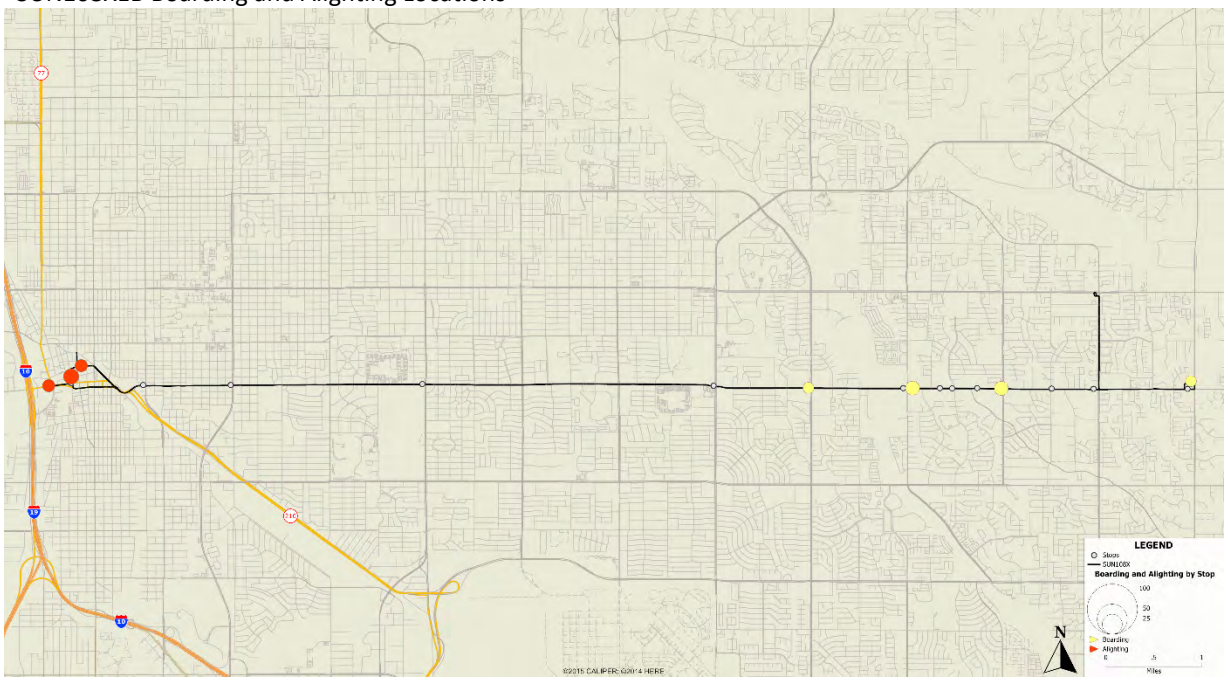
SUN107XNB Boarding and Alighting Locations



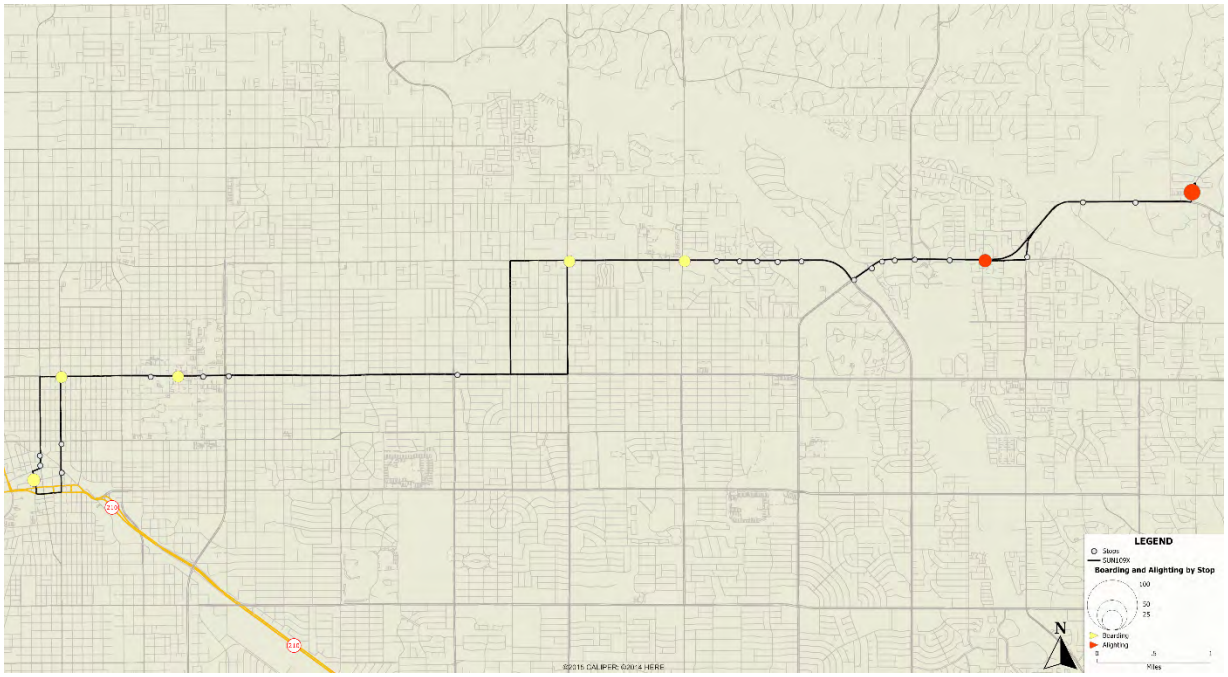
SUN107XSB Boarding and Alighting Locations



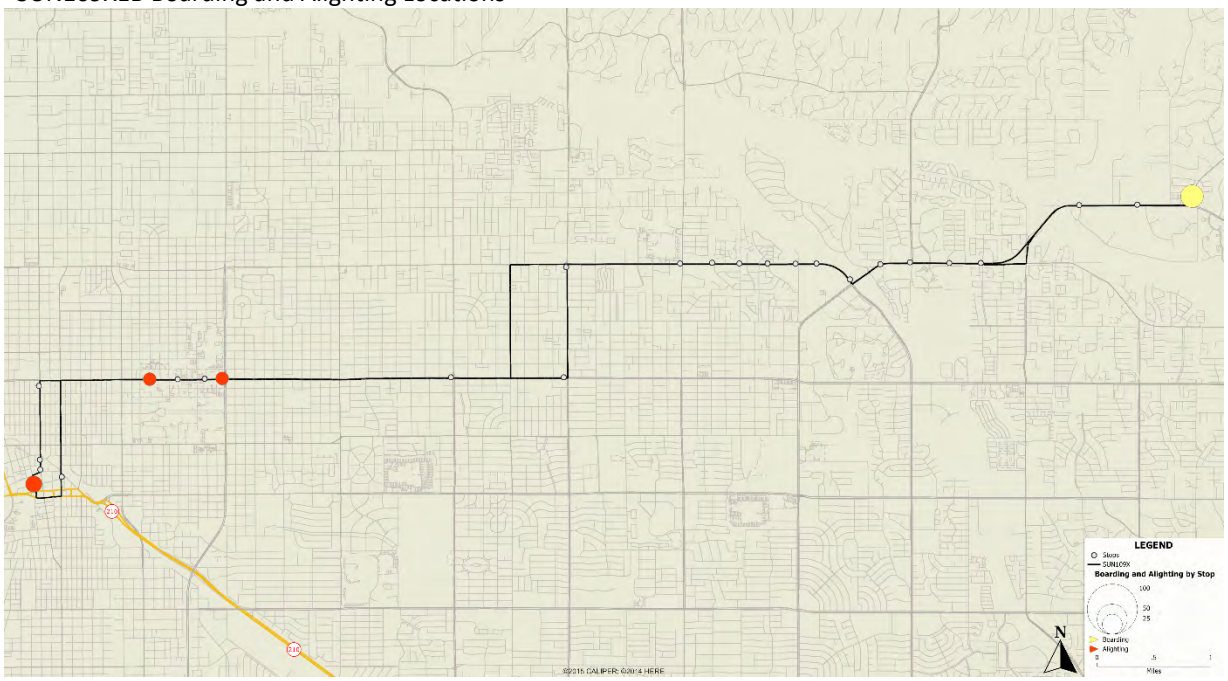
SUN108XEB Boarding and Alighting Locations



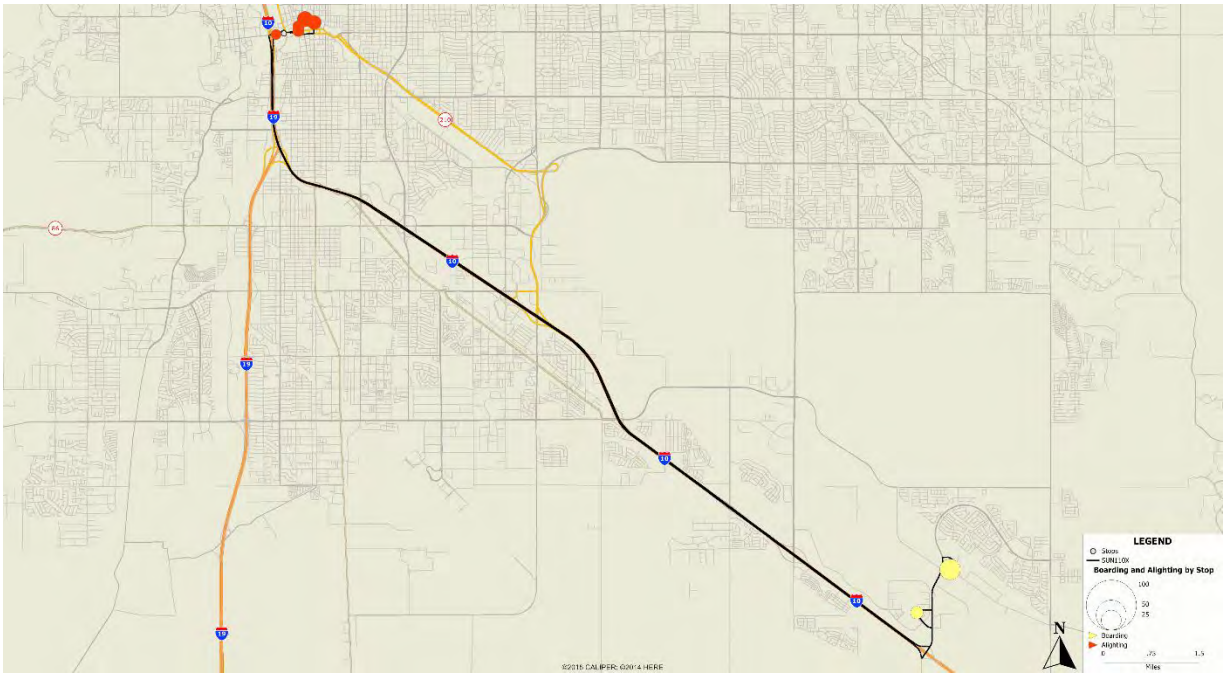
SUN108XWB Boarding and Alighting Locations



SUN109XEB Boarding and Alighting Locations

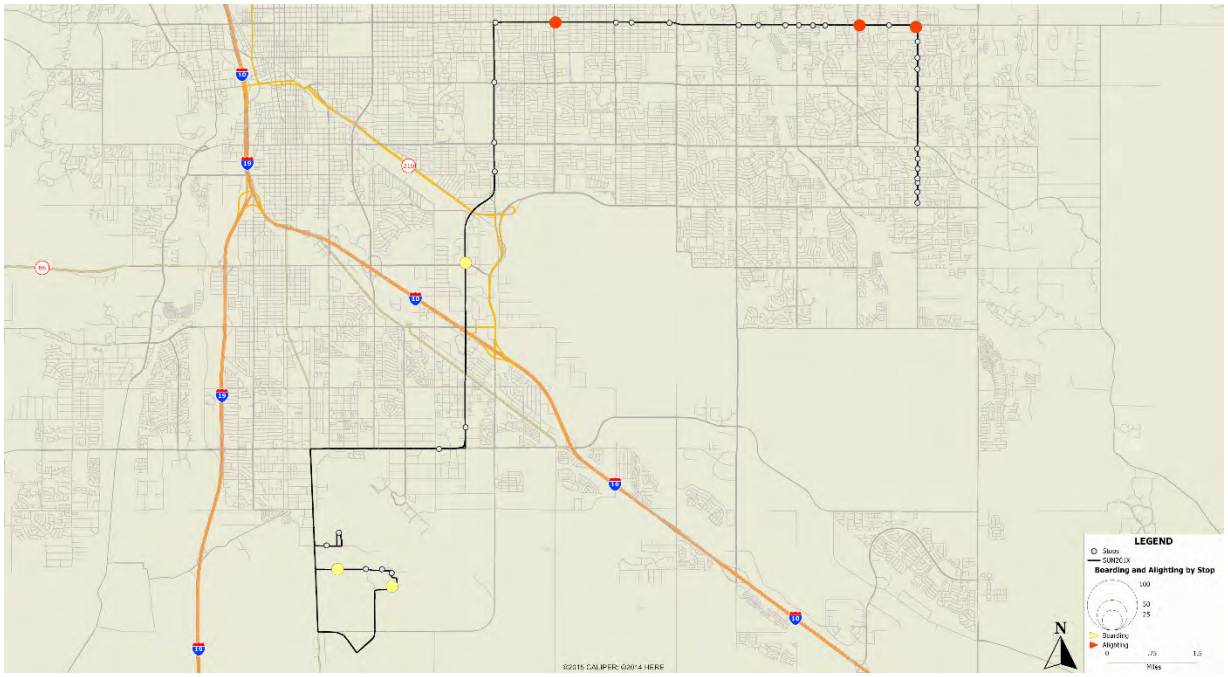


SUN109XWB Boarding and Alighting Locations

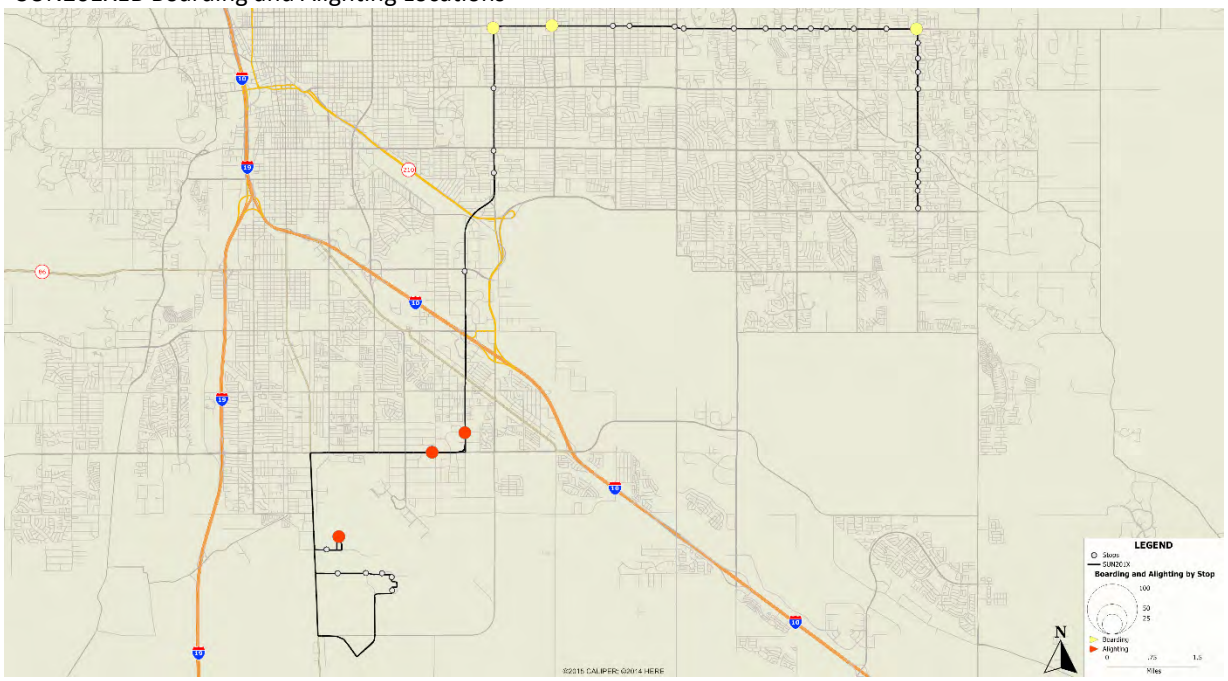


SUN110XNB Boarding and Alighting Locations

SUN110XSB Boarding and Alighting Locations

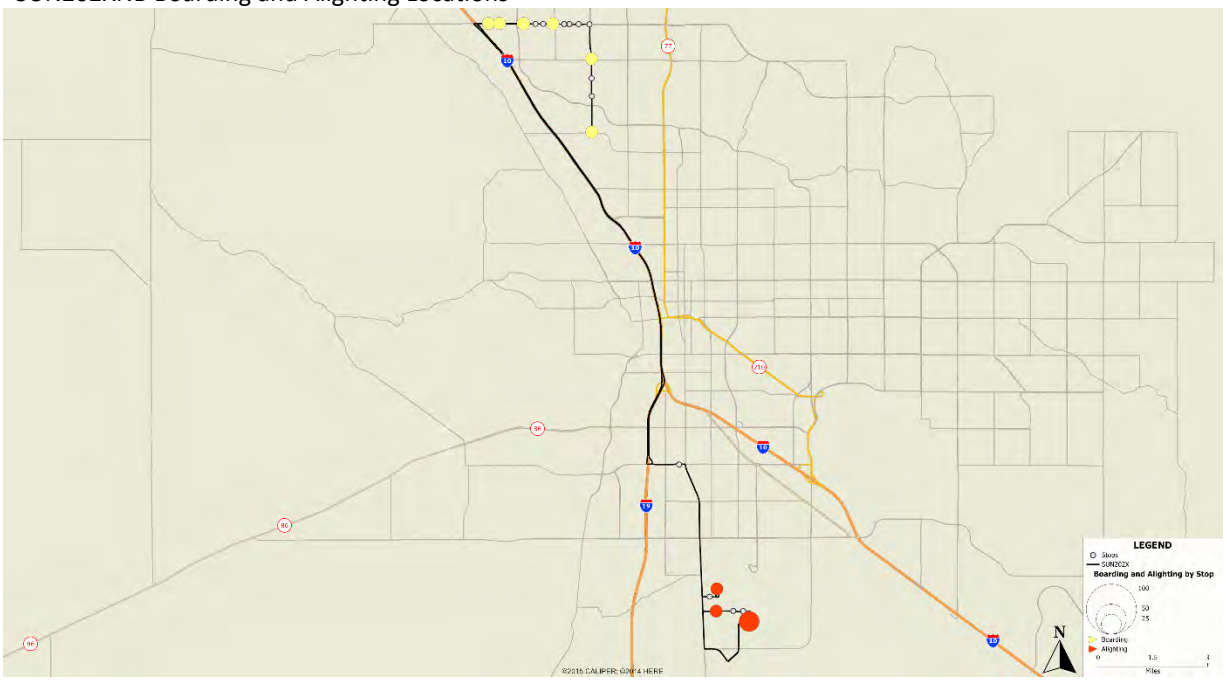


SUN201XEB Boarding and Alighting Locations

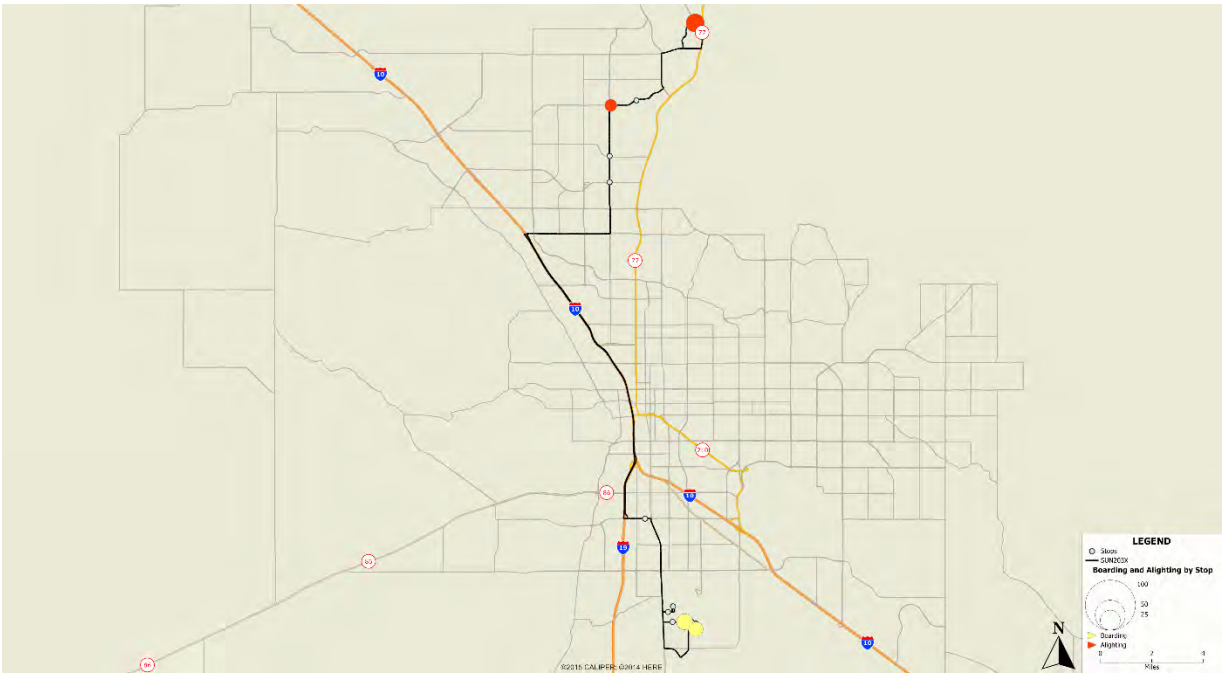


SUN201XWB Boarding and Alighting Locations

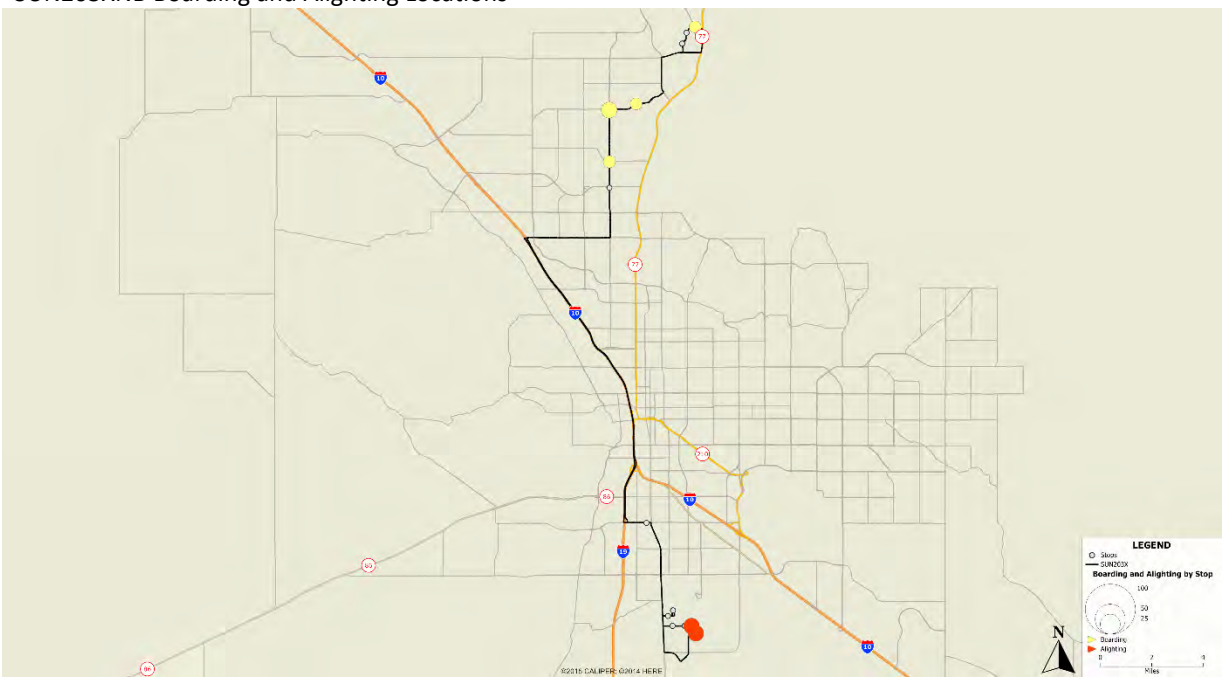
SUN202XNB Boarding and Alighting Locations



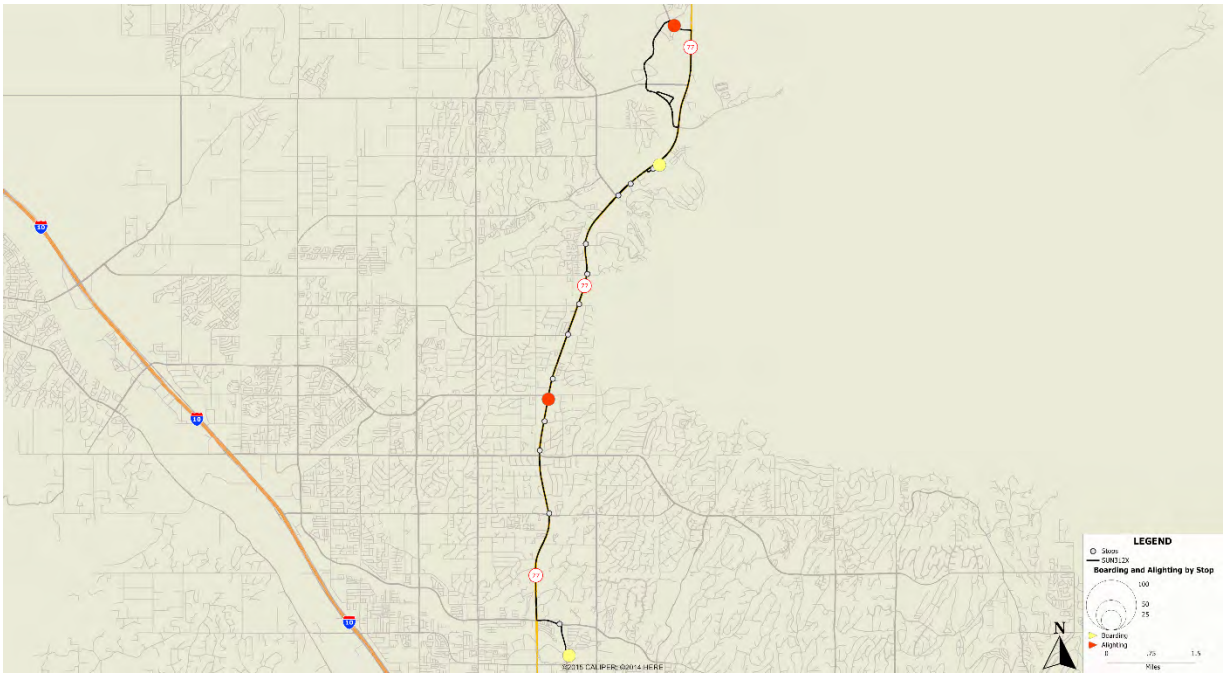
SUN202XSB Boarding and Alighting Locations



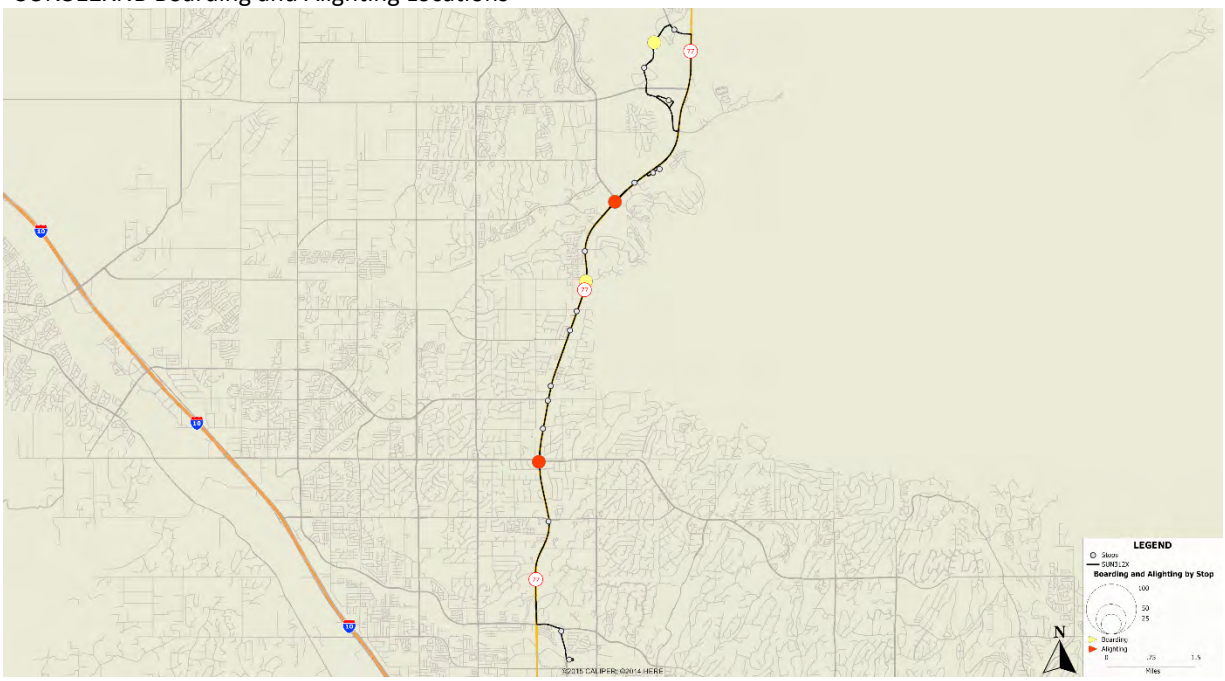
SUN203XNB Boarding and Alighting Locations



SUN203XSB Boarding and Alighting Locations

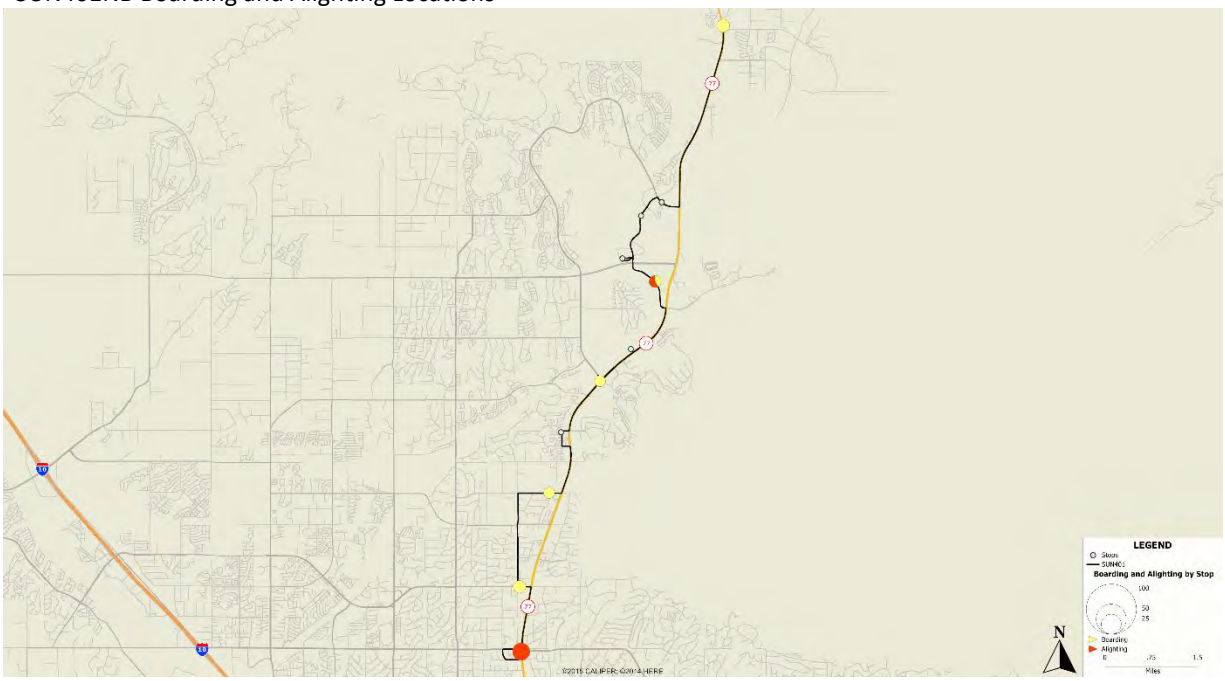


SUN312XNB Boarding and Alighting Locations

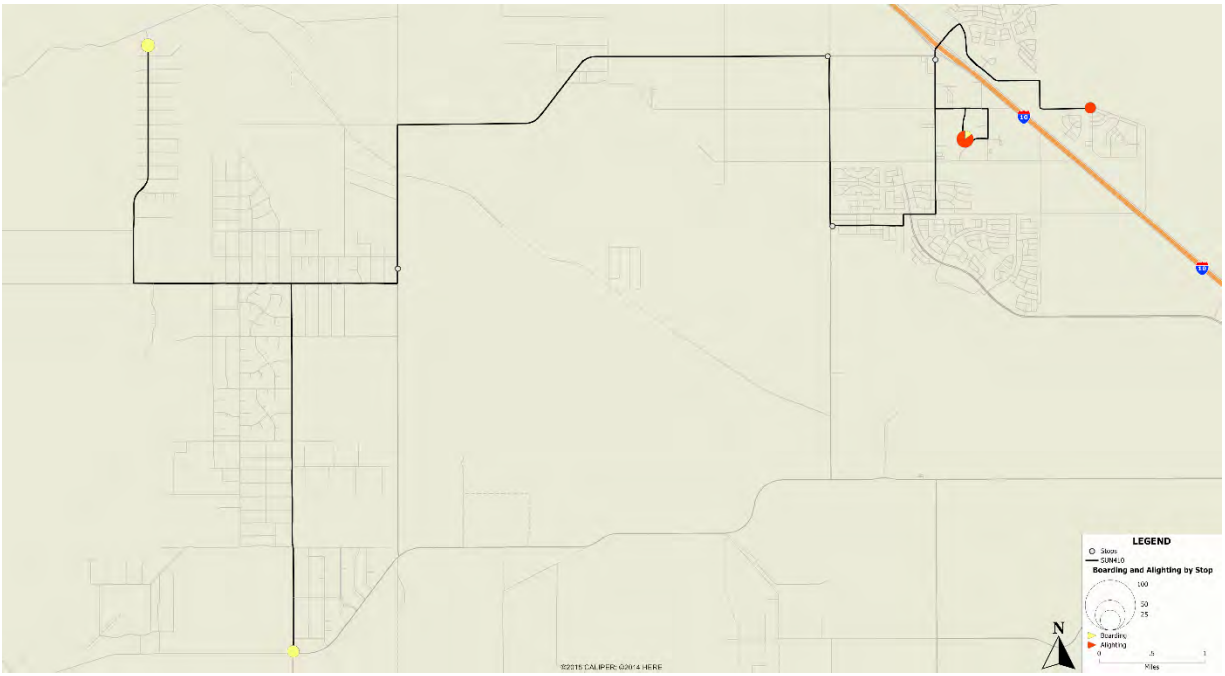


SUN312XSB Boarding and Alighting Locations

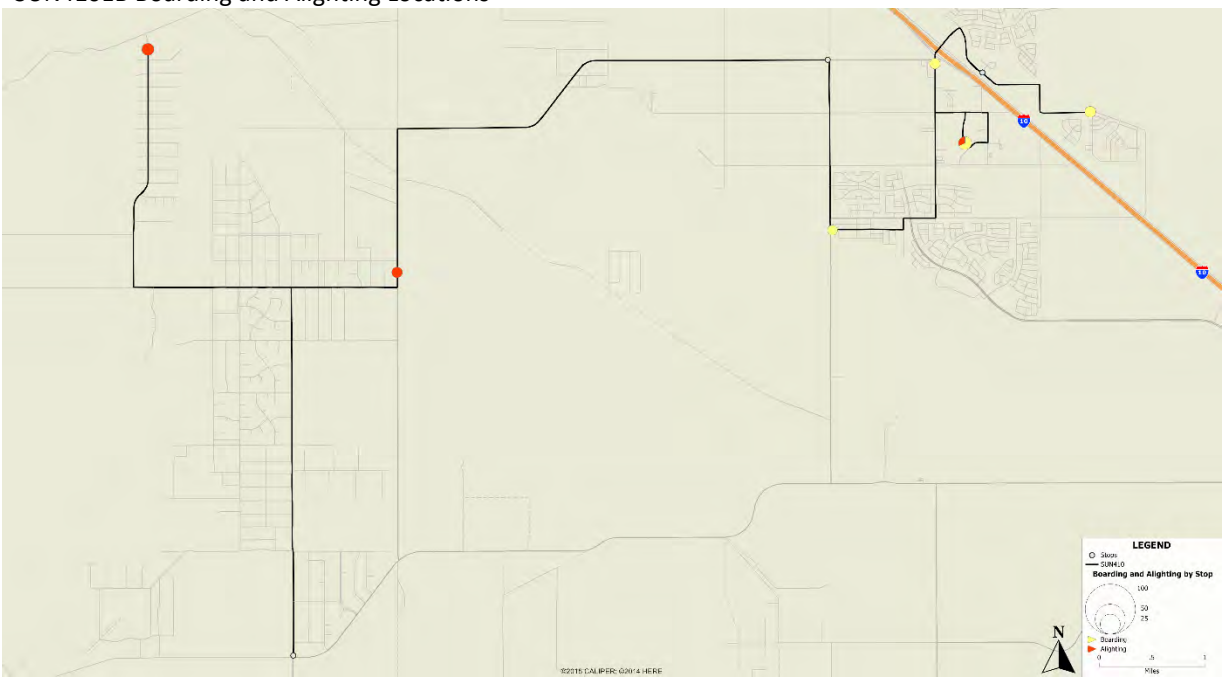
SUN401NB Boarding and Alighting Locations



SUN401SB Boarding and Alighting Locations

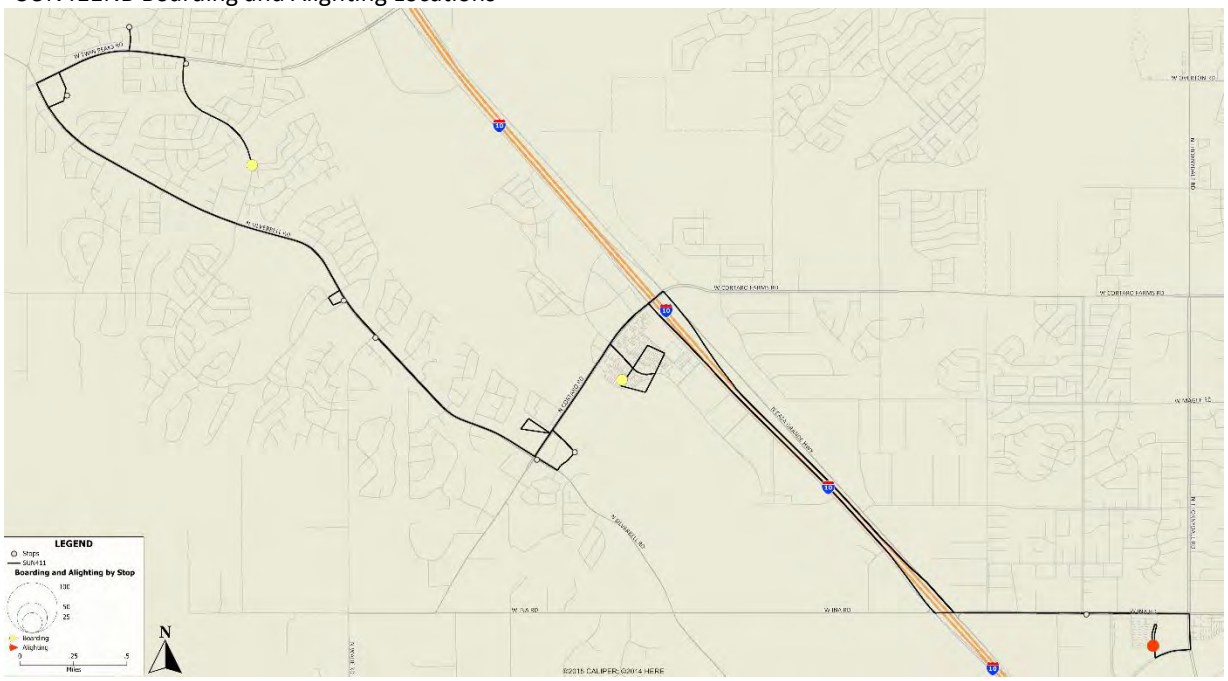


SUN410EB Boarding and Alighting Locations

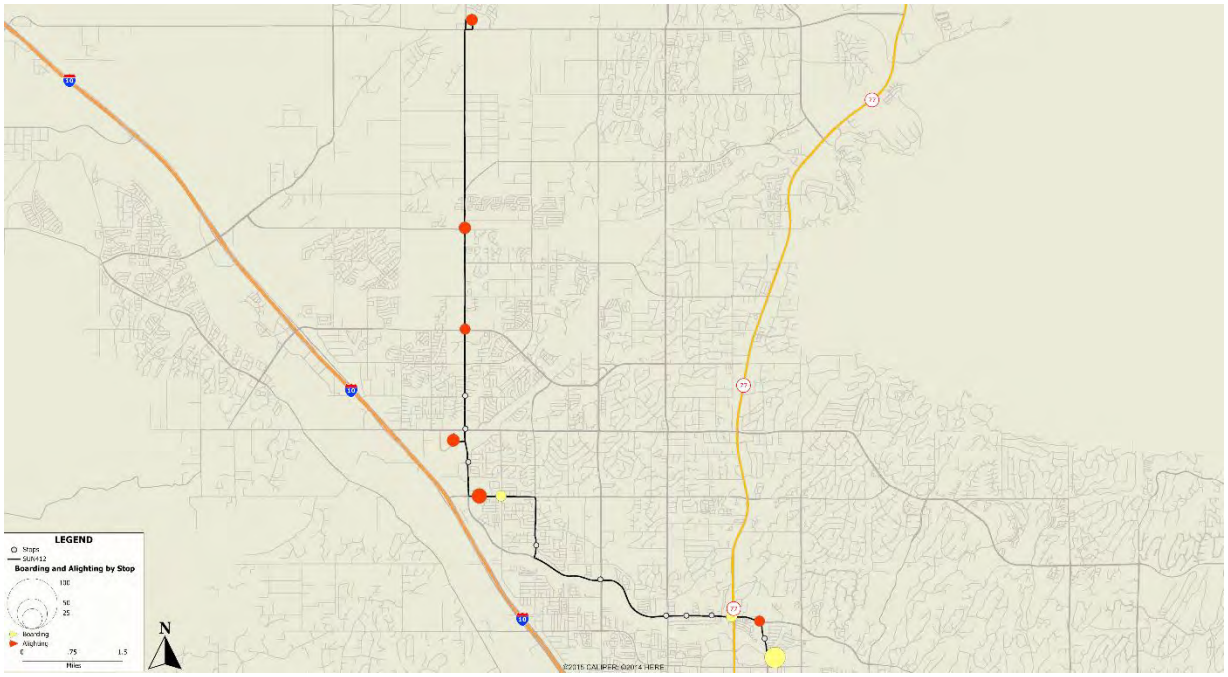


SUN410WB Boarding and Alighting Locations

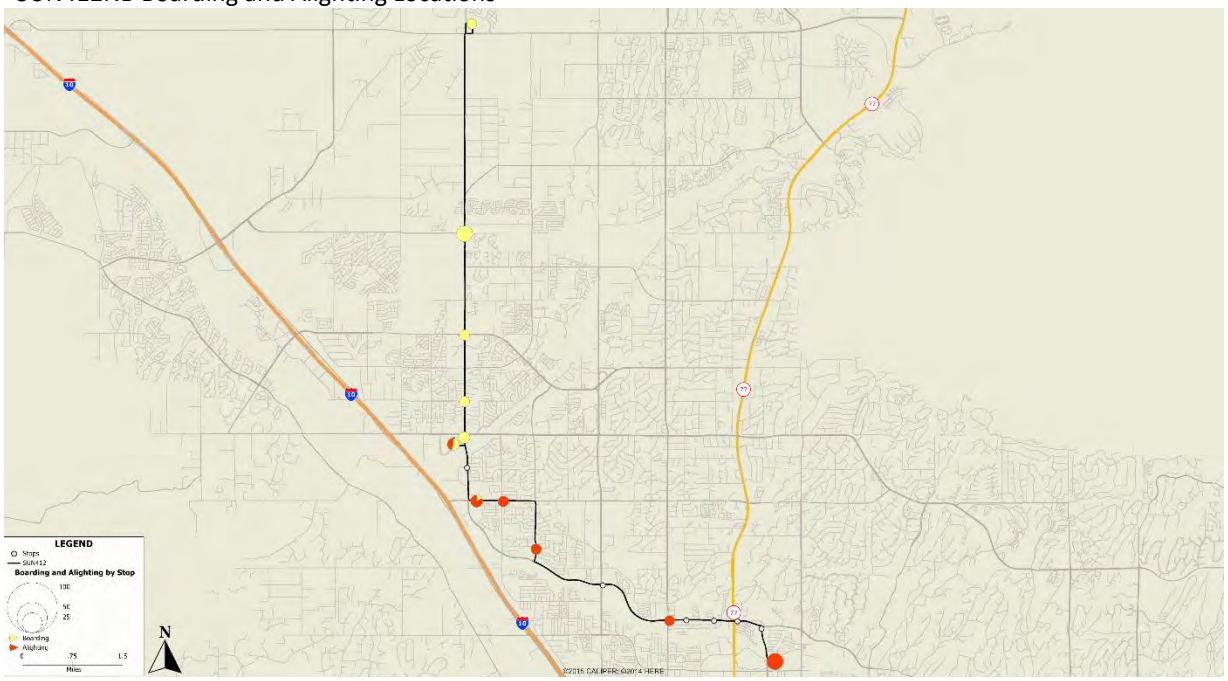
SUN411NB Boarding and Alighting Locations



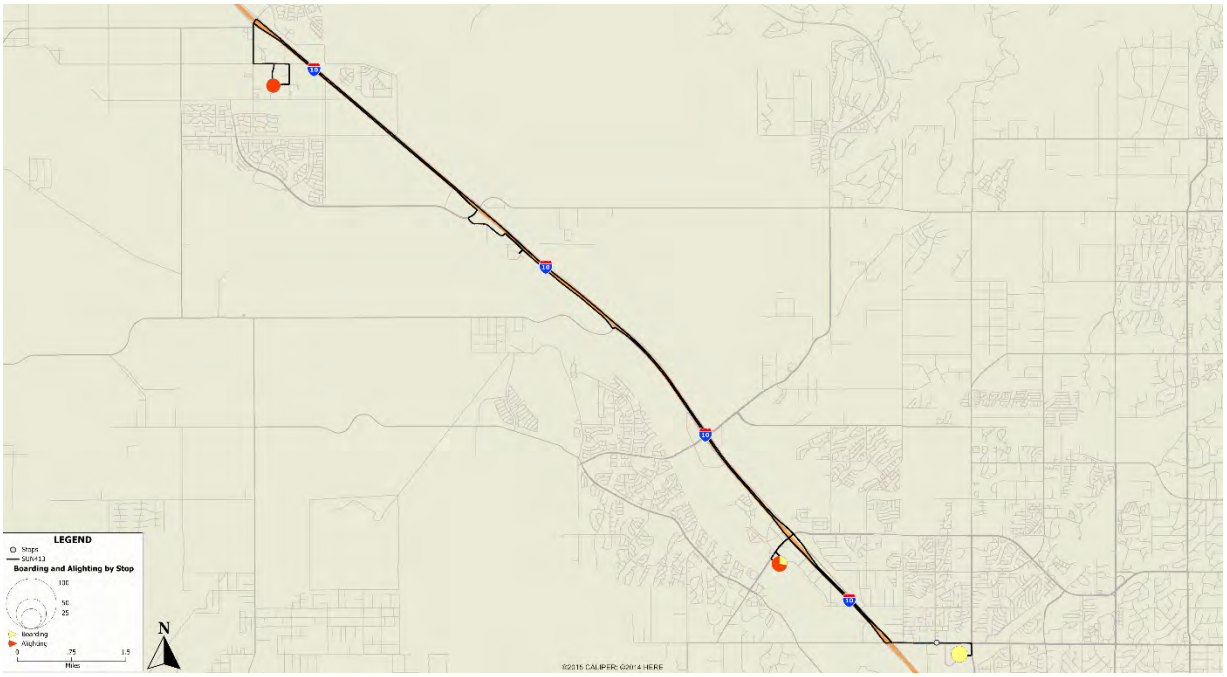
SUN411SB Boarding and Alighting Locations



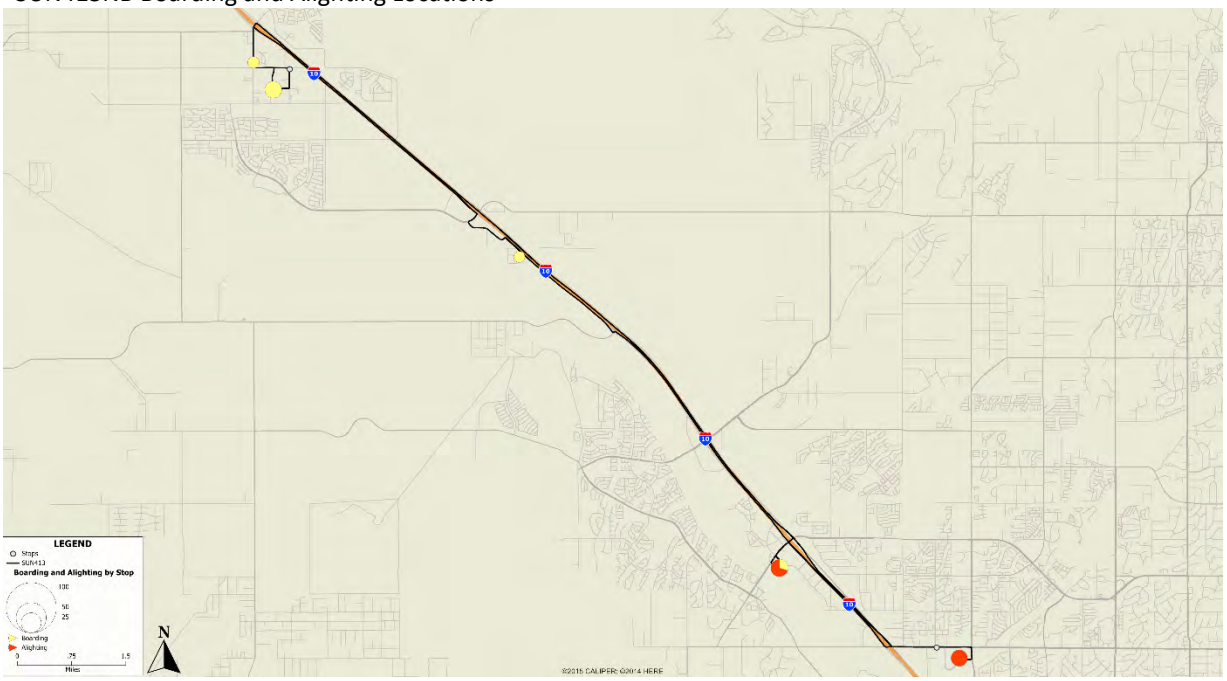
SUN412NB Boarding and Alighting Locations



SUN412SB Boarding and Alighting Locations

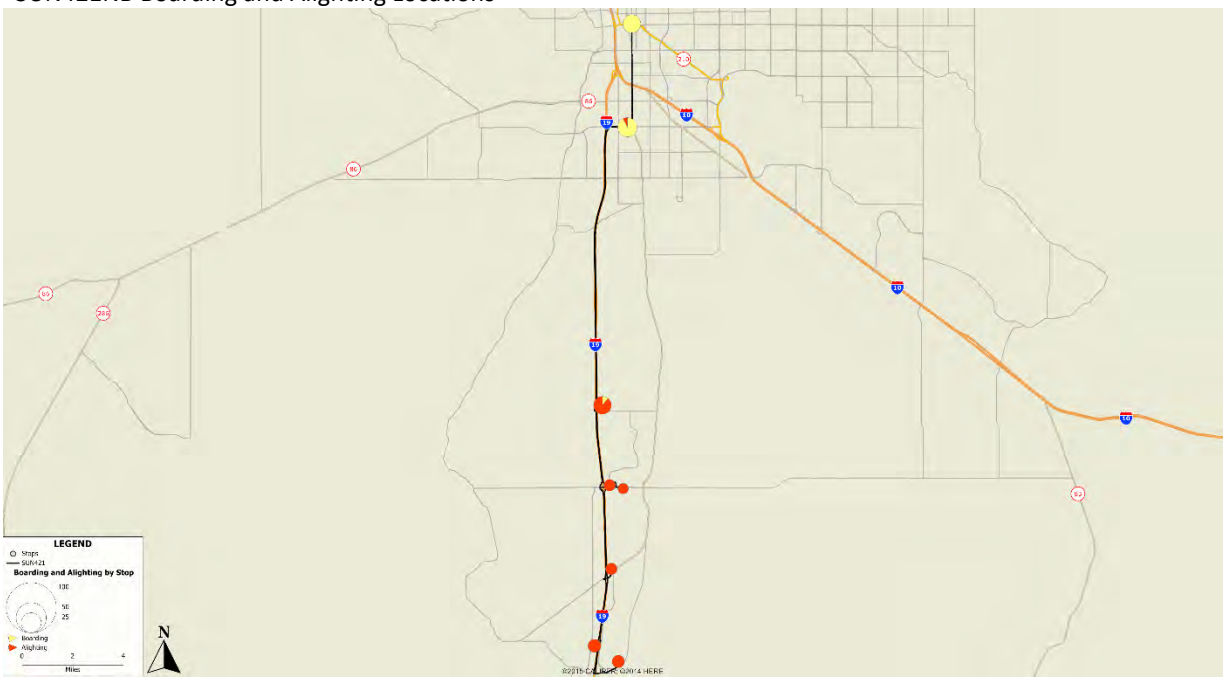


SUN413NB Boarding and Alighting Locations

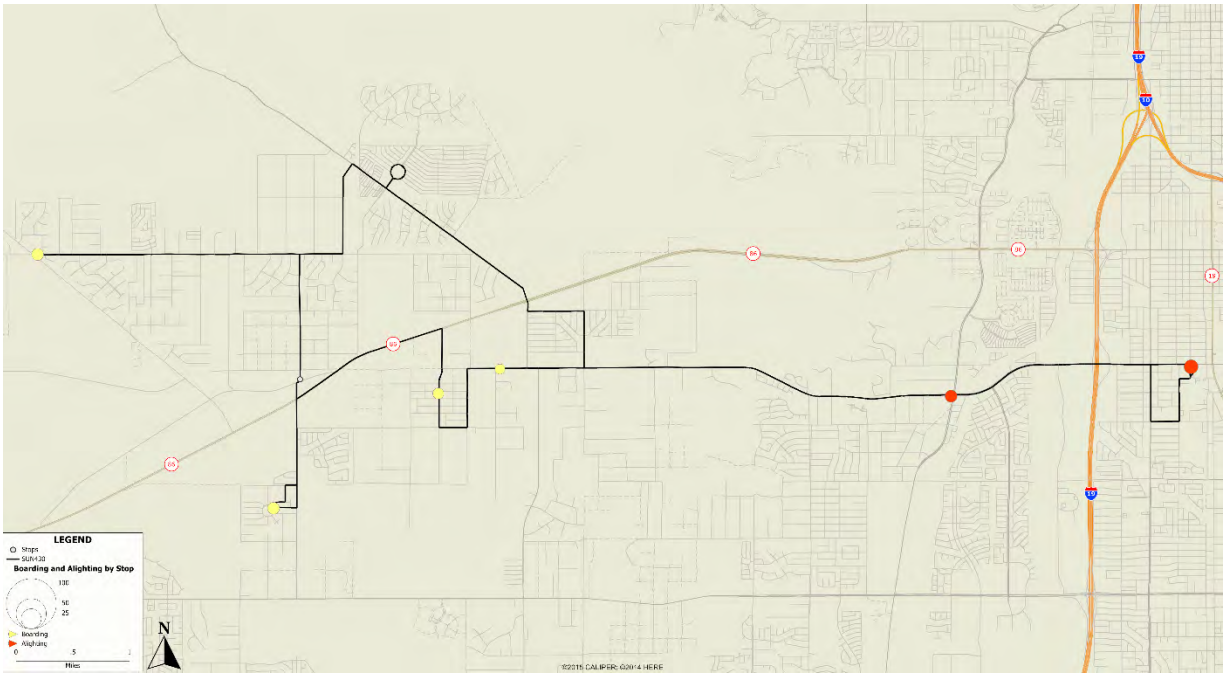


SUN413SB Boarding and Alighting Locations

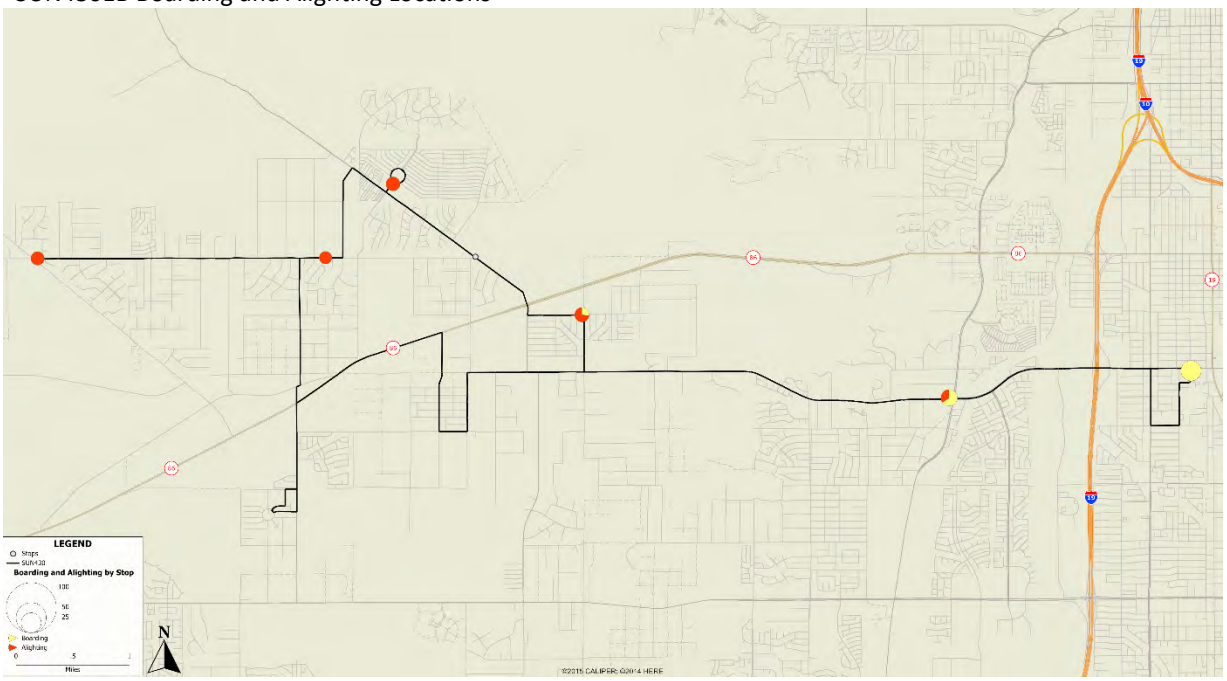
SUN421NB Boarding and Alighting Locations



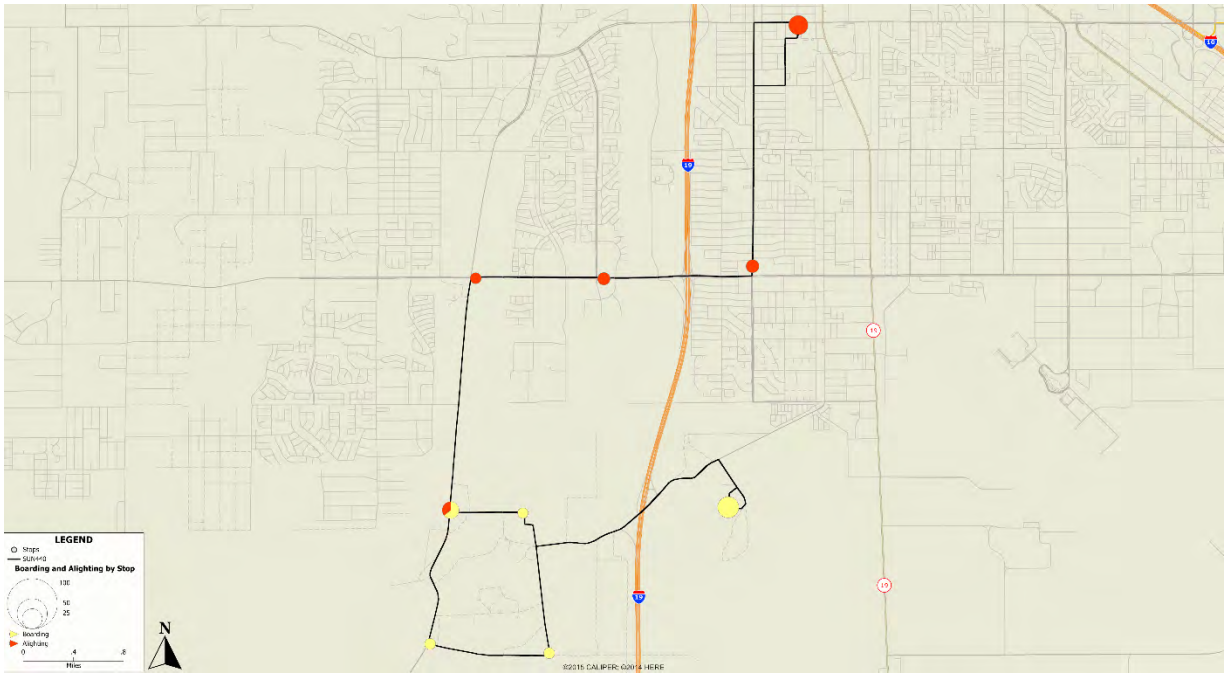
SUN421SB Boarding and Alighting Locations



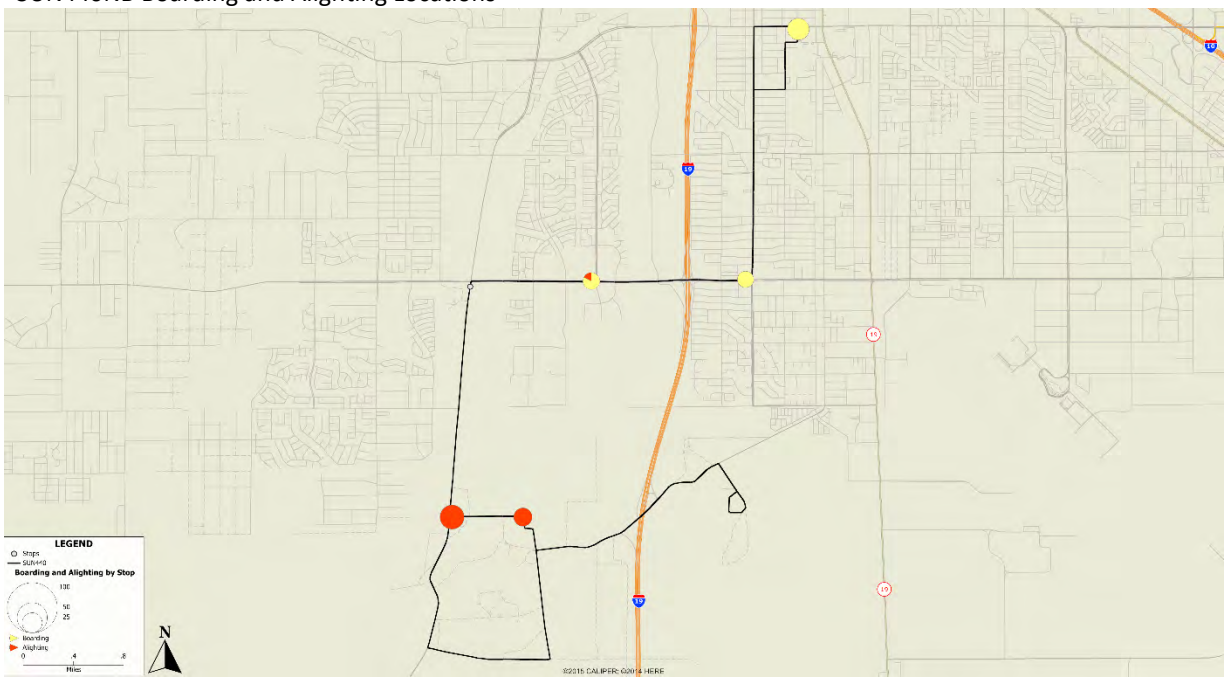
SUN430EB Boarding and Alighting Locations



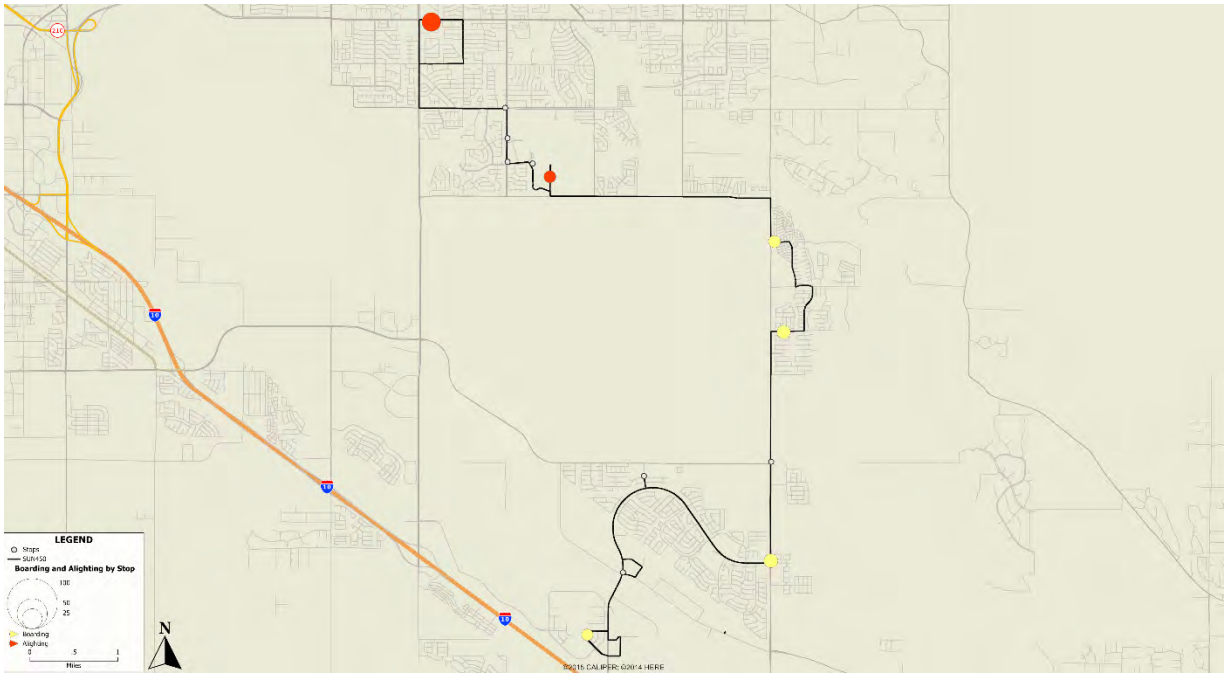
SUN430WB Boarding and Alighting Locations



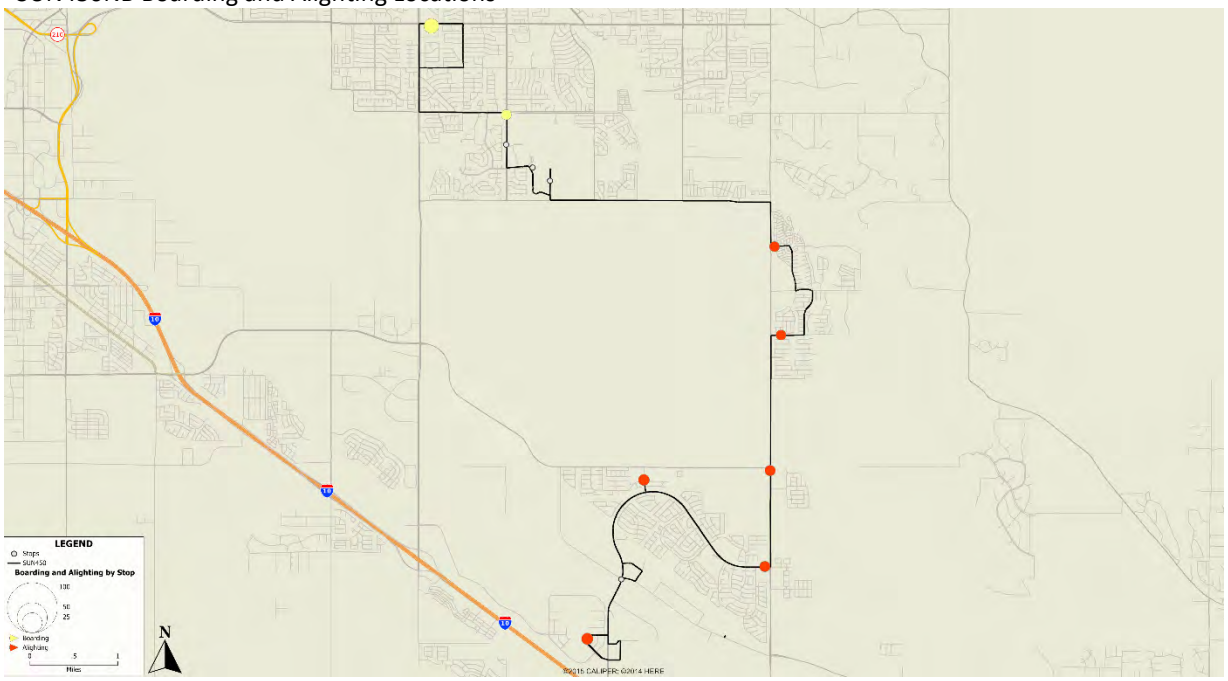
SUN440NB Boarding and Alighting Locations



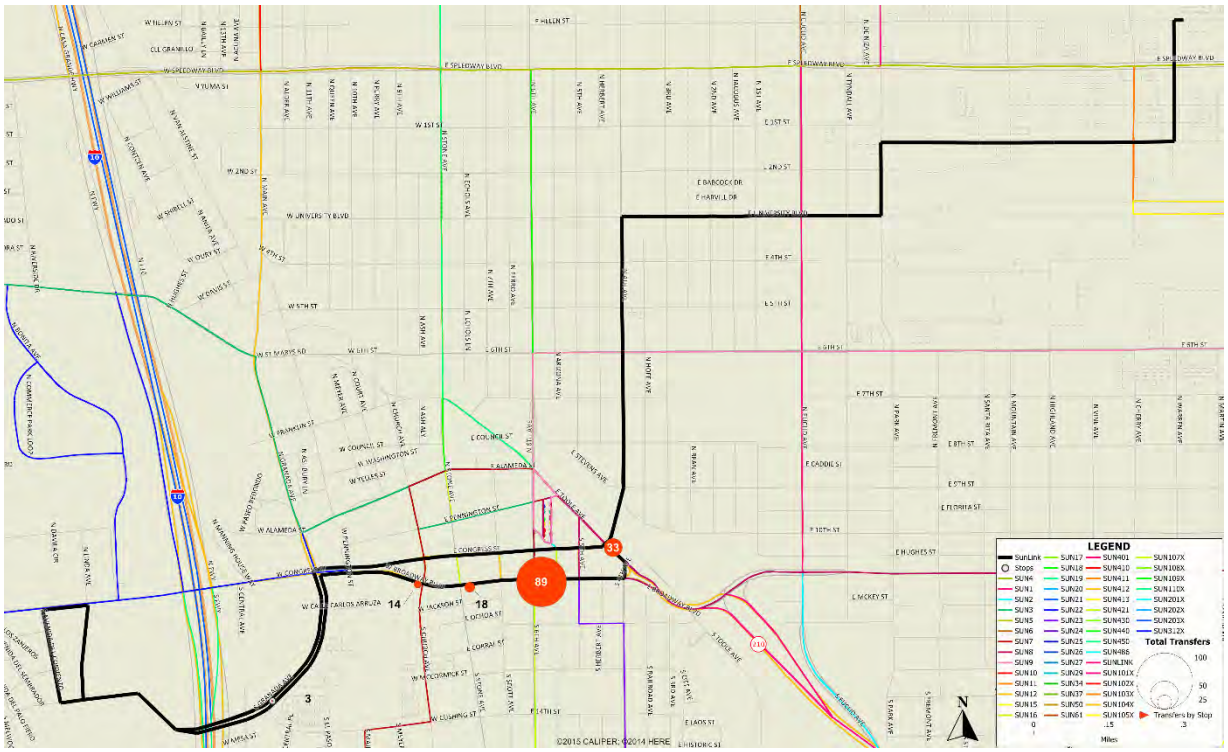
SUN440SB Boarding and Alighting Locations



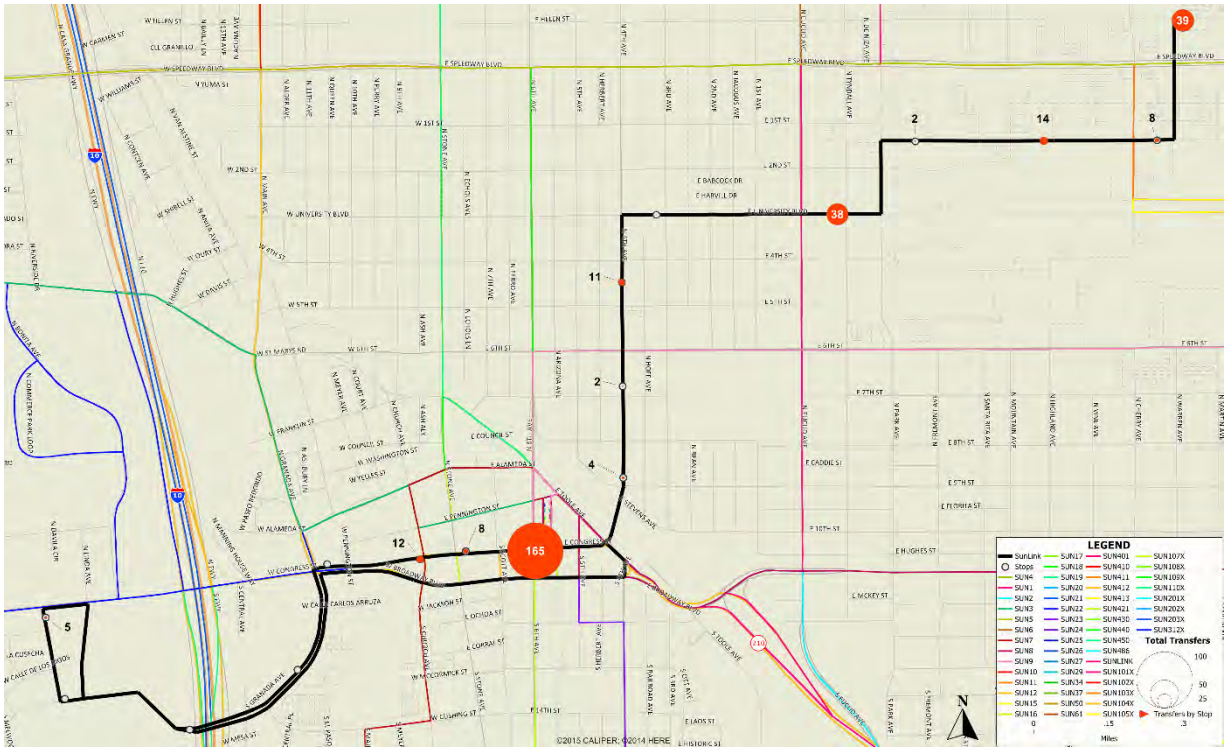
SUN450NB Boarding and Alighting Locations



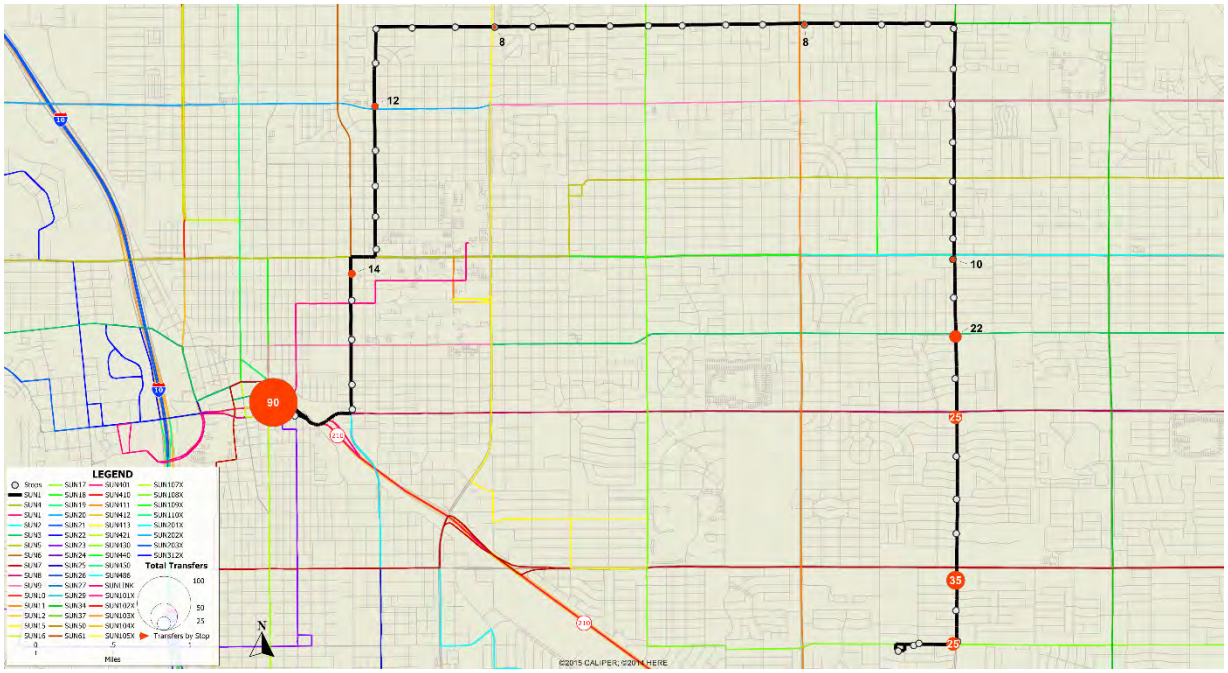
SUN450SB Boarding and Alighting Locations



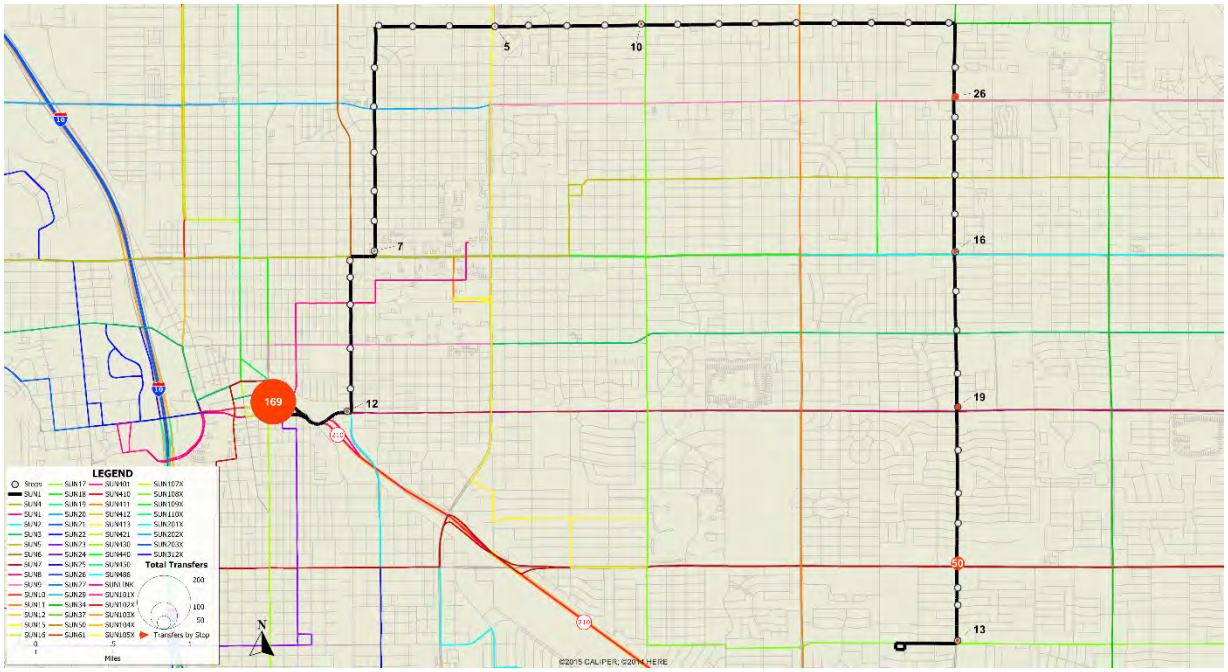
SUNLINKEB Transfer Locations



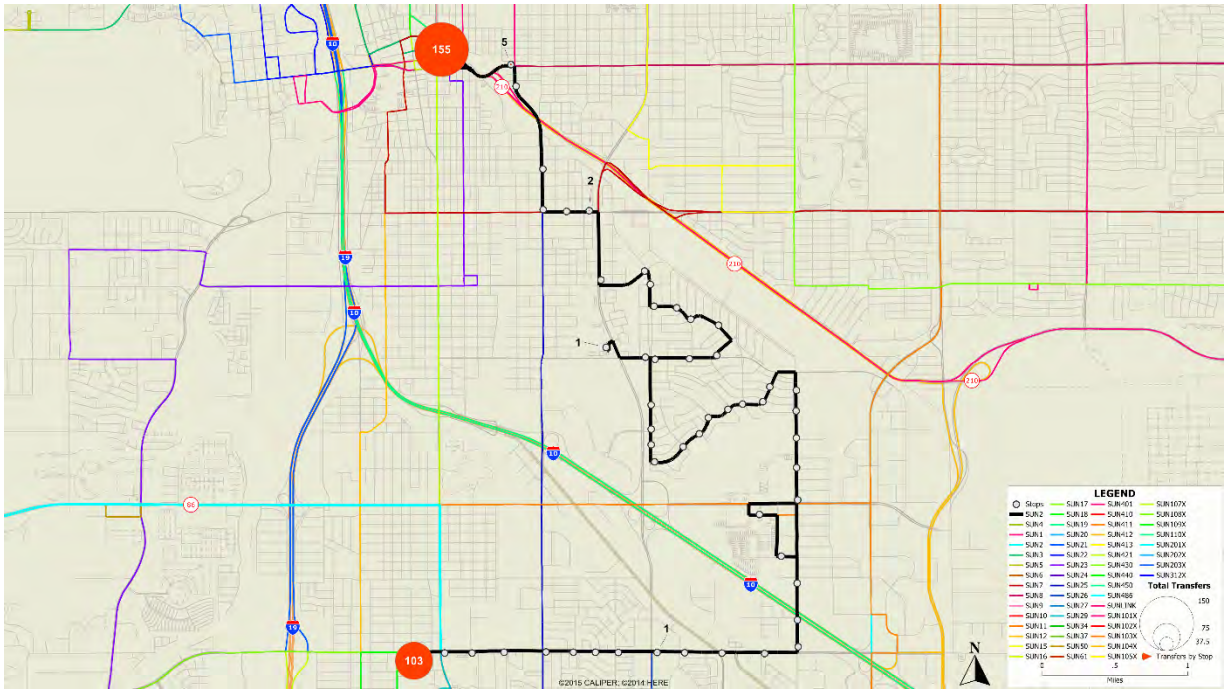
SUNLINKWB Transfer Locations



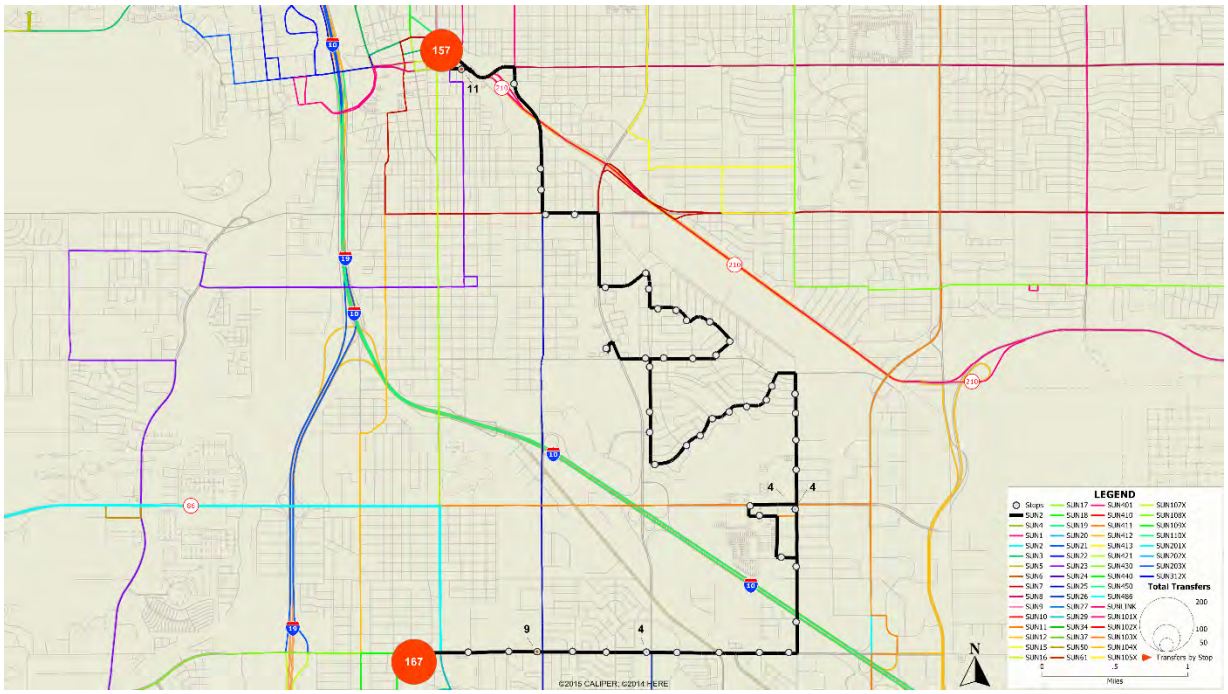
SUN1NB Transfer Locations



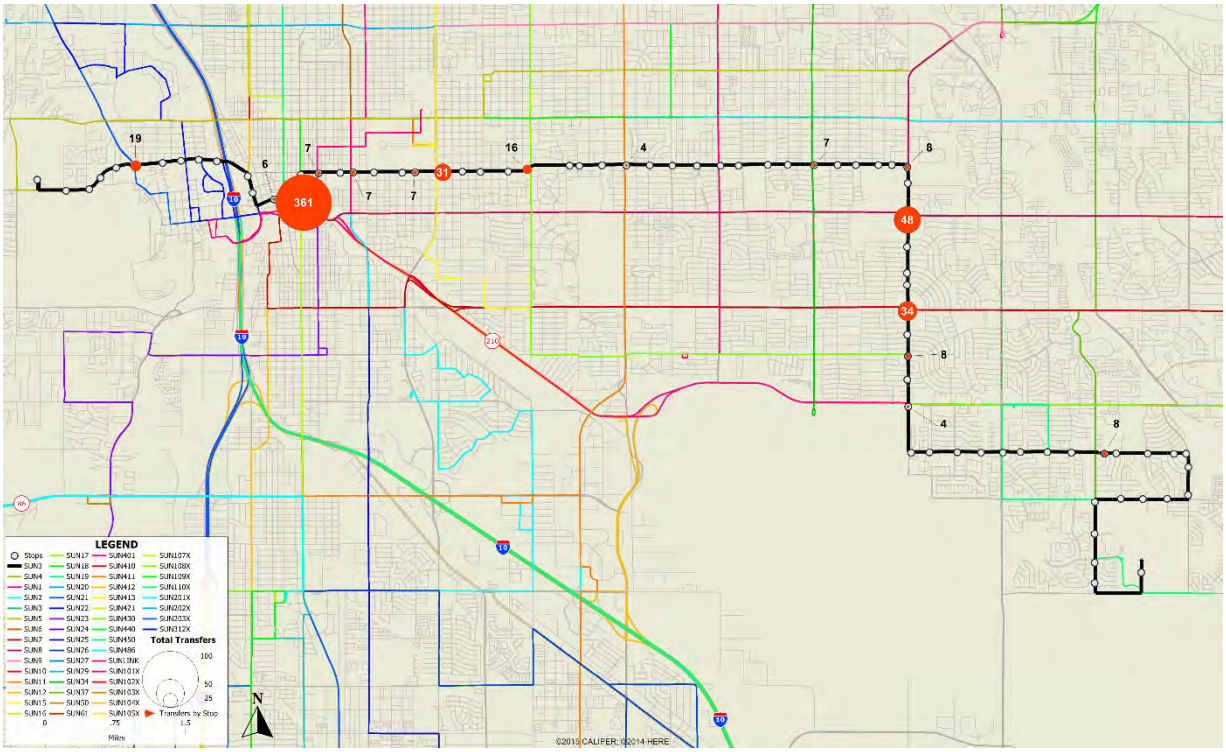
SUN1SB Transfer Locations



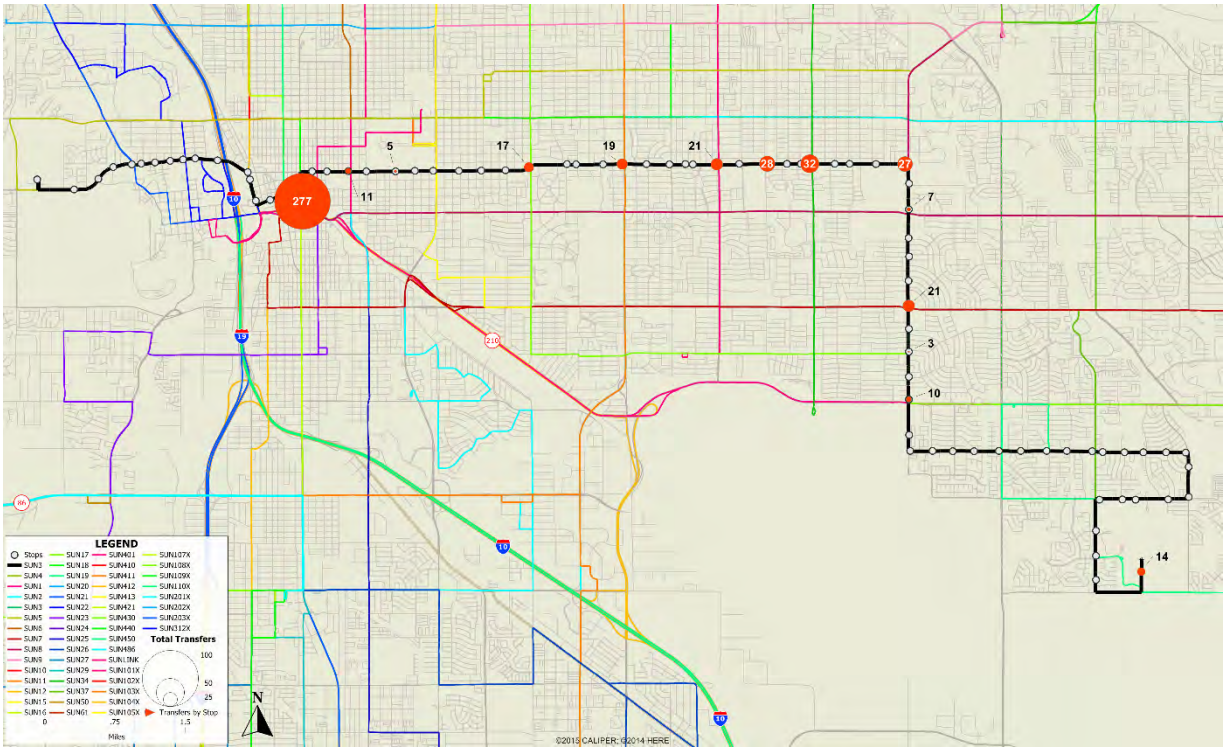
SUN2NB Transfer Locations



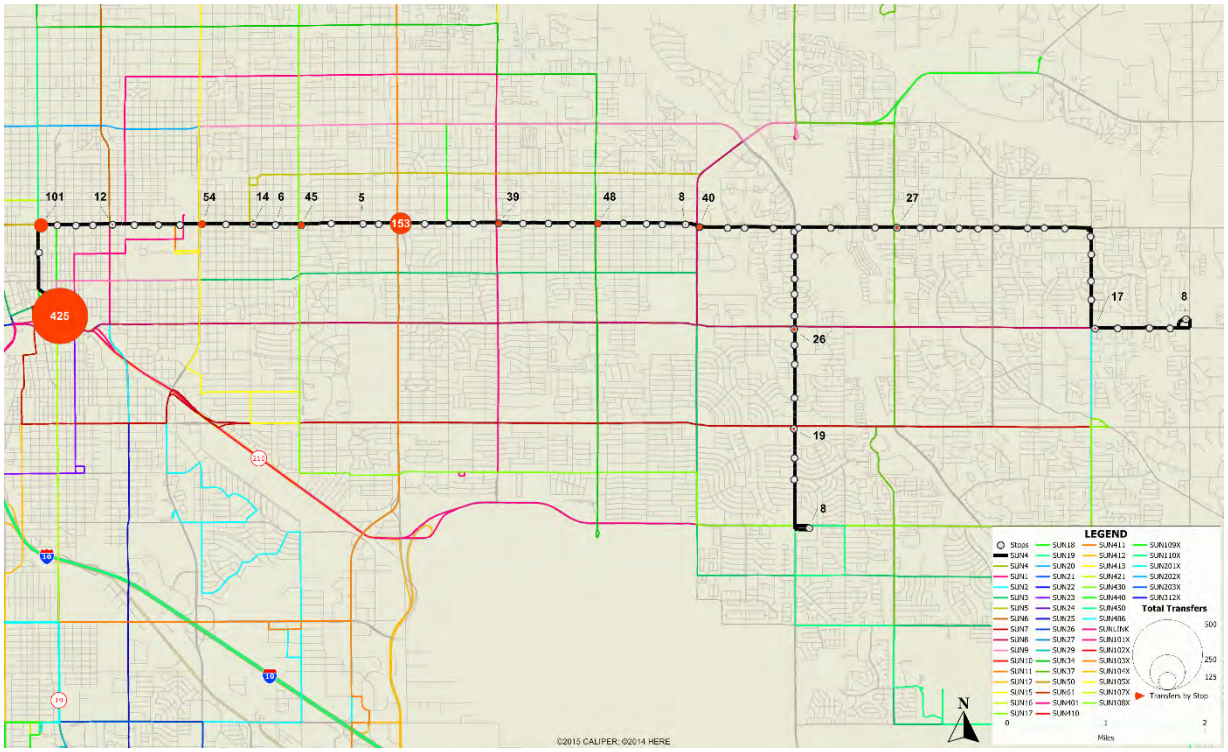
SUN2SB Transfer Locations



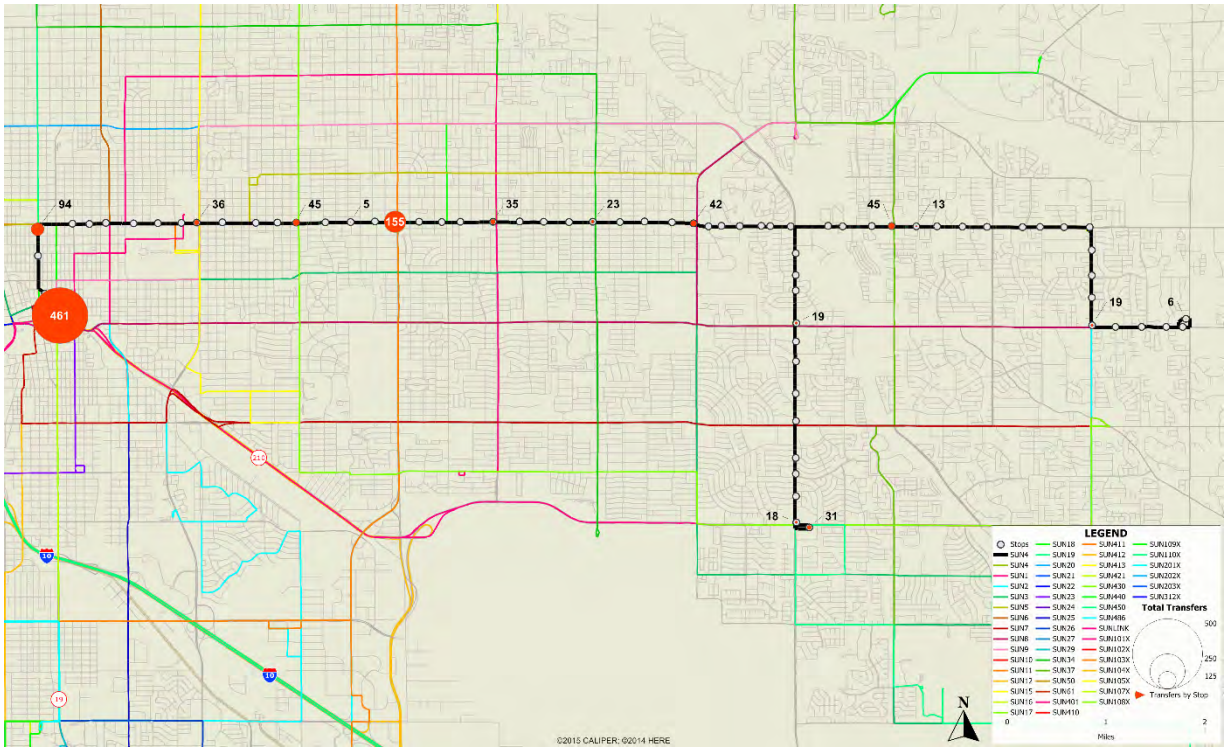
SUN3EB Transfer Locations



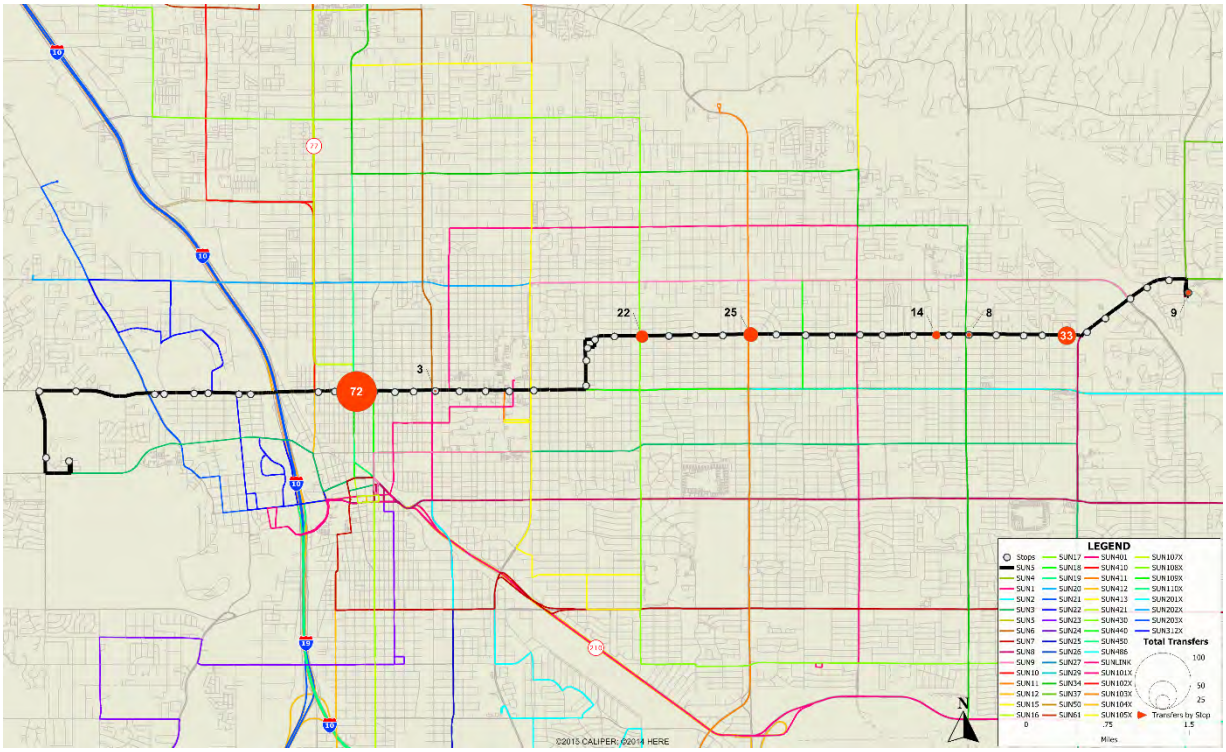
SUN3WB Transfer Locations



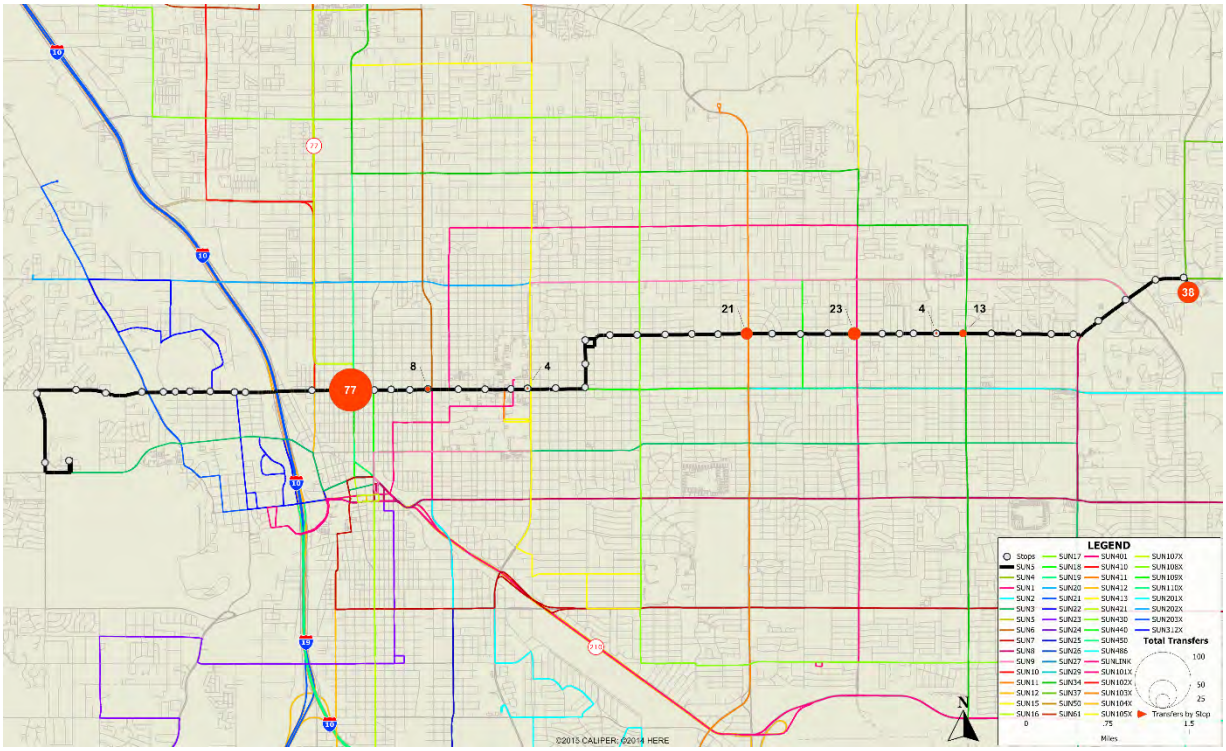
SUN4EB Transfer Locations



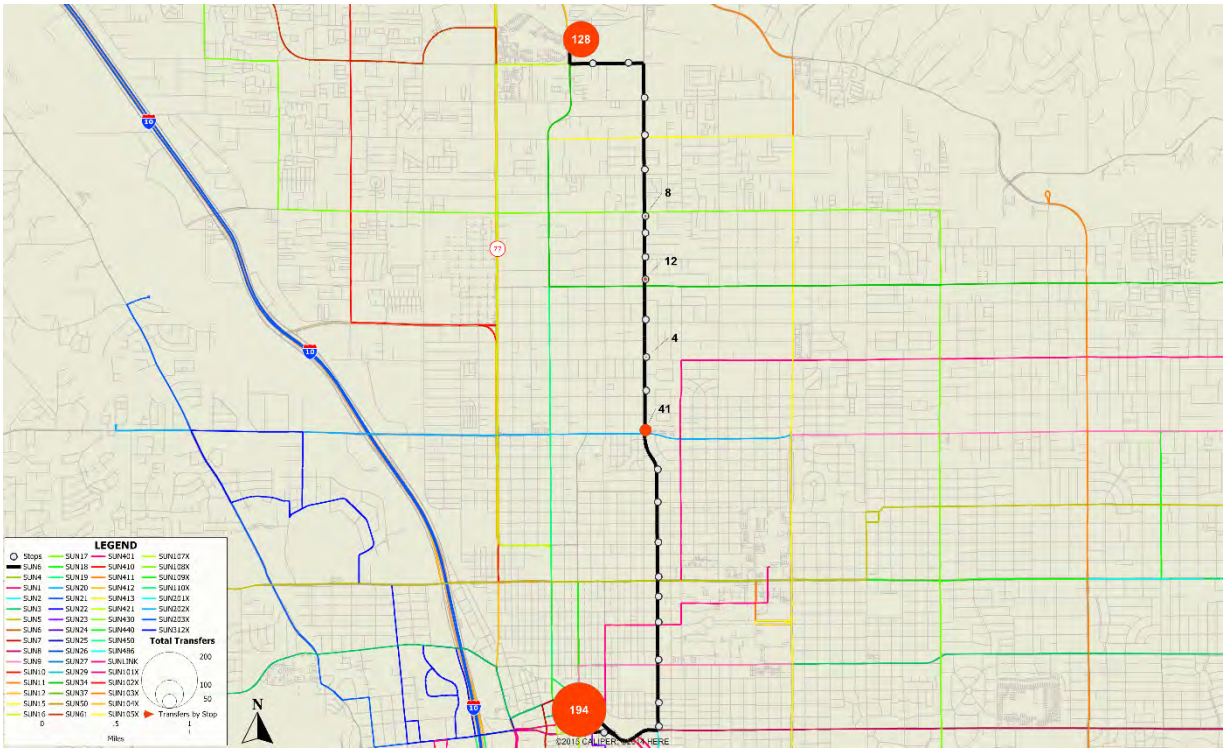
SUN4WB Transfer Locations



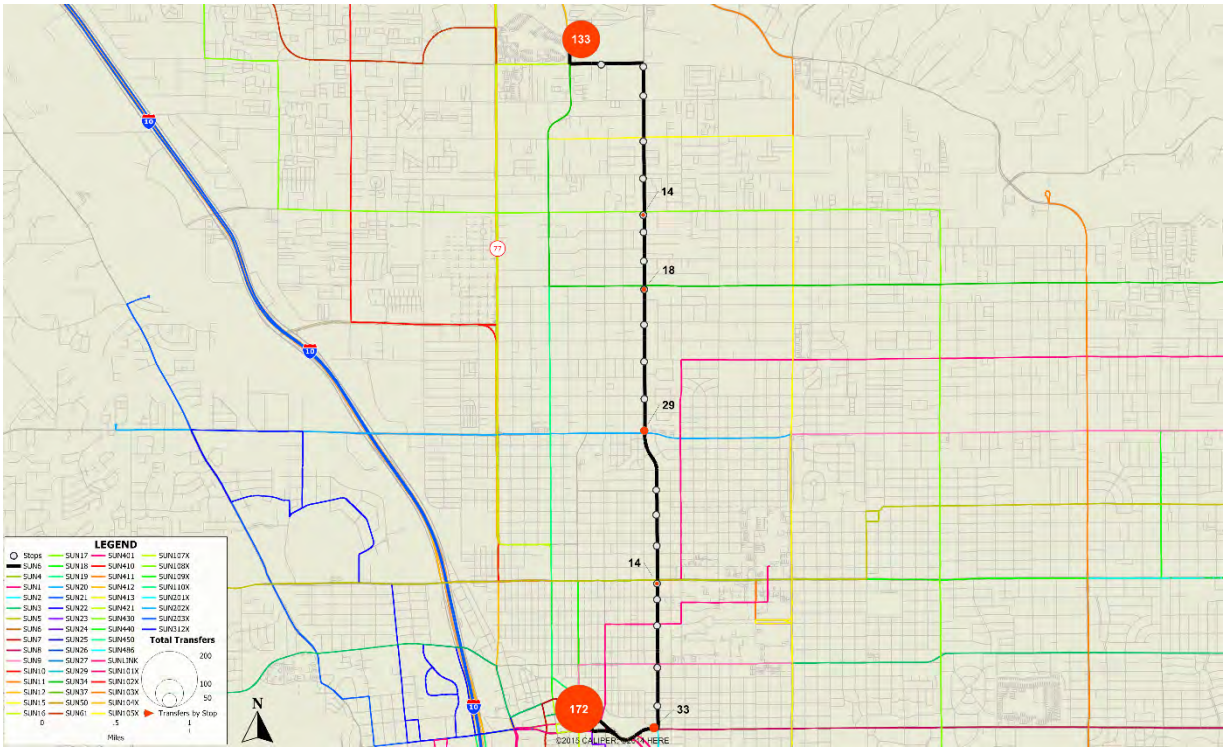
SUN5EB Transfer Locations



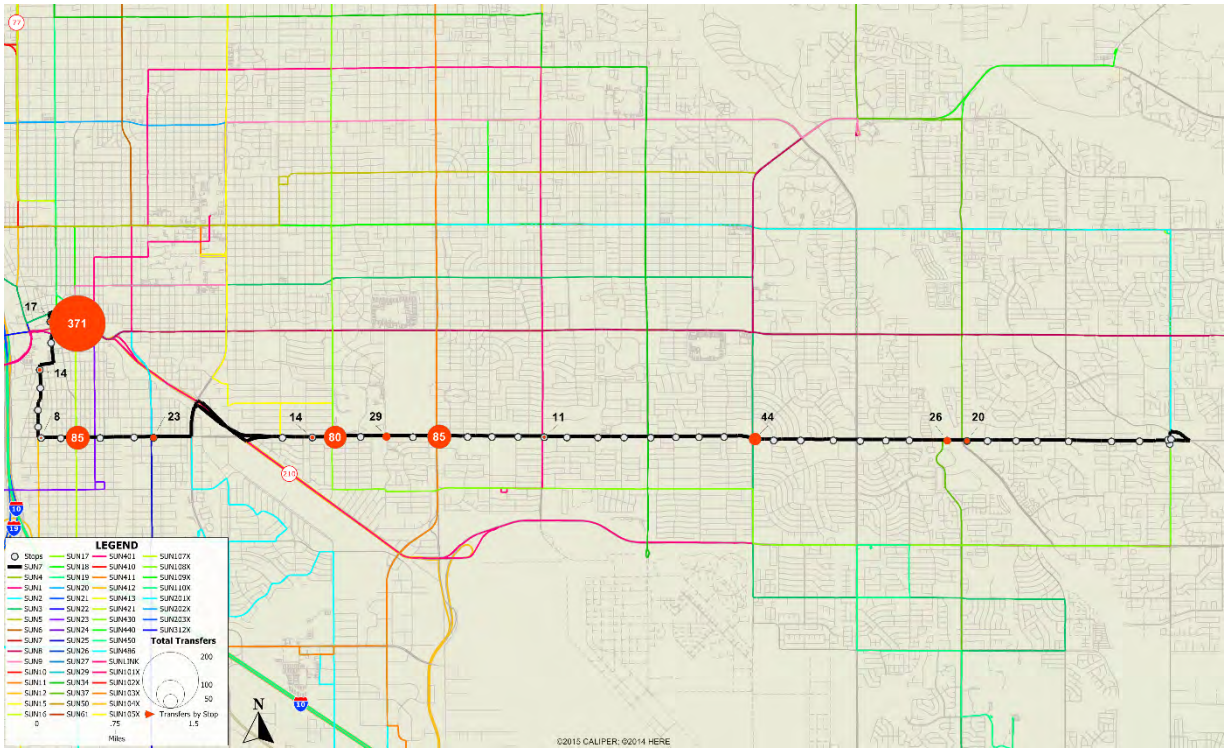
SUN5WB Transfer Locations



SUN6NB Transfer Locations



SUN6SB Transfer Locations



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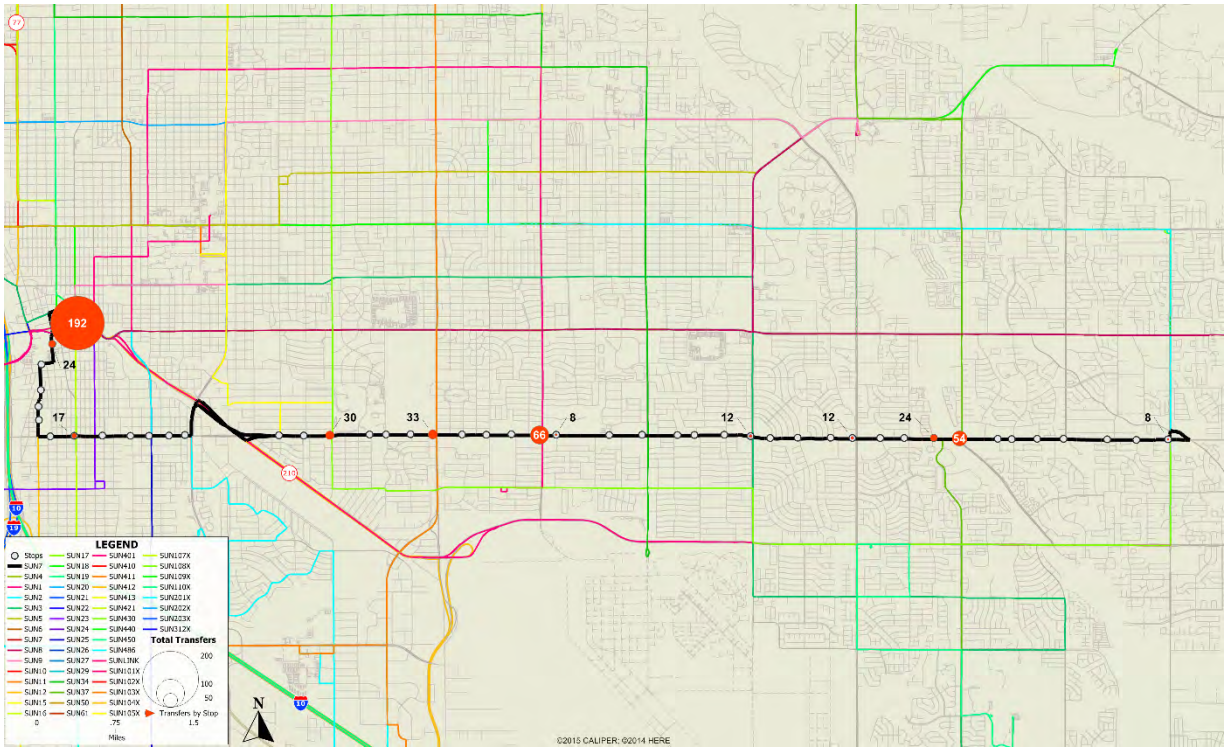

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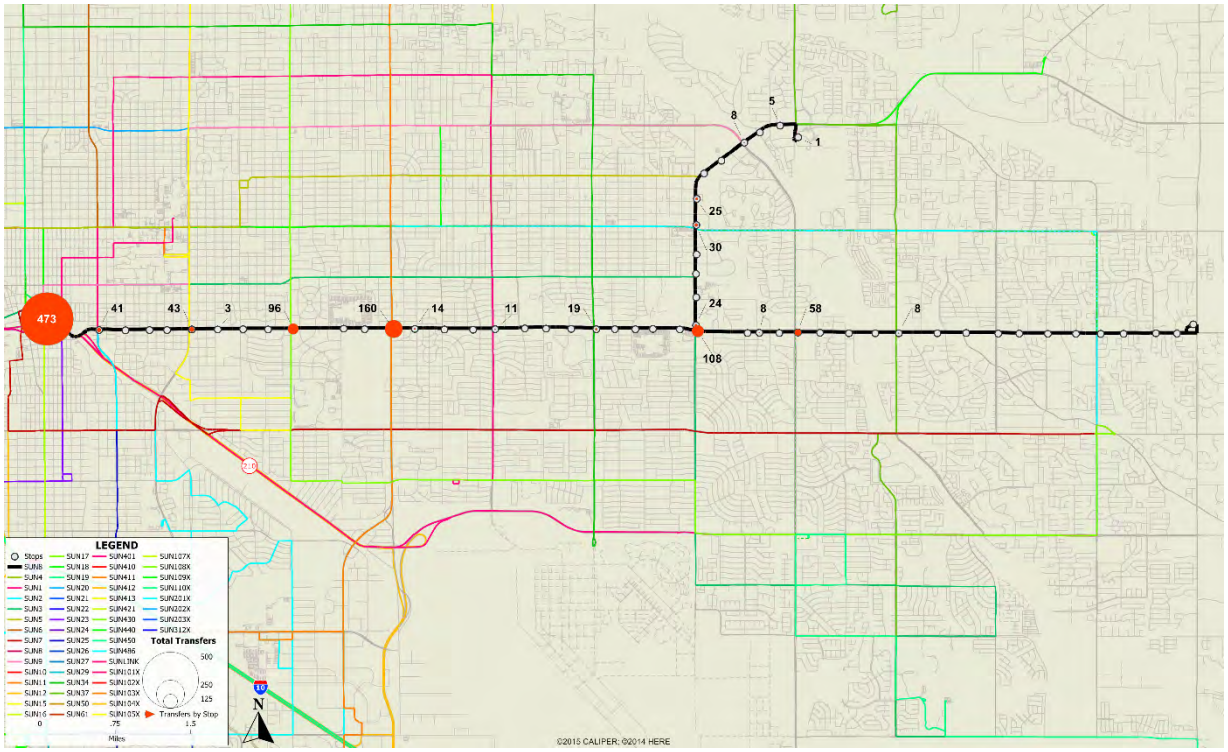

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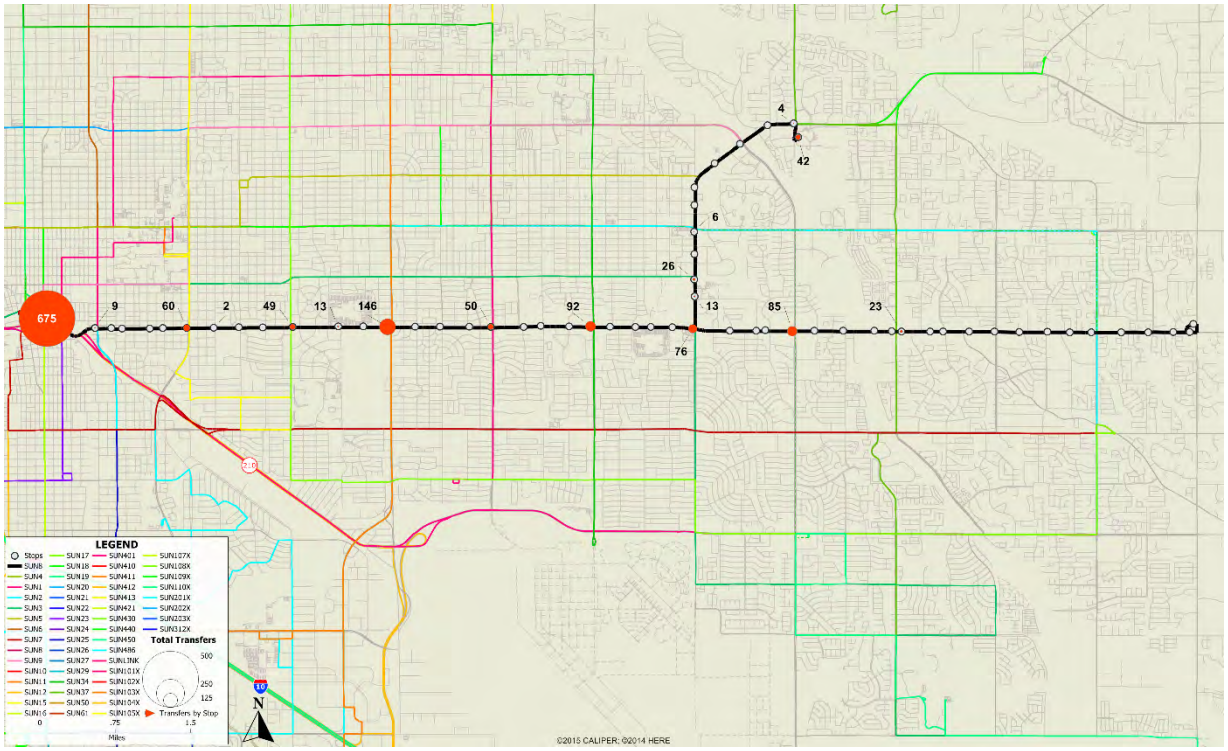

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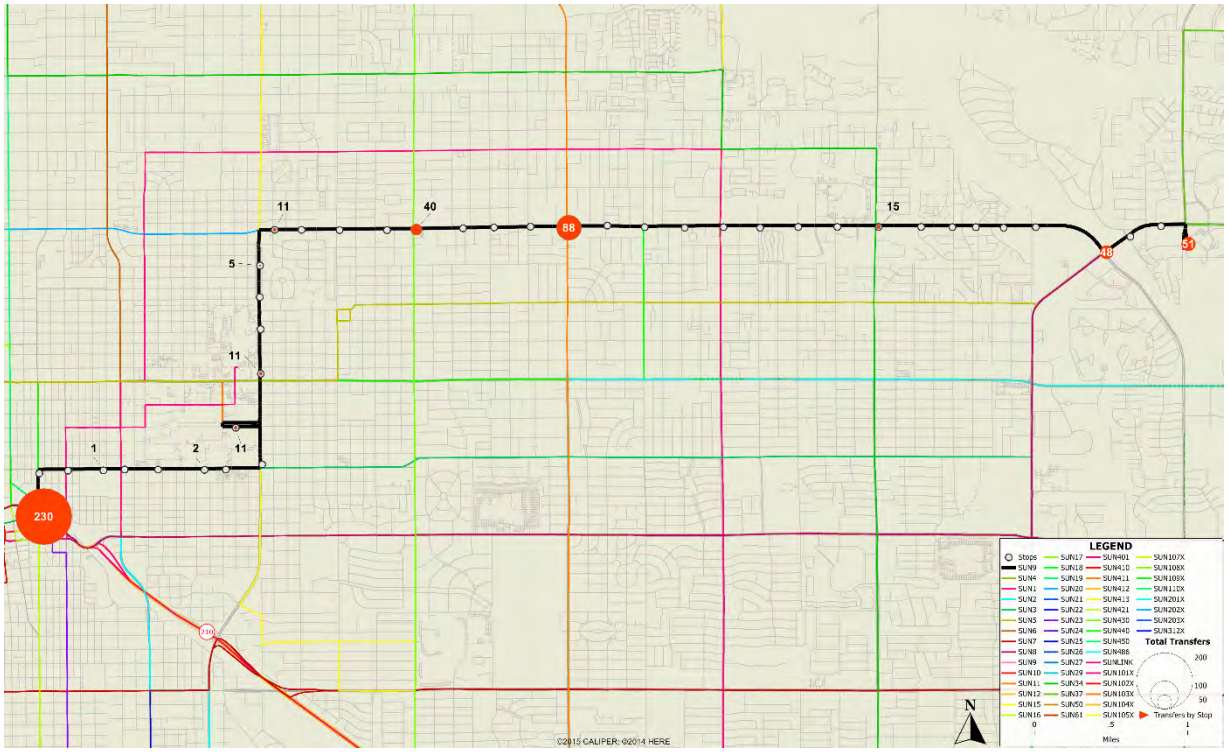
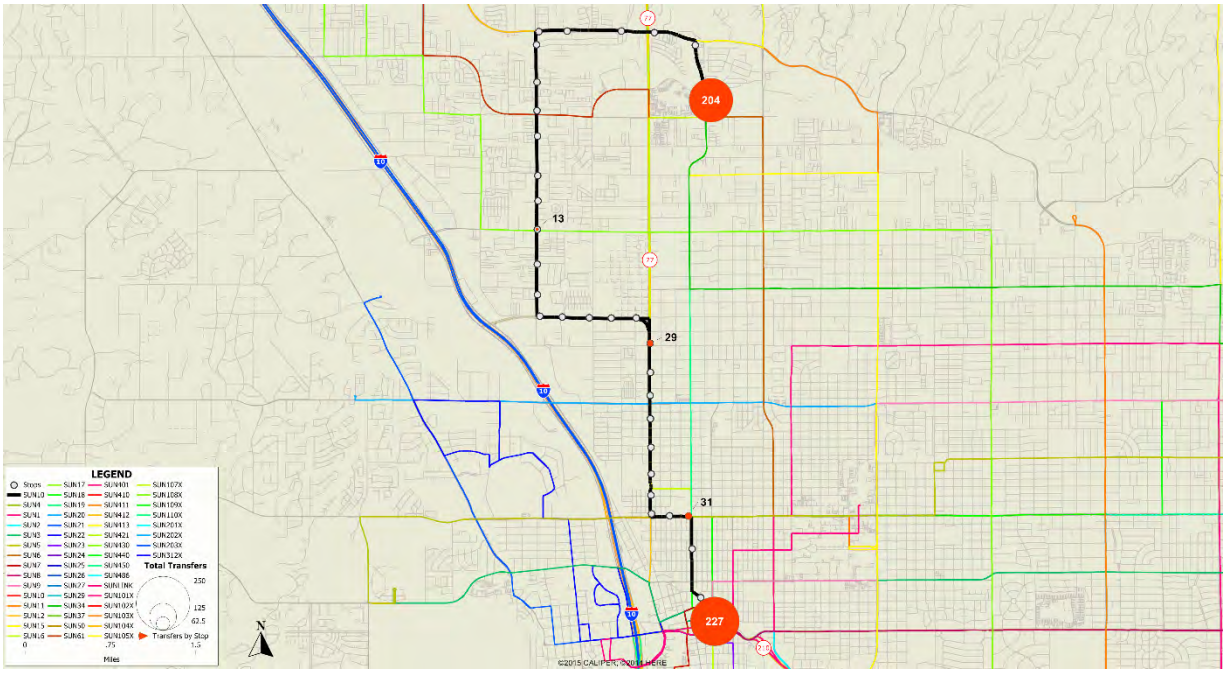


SUN9EB Transfer Locations

SUN9WB Transfer Locations



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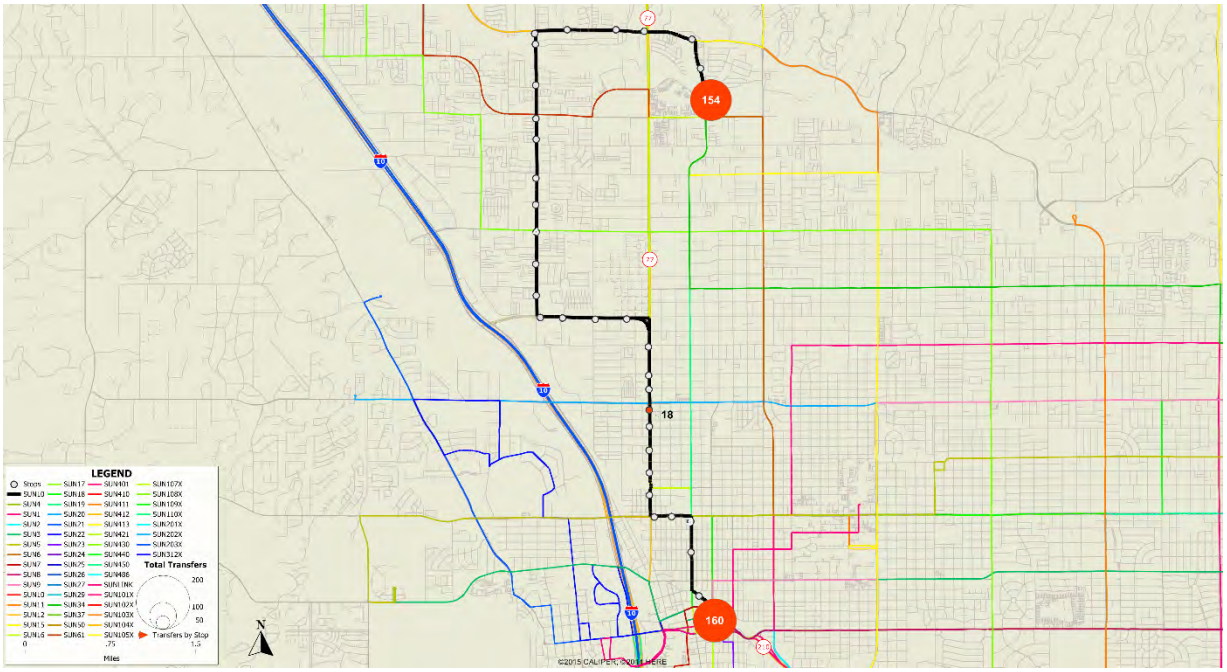
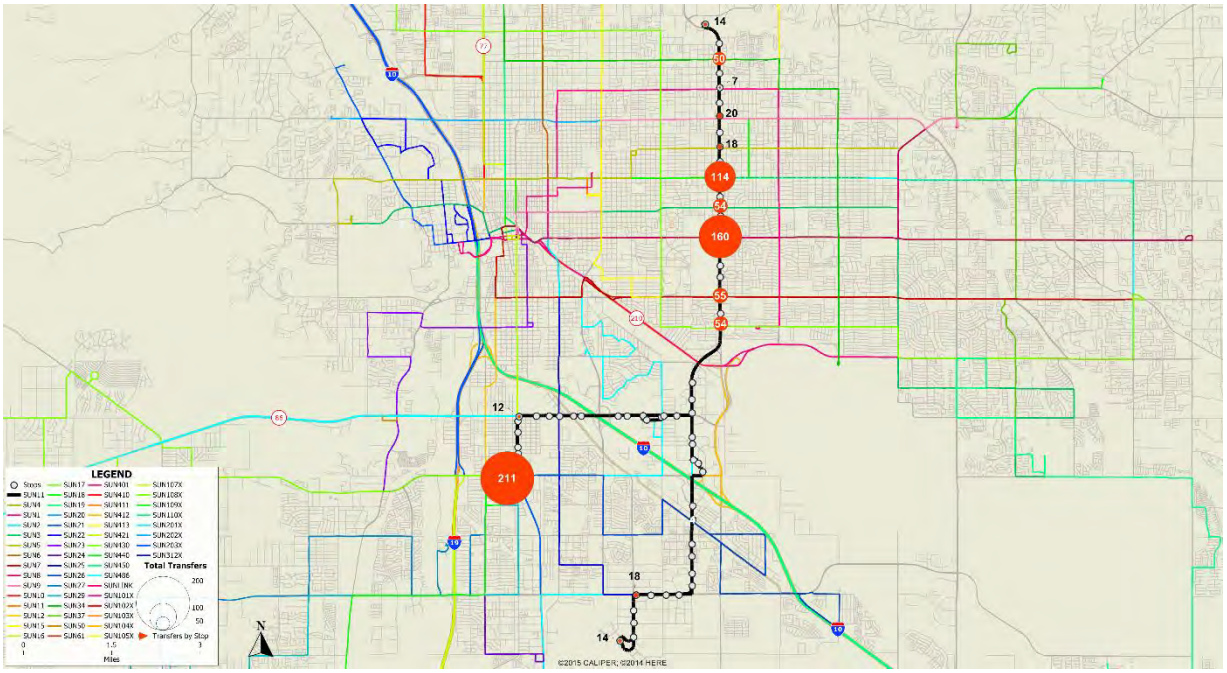


SUN10SB Transfer Locations



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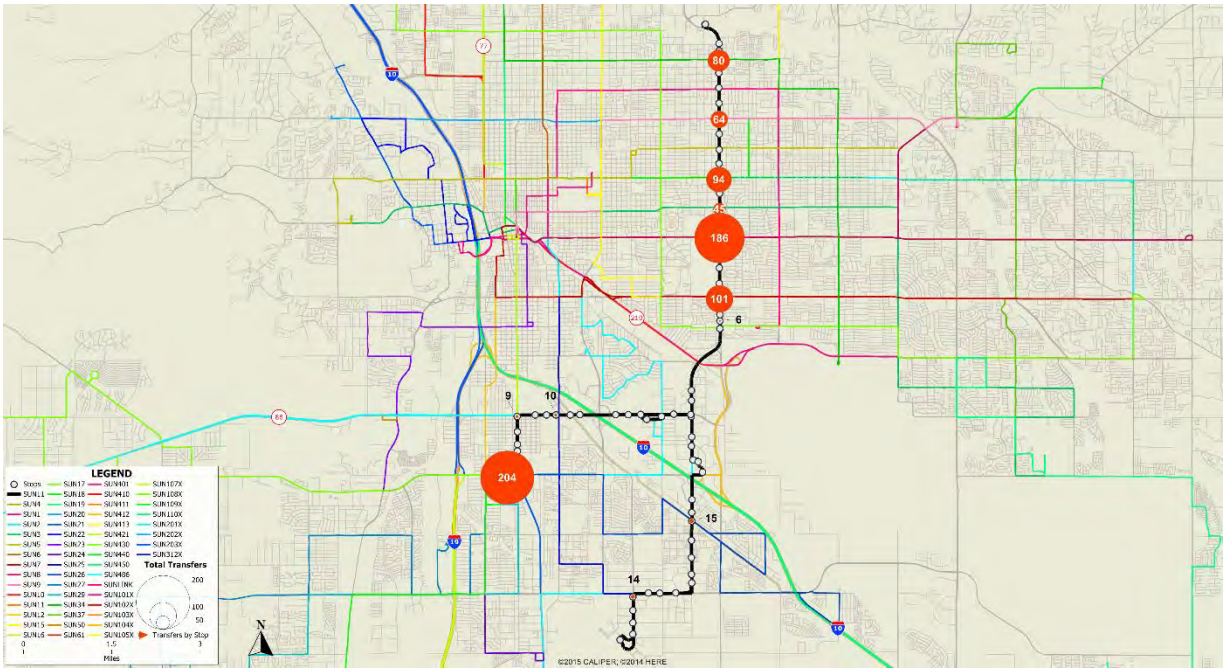

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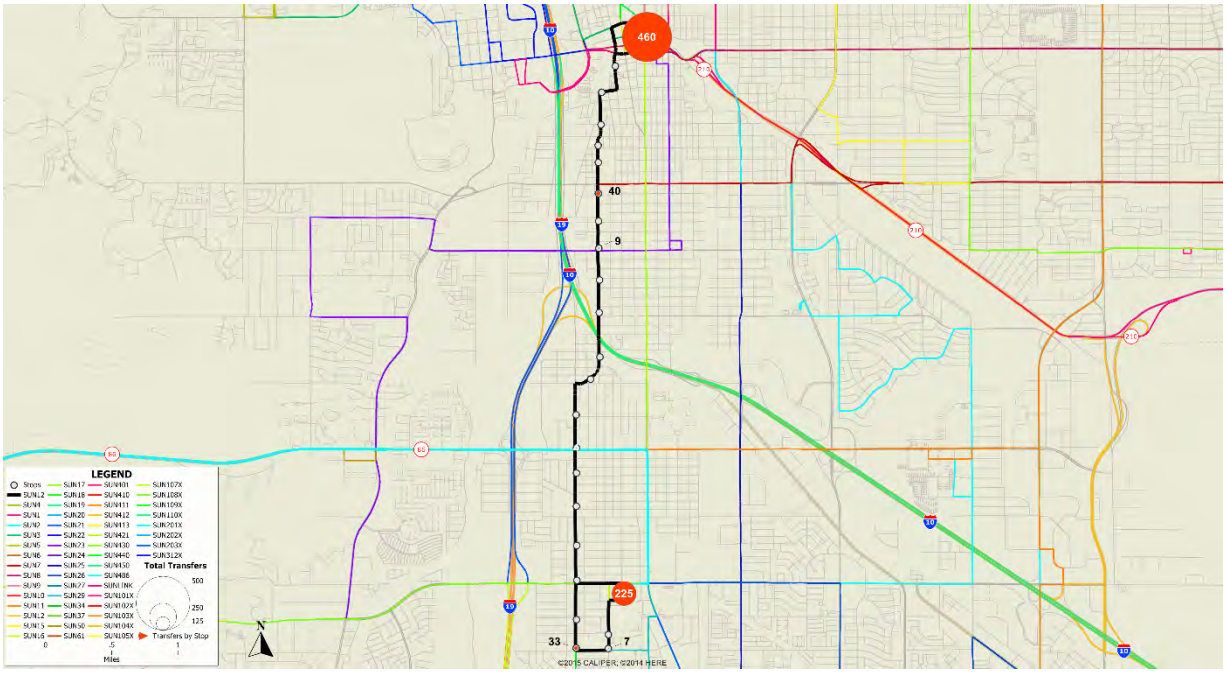

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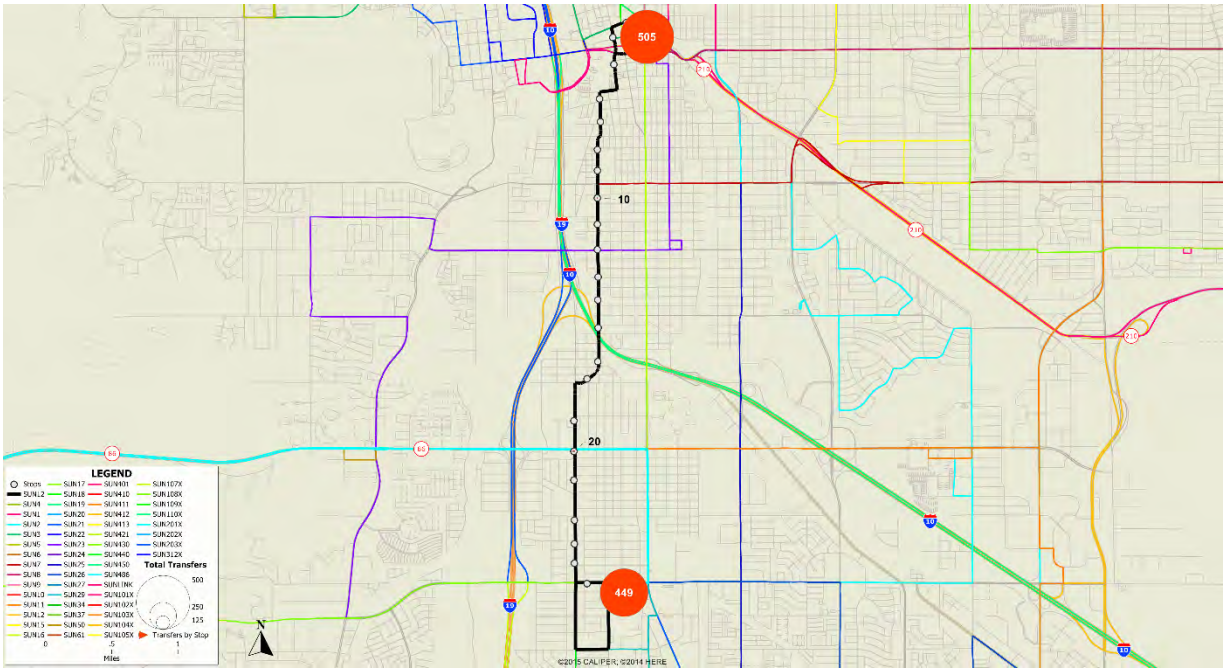

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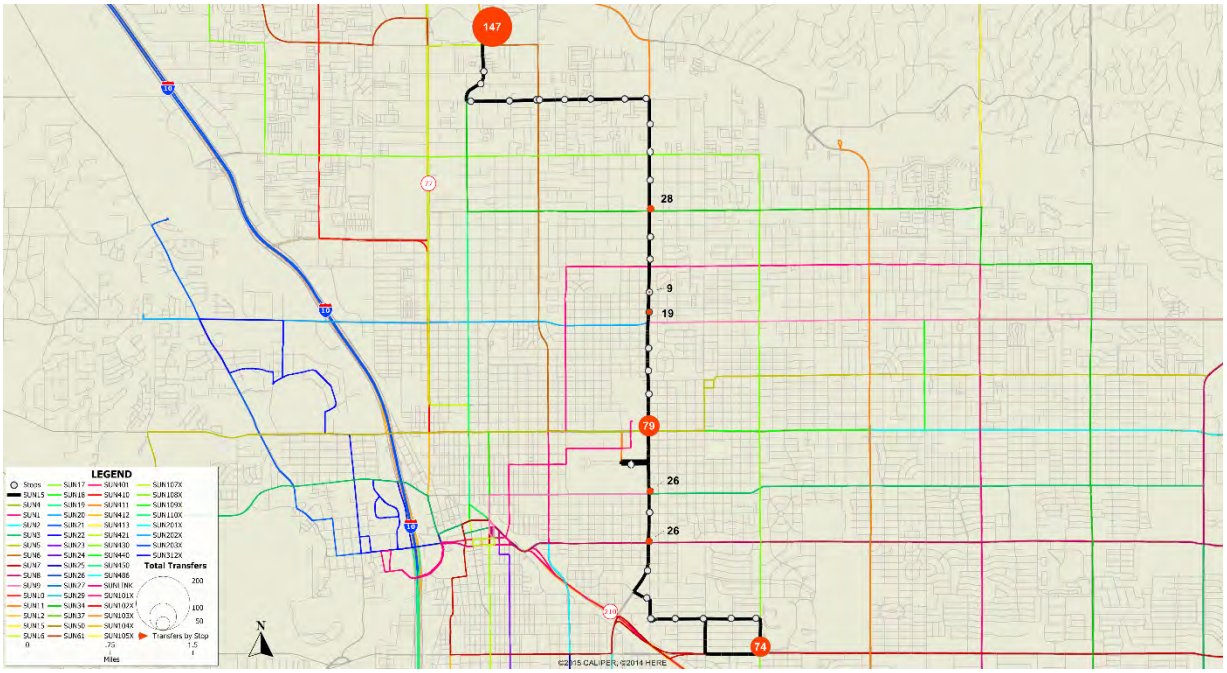

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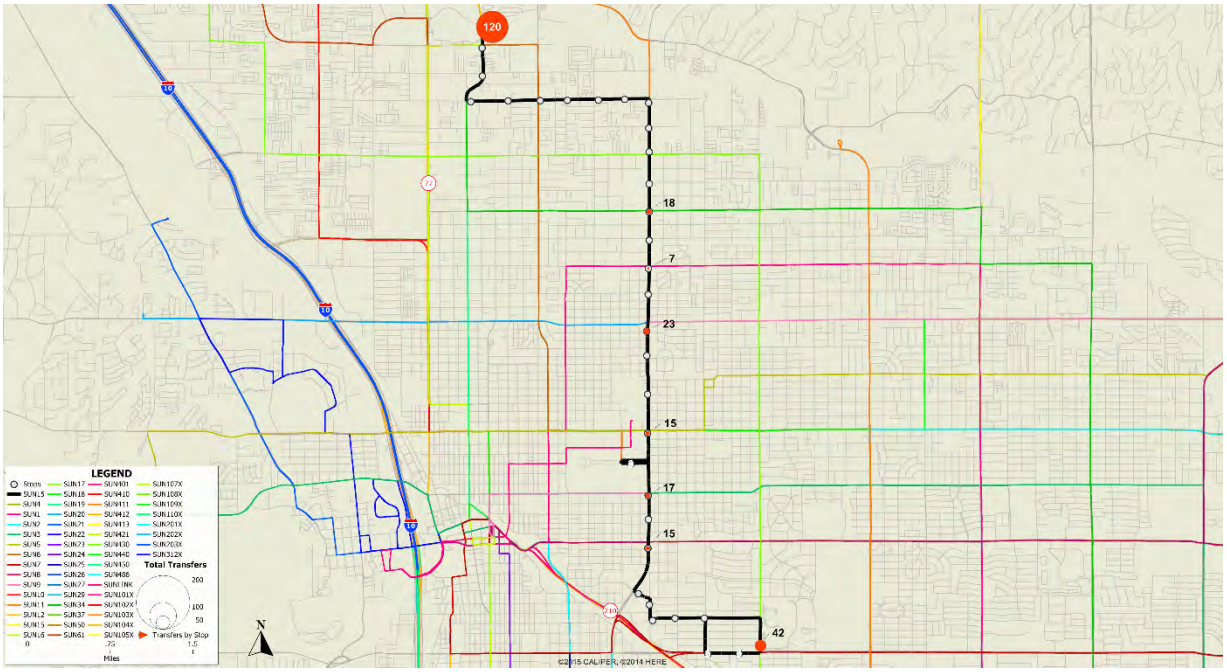

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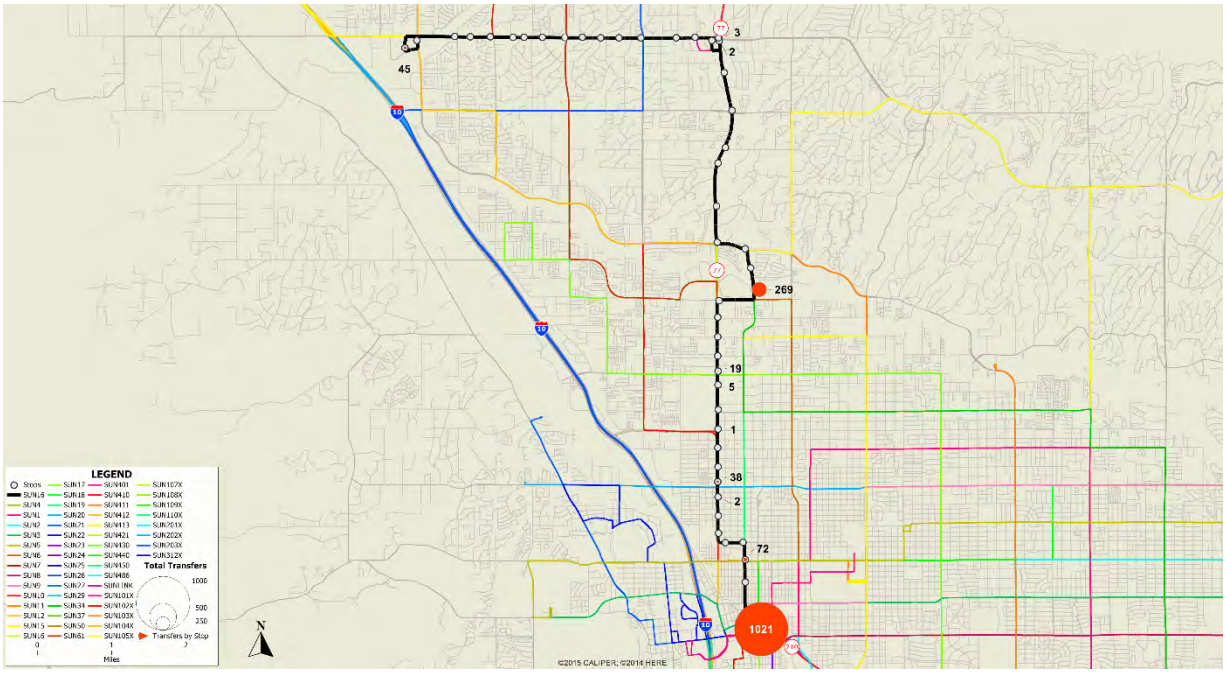

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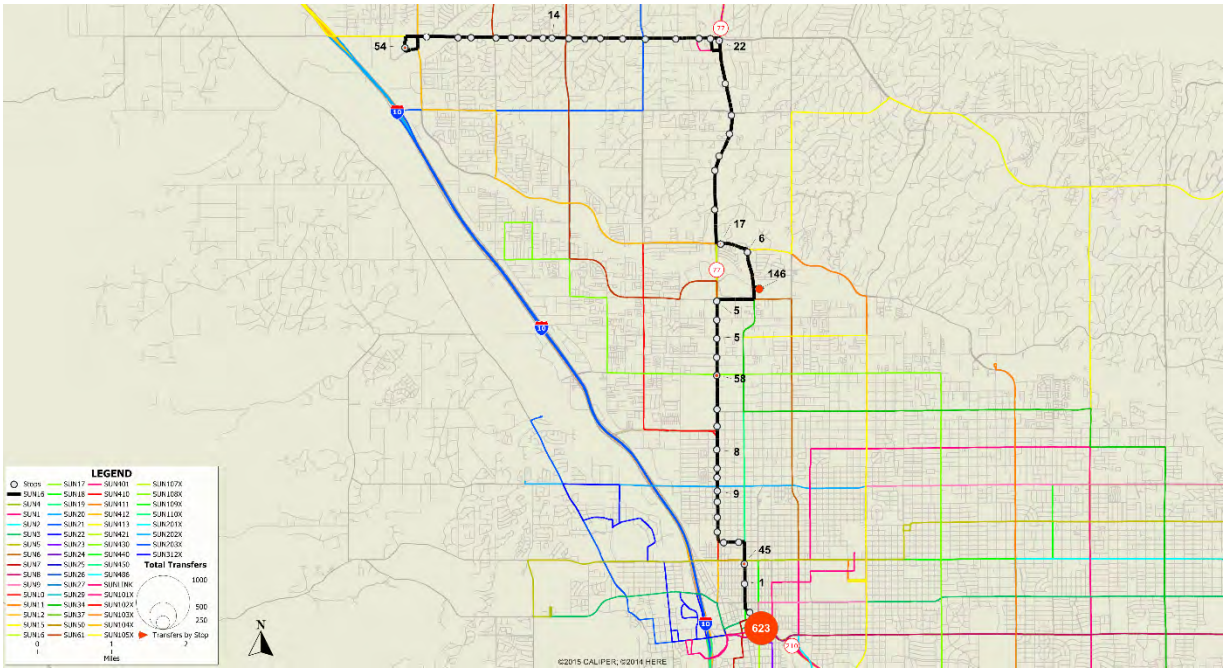

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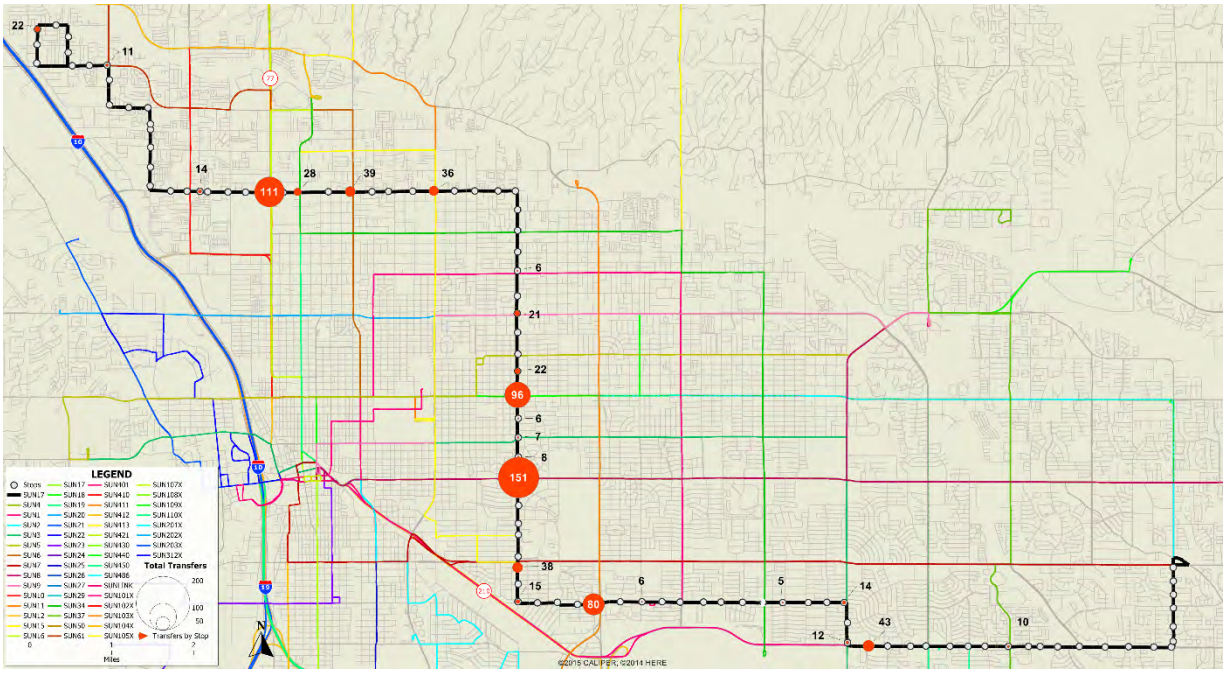

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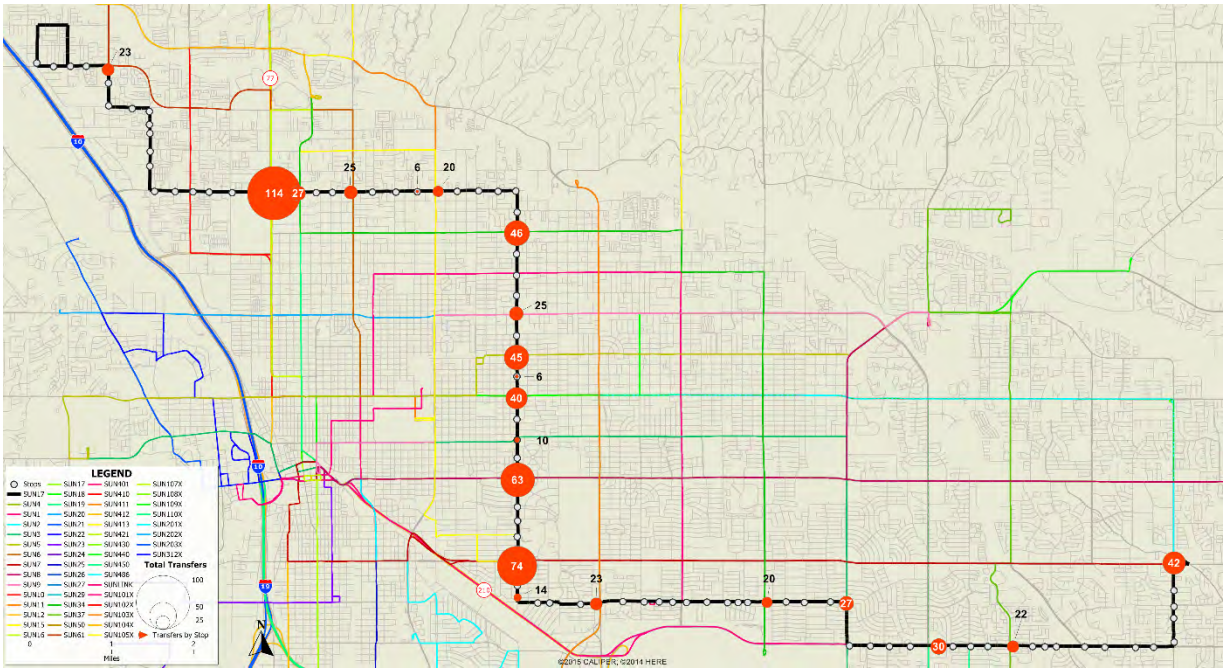

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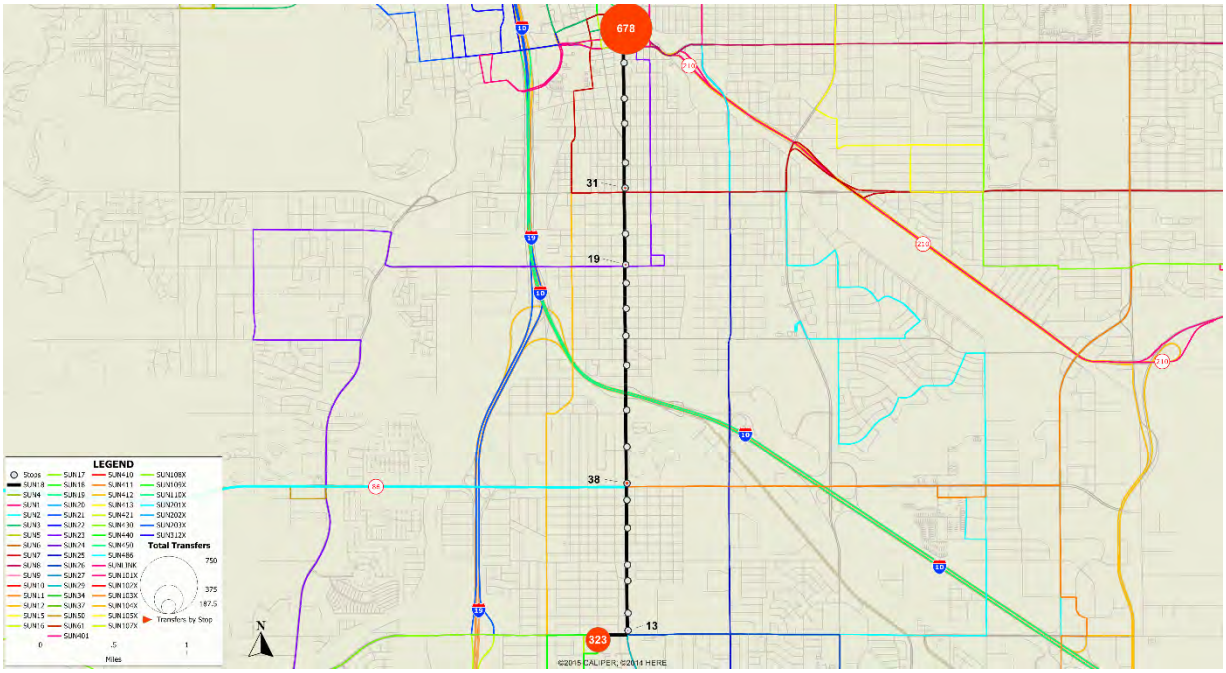

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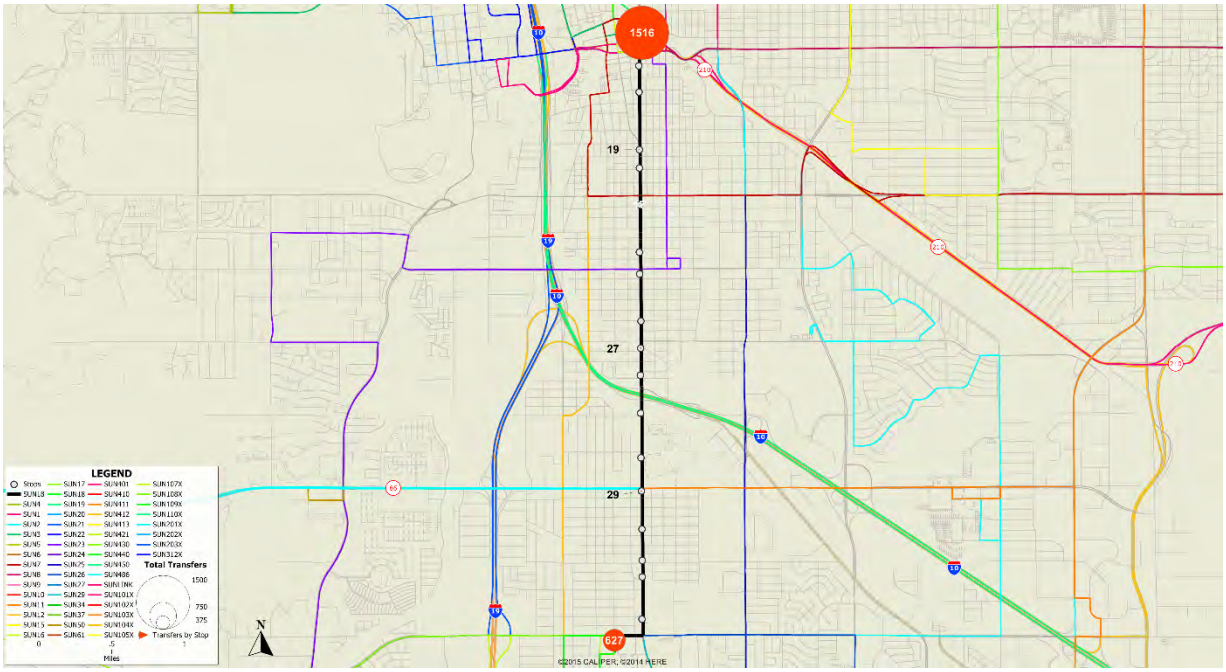

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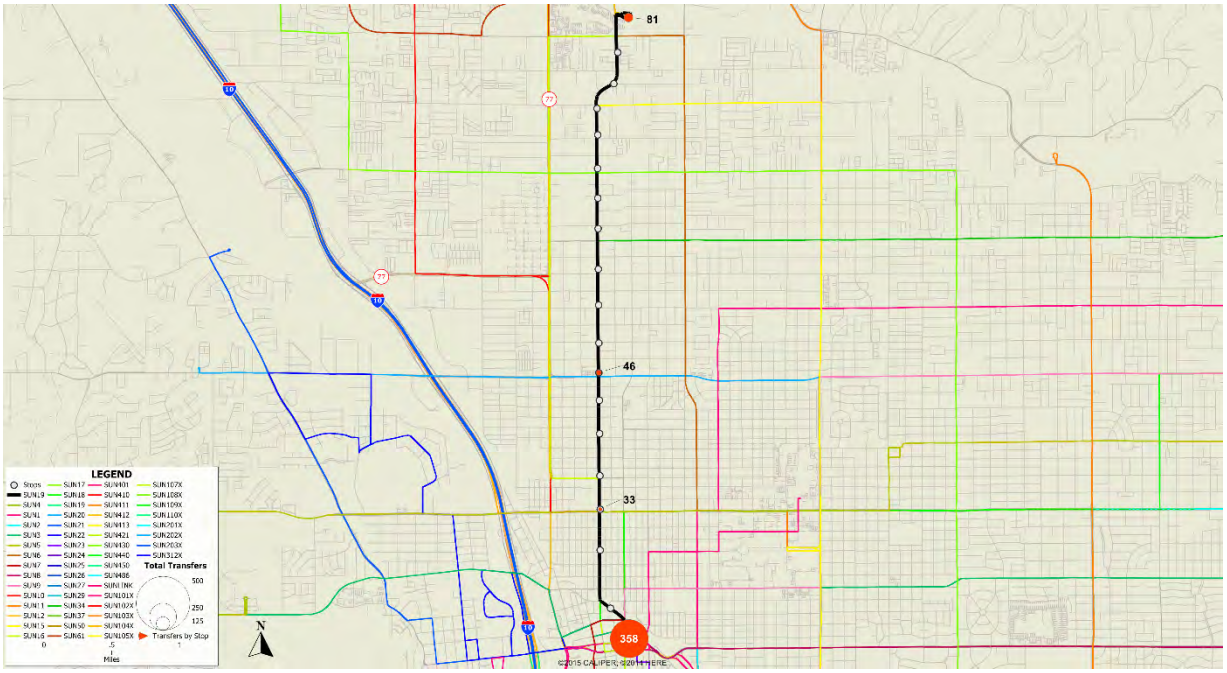

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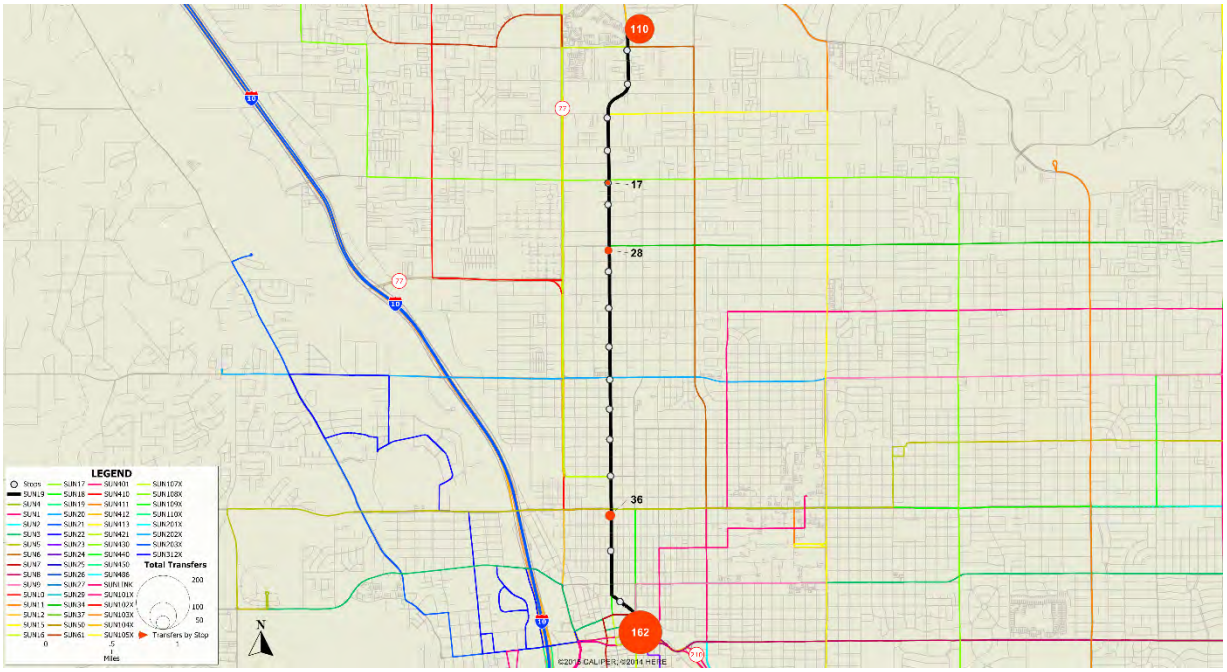

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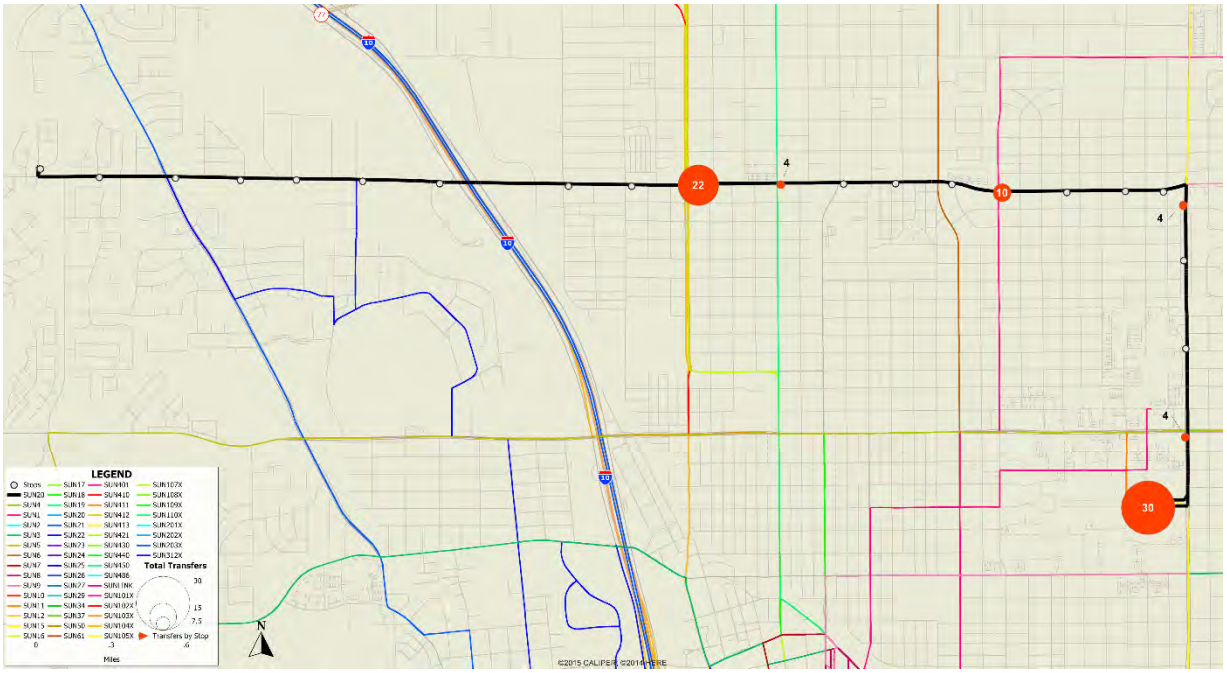

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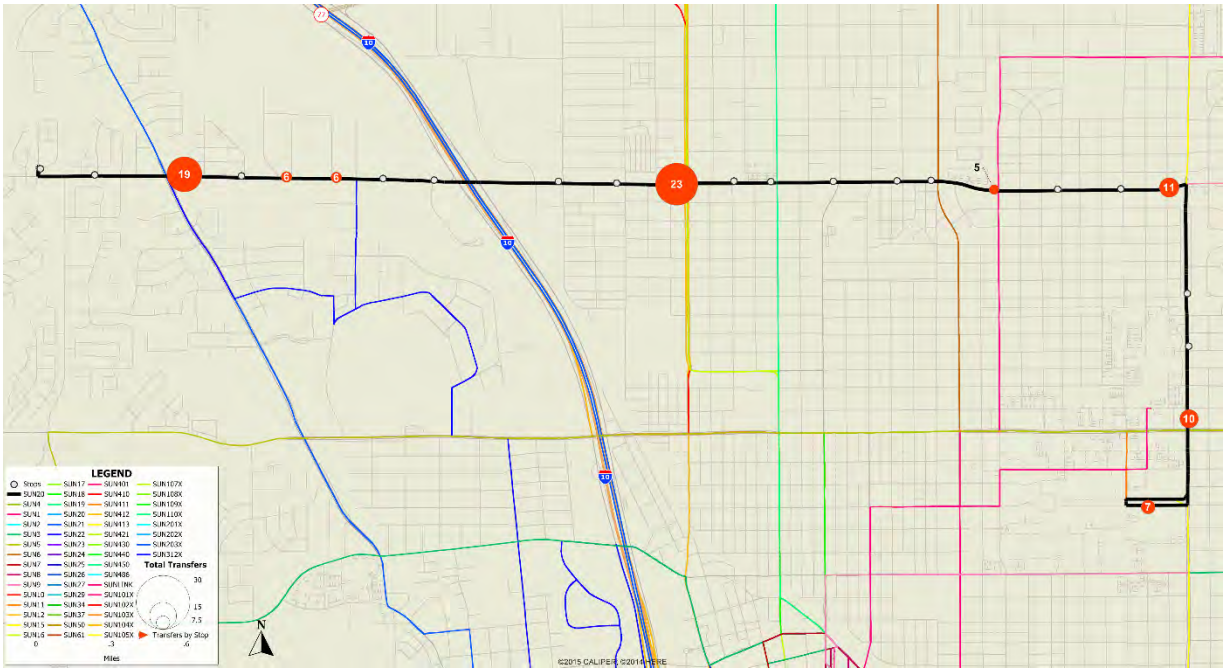

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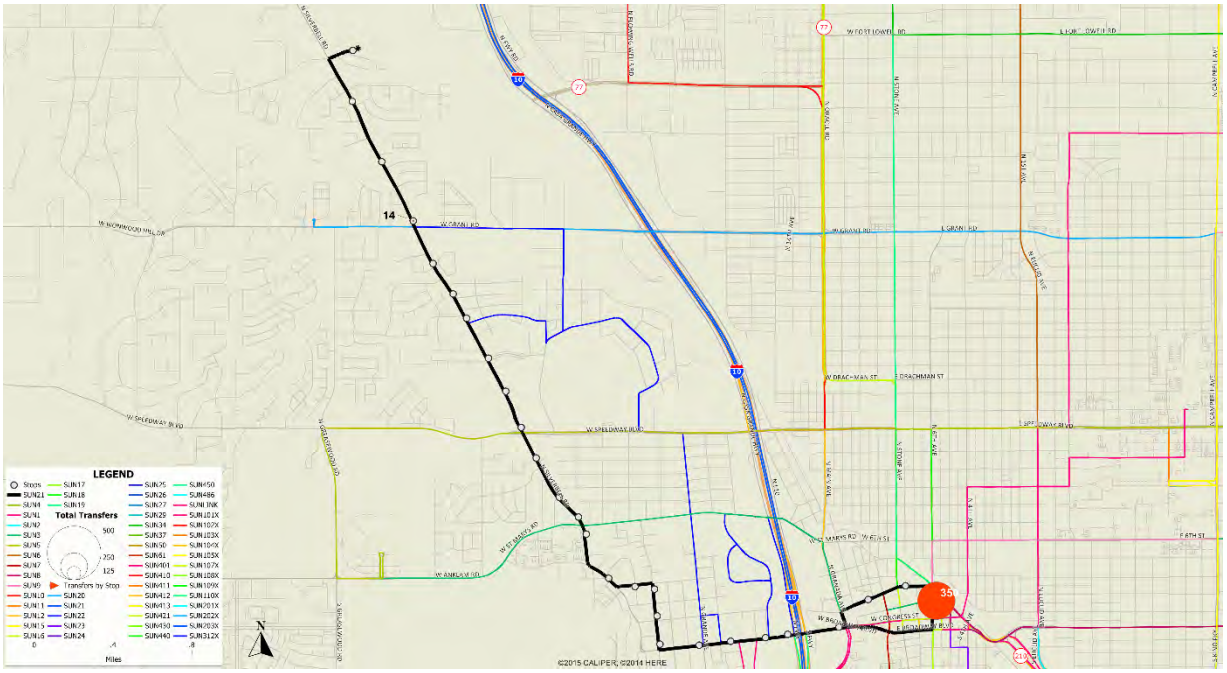

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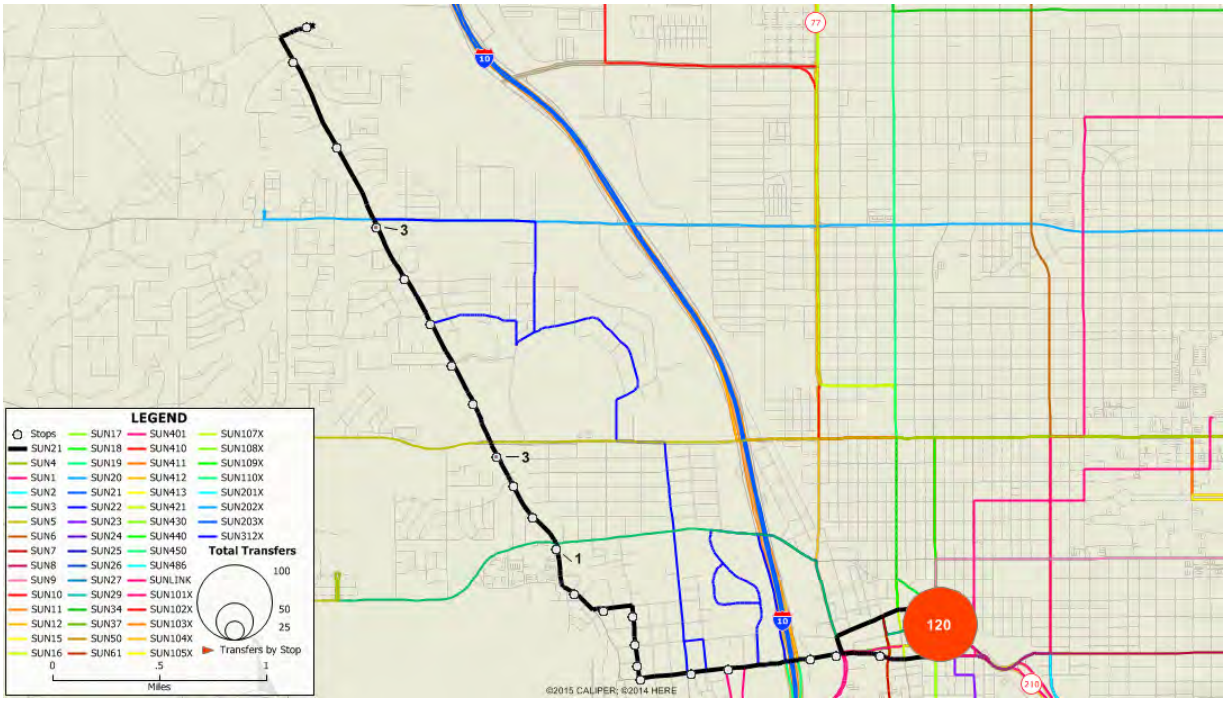

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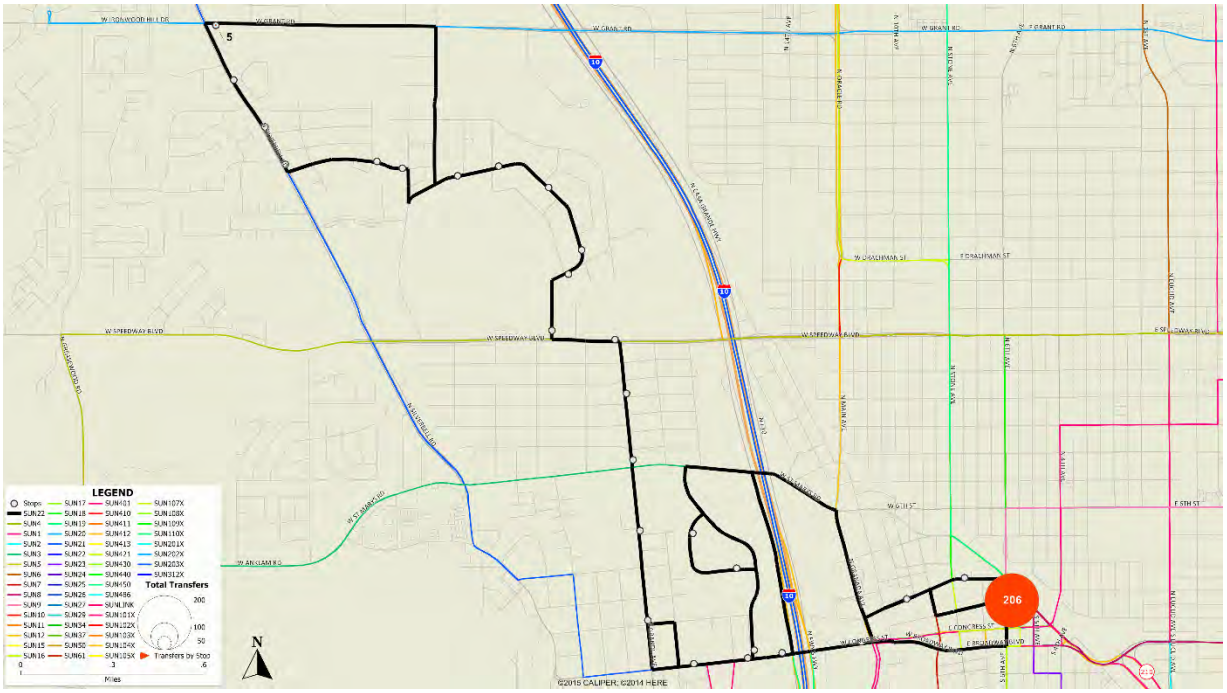

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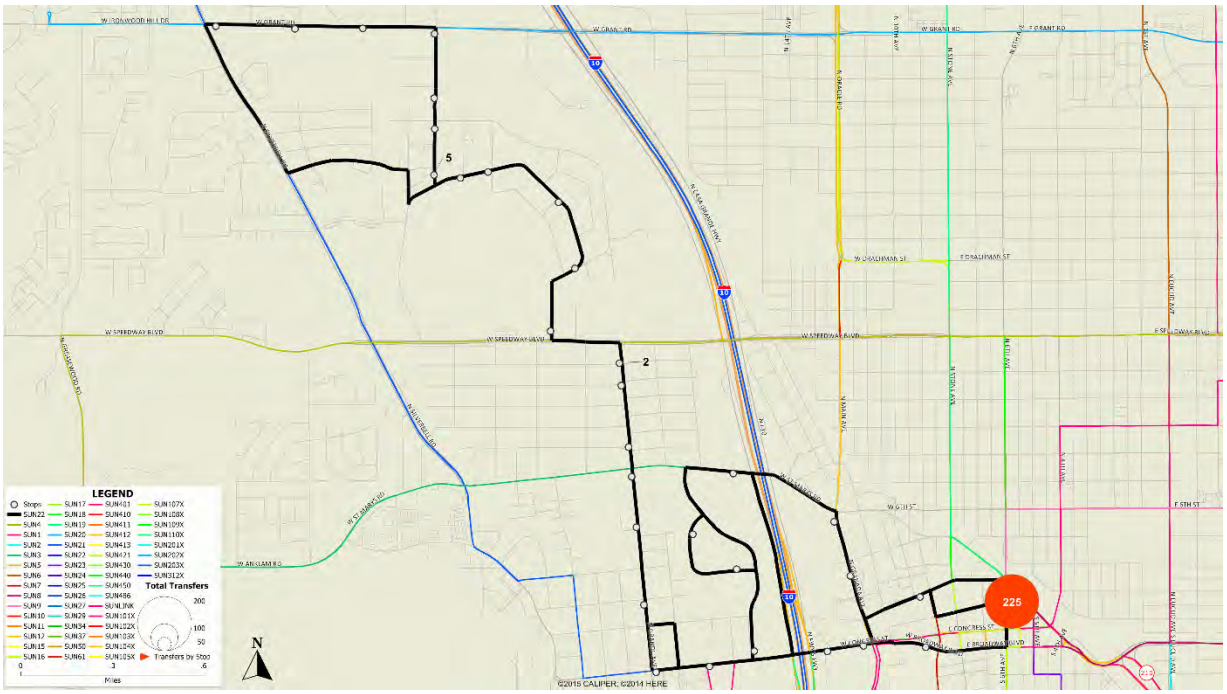

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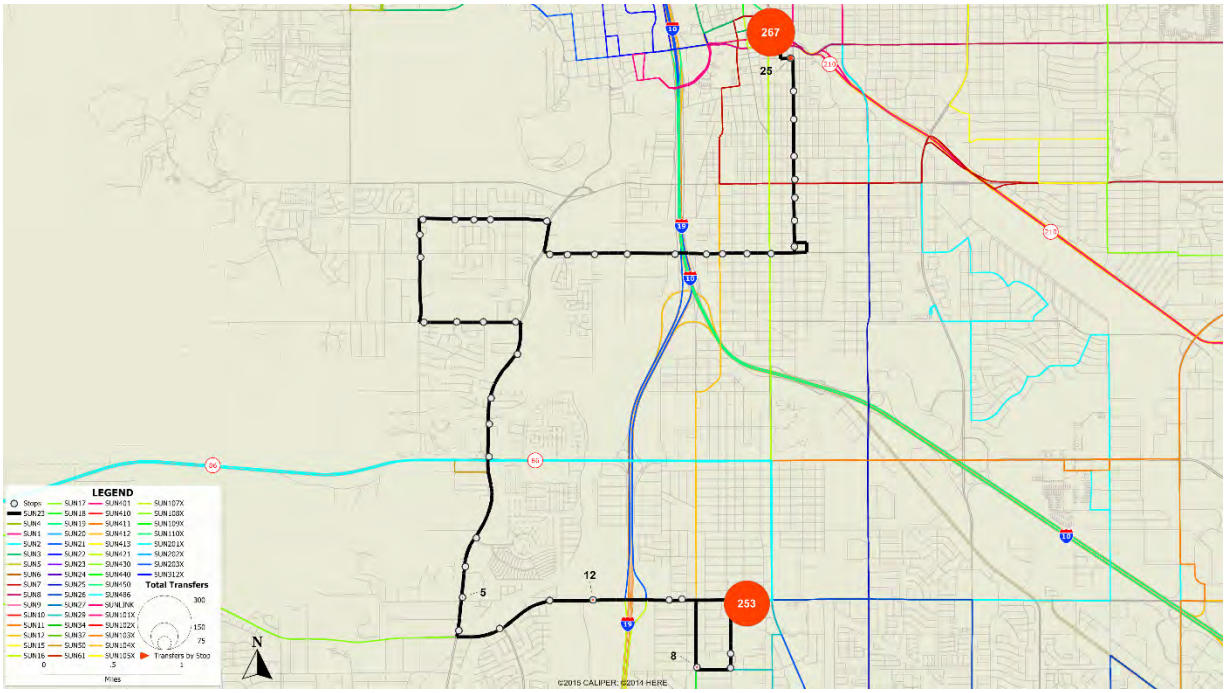

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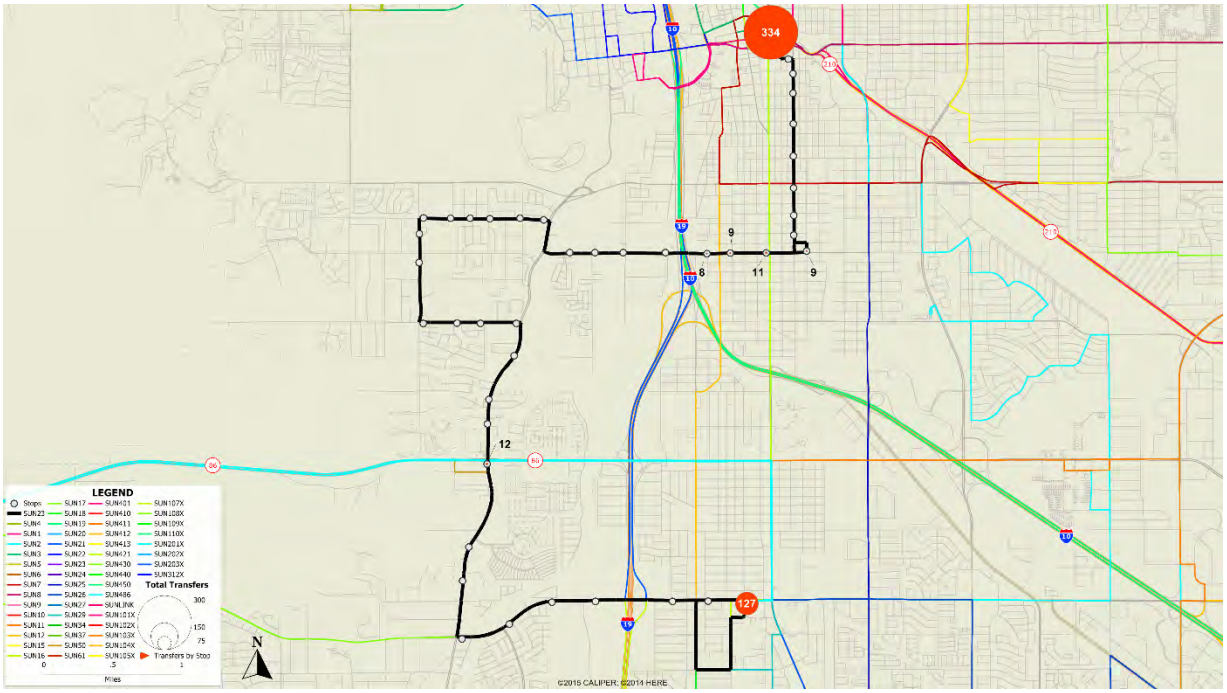

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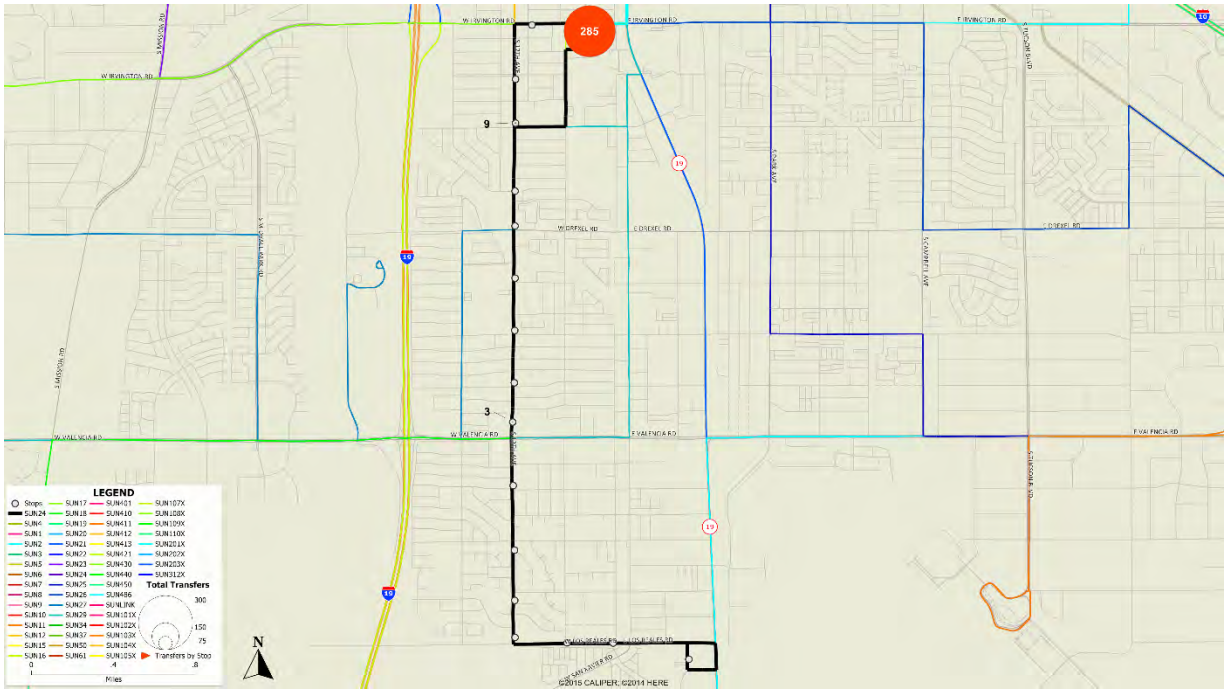

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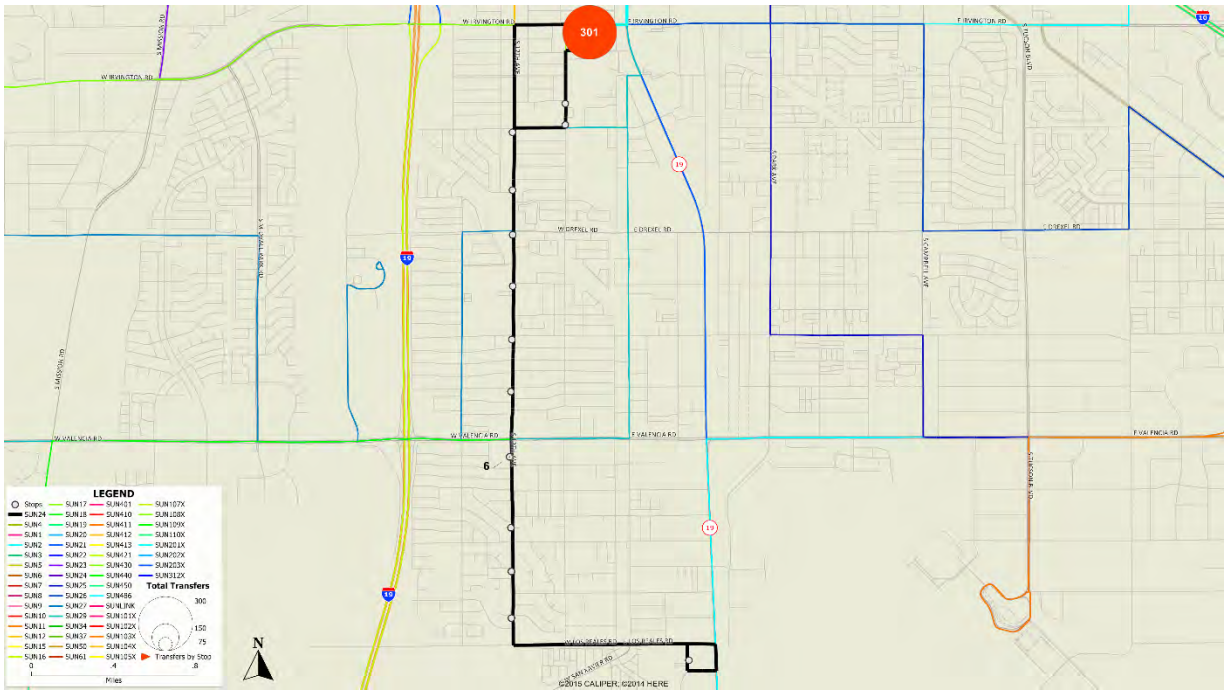

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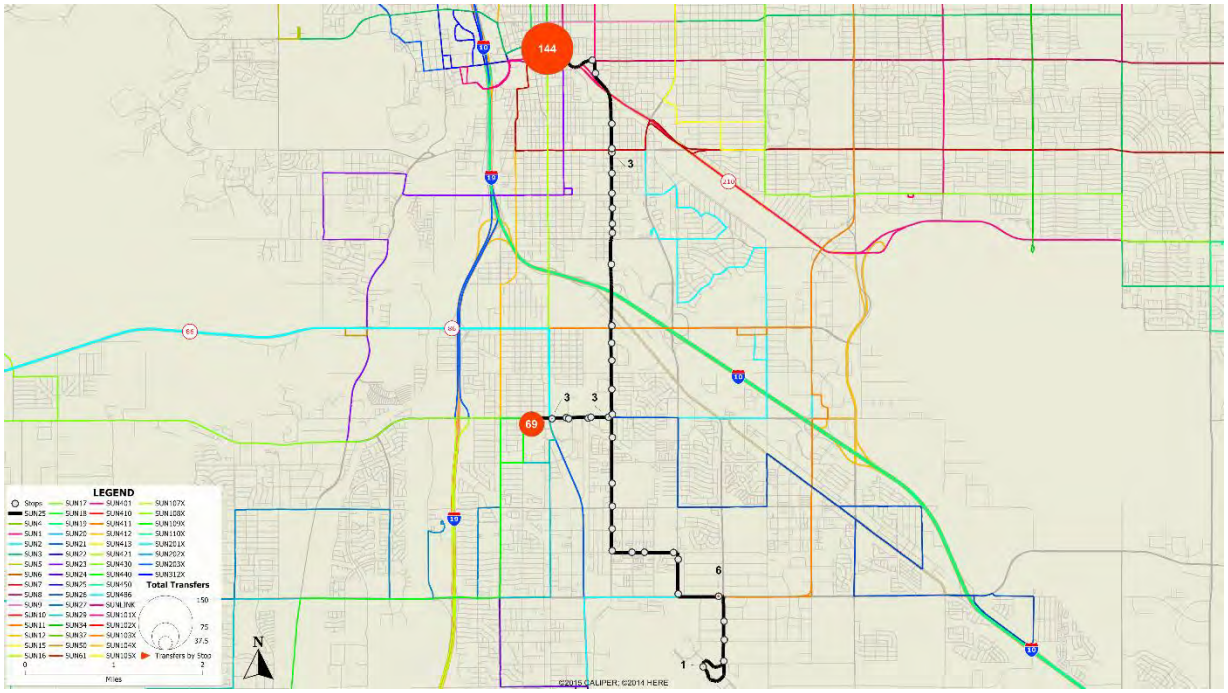

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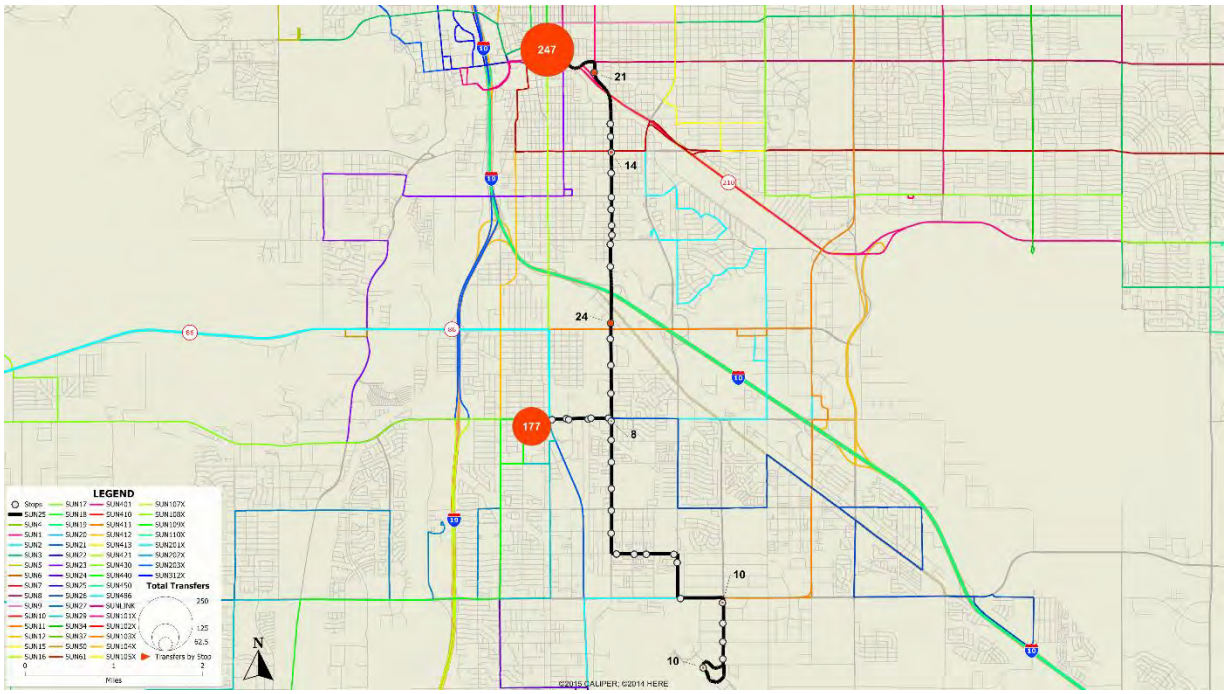

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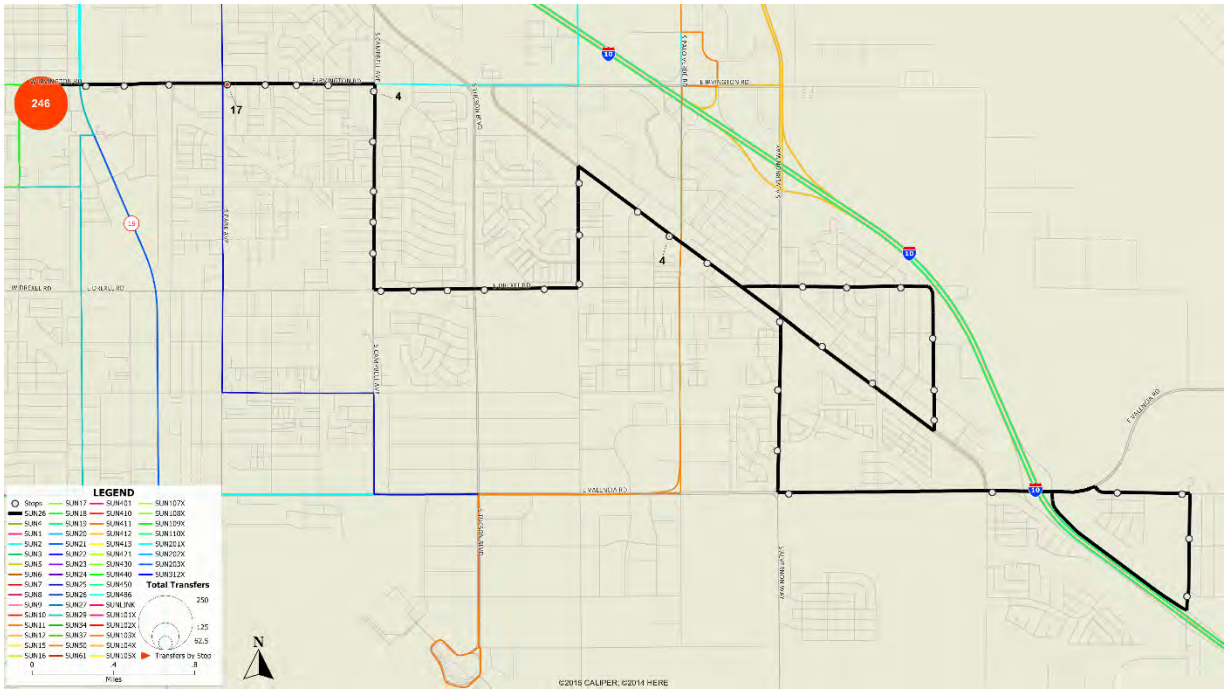

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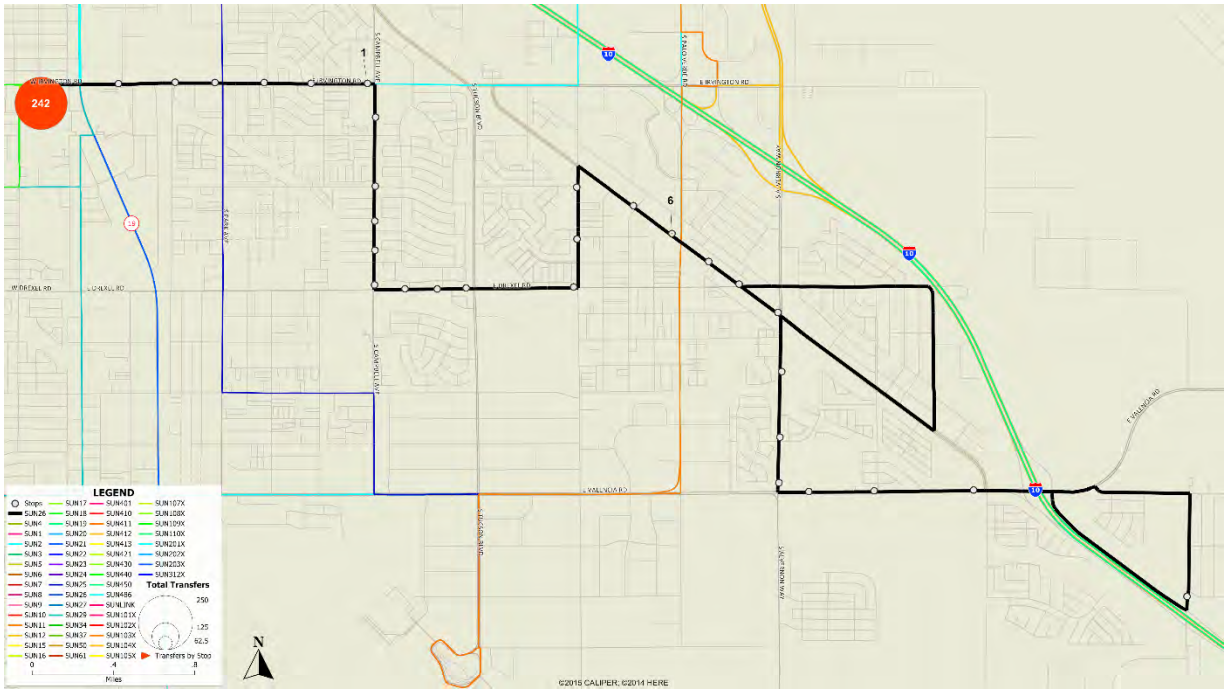

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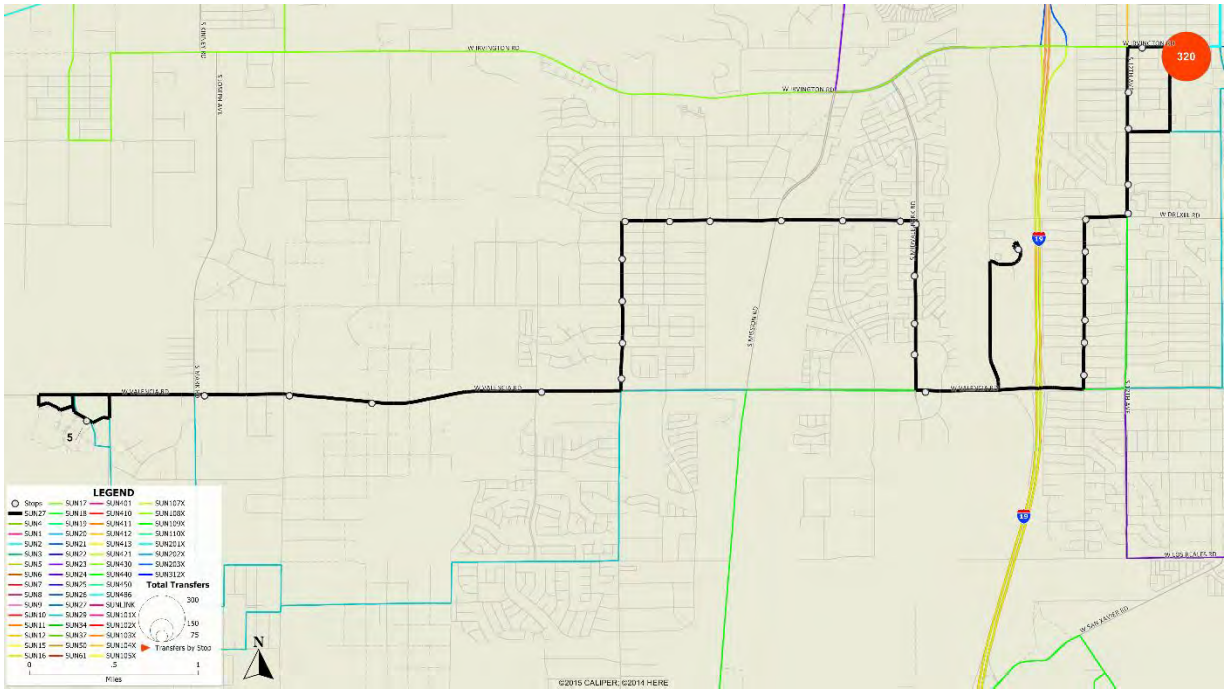

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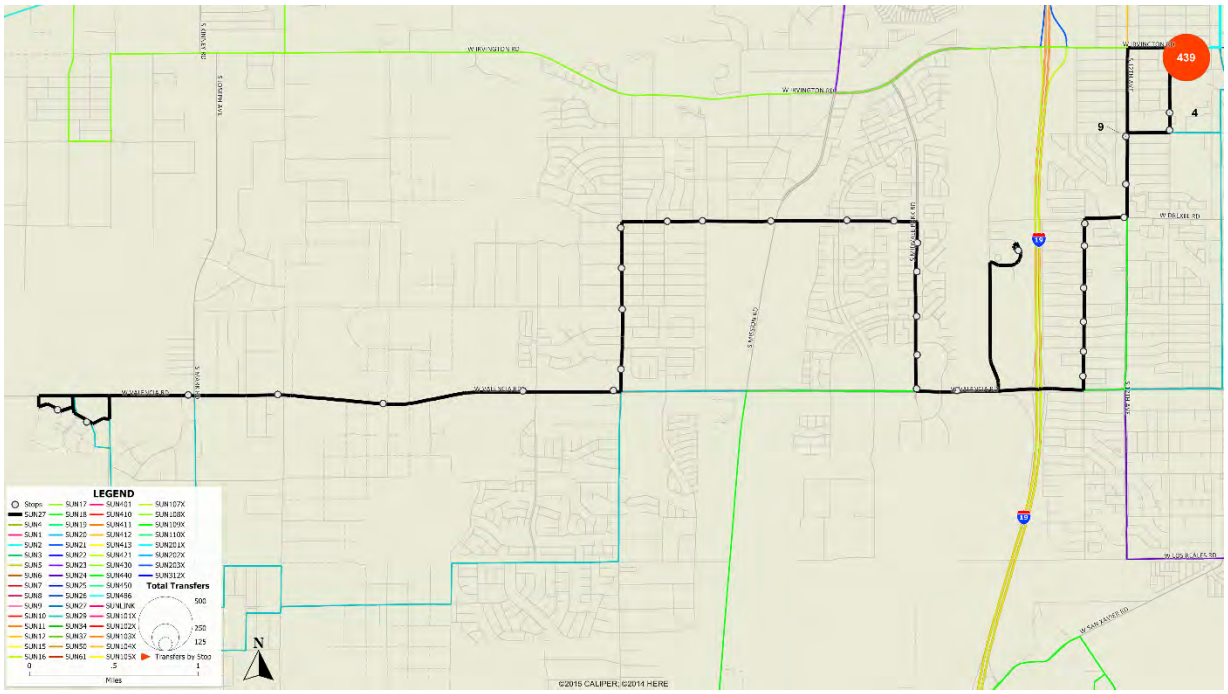

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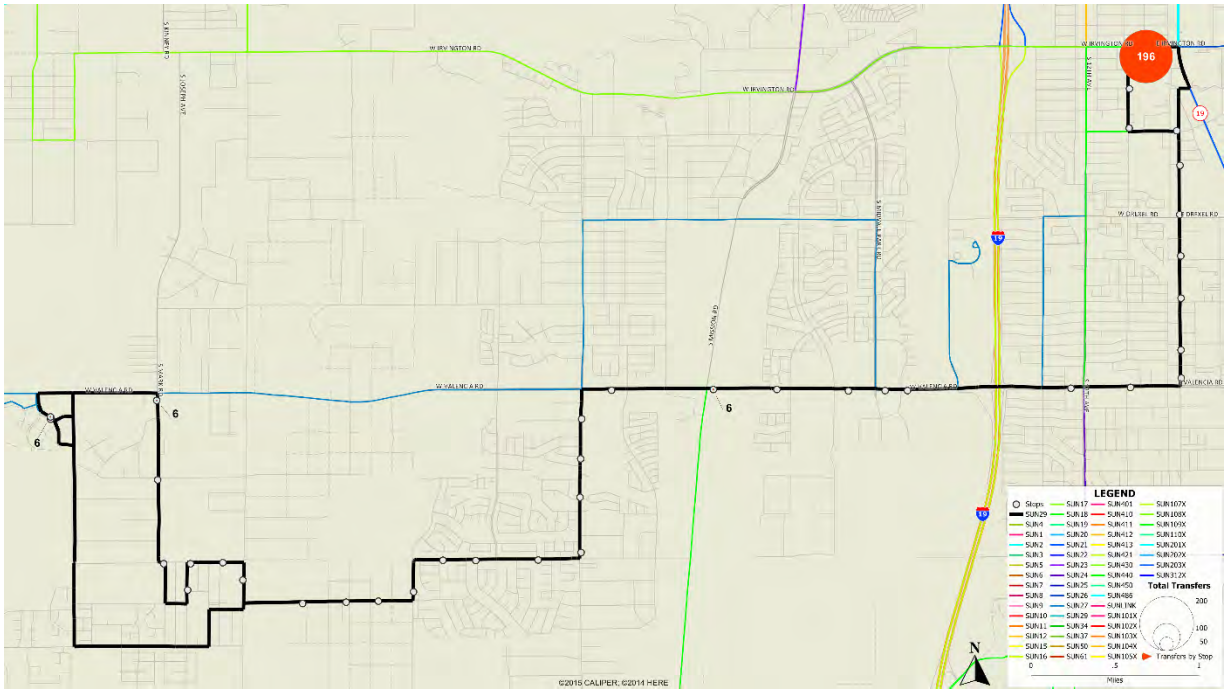

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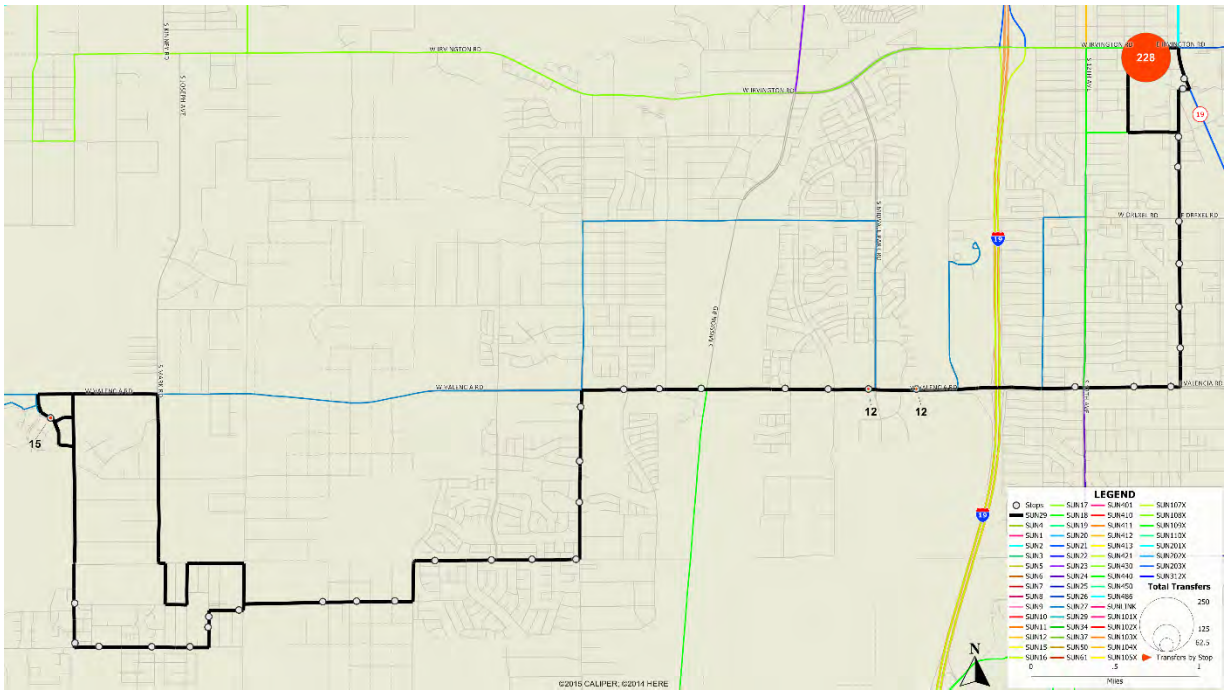

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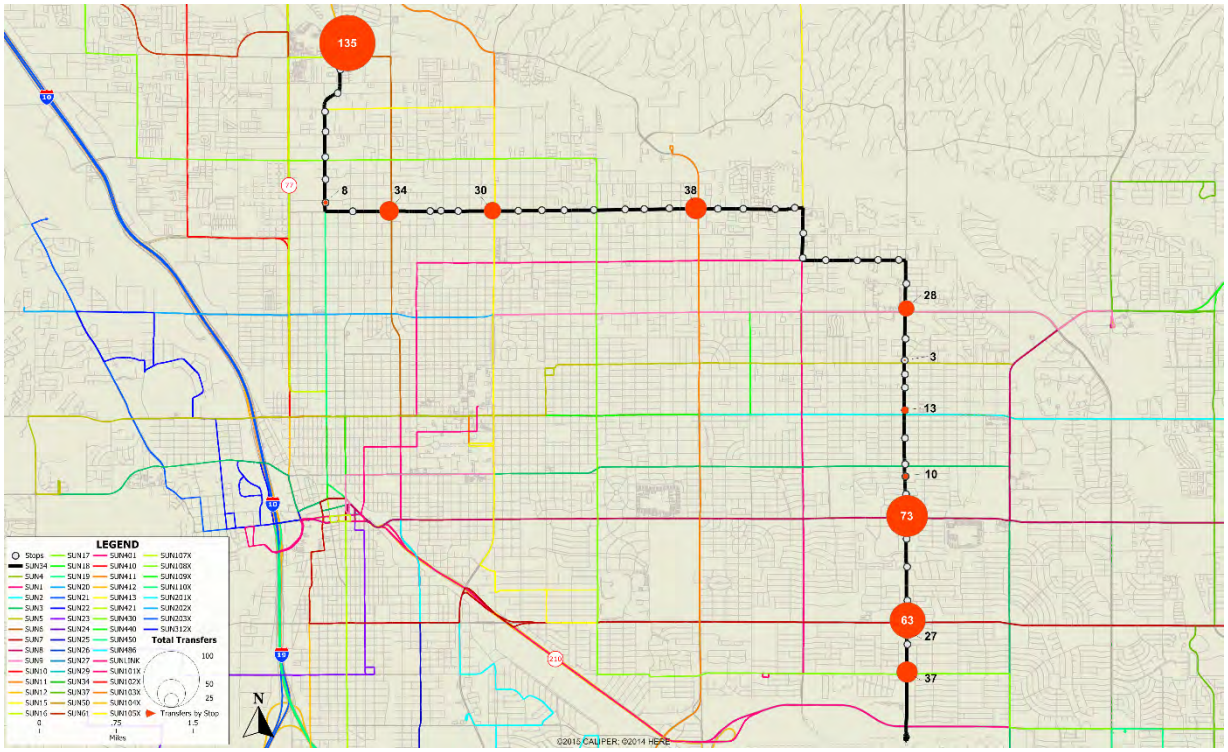

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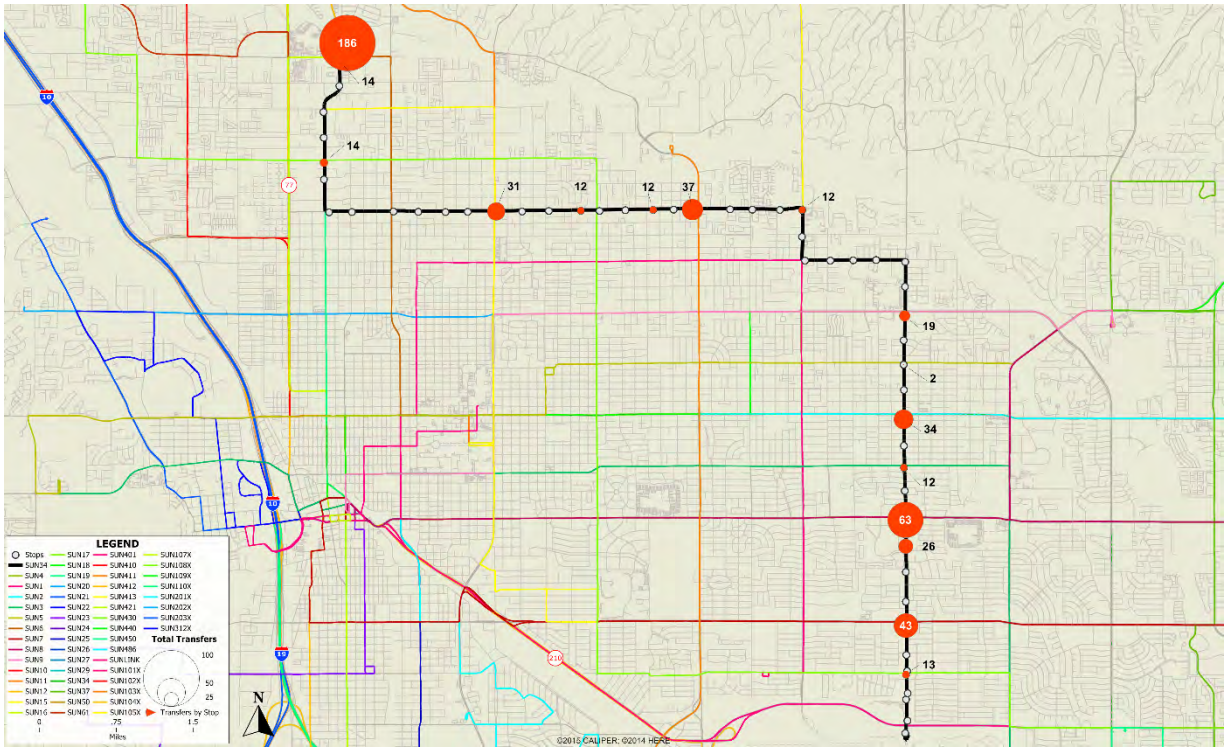

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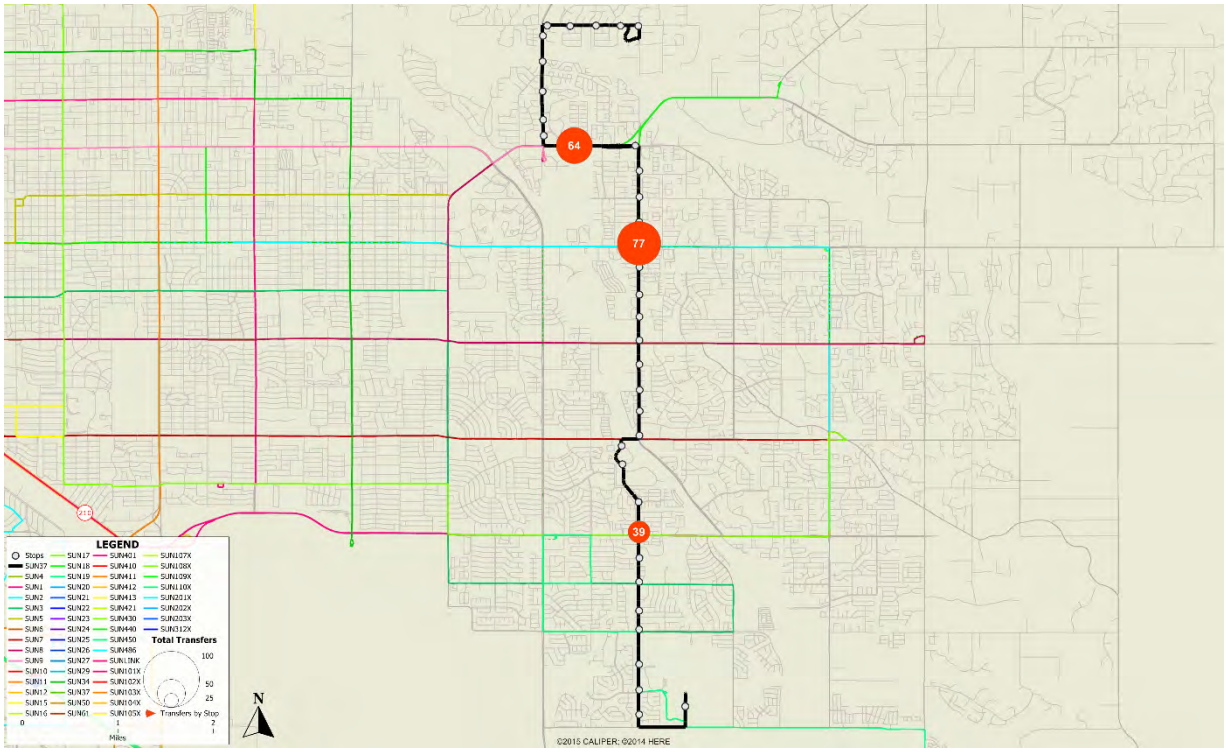

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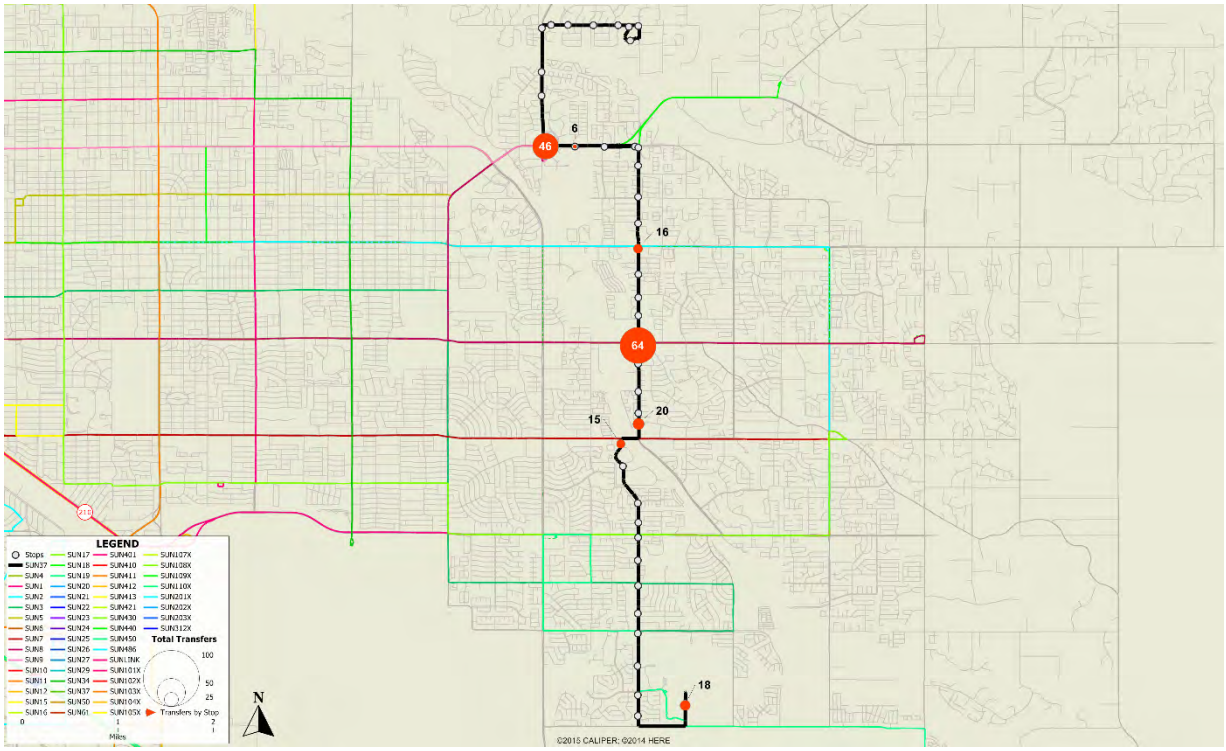

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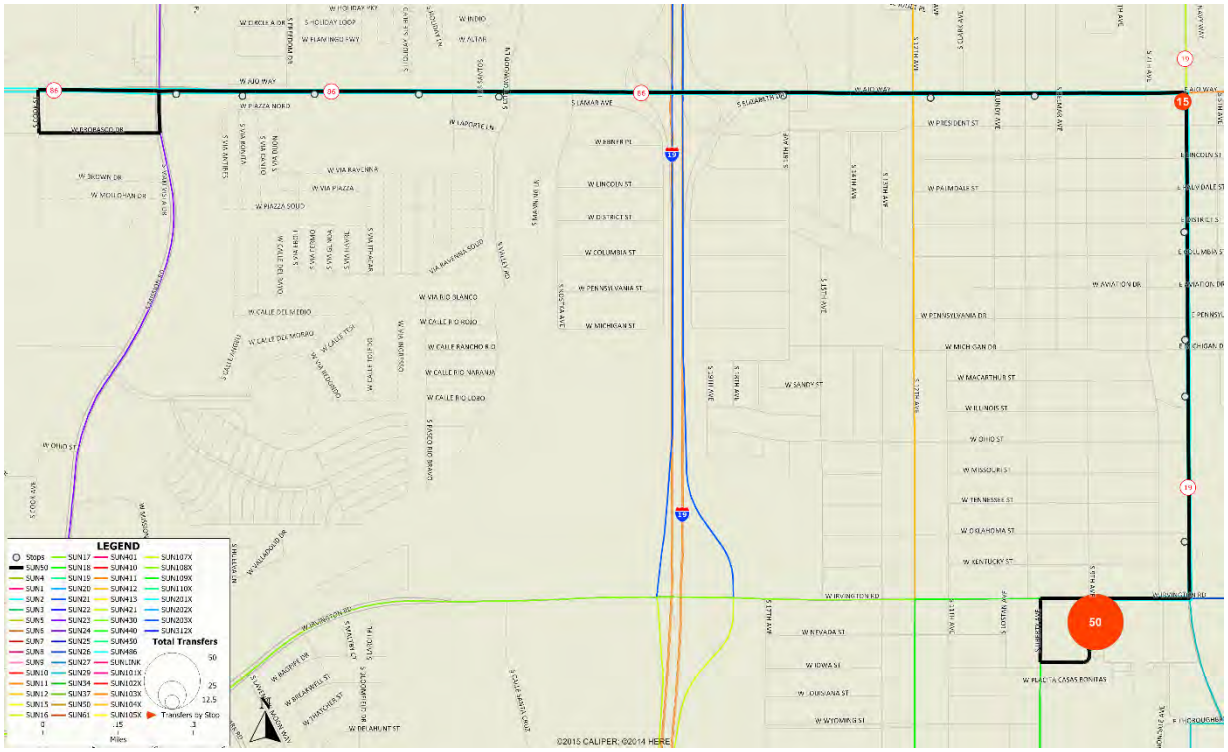

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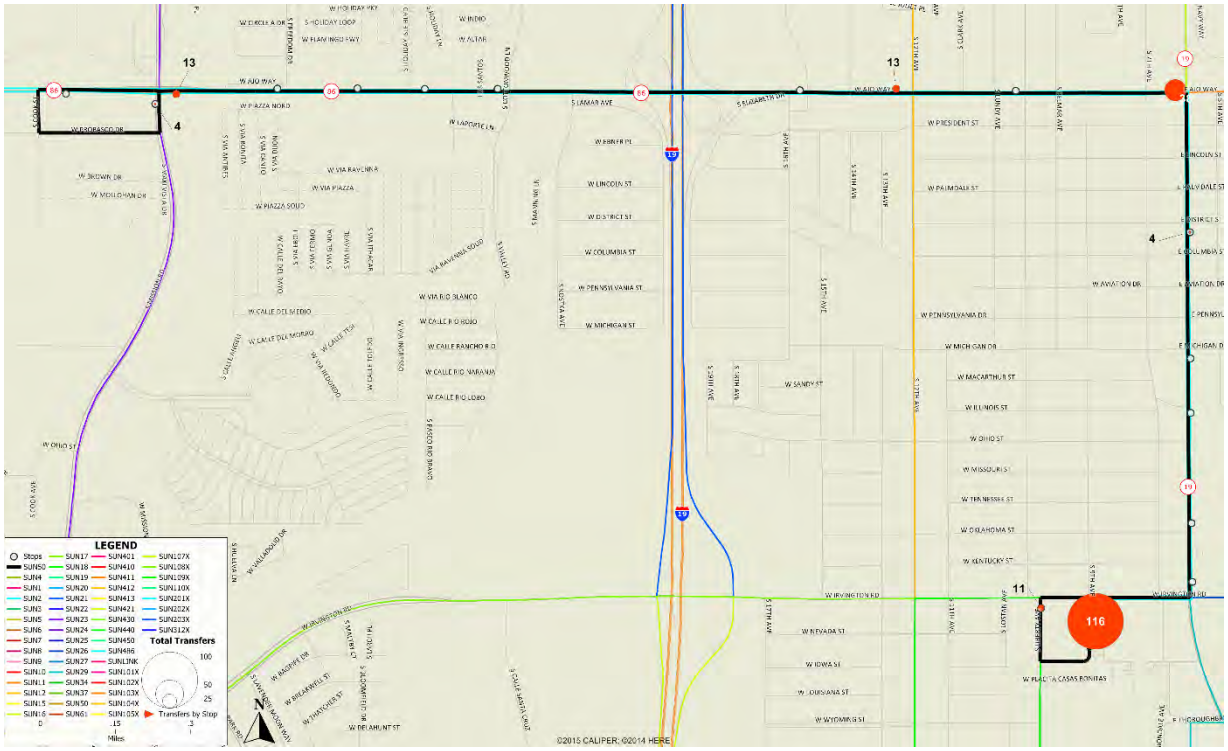
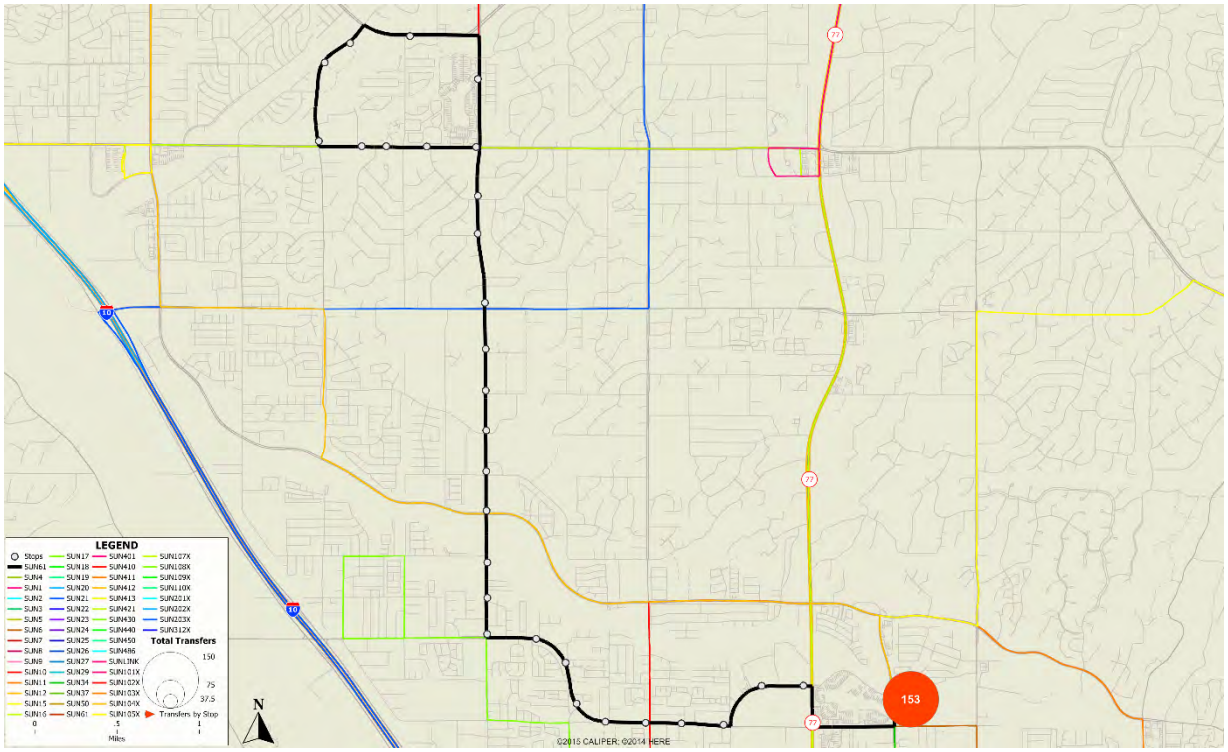


SUN50WB Transfer Locations



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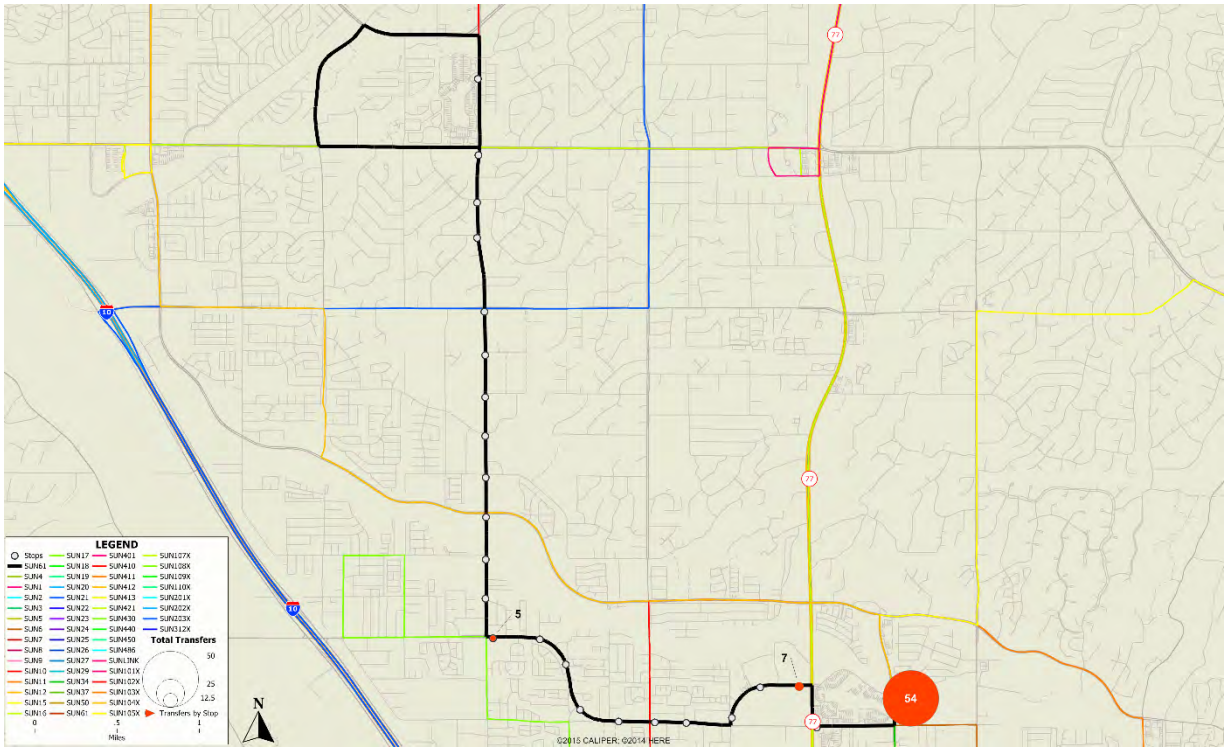

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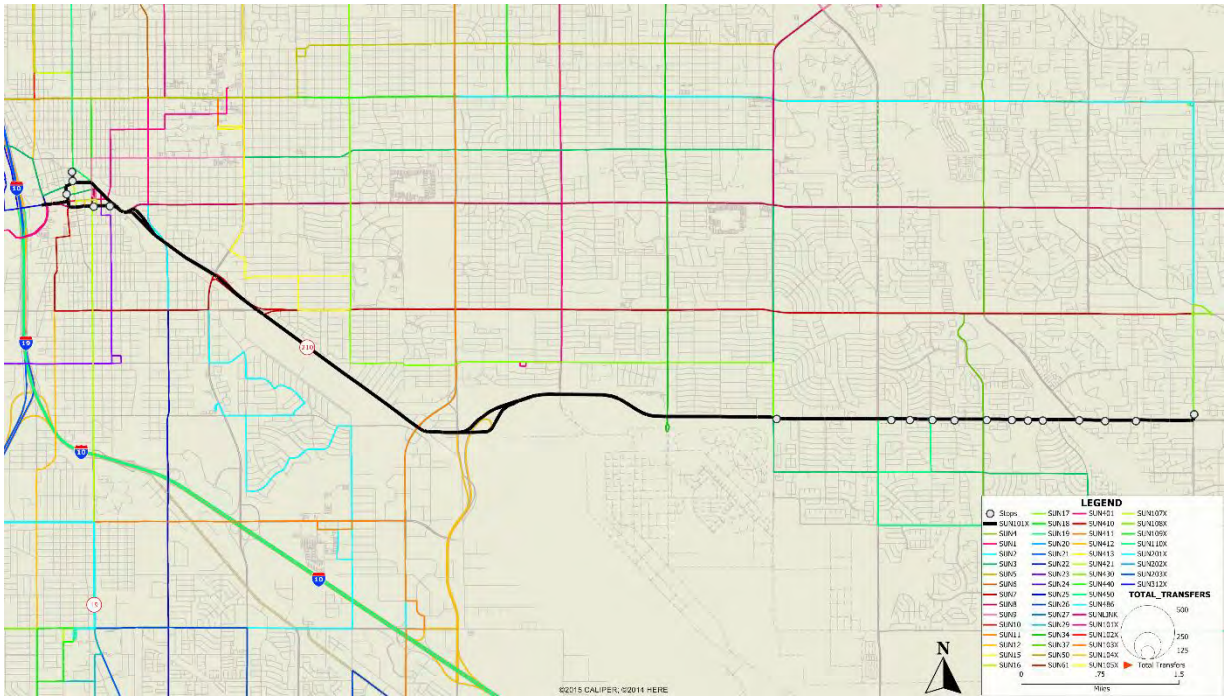

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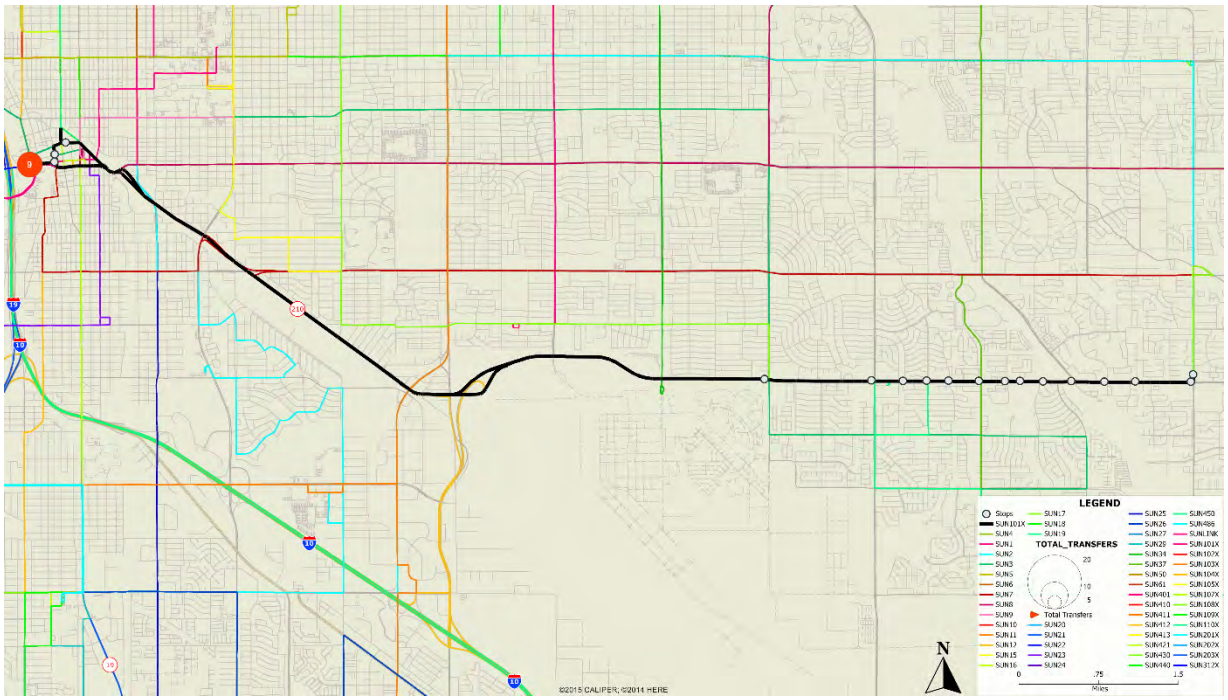

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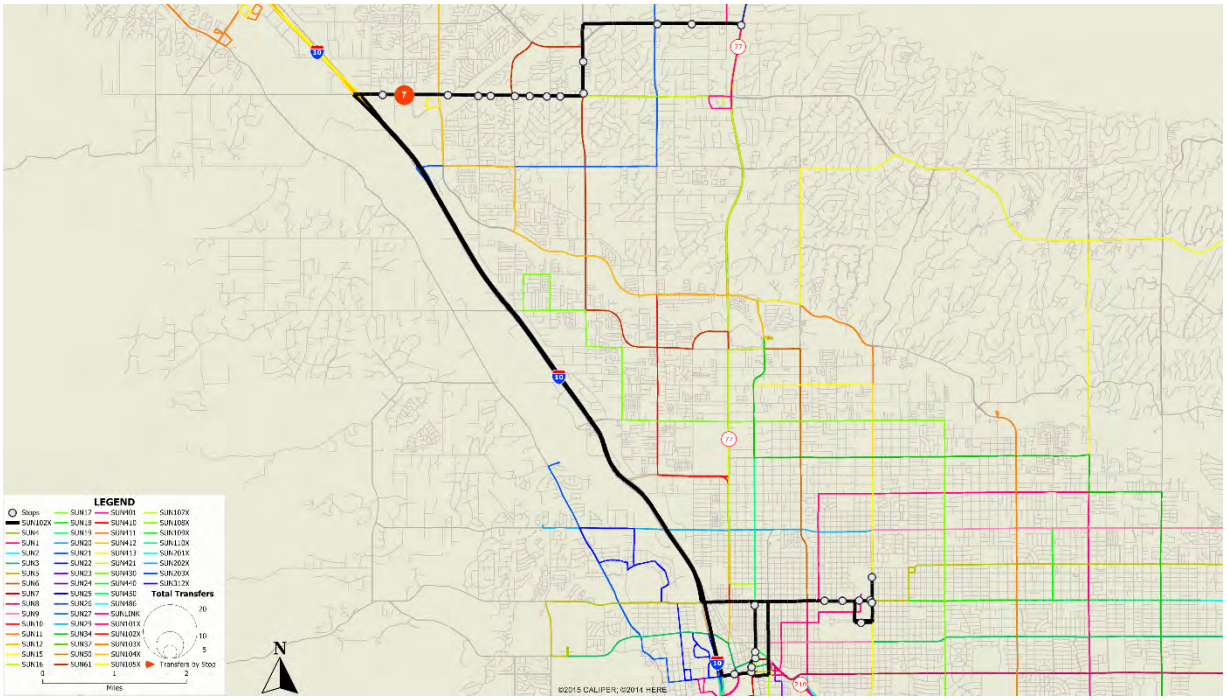

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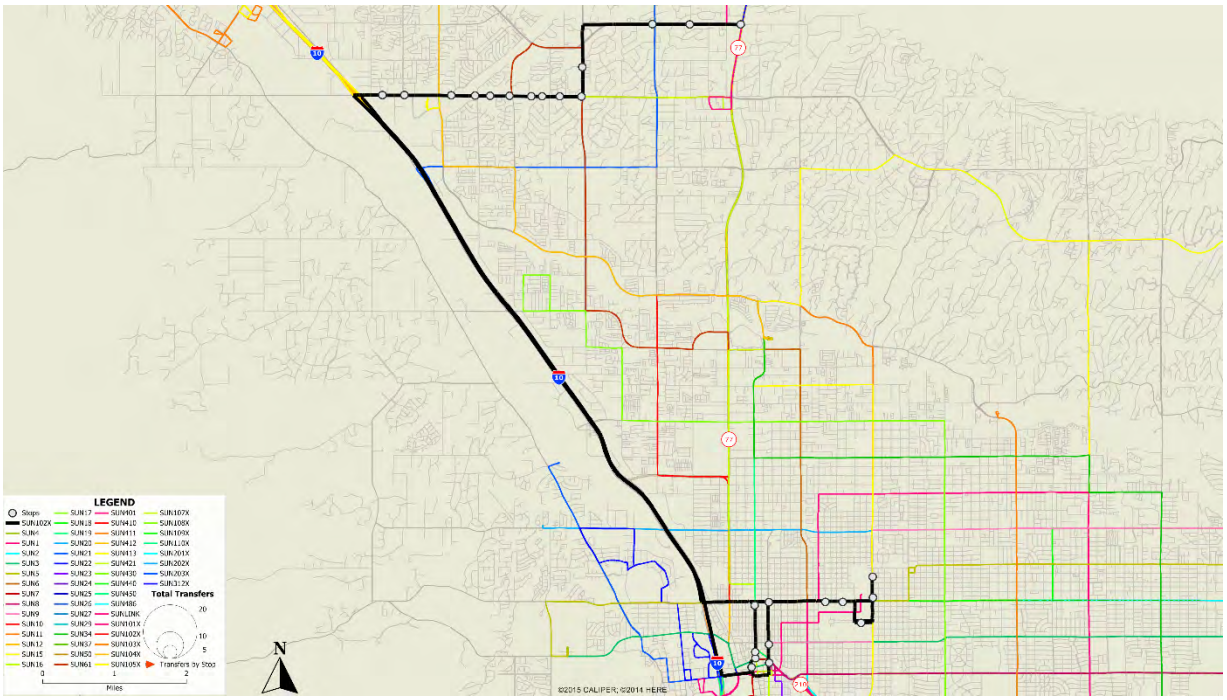

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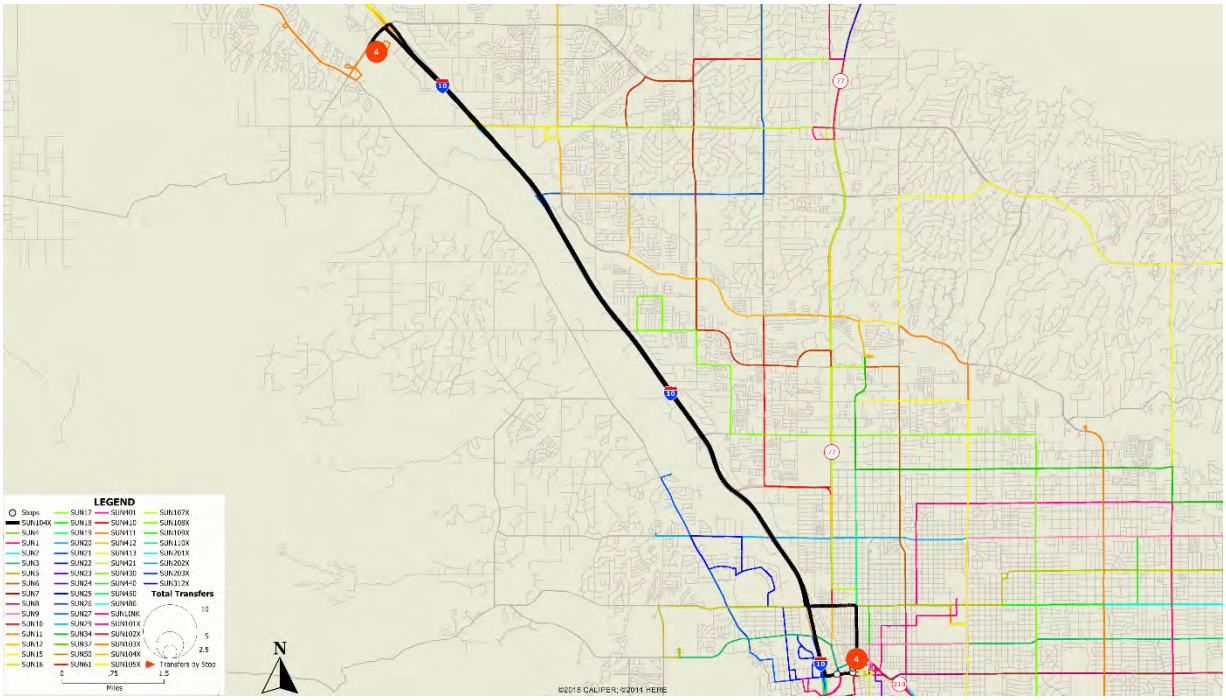

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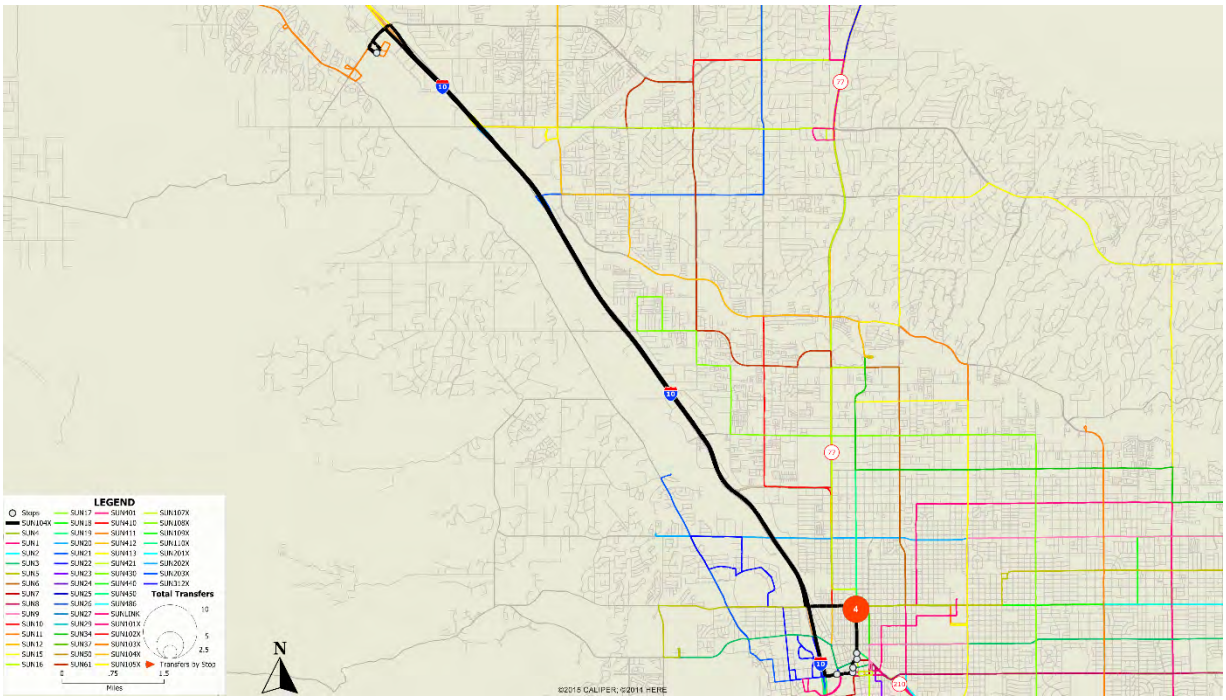

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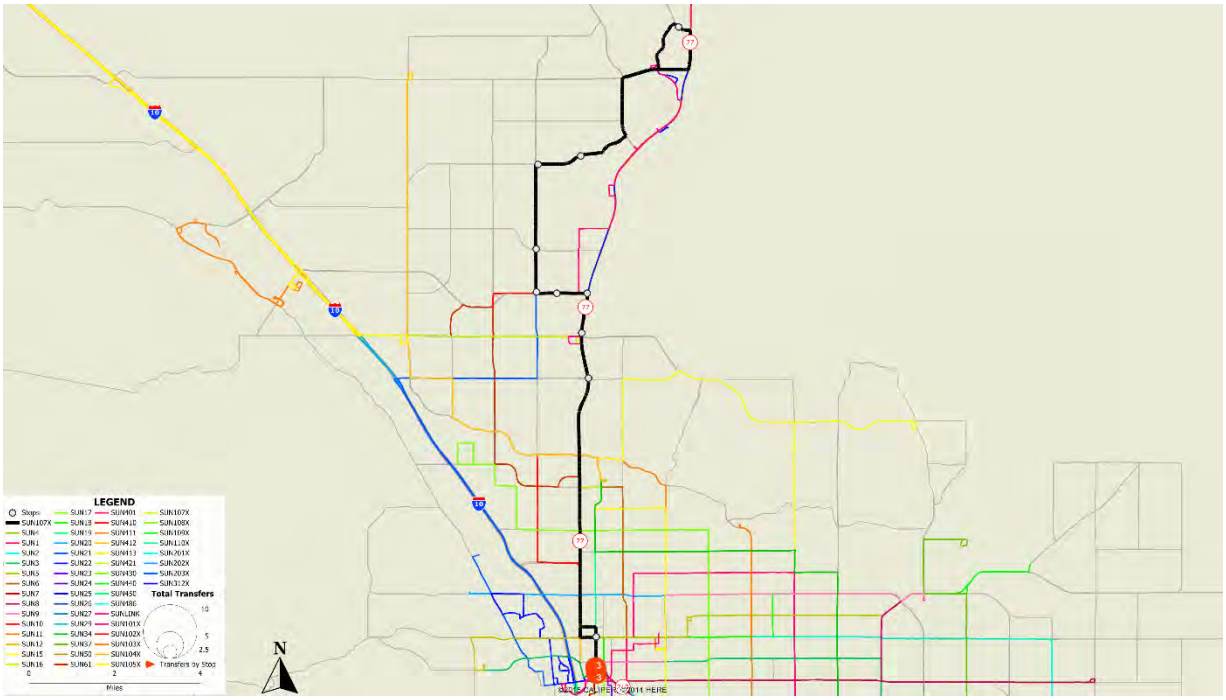

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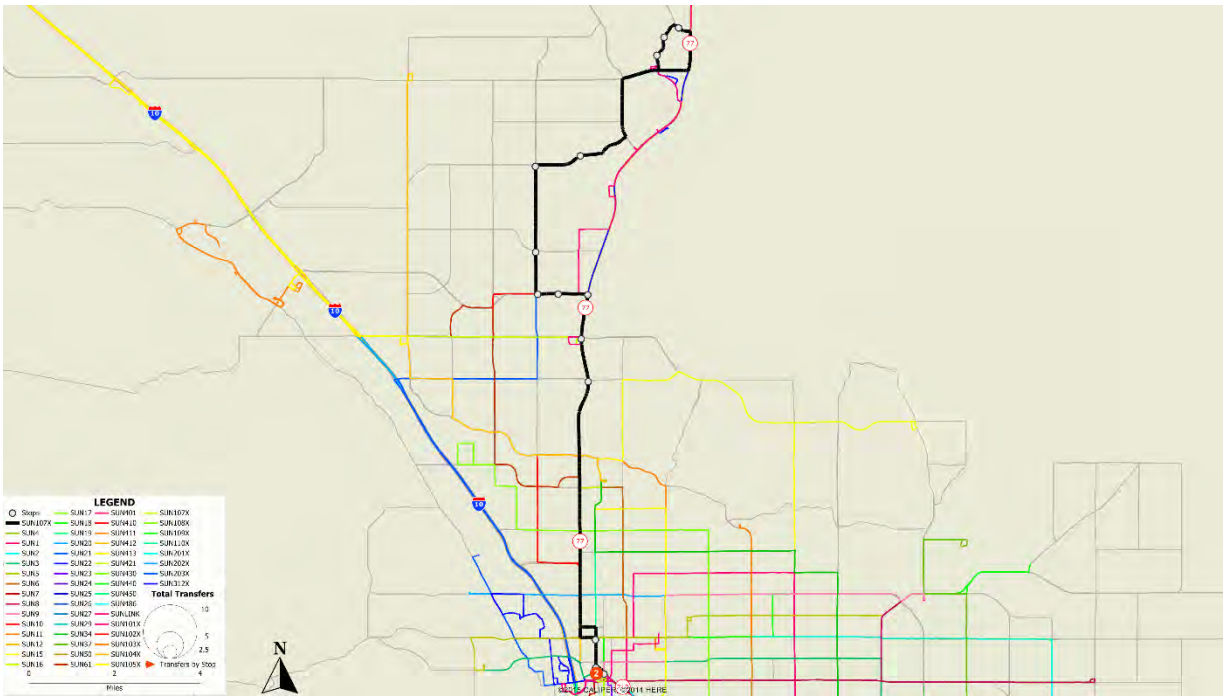

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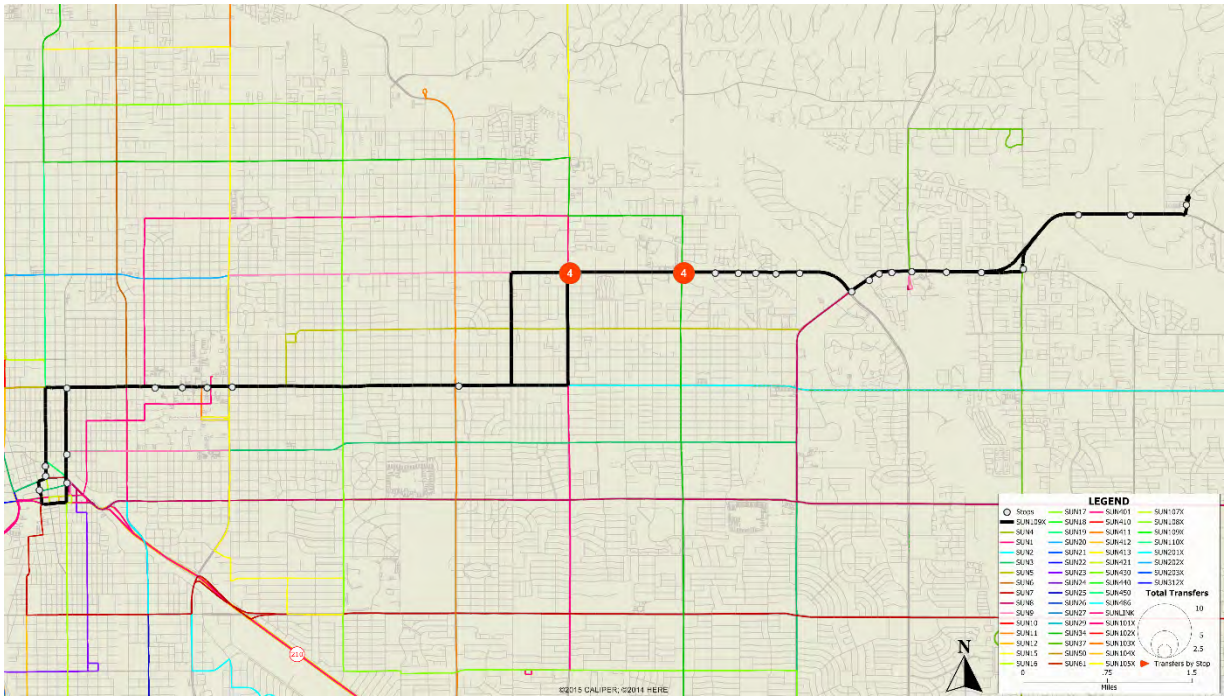

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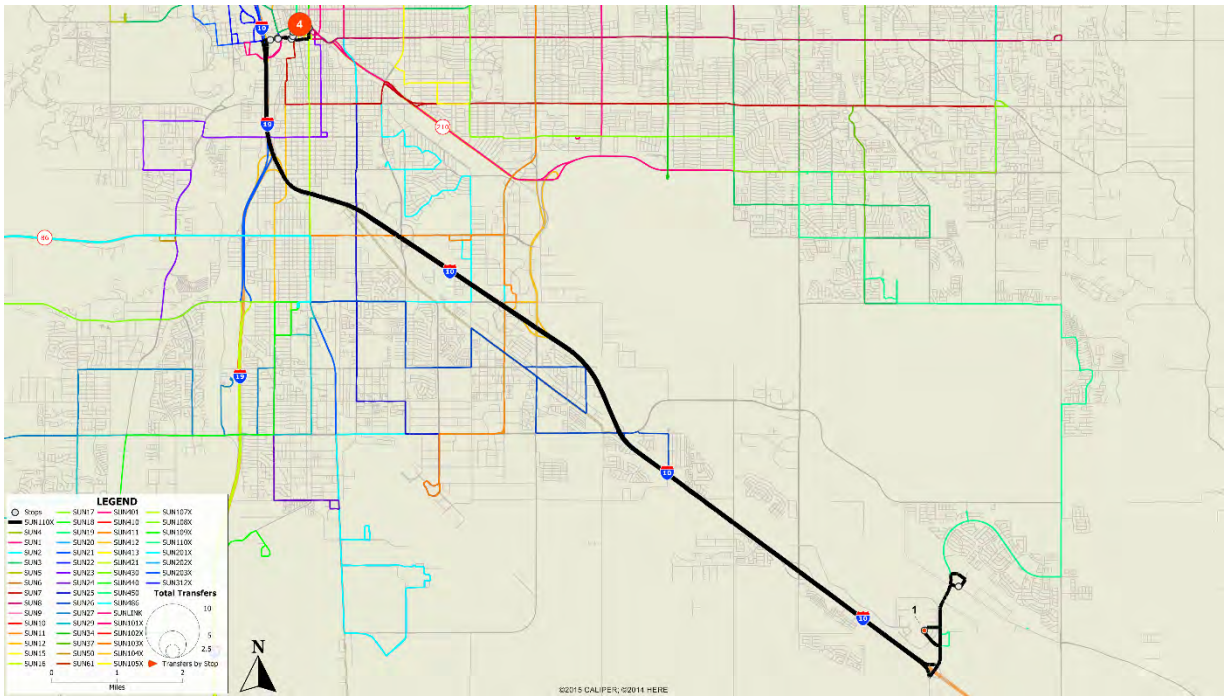

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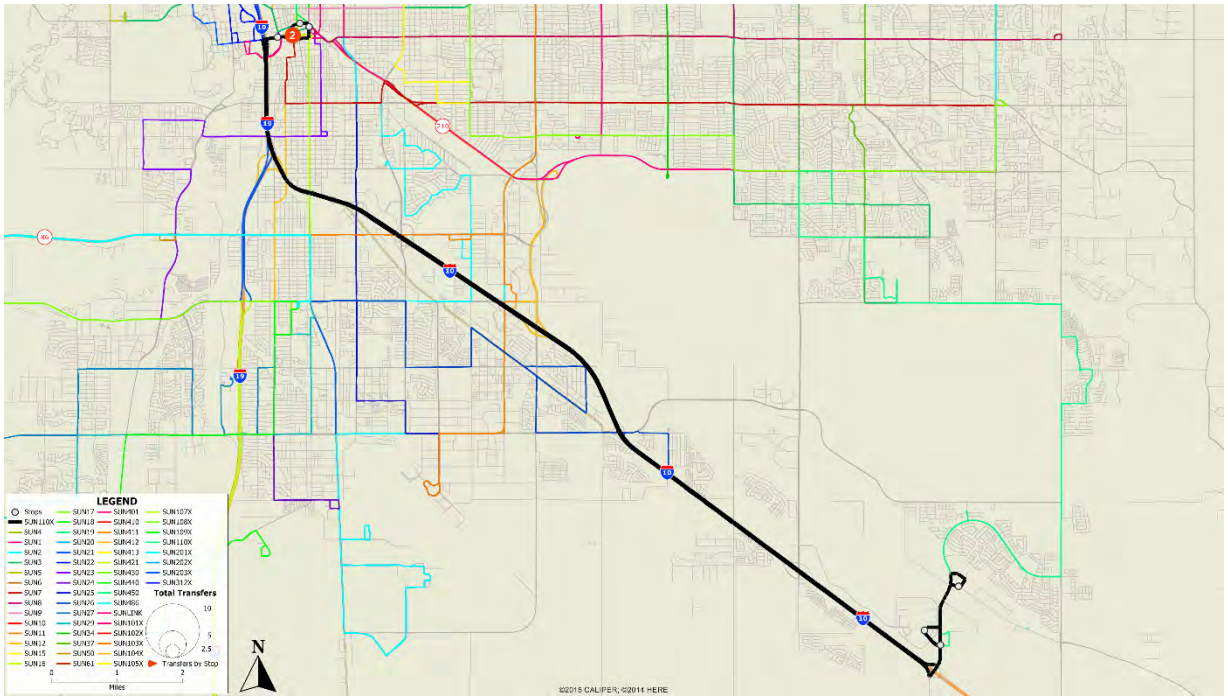

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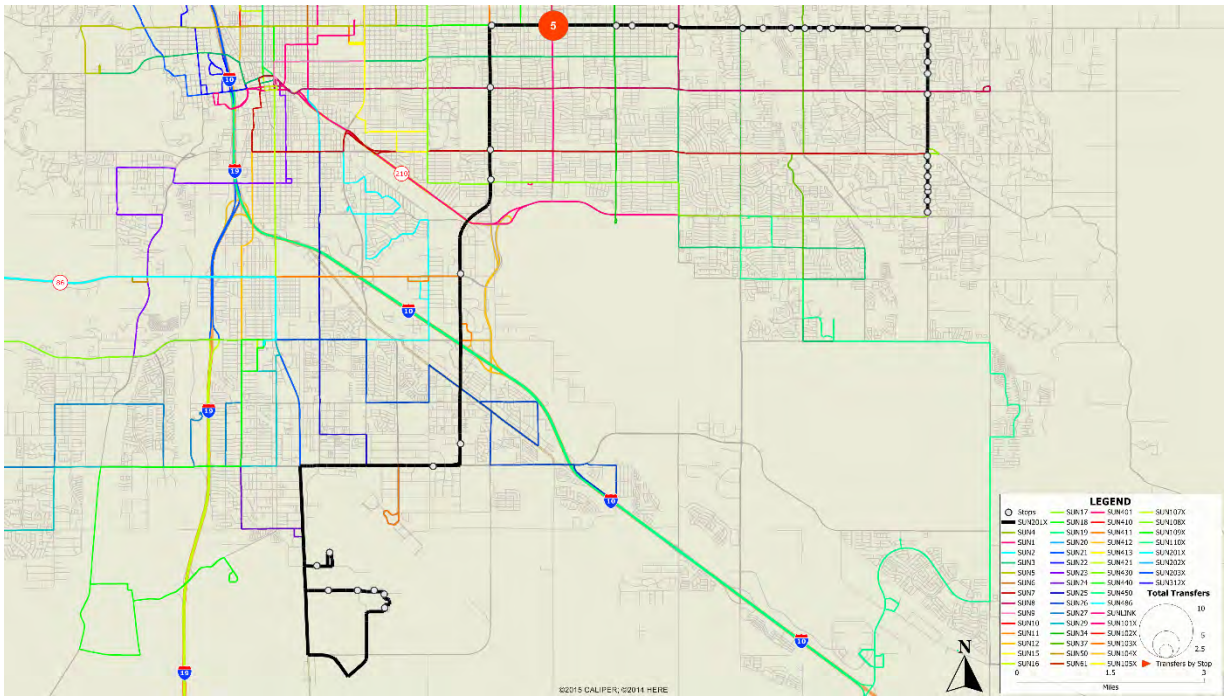

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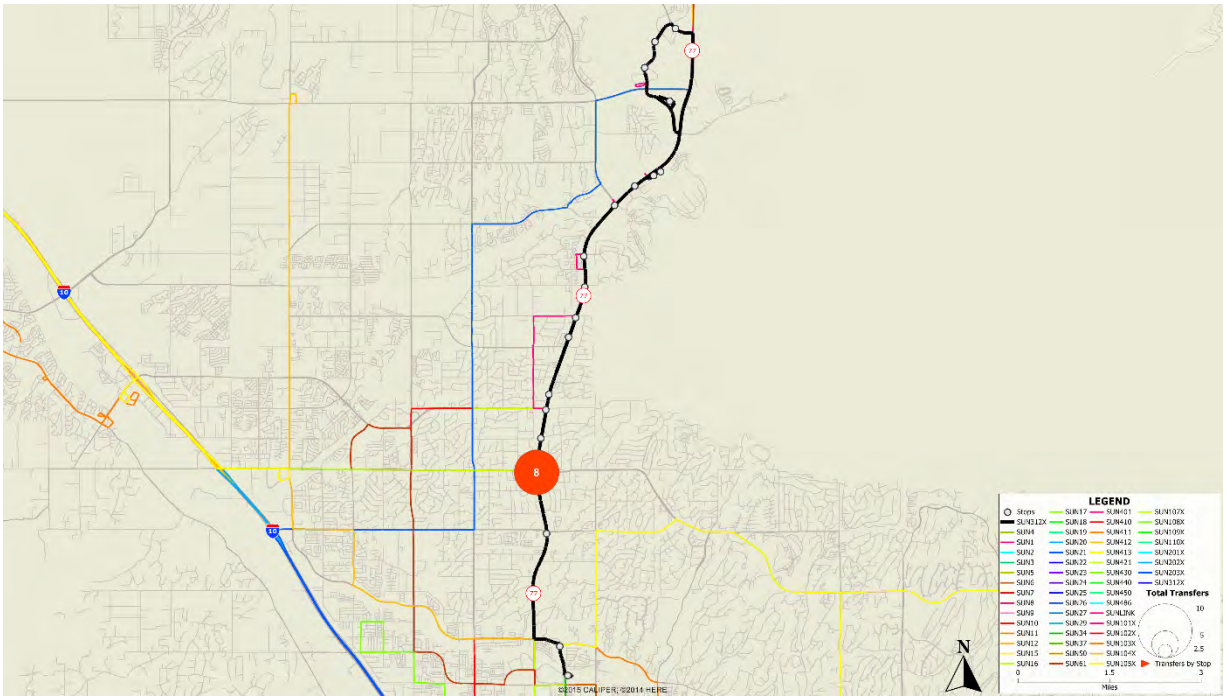

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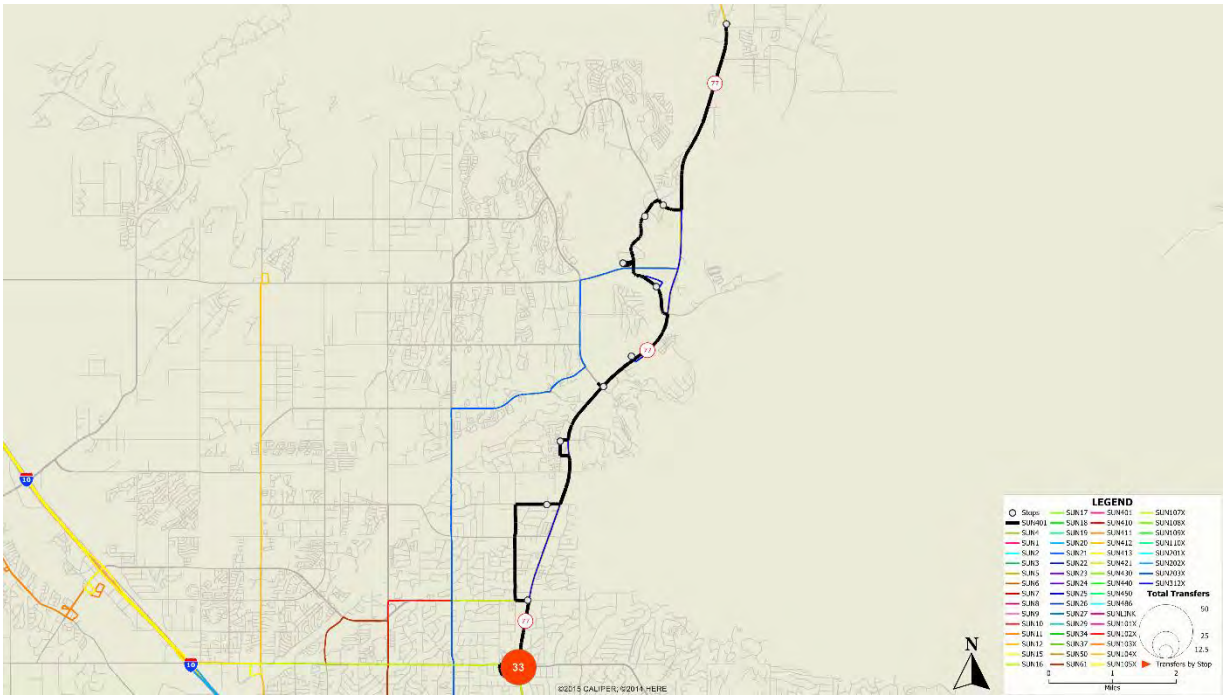

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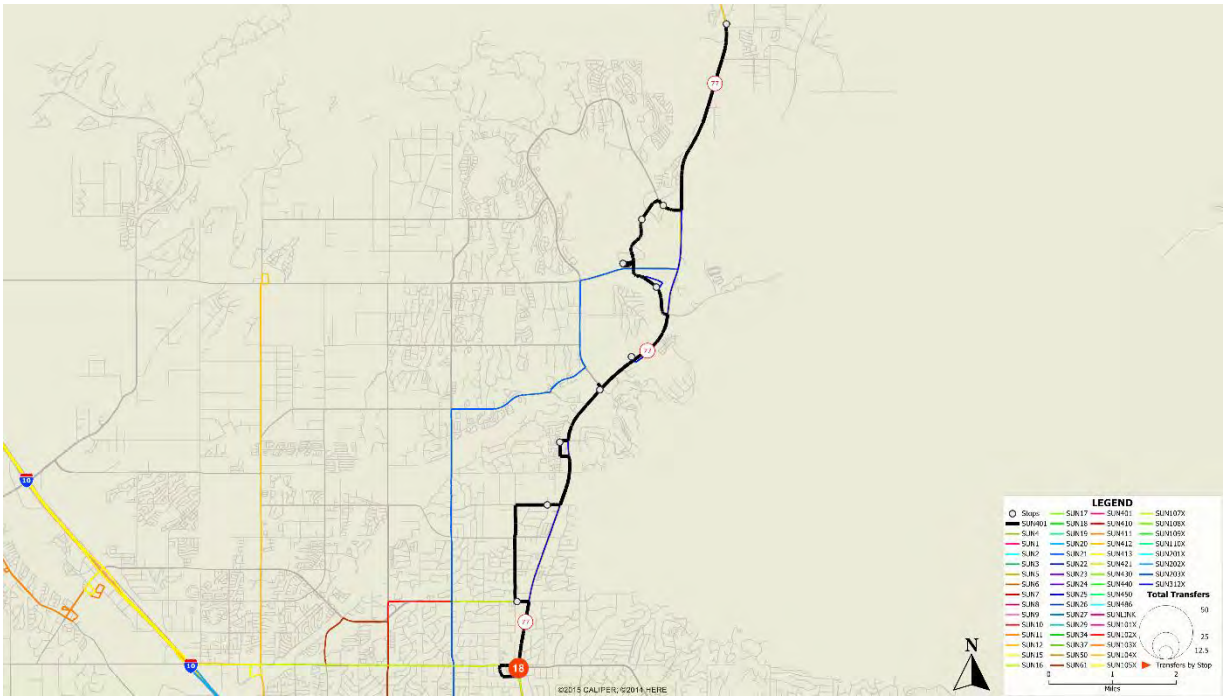

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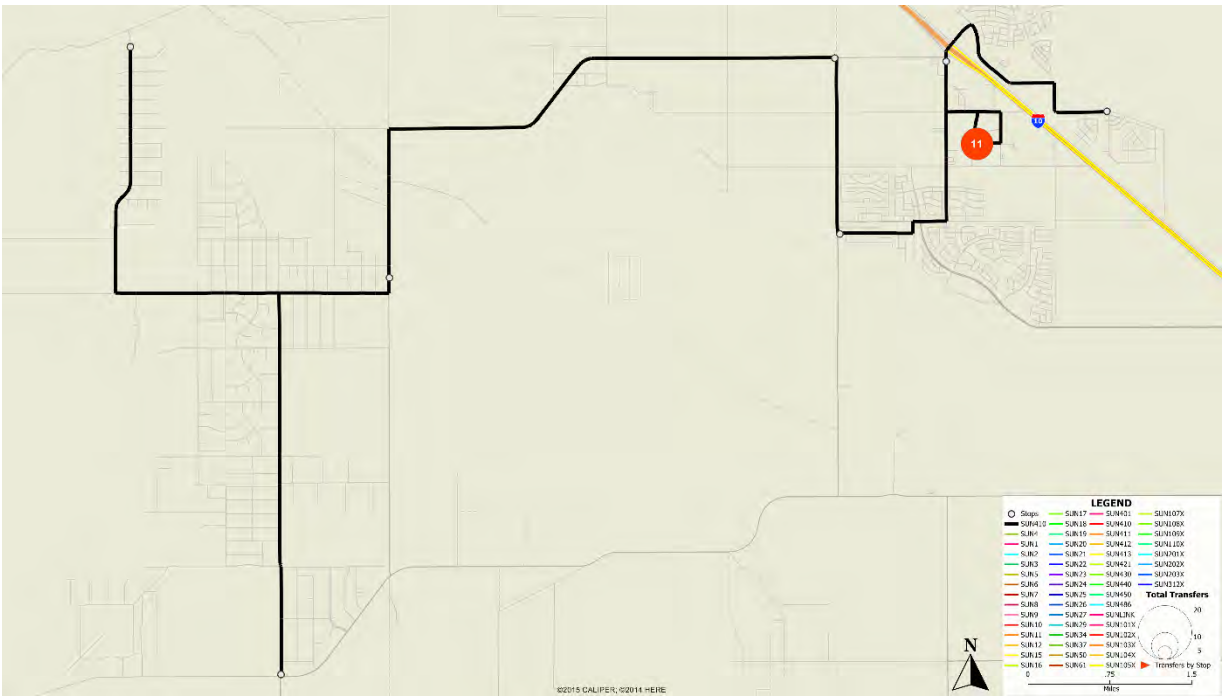

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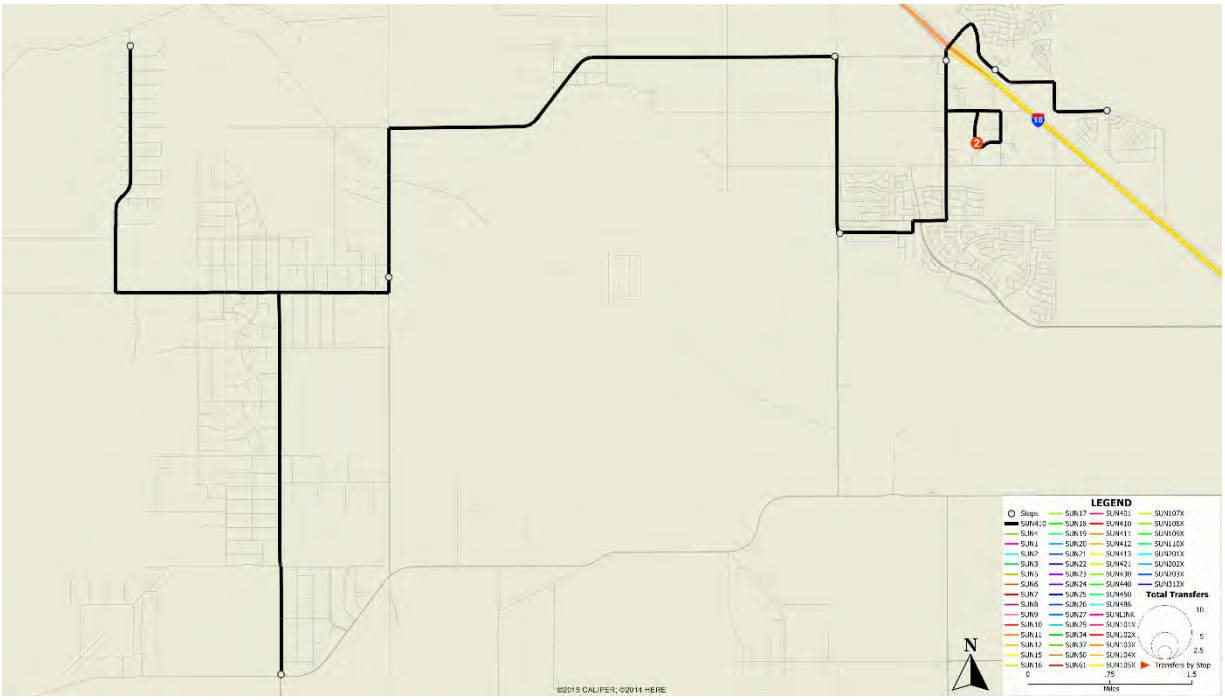

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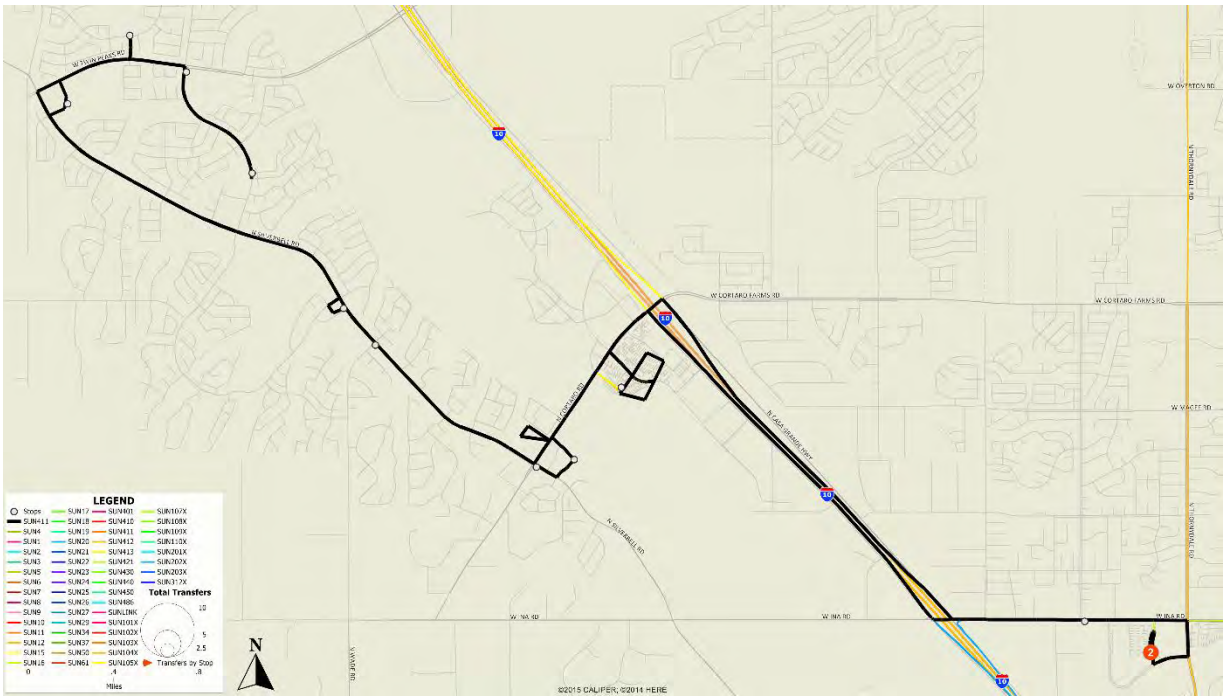

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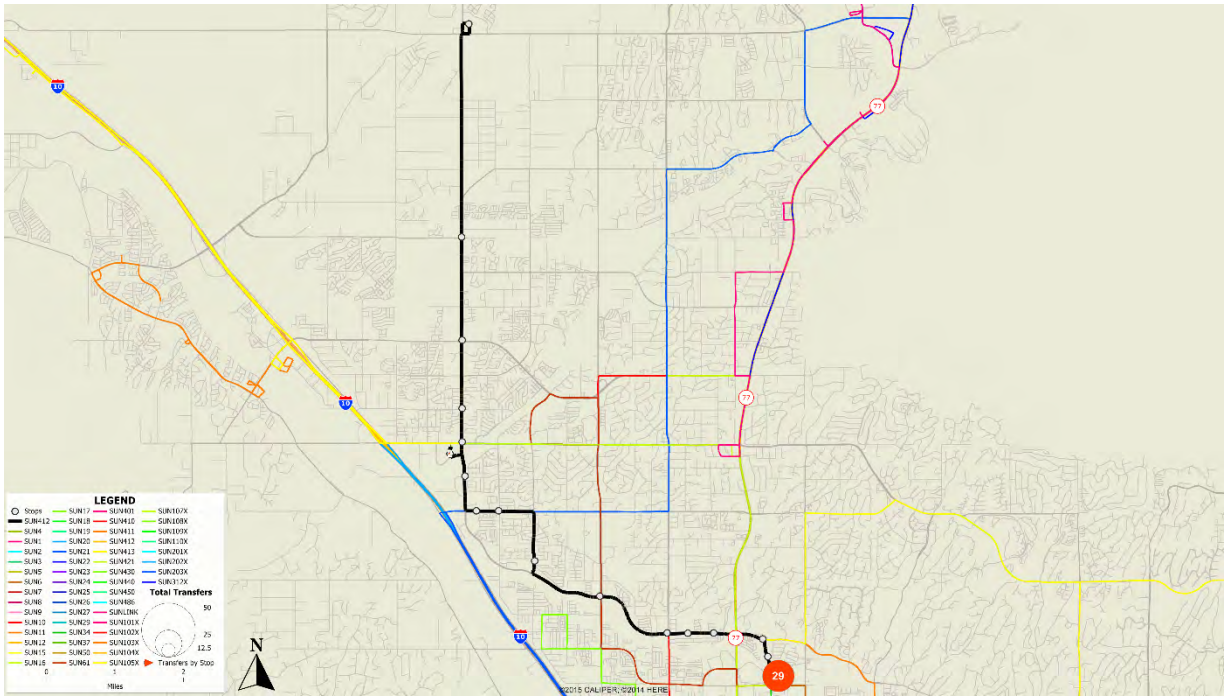

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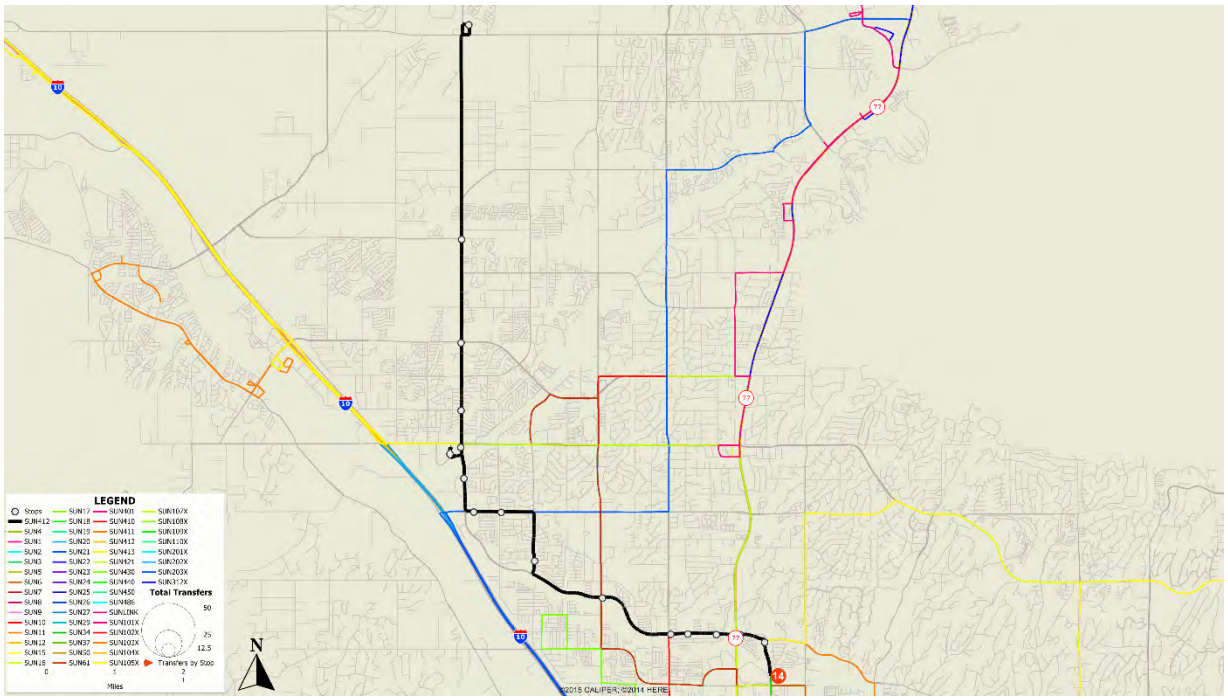

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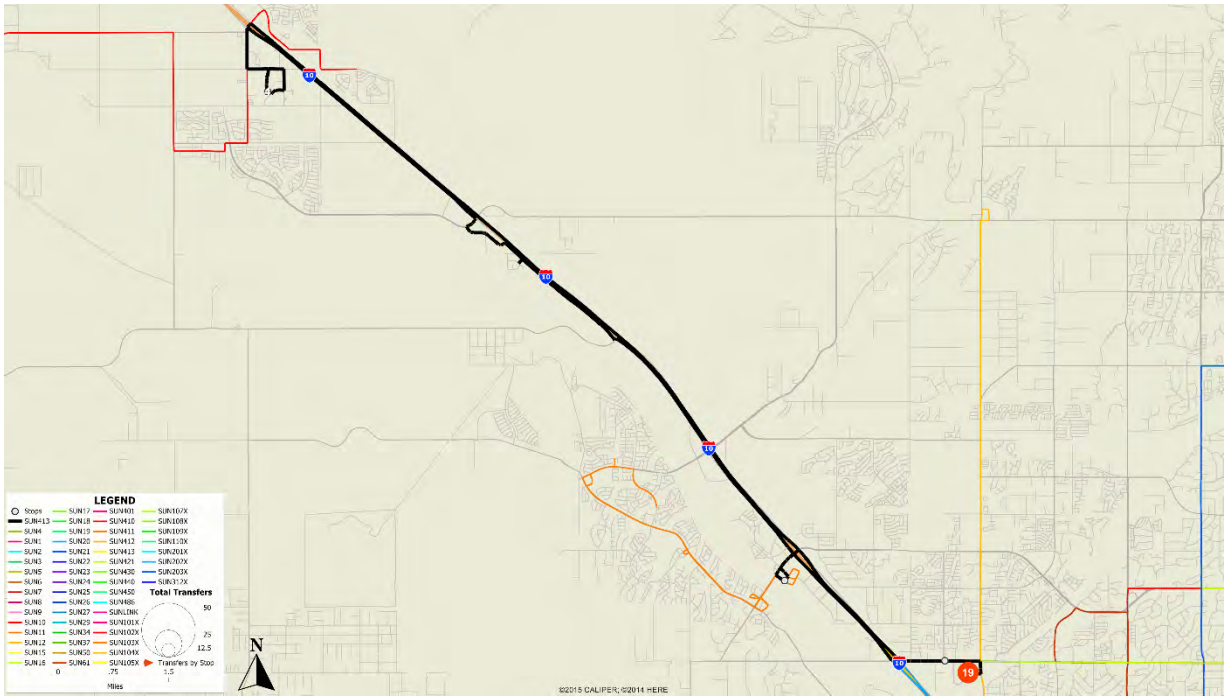

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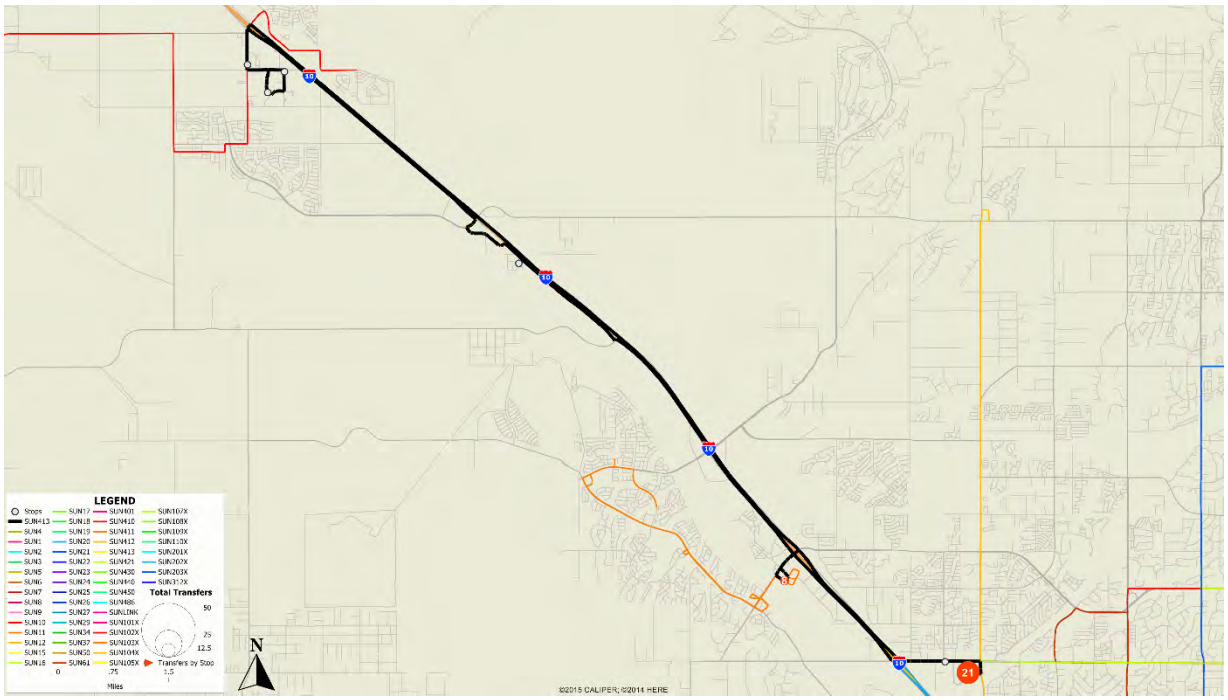

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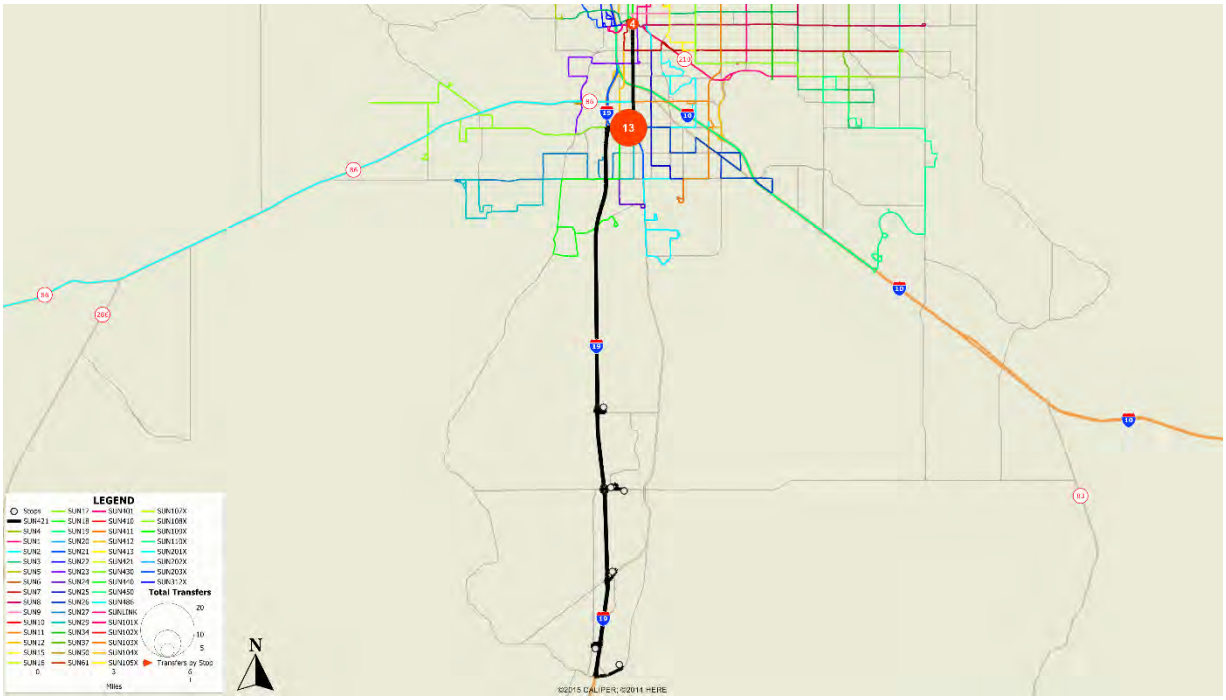

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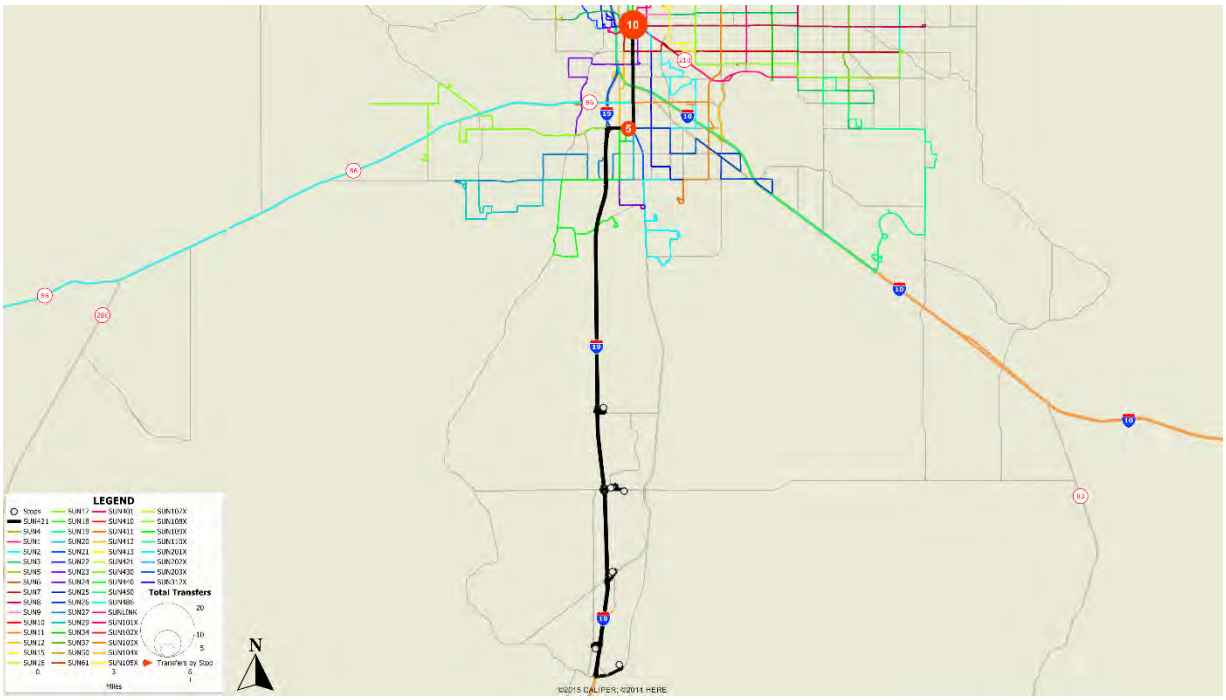

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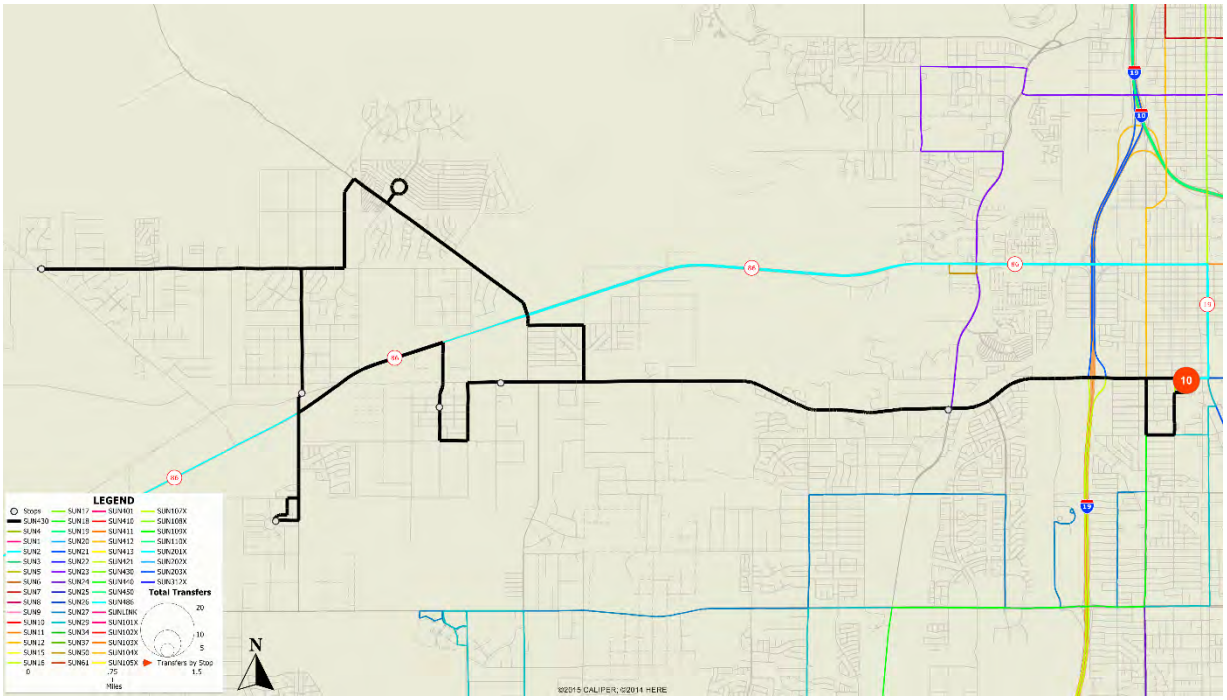

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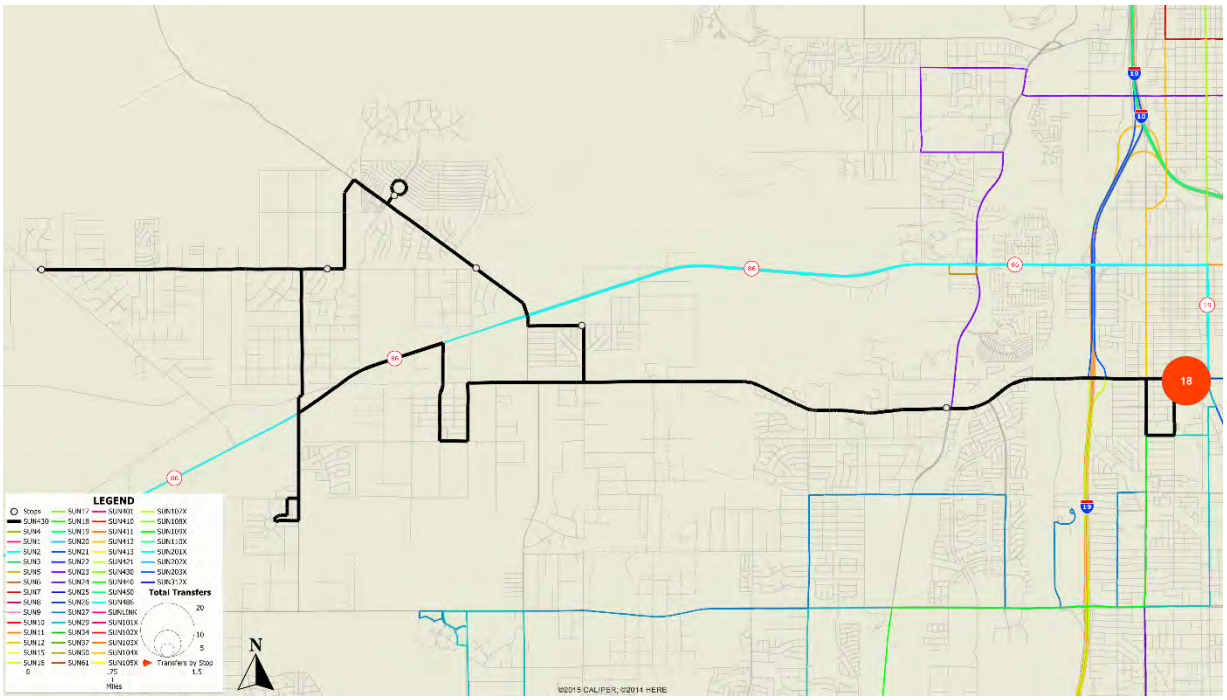

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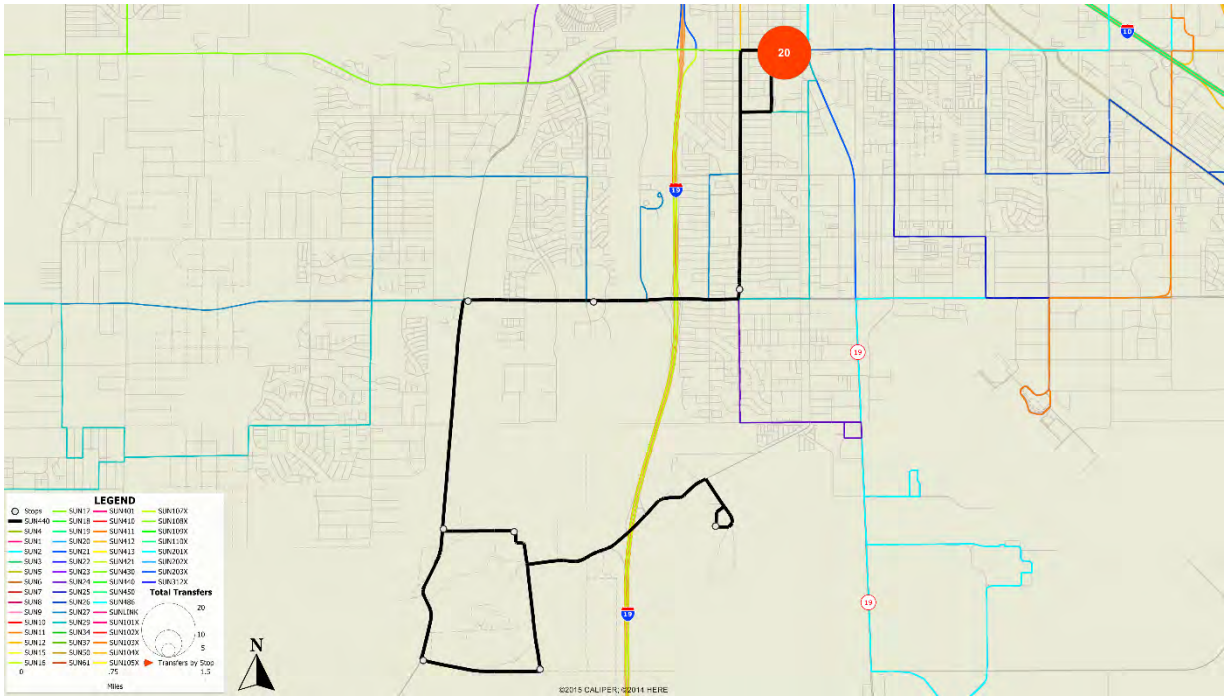

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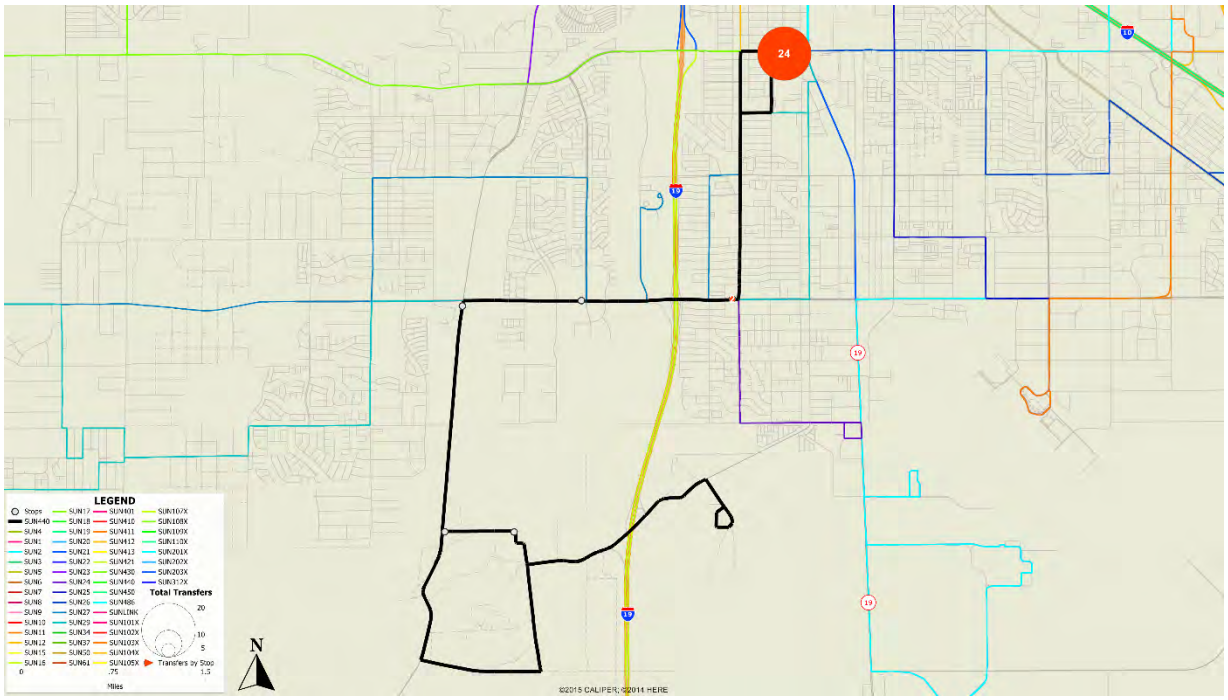

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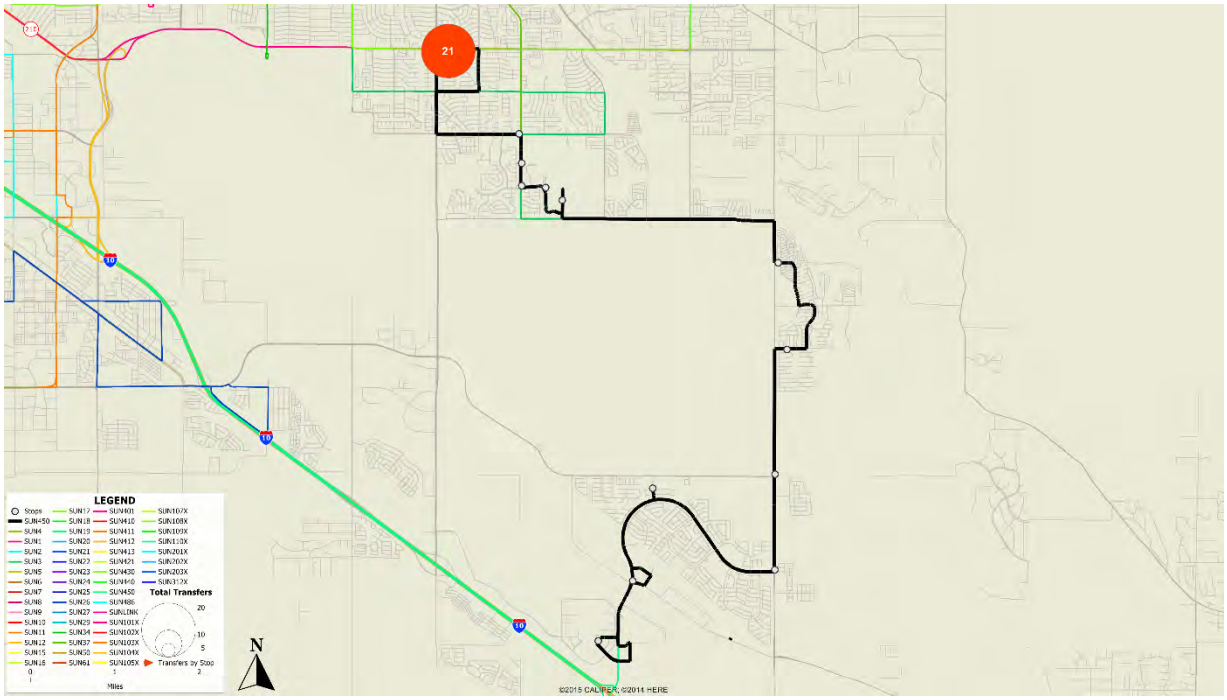

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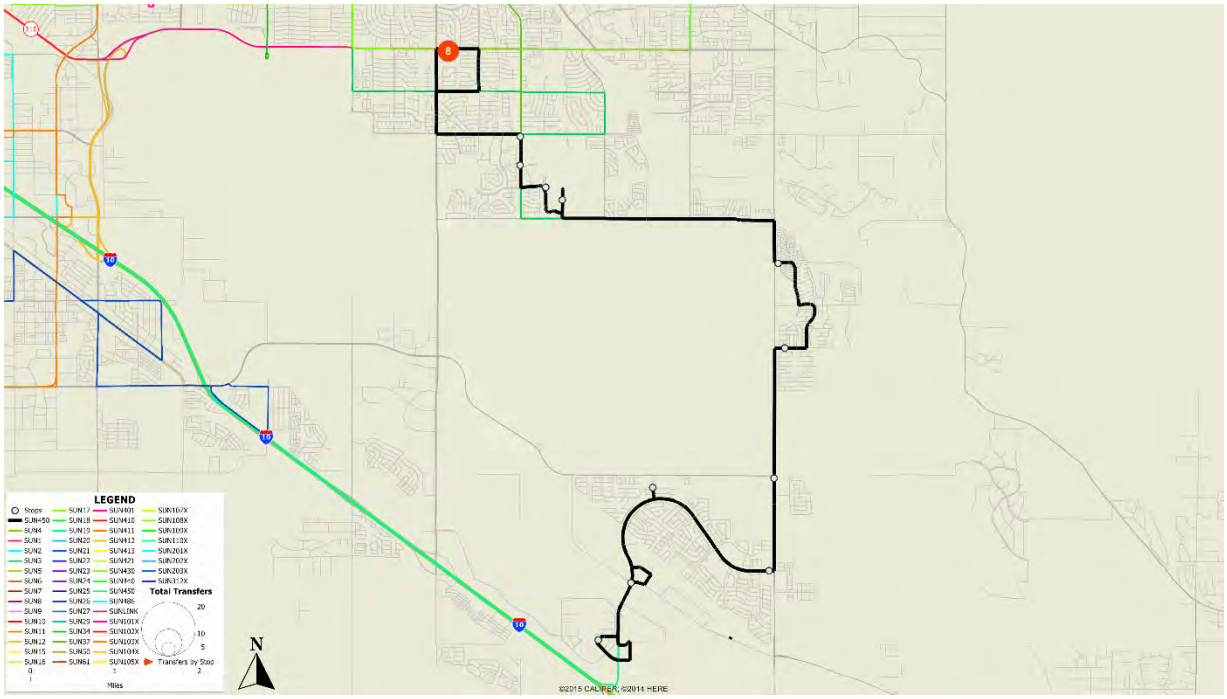

SUN450SB Transfer Locations

Appendix C 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 as a whole. 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:

	ROUTE SURVEYED	FROM TRANSFERS	TO TRANSFERS	TOTAL LINKED	RIDERSHIP	ABS_DIFF	PCT_DIFF
SUN LINK	3046	105	134	3285	3290	-5	-0.1%
SUN SHUTTLE	401	109	130	639	534	105	19.6%
SUN TRAN LB	43834	6916	6730	57480	57645	-165	-0.3%
SUN TRAN XB	742	37	51	829	775	54	7.0%

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

		Linked Trips						
ROUTE	Transit Mode	ROUTE SURVEYED	FROM TRANSFERS	TO TRANSFERS	TOTAL LINKED	APC/FARE BOX RIDERSHIP	ABSOLUTE DIFF	PERCENT DIFF
SUNLINK	SUN LINK	3046	105	134	3285	3290	-5	-0.1%
GRNDAR	SUN SHUTTLE	9	0	0	10	10	0	-2.5%
ORODAR	SUN SHUTTLE	49	5	0	54	49	5	10.8%
SUN401	SUN SHUTTLE	29	7	3	40	51	-11	-21.5%
SUN410	SUN SHUTTLE	19	0	3	22	27	-4	-16.3%
SUN411	SUN SHUTTLE	12	9	11	32	13	18	136.5%
SUN412	SUN SHUTTLE	39	30	47	117	58	59	101.6%
SUN413	SUN SHUTTLE	27	8	29	64	49	15	30.7%
SUN421	SUN SHUTTLE	61	16	2	79	78	1	0.8%
SUN430	SUN SHUTTLE	42	12	21	75	55	20	36.4%
SUN440	SUN SHUTTLE	84	7	7	97	105	-8	-7.3%
SUN450	SUN SHUTTLE	28	14	7	50	40	10	24.4%
SUN1	SUN TRAN LB	1363	159	163	1686	1640	46	2.8%
SUN10	SUN TRAN LB	823	189	98	1110	1186	-76	-6.4%
SUN11	SUN TRAN LB	3262	450	376	4089	4020	69	1.7%
SUN12	SUN TRAN LB	1176	237	214	1627	1950	-323	-16.5%
SUN15	SUN TRAN LB	956	158	136	1250	1271	-20	-1.6%
SUN16	SUN TRAN LB	3396	641	570	4606	4504	102	2.3%
SUN17	SUN TRAN LB	2523	244	263	3031	3168	-138	-4.3%
SUN18	SUN TRAN LB	2883	593	523	3998	4326	-328	-7.6%
SUN19	SUN TRAN LB	1095	170	144	1409	1486	-77	-5.2%
SUN2	SUN TRAN LB	808	134	89	1031	1101	-69	-6.3%
SUN20	SUN TRAN LB	287	30	60	377	368	9	2.5%
SUN21	SUN TRAN LB	337	86	83	506	565	-59	-10.5%
SUN22	SUN TRAN LB	387	63	63	514	589	-76	-12.8%
SUN23	SUN TRAN LB	859	175	199	1234	1369	-135	-9.9%
SUN24	SUN TRAN LB	405	77	114	595	645	-50	-7.7%
SUN25	SUN TRAN LB	1303	284	236	1823	1658	166	10.0%
SUN26	SUN TRAN LB	687	109	136	933	918	15	1.6%
SUN27	SUN TRAN LB	862	176	248	1286	1188	97	8.2%
SUN29	SUN TRAN LB	1208	160	219	1586	1417	169	12.0%
SUN3	SUN TRAN LB	2590	466	352	3408	3095	313	10.1%
SUN34	SUN TRAN LB	1565	170	188	1923	2039	-116	-5.7%
SUN37	SUN TRAN LB	555	82	111	747	728	19	2.6%
SUN4	SUN TRAN LB	3808	411	491	4711	4776	-65	-1.4%
SUN5	SUN TRAN LB	787	62	124	972	950	22	2.3%
SUN50	SUN TRAN LB	260	44	49	352	382	-30	-7.8%
SUN6	SUN TRAN LB	1686	317	232	2235	2057	178	8.7%
SUN61	SUN TRAN LB	318	47	74	439	418	20	4.9%
SUN7	SUN TRAN LB	2103	262	334	2698	2709	-11	-0.4%
SUN8	SUN TRAN LB	3837	700	567	5104	4960	144	2.9%
SUN9	SUN TRAN LB	1706	223	272	2200	2161	40	1.8%
SUN101X	SUN TRAN XB	82	0	0	82	87	-5	-5.5%
SUN102X	SUN TRAN XB	65	0	0	65	69	-4	-5.3%
SUN103X	SUN TRAN XB	57	0	3	60	57	3	5.5%
SUN104X	SUN TRAN XB	51	6	4	61	57	5	8.2%
SUN105X	SUN TRAN XB	60	5	10	75	60	14	23.9%
SUN107X	SUN TRAN XB	59	0	0	59	64	-5	-7.9%
SUN108X	SUN TRAN XB	54	0	13	68	54	13	24.6%
SUN109X	SUN TRAN XB	52	3	4	59	56	3	6.1%
SUN110X	SUN TRAN XB	67	0	0	67	71	-4	-5.8%
SUN201X	SUN TRAN XB	33	4	0	37	36	1	2.6%
SUN202X	SUN TRAN XB	76	3	0	79	76	3	3.9%
SUN203X	SUN TRAN XB	56	1	11	67	56	11	20.2%
SUN312X	SUN TRAN XB	28	15	6	49	32	17	54.4%

Appendix C – City of Tucson Fare Ordinance # 11401

OPTION 4

ADOPTED BY THE
MAYOR AND COUNCIL

September 20, 2016

ORDINANCE NO. 11401

RELATING TO TRANSIT FARES; AMENDING THE TUCSON CODE (TC), CHAPTER 2 ARTICLE I, IN GENERAL; SECTION 2-18, CITY FIXED ROUTE, REGULARLY SCHEDULED BUS SYSTEM CALLED SUN TRAN AND MODERN STREETCAR SYSTEM CALLED SUN LINK; FARES; ELIGIBILITY AND PROHIBITED ACTIVITY; SECTION 2-19, CITY CURB-TO-CURB BARRIER-FREE TRANSPORTATION SERVICE CALLED SUN VAN, THE COMPLEMENTARY PARATRANSIT SERVICE; FARES; ELIGIBILITY AND PROHIBITED ACTIVITY; AND SECTION 2-22, CITY SUN TRAN, SUN LINK AND PARATRANSIT SERVICE SYSTEMS FARE SUBSIDY PROGRAM FOR LOW-INCOME INDIVIDUALS; FARE SUBSIDIES; ELIGIBILITY AND PROHIBITED ACTIVITY; SETTING EFFECTIVE DATES; AND DECLARING AN EMERGENCY

BE IT ORDAINED BY THE MAYOR AND COUNCIL OF THE CITY OF TUCSON, ARIZONA, AS FOLLOWS:

SECTION 1. TC Chapter 2, Article I, Section 2-18, Section 2-19 and Section 2-22 are hereby amended to read as follows:

ARTICLE I. IN GENERAL

* * *

Sec. 2-18. City fixed route, regularly scheduled bus system called Sun Tran and modern streetcar system called Sun Link; fares; eligibility and prohibited activity.

* * *

(c) Fares: The fares for the Sun Tran and Sun Link systems shall be as follows:

	FY 2017	FY 2018
Per Ride, $0.25 surcharge over stored value fare	$1.75	$1.85

2) Full fare (stored value):

	FY 2017	FY 2018
Per Ride (Base Fare)	$1.50	$1.60
Per Day	$3.75	$4.00
30 Day Pass	$45.00	$48.00

(3) Economy fare (cash):

	FY 2017	FY 2018
Per Ride, $0.15 surcharge over stored value fare	$0.75	$0.75

(4) Economy fare (stored value):

	FY 2017	FY2018
Per Ride	$0.60	$0.75
30 Day Pass	$22.50	$22.50

(5) Express fare:

	FY 2017	FY2018
Per Ride	$2.25	$2.35
30 Day Pass	$60.00	$64.00

(6) Transfers to regular routes and streetcar: Free for passengers paying appropriate fare and accompanied by appropriately issued transfer medium as determined by the director of transportation.

(7) Transfers to express routes: Passengers must pay a surcharge equal to the difference between the one-way base fare in the appropriate fare category and the one-way express fare.

(8) Children: Free for persons five (5) years of age or under when accompanied by paying adult.

(9) Ridership incentive programs: To encourage ridership among specific groups of persons shall be as follows:

a. University of Arizona pass: For employees and students of the University of Arizona, as follows:

	FY2017	FY2018
Fall Semester Pass, effective August 1 through December 31 of each calendar year	$180.00	$192.00
Fall Semester Express Pass, effective August 1 through December 31 of each calendar year	$240.00	$256.00
Spring Semester Pass, effective January 1 through May 31 of each calendar year	$180.00	$192.00
Spring Semester Express Pass, effective January 1 through May 31 of each calendar year	$240.00	$256.00
Annual Pass, effective August 1 through July 31	$450.00	$480.00
Annual Express Pass, effective August 1 through July 31	$570.00	$608.00

b. Semester pass: For students of all other local public and private educational institutions registered with Sun Tran as a bulk sales organization, as follows:

	FY2017	FY2018
Fall Semester Pass, effective August 1 through December 31 of each calendar year	$180.00	$192.00
Fall Semester Express Pass, effective August 1 through December 31 of each calendar year	$240.00	$256.00
Spring Semester Pass, effective January 1 through May 31 of each calendar year	$180.00	$192.00
Spring Semester Express Pass, effective January 1 through May 31 of each calendar year	$240.00	$256.00

* * *

(6) Nonprofit program: Organizations in the nonprofit program shall be eligible to purchase economy fares on behalf of an organization's qualified clients on the Sun Tran and Sun Link systems. The nonprofit program shall be defined and facilitated as determined by the director of transportation.

a. Discount one (1) day pass: Organizations in the nonprofit program shall be eligible to purchase for clients not yet qualified for the economy program as follows:

	FY 2017	FY 2018
Discounted Day Pass	$2.00	$2.05

* * *

b. Economy thirty (30) day ticket: Organizations in the nonprofit program shall be eligible to purchase an economy thirty (30) day ticket for those clients who have obtained the appropriate ID required for purchase of economy fares as follows:

	FY 2017	FY 2018
Discounted 30 Day Pass	$22.50	$22.50

* * *

***Sec. 2-19. City curb-to-curb barrier-free transportation service called Sun Van, the complementary paratransit service*; fares; eligibility and prohibited activity**.

* * *

(b) Fares: The fares for paratransit service provided by contractors for the city shall be as follows:

	FY 2017	FY 2018
Full Fare, per ride	$3.00	$3.20
Low-income Fare, per ride	$1.50	$1.60
Children, Five (5) years of age when accompanied by a paying adult	Free	Free
Optional ADA Fee, per ride outside of ¾ mile of fixed route service	$2.00	$2.50

* * *

Sec. 2-22. City Sun Tran, Sun Link and paratransit service systems fare subsidy program for low-income individuals; fare subsidies; eligibility and prohibited activity.

* * *

(1) Economy fare subsidy: For riders who qualify for the Sun Tran and Sun Link system economy fare, the subsidies shall be:

	FY 2017	FY 2018
Full Fare (cash) per ride	$1.00	$1.10
Full Fare (stored value)	$0.90	$0.85
Full Fare 30 Day Pass	$22.50	$25.50
Discounted Day Pass, purchased through nonprofit program	$1.75	$1.95

(c) Sun Van fare subsidy: The Sun Van service fare subsidy for qualified low-income individuals shall be as follows:

	FY 2017	FY 2018
Full Fare, per ride	$1.50	$1.60

* * *

SECTION 2. The fares approved by this Ordinance shall take effect on October 16, 2016, for Fiscal Year 2017; and July 1, 2017, for Fiscal Year 2018.

SECTION 3. WHEREAS, it is necessary for the preservation of the peace, health and safety of the City of Tucson that this Ordinance become immediately effective, an emergency is hereby declared to exist, and this Ordinance 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 20, 2016.

_____
MAYOR

ATTEST:

_____
CITY CLERK

APPROVED AS TO FORM:

_____
CITY ATTORNEY

REVIEWED BY:

_____
CITY MANAGER

DF:mg
9/13/16

{A0137559.DOCX/}

Appendix D – FTA Circular 4702.1B, Appendix K
Service and Fare Equity Questionnaire Checklist
Considerations for a Service Equity Analysis
(App. K-1 – App. K-10-11)

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

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(2) Considerations for a Fare Equity Analysis

- ❒ We have briefly and clearly stated our policy to determine when a "disparate impact" occurs in the contexts of fare changes. In particular, our agency has developed policy thresholds (in terms of absolute numbers or proportions) for identifying disparate impacts.
- ❒ Our policy specifies how we engaged the public in developing our policy for measuring disparate impacts.
- ❒ We have briefly and clearly stated our disproportionate burden policy, and our policy describes how we engaged the public in developing the disproportionate burden policy.
- ❒ We have analyzed the fare media generated from ridership surveys indicating whether minority and/or low-income riders are disproportionately more likely to use the mode of service, payment type, or fare media that would be subject to the fare increase or decrease (see sample, page K-12).
- ❒ We have determined the number and percent of users of each fare media proposed for increase or decrease.
    - o Our analysis includes a profile of fare usage by group—minority, low-income, and overall ridership—as shown below.
    - o If the proposed changes would only affect certain fare media, the analysis should address whether focusing changes on those fare media may lead to a disparate impact or disproportionate burden.
- ❒ We have clearly depicted the information in tabular format.
    - o The table depicts the fare media comparing the existing cost, the percent change, and the usage of minority groups as compared to overall usage and low-income groups as compared to overall usage. We have clearly analyzed fare media for minority groups distinct from low-income.
- ❒ We have compared the differences in impacts between minority users and overall users.
- ❒ We have compared the differences in impacts between low-income users and overall users.
- ❒ We have analyzed any alternative transit modes, fare payment types, or fare media available for people affected by the fare change.
    - o Analysis compared the fares paid by the proposed changes with fares that would be paid through available alternatives.

- Analysis shows whether vendors that distribute/sell the fare media are located in areas that would be convenient to impacted 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 fare changes despite these impacts, we have also:

- Clearly demonstrated that we have a substantial legitimate justification for the proposed fare changes; and
- Clearly demonstrated that we analyzed alternatives to determine whether the proposed fare changes are the least discriminatory alternative.

❒ If we have documented a disparate impact or a disproportionate burden, we have explored alternatives and mitigation, including the timing of implementing the fare increases, providing discounts on passes to social service agencies that serve the impacted populations, and other alternatives as appropriate.

Charting fare payment by ridership group (as shown on the next page) can be a useful early step in a fare equity analysis to understand how fare media usage varies between low-income riders, minority riders, and overall ridership. Comparing fare payment patterns for minority versus non-minority and low-income versus higher-income riders can yield even clearer depictions of differences that should be considered when developing fare change proposals.