

**Regional Transportation Commission of Southern Nevada (RTC)
2014 On-Board Transit Survey**



Prepared for:
Regional Transportation Commission of Southern Nevada (RTC)

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Disclaimer

The preparation of this report has been financed in part through grant[s] from the Federal Highway Administration and Federal Transit Administration, U.S. Department of Transportation, under the Metropolitan Planning Program, Section 104(f) of Title 23, U.S. Code. The contents of this report do not necessarily reflect the official views or policy of the U.S. Department of Transportation.

Acknowledgments

The Las Vegas Valley Origin Destination Transit On board Survey project was made possible by the cooperative efforts of the following individuals and organizations who contributed significantly to the successful completion of the project:

RTC Board of Commissioners

Larry Brown (Chairman), Clark County
Debra March (Vice Chairman), City of Henderson
Roger Tobler, Boulder City
Chris Giunchigliani, Clark County
Steve Ross, City of Las Vegas
Allan Litman, City of Mesquite
Lois Tarkanian, City of Las Vegas
John Lee, City of North Las Vegas

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Bob Scales, Parsons Transportation Group

Executive Summary

An onboard survey was carried out by ETC Institute on behalf of RTC, with Parsons Corporation's Greg Gaides serving as the modeling Consultant for the Project. The Project began in January of 2014 and ended in August of 2015. The study was conducted in the Las Vegas area which includes the City of Las Vegas, North Las Vegas, City of Henderson, Boulder City, Sunrise Manor, Spring Valley, Paradise and some unincorporated areas of Clark County.

The purpose of the study was to gather updated travel behavior data from transit users in the Las Vegas area that encompasses all RTC fixed bus services. The data will be used to:

- Improve regional transit ridership forecasts produced by RTC's travel demand model
- Compile statistically accurate information about transit customers and how they use the transit system for transit agency planning purposes
- Evaluate changes from new services introduced or to be introduced
- Generate reliable linked Origin-Destination data to support computerized travel demand modeling and transportation network simulation activities
- Obtain the best quality data from all segments of public transportation users
- Improve the statistical quality of survey sample along bus routes as required to enhance the effectiveness of the regional transit model
- Assist in fulfilling requirements that will allow RTC to compete for Federal Transit Administration (FTA) New Starts funding.

The goals were to obtain useable On-to-Off pairs from at least 20% of riders on routes with an average Tuesday-Thursday daily ridership of at least 2,000 (10% - SDX and Deuce). In addition, the goal was to also obtain useable Intercept Interviews (Origin – Destination (OD) Survey) from at least 7.5% of riders for all routes (4.5% - SDX and Deuce). Overall, the goals were to complete over 30,000 on-to-off pairs and 12,000 intercept surveys total. Ultimately over 41,700 on-to-off pairs were completed and over 14,100 intercept surveys were completed.

- **Type of place transit riders are coming from:** Approximately Forty-four percent (43.7%) of all transit riders are coming from user's home. Approximately Forty percent (39.6%) of Downtown/Strip Riders are coming from a Hotel/Casino/Convention Center.
- **Type of place transit riders are going to:** Approximately thirty-four percent (34.2%) of all transit riders are going to user's home. Approximately Forty percent (39.5%) of Downtown/Strip Riders are going to a Hotel/Casino/Convention Center.

This survey was one of the most comprehensive transit surveys ever conducted in the United States. RTC fully incorporated all best practices recommended by the FTA. The data from this survey will greatly assist future planning and operational decision-making.

The 2014 Regional Transportation Commission of Southern Nevada Project involved two types of onboard surveys with bus riders in the Las Vegas metro area using the “RTC” transit fleet. This area includes the City of Las Vegas, North Las Vegas, City of Henderson, Boulder City, Sunrise Manor, Spring Valley, Paradise and some unincorporated areas of Clark County. Overall, the goals were to complete over 30,000 on-to-off surveys and 12,000 main surveys total. Ultimately over 41,700 on-to-off surveys were completed and over 14,100 main surveys were completed.

Table 1-1. Overall Survey Goals

| Survey Type | Goal | Completed |
|-------------------|--------|-----------|
| On-to-Off Surveys | 30,000 | 41,700 |
| Main Surveys | 12,000 | 14,100 |

The onboard survey was carried out by ETC Institute on behalf of RTC, with Parsons Corporation’s Greg Gaides serving as the modeling Consultant for the Project. The Project began in January of 2014 and ended in August of 2015. Surveying on buses was halted during the summer when school was out of session. The survey consisted of two major elements: The On-to-Off element is intended to identify boarding and alighting patterns of bus riders as well as provide a basis for expanding the results of the Main Survey and the Main Survey element consisted of detailed surveys of riders conducted onboard RTC bus routes. The following sections further describe the survey process.

1.1 Purpose and Objectives

The purpose of the project was to gather updated travel behavior data from transit users in the Las Vegas metropolitan area that encompasses all fixed bus route services in the Regional Transportation Commission of Southern Nevada region. The data collected will be used to:

- Improve regional transit ridership forecasts produced by RTC’s travel demand model
- Compile statistically accurate information about transit customers and how they use the transit system for transit agency planning purposes
- Evaluate changes from new services introduced or to be introduced
- Generate reliable linked Origin-Destination data to support computerized travel demand modeling and transportation network simulation activities
- Obtain the best quality data from all segments of public transportation users
- Improve the statistical quality of survey sample along bus routes as required to enhance the effectiveness of the regional transit model
- Assist in fulfilling requirements that will allow RTC to compete for Federal Transit Administration (FTA) New Starts funding.

1.2 Survey Design and Development Process

The survey development process began by having the project team (RTC's Project Manager, ETC Institute and Greg Gaides of Parsons Transportation Group - RTC's Travel Demand Model project consultant) review the data requirements for the travel demand model, design the Survey Instrument and review the instrument. The primary objective of the project was to better understand the local transit travel patterns, and most of the questions on the survey instrument were focused on collecting data that will support current and future transportation forecasting efforts.

The survey instrument was shared with representatives of the Federal Transit Administration (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. A pilot test was also conducted 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 main survey administration to begin.

1.2.1 *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. Some of the data required to fulfill the objectives of the project are listed below:

- Type of place where the trip began
- Address where the trip began
- Mode of access to the transit system
- Boarding location
- Alighting location
- Transfers used to get to and from the route/station where the survey was administered
- Mode of egress from the transit system
- Destination address
- Type of place where the trip ended
- Respondent's home address
- Respondent's Annual Household Income
- Respondent's employment status
- Respondent's student status
- Respondent's driver's license status
- Respondent's age
- Number of operational vehicles available in the household

1.2.2 *Project Schedule*

The Las Vegas On-Board Survey Project Schedule is listed below.

- Survey Preparation/Design (Jan – Mar 2014)
- Survey Administration (April - Jan 2015)
 - On-to-Off Survey (April & Sept 2014)
 - Full Intercept Survey (May & Sept – Oct 2014)
 - Targeted Survey Administration (Nov 2014-Jan 2015)
- Data Processing (Summer 2014 & Nov – Jan 2015)
- Data Expansion (Feb - Mar 2015)
- Survey Documentation & Report (April-August 2015)

1.3 Survey Instrument Administration

The survey instrument was designed to be administered as a face-to-face interview using tablet PCs. A handful of screenshots from the tablet PC survey are below and on the following page (The survey instrument is available in Appendix A).

Respondents who did not have time to complete the survey during their bus trip were also given the option of providing their phone numbers. Those who provided their phone numbers were then contacted by ETC Institute's call center to complete the survey.

Figure 1-1. Tablet PC screenshot for Question: "What type of place are you coming from now?"

The screenshot displays the 'RTC 2014 On-Board Transit Survey' interface. The question is: "What type of place are you COMING FROM NOW (the starting place for your one-way trip)?". Below the question, it says "Choose one of the following answers". There are ten radio button options arranged in two columns:

- Your Home
- Place of Work
- Other work related
- College/University (student only)
- School (K-12) (student only)
- Medical / Hospital, non work
- Hotel / Casino / Convention Center
- Shopping / Eating / Dining
- Recreation / Sightseeing / Sports Event
- Airport (passengers only)
- Other:

At the bottom of the form, there are four buttons: "Exit and clear survey" (red), "Previous" (orange), "Callback" (blue), and "Next" (green). The copyright notice "© ETC Institute 2014" is centered at the bottom.

Figure 1-2. Tablet PC screenshot for Question: "What is the location of the place you are coming from?"

The screenshot displays the 'RTC 2014 On-Board Transit Survey' interface for the question: "What is the EXACT STREET ADDRESS of this place?". The form includes the following fields:

- Hotel or Place Name:
- Street Address:
- City:
- State:
- Zip Code:
- Latitude:
- Longitude:

Below the form, there are two radio buttons: "Address" (selected) and "Place". To the right of these are "Clear" and "Me" buttons. Below the form is a map of Las Vegas, Nevada, with a red pin indicating the location. At the bottom of the form, there are four buttons: "Exit and clear survey" (red), "Previous" (orange), "Callback" (blue), and "Next" (green).

Figure 1-3 Tablet PC screenshot for Question: "What kind of fare did you use for this trip?"

RTC 2014 On-Board Transit Survey

What kind of fare did you use for this trip?
Choose one of the following answers

- Single Ride
- 2-hour pass
- 24 Hour
- 3 Day pass
- 15 Day pass
- 30 Day pass
- U Pass

Exit and clear survey Previous Callback Next

© ETC Institute 2014

Figure 1-4 Tablet PC screenshot for Question: "Including you, how many people (average age 15) in your household are employed full/part-time?"

RTC 2014 On-Board Transit Survey

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

This question is mandatory.

people
Only numbers may be entered in this field.

Exit and clear survey Previous Callback Next

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This chapter describes the procedures used for carrying out the sampling of bus 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.

2.1 Sampling Goals

In order to ensure that the distribution of completed surveys mirrored the actual distribution of riders, ETC Institute developed a sampling plan that would ensure the completion of the On-to-Off survey with at least 30,000 of the system's riders, and 12,000 surveys of the full Origin-and-Destination based on Tuesday – Thursday average ridership.

2.1.1 Sampling Goals for On-to-Off Survey

The sampling plan for the On-to-Off survey was designed to obtain completed surveys from a minimum of 20% of the daily ridership on each of the Express/Residential routes that are operated by the transit agency in the region that has a minimum daily ridership of 2,000. The Downtown/Strip routes are heavily tourist based and have limited stops, so the sampling plan for the On-to-Off survey was designed to obtain completed surveys from a minimum of 10% of their daily ridership. Additional tourist information will be acquired during the 2014 RTC Visitors Survey. Table 2-1 shows the goals and the actual number of completed On-to-Off surveys that were obtained by Route, Time Period, and Direction (RTD). The total estimated weekday ridership was provided by The Regional Transportation Commission of Southern Nevada.

| RTCSN | | SAMPLING PLAN | | | | | COMPLETED | | | | | WEIGHT FACTOR BY RTD | | | | |
|---------------------|-----|-----------------------|------------------------|-----------------------|------------------------|--------|-----------------------|------------------------|-----------------------|------------------------|-------|----------------------|-----------------------|------------------------|-----------------------|------------------------|
| Route | Dir | AM Peak (6:00-9:00am) | Midday (9:01am-2:00pm) | PM Peak (2:01-7:00pm) | Evening (7:01-11:00pm) | Total | AM Peak (6:00-9:00am) | Midday (9:01am-2:00pm) | PM Peak (2:01-7:00pm) | Evening (7:01-11:00pm) | Total | Total Surveys | AM Peak (6:00-9:00am) | Midday (9:01am-2:00pm) | PM Peak (2:01-7:00pm) | Evening (7:01-11:00pm) |
| 101 | N | 49 | 96 | 122 | 41 | 308 | 71 | 138 | 152 | 41 | 402 | 823 | 3.444 | 3.487 | 4.003 | 4.983 |
| | S | 58 | 93 | 89 | 32 | 271 | 104 | 107 | 165 | 45 | 421 | | 2.766 | 4.333 | 2.687 | 3.597 |
| 102 | N | 38 | 71 | 84 | 27 | 220 | 69 | 177 | 145 | 26 | 417 | 820 | 2.739 | 2.016 | 2.909 | 5.147 |
| | S | 43 | 78 | 77 | 24 | 223 | 72 | 191 | 106 | 34 | 403 | | 3.007 | 2.041 | 3.649 | 3.522 |
| 103 | N | 70 | 152 | 182 | 71 | 476 | 83 | 219 | 232 | 132 | 666 | 1343 | 4.231 | 3.480 | 3.929 | 2.678 |
| | S | 101 | 162 | 159 | 60 | 482 | 141 | 235 | 187 | 114 | 677 | | 3.577 | 3.437 | 4.254 | 2.646 |
| 104 | N | 48 | 76 | 112 | 28 | 265 | 72 | 145 | 112 | 64 | 393 | 814 | 3.330 | 2.630 | 4.993 | 2.225 |
| | S | 71 | 87 | 86 | 30 | 274 | 78 | 95 | 204 | 44 | 421 | | 4.546 | 4.556 | 2.104 | 3.456 |
| 105 | N | 43 | 79 | 103 | 42 | 267 | 57 | 135 | 173 | 48 | 413 | 886 | 3.760 | 2.933 | 2.970 | 4.414 |
| | S | 54 | 94 | 72 | 24 | 244 | 78 | 137 | 176 | 82 | 473 | | 3.464 | 3.431 | 2.044 | 1.476 |
| 106 | N | 47 | 89 | 104 | 38 | 278 | 161 | 92 | 189 | 41 | 483 | 1052 | 1.462 | 4.856 | 2.748 | 4.630 |
| | S | 55 | 101 | 104 | 38 | 297 | 75 | 203 | 169 | 122 | 569 | | 3.640 | 2.480 | 3.087 | 1.538 |
| 108 | N | 40 | 71 | 72 | 30 | 214 | 68 | 103 | 179 | 46 | 396 | 857 | 2.946 | 3.456 | 2.006 | 3.311 |
| | S | 49 | 85 | 78 | 33 | 246 | 66 | 105 | 246 | 44 | 461 | | 3.705 | 4.067 | 1.587 | 3.767 |
| 109 | N | 125 | 296 | 321 | 120 | 862 | 233 | 629 | 487 | 245 | 1594 | 3060 | 2.681 | 2.350 | 3.301 | 2.452 |
| | S | 172 | 347 | 309 | 114 | 941 | 342 | 548 | 443 | 133 | 1466 | | 2.508 | 3.164 | 3.492 | 4.275 |
| 110 | N | 87 | 193 | 251 | 89 | 620 | 130 | 234 | 256 | 123 | 743 | 1649 | 3.344 | 4.116 | 4.911 | 3.612 |
| | S | 156 | 236 | 209 | 68 | 668 | 196 | 269 | 352 | 89 | 906 | | 3.969 | 4.383 | 2.967 | 3.825 |
| 111 | N | 55 | 115 | 146 | 38 | 354 | 174 | 192 | 215 | 57 | 638 | 1228 | 1.574 | 2.998 | 3.388 | 3.365 |
| | S | 105 | 128 | 116 | 29 | 377 | 176 | 195 | 159 | 60 | 590 | | 2.969 | 3.286 | 3.633 | 2.403 |
| 113 | N | 57 | 159 | 155 | 91 | 462 | 98 | 238 | 333 | 112 | 781 | 1379 | 2.929 | 3.339 | 2.324 | 4.052 |
| | S | 72 | 143 | 105 | 59 | 379 | 87 | 179 | 212 | 120 | 598 | | 4.140 | 3.994 | 2.474 | 2.442 |
| 115 | N | 67 | 154 | 191 | 81 | 494 | 74 | 173 | 306 | 94 | 647 | 1284 | 4.553 | 4.449 | 3.125 | 4.315 |
| | S | 93 | 180 | 169 | 67 | 508 | 95 | 255 | 214 | 73 | 637 | | 4.886 | 3.523 | 3.950 | 4.577 |
| 120 | N | 16 | 33 | 38 | 17 | 104 | 22 | 32 | 77 | 33 | 164 | 326 | 3.579 | 5.170 | 2.495 | 5.251 |
| | S | 20 | 32 | 37 | 17 | 106 | 22 | 48 | 70 | 22 | 162 | | 4.522 | 3.331 | 2.613 | 3.889 |
| 201 | E | 137 | 272 | 355 | 141 | 905 | 221 | 530 | 355 | 166 | 1272 | 2527 | 3.101 | 2.566 | 5.004 | 4.248 |
| | W | 167 | 293 | 329 | 145 | 934 | 204 | 467 | 344 | 240 | 1255 | | 4.088 | 3.142 | 4.778 | 3.025 |
| 202 | E | 175 | 361 | 403 | 164 | 1103 | 210 | 444 | 408 | 211 | 1273 | 2546 | 4.164 | 4.062 | 4.945 | 3.879 |
| | W | 182 | 380 | 420 | 157 | 1140 | 182 | 452 | 476 | 163 | 1273 | | 4.990 | 4.206 | 4.416 | 4.829 |
| 203 | E | 121 | 216 | 260 | 89 | 686 | 175 | 266 | 315 | 131 | 887 | 1704 | 3.460 | 4.052 | 4.132 | 3.393 |
| | W | 126 | 238 | 260 | 89 | 712 | 129 | 284 | 312 | 92 | 817 | | 4.873 | 4.182 | 4.169 | 4.830 |
| 206 | E | 143 | 382 | 377 | 119 | 1021 | 248 | 612 | 450 | 143 | 1453 | 2699 | 2.878 | 3.120 | 4.194 | 4.161 |
| | W | 202 | 444 | 348 | 112 | 1107 | 235 | 456 | 414 | 141 | 1246 | | 4.303 | 4.873 | 4.204 | 3.970 |
| 208 | E | 55 | 83 | 95 | 32 | 265 | 115 | 90 | 141 | 65 | 411 | 766 | 2.379 | 4.622 | 3.377 | 2.454 |
| | W | 41 | 76 | 97 | 31 | 246 | 42 | 112 | 114 | 87 | 355 | | 4.922 | 3.409 | 4.258 | 1.785 |
| 210 | E | 84 | 170 | 215 | 82 | 551 | 102 | 214 | 283 | 117 | 716 | 1378 | 4.097 | 3.982 | 3.795 | 3.520 |
| | W | 109 | 178 | 192 | 69 | 547 | 109 | 229 | 235 | 89 | 662 | | 4.978 | 3.876 | 4.089 | 3.868 |
| 215 | E | 26 | 62 | 57 | 15 | 160 | 28 | 92 | 64 | 28 | 212 | 496 | 4.579 | 3.345 | 4.461 | 2.673 |
| | W | 39 | 75 | 75 | 21 | 200 | 56 | 115 | 89 | 24 | 284 | | 3.499 | 3.261 | 3.676 | 4.349 |
| 218 | E | 47 | 72 | 67 | 20 | 205 | 66 | 128 | 75 | 45 | 314 | 611 | 3.535 | 2.799 | 4.437 | 2.250 |
| | W | 42 | 73 | 72 | 21 | 209 | 71 | 101 | 93 | 32 | 297 | | 2.942 | 3.636 | 3.886 | 3.338 |
| 301 - Ducece | N | 71 | 355 | 426 | 321 | 1174 | 268 | 464 | 1041 | 691 | 2464 | 5037 | 2.667 | 7.660 | 4.091 | 4.646 |
| 10% (Sampling Plan) | S | 92 | 365 | 438 | 290 | 1185 | 431 | 580 | 998 | 564 | 2573 | | 2.143 | 6.292 | 4.386 | 5.146 |
| 501 - MAX | N | 38 | 75 | 89 | 3 | 204 | 118 | 176 | 213 | 3 | 510 | 1079 | 1.590 | 2.143 | 2.083 | 4.270 |
| | S | 56 | 95 | 76 | 6 | 234 | 125 | 190 | 247 | 7 | 569 | | 2.250 | 2.511 | 1.548 | 4.143 |
| 502 - SDX | N | 7 | 264 | 278 | 140 | 1378 | 49 | 528 | 549 | 247 | 1373 | 2436 | 1.420 | 5.009 | 5.055 | 5.663 |
| 10% (Sampling Plan) | S | 6 | 283 | 366 | 168 | 1645 | 3 | 333 | 559 | 168 | 1063 | | 20.557 | 8.506 | 6.541 | 9.978 |
| 503 - BHX | N | 141 | 290 | 297 | 128 | 856 | 147 | 534 | 366 | 199 | 1246 | 2557 | 4.792 | 2.711 | 4.061 | 3.218 |
| | S | 126 | 282 | 302 | 137 | 847 | 250 | 487 | 442 | 132 | 1311 | | 2.514 | 2.896 | 3.415 | 5.195 |
| 504 - SX | E | 142 | 307 | 367 | 152 | 968 | 156 | 358 | 512 | 219 | 1245 | 2415 | 4.538 | 4.294 | 3.585 | 3.460 |
| | W | 185 | 325 | 331 | 114 | 955 | 211 | 463 | 375 | 121 | 1170 | | 4.372 | 3.508 | 4.412 | 4.726 |
| TOTAL | | 4,346 | 9,368 | 10,075 | 4,075 | 29,375 | 29,165 | 6,795 | 13,779 | 15,029 | 6,169 | 41,772 | | | | |

Table 2-1. Sampling Goals and On-to-Off Surveys Completed by Time of Day and Direction

Sampling targets. The sampling target for each route involved completed surveys that were within 10% or within 10 surveys of the goal with a RTD Weight Factor below 25. For example, the goal for RTC Route 101 based on the ridership during the “Midday” time period heading “South” was 93 completed surveys. With 107 completed On-to-Off surveys for Route 101, the sample target was achieved. In the case of Route 120 during the “Midday” time period heading “North”, the goal was 33 completed surveys. Since the number of completed surveys (32) for this route was within 10% of the goal and a RTD Weight Factor below 25 (5.17), the target was achieved. Overall, when including the overall goals plus the goals by time and direction, there were 234 total goals. Of the 234 goals, all targets were completed.

2.1.2 Sampling Goals for Main Survey

ETC Institute developed a sampling plan that would ensure the completion of the full Origin-and-Destination Survey with nearly 12,000 of the system’s riders, as well as trying to reach a goal of being within 10 surveys or within 10% of the established goal based on the overall estimated ridership, and being within 10 surveys or within 10% of additional established goals with a RTD Weight Factor below 25 based on the estimated ridership by time period and direction for each route. The time periods for this project were as follows: “AM Peak” time period (6am-9am), “Midday” time period (9am-2pm), “PM Peak” time period (2pm-7pm), and “Evening” time period (7pm-11pm).

Table 2-2 shows the goals and the actual number of completed surveys that were obtained by Route, Time Period, and Direction (RTD). The sampling plan for the Origin-Destination survey will be designed to obtain completed surveys from a minimum of 7.5% of the ridership on each of the Express/Residential bus routes that are operated by the transit agency in the region. The Downtown/Strip Routes were sampled at 4.5% of the estimated ridership. The total estimated weekday ridership was provided by The Regional Transportation Commission of Southern Nevada.

Table 2-2. Sampling Goals and Main Surveys Completed by Time of Day and Direction

| RTCSN | | SAMPLING GOALS | | | | | COMPLETED SURVEYS | | | | | WEIGHT FACTOR BY RTD | | | | | |
|-------|-----|------------------------------|-------------------------------|------------------------------|-------------------------------|-------|-------------------|------------------------------|-------------------------------|------------------------------|-------------------------------|----------------------|------------------|------------------------------|-------------------------------|------------------------------|-------------------------------|
| Route | Dir | AM Peak (6:00- 9:00am) | Midday (9:01am- 2:00pm) | PM Peak (2:01- 7:00pm) | Evening (7:01- 11:00pm) | Total | Total Surveys | AM Peak (6:00- 9:00am) | Midday (9:01am- 2:00pm) | PM Peak (2:01- 7:00pm) | Evening (7:01- 11:00pm) | Total | Total Surveys | AM Peak (6:00- 9:00am) | Midday (9:01am- 2:00pm) | PM Peak (2:01- 7:00pm) | Evening (7:01- 11:00pm) |
| 101 | N | 18 | 36 | 46 | 15 | 115 | 217 | 24 | 54 | 51 | 17 | 146 | 292 | 10.188 | 8.910 | 11.930 | 12.018 |
| | S | 22 | 35 | 33 | 12 | 102 | | 27 | 62 | 43 | 14 | 146 | | 10.654 | 7.477 | 10.312 | 11.561 |
| 102 | N | 14 | 27 | 32 | 10 | 83 | 166 | 15 | 40 | 32 | 11 | 98 | 200 | 12.597 | 8.920 | 13.182 | 12.165 |
| | S | 16 | 29 | 29 | 9 | 83 | | 23 | 33 | 30 | 16 | 102 | | 9.414 | 11.812 | 12.894 | 7.484 |
| 103 | N | 26 | 57 | 68 | 27 | 178 | 359 | 43 | 69 | 69 | 28 | 209 | 424 | 8.167 | 11.046 | 13.210 | 12.627 |
| | S | 38 | 61 | 60 | 23 | 181 | | 43 | 75 | 63 | 34 | 215 | | 11.729 | 10.769 | 12.627 | 8.871 |
| 104 | N | 18 | 29 | 42 | 11 | 99 | 202 | 20 | 50 | 45 | 11 | 126 | 256 | 11.989 | 7.627 | 12.427 | 12.943 |
| | S | 27 | 32 | 32 | 11 | 103 | | 28 | 56 | 33 | 13 | 130 | | 12.663 | 7.729 | 13.006 | 11.698 |
| 105 | N | 16 | 30 | 39 | 16 | 100 | 192 | 34 | 43 | 40 | 16 | 133 | 254 | 6.304 | 9.208 | 12.847 | 13.243 |
| | S | 20 | 35 | 27 | 9 | 92 | | 23 | 53 | 29 | 16 | 121 | | 11.747 | 8.869 | 12.407 | 7.565 |
| 106 | N | 18 | 34 | 39 | 14 | 104 | 216 | 31 | 45 | 48 | 15 | 139 | 290 | 7.593 | 9.928 | 10.819 | 12.654 |
| | S | 20 | 38 | 39 | 14 | 111 | | 20 | 57 | 47 | 27 | 151 | | 13.650 | 8.831 | 11.099 | 6.948 |
| 108 | N | 15 | 27 | 27 | 11 | 80 | 172 | 16 | 47 | 33 | 13 | 109 | 225 | 12.519 | 7.574 | 10.883 | 11.715 |
| | S | 18 | 32 | 29 | 12 | 92 | | 25 | 43 | 35 | 13 | 116 | | 9.782 | 9.930 | 11.155 | 12.749 |
| 109 | N | 47 | 111 | 121 | 45 | 323 | 676 | 53 | 157 | 124 | 57 | 391 | 798 | 11.788 | 9.416 | 12.963 | 10.541 |
| | S | 64 | 130 | 116 | 43 | 353 | | 93 | 146 | 123 | 45 | 407 | | 9.221 | 11.877 | 12.575 | 12.635 |
| 110 | N | 33 | 72 | 94 | 33 | 232 | 483 | 45 | 85 | 103 | 44 | 277 | 585 | 9.659 | 11.332 | 12.207 | 10.096 |
| | S | 58 | 88 | 78 | 26 | 251 | | 63 | 90 | 122 | 33 | 308 | | 12.349 | 13.100 | 8.561 | 10.315 |
| 111 | N | 21 | 43 | 55 | 14 | 133 | 274 | 26 | 64 | 56 | 17 | 163 | 324 | 10.534 | 8.994 | 13.008 | 11.283 |
| | S | 39 | 48 | 43 | 11 | 141 | | 40 | 50 | 59 | 12 | 161 | | 13.066 | 12.815 | 9.790 | 12.016 |
| 113 | N | 22 | 60 | 58 | 34 | 173 | 315 | 34 | 70 | 68 | 40 | 212 | 398 | 8.441 | 11.353 | 11.383 | 11.346 |
| | S | 27 | 54 | 39 | 22 | 142 | | 36 | 64 | 42 | 44 | 186 | | 10.004 | 11.170 | 12.490 | 6.661 |
| 115 | N | 25 | 58 | 72 | 30 | 185 | 376 | 34 | 67 | 73 | 30 | 204 | 419 | 9.909 | 11.488 | 13.101 | 13.521 |
| | S | 35 | 67 | 63 | 25 | 191 | | 45 | 77 | 64 | 29 | 215 | | 10.315 | 11.666 | 13.209 | 11.521 |
| 117 | E | 12 | 23 | 25 | 9 | 68 | 133 | 15 | 36 | 24 | 9 | 84 | 161 | 10.704 | 8.361 | 13.732 | 13.049 |
| | W | 12 | 19 | 24 | 10 | 65 | | 12 | 29 | 28 | 8 | 77 | | 13.423 | 8.654 | 11.554 | 16.130 |
| 119 | N | 8 | 18 | 26 | 10 | 63 | 128 | 7 | 23 | 26 | 11 | 67 | 144 | 15.661 | 10.634 | 13.443 | 12.518 |
| | S | 17 | 21 | 20 | 8 | 65 | | 23 | 25 | 21 | 8 | 77 | | 9.783 | 10.972 | 12.866 | 12.649 |
| 120 | N | 6 | 12 | 14 | 6 | 39 | 79 | 8 | 36 | 14 | 11 | 69 | 129 | 9.843 | 4.596 | 13.722 | 7.563 |
| | S | 7 | 12 | 14 | 6 | 40 | | 11 | 29 | 14 | 6 | 60 | | 9.044 | 5.513 | 13.064 | 14.260 |

Table 2-1(Continued). Sampling Goals and Main Surveys Completed by Time of Day and Direction

| RTCSN | SAMPLING GOALS | | | | | COMPLETED SURVEYS | | | | | WEIGHT FACTOR BY RTD | | | | | | |
|-------------------------------------|----------------|--------------|------------------------------|-------------------------------|------------------------------|-------------------------------|---------------|------------------|------------------------------|-------------------------------|------------------------------|-------------------------------|---------------|------------------|------------------------------|-------------------------------|------------------------------|
| | Route | Dir | AM Peak (6:00- 9:00am) | Midday (9:01am- 2:00pm) | PM Peak (2:01- 7:00pm) | Evening (7:01- 11:00pm) | Total | Total Surveys | AM Peak (6:00- 9:00am) | Midday (9:01am- 2:00pm) | PM Peak (2:01- 7:00pm) | Evening (7:01- 11:00pm) | Total | Total Surveys | AM Peak (6:00- 9:00am) | Midday (9:01am- 2:00pm) | PM Peak (2:01- 7:00pm) |
| 201 | E | 51 | 102 | 133 | 53 | 340 | 690 | 50 | 104 | 132 | 57 | 343 | 740 | 13.707 | 13.076 | 13.458 | 12.371 |
| | W | 63 | 110 | 123 | 54 | 350 | | 67 | 121 | 151 | 58 | 397 | | 12.447 | 12.126 | 10.886 | 12.519 |
| 202 | E | 66 | 135 | 151 | 61 | 414 | 841 | 66 | 136 | 154 | 73 | 429 | 912 | 13.249 | 13.261 | 13.100 | 11.211 |
| | W | 68 | 143 | 158 | 59 | 427 | | 79 | 161 | 161 | 82 | 483 | | 11.497 | 11.808 | 13.056 | 9.599 |
| 203 | E | 45 | 81 | 98 | 33 | 257 | 524 | 68 | 90 | 98 | 33 | 289 | 584 | 8.905 | 11.974 | 13.282 | 13.468 |
| | W | 47 | 89 | 98 | 33 | 267 | | 50 | 98 | 105 | 42 | 295 | | 12.572 | 12.120 | 12.389 | 10.579 |
| 206 | E | 54 | 143 | 142 | 45 | 383 | 798 | 76 | 177 | 150 | 78 | 481 | 1013 | 9.392 | 10.788 | 12.582 | 7.629 |
| | W | 76 | 167 | 131 | 42 | 415 | | 107 | 190 | 160 | 75 | 532 | | 9.450 | 11.695 | 10.877 | 7.463 |
| 207 | E | 6 | 13 | 13 | 2 | 34 | 68 | 9 | 19 | 25 | 3 | 56 | 123 | 8.864 | 9.162 | 6.951 | 8.937 |
| | W | 7 | 13 | 11 | 2 | 33 | | 12 | 15 | 36 | 4 | 67 | | 8.108 | 11.123 | 4.140 | 8.120 |
| 208 | E | 21 | 31 | 36 | 12 | 99 | 192 | 23 | 35 | 50 | 15 | 123 | 237 | 11.894 | 11.885 | 9.524 | 10.632 |
| | W | 16 | 29 | 36 | 12 | 92 | | 17 | 37 | 45 | 15 | 114 | | 12.161 | 10.318 | 10.788 | 10.353 |
| 209 | E | 8 | 11 | 12 | 4 | 35 | 70 | 8 | 16 | 18 | 5 | 47 | 94 | 13.101 | 9.428 | 9.099 | 9.400 |
| | W | 8 | 12 | 11 | 4 | 35 | | 14 | 17 | 12 | 4 | 47 | | 7.569 | 9.098 | 12.645 | 14.750 |
| 210 | E | 31 | 64 | 81 | 31 | 207 | 412 | 31 | 68 | 80 | 31 | 210 | 421 | 13.479 | 12.532 | 13.423 | 13.287 |
| | W | 41 | 67 | 72 | 26 | 205 | | 43 | 67 | 73 | 28 | 211 | | 12.618 | 13.249 | 13.163 | 12.295 |
| 212 | E | 11 | 16 | 22 | 7 | 57 | 120 | 17 | 44 | 25 | 9 | 95 | 176 | 8.994 | 4.788 | 11.745 | 10.983 |
| | W | 14 | 19 | 23 | 8 | 64 | | 15 | 36 | 22 | 8 | 81 | | 12.338 | 6.859 | 13.828 | 14.051 |
| 214 | E | 8 | 15 | 15 | 7 | 46 | 68 | 8 | 17 | 15 | 7 | 47 | 89 | 14.024 | 11.806 | 13.605 | 13.339 |
| | W | 5 | 8 | 8 | 1 | 23 | | 7 | 20 | 12 | 3 | 42 | | 8.889 | 5.645 | 9.349 | 4.853 |
| 215 | E | 10 | 23 | 22 | 6 | 60 | 135 | 18 | 29 | 47 | 16 | 110 | 201 | 7.123 | 10.613 | 6.102 | 4.678 |
| | W | 15 | 28 | 25 | 8 | 75 | | 16 | 31 | 32 | 12 | 91 | | 12.246 | 12.097 | 10.225 | 8.698 |
| 217 | E | 8 | 11 | 19 | 8 | 46 | 104 | 8 | 15 | 27 | 11 | 61 | 127 | 13.435 | 9.877 | 9.284 | 10.006 |
| | W | 14 | 22 | 16 | 6 | 58 | | 14 | 29 | 16 | 7 | 66 | | 13.436 | 10.059 | 13.067 | 12.313 |
| 218 | E | 17 | 27 | 25 | 8 | 77 | 155 | 18 | 35 | 26 | 18 | 97 | 190 | 12.963 | 10.237 | 12.799 | 5.626 |
| | W | 16 | 28 | 27 | 8 | 78 | | 17 | 35 | 26 | 15 | 93 | | 12.288 | 10.491 | 13.902 | 7.121 |
| 219 | E | 10 | 20 | 24 | 9 | 63 | 129 | 11 | 25 | 24 | 11 | 71 | 149 | 12.024 | 10.880 | 13.116 | 10.983 |
| | W | 14 | 22 | 23 | 8 | 66 | | 14 | 31 | 23 | 10 | 78 | | 13.164 | 9.410 | 13.187 | 10.256 |
| 301 - Deuce 4.5% (sampling goal) | N | 32 | 160 | 192 | 144 | 528 | 1062 | 47 | 232 | 202 | 155 | 636 | 1295 | 15.205 | 15.321 | 21.081 | 20.710 |
| | S | 42 | 164 | 197 | 131 | 533 | | 70 | 220 | 223 | 146 | 659 | | 13.194 | 16.589 | 19.628 | 19.881 |
| 501 - MAX | N | 14 | 28 | 33 | 1 | 77 | 164 | 31 | 43 | 35 | 6 | 115 | 218 | 6.054 | 8.772 | 12.679 | 2.135 |
| | S | 21 | 36 | 29 | 2 | 88 | | 23 | 42 | 31 | 7 | 103 | | 12.226 | 11.357 | 12.333 | 4.143 |
| 502 - SDX 4.5% (sampling goal) | N | 3 | 119 | 125 | 63 | 310 | 680 | 7 | 154 | 139 | 100 | 400 | 816 | 9.941 | 17.175 | 19.965 | 13.988 |
| | S | 0 | 127 | 165 | 75 | 370 | | 4 | 144 | 183 | 85 | 416 | | 15.418 | 19.670 | 19.982 | 19.721 |
| 503 - BHX | N | 53 | 109 | 111 | 48 | 321 | 638 | 52 | 108 | 112 | 53 | 325 | 663 | 13.546 | 13.405 | 13.270 | 12.082 |
| | S | 47 | 106 | 113 | 51 | 318 | | 53 | 114 | 120 | 51 | 338 | | 11.860 | 12.372 | 12.578 | 13.446 |
| 504 - SX | E | 53 | 115 | 138 | 57 | 363 | 721 | 56 | 133 | 160 | 59 | 408 | 812 | 12.643 | 11.559 | 11.471 | 12.844 |
| | W | 69 | 122 | 124 | 43 | 358 | | 72 | 139 | 147 | 46 | 404 | | 12.814 | 11.684 | 11.254 | 12.432 |
| 901 - CX | N | 3 | 9 | 20 | 7 | 39 | 78 | 6 | 13 | 20 | 9 | 48 | 94 | 7.192 | 9.174 | 13.048 | 10.478 |
| | S | 13 | 11 | 10 | 5 | 39 | | 15 | 12 | 13 | 6 | 46 | | 11.696 | 12.139 | 10.430 | 11.635 |
| 902 - WAX | N | 11 | 13 | 13 | 8 | 45 | 80 | 9 | 18 | 16 | 10 | 53 | 98 | 15.893 | 9.883 | 10.863 | 10.037 |
| | S | 4 | 10 | 15 | 6 | 36 | | 9 | 14 | 12 | 10 | 45 | | 6.256 | 9.352 | 17.080 | 8.230 |
| 903 - HDX | N | 7 | 12 | 11 | 5 | 34 | 78 | 6 | 13 | 11 | 8 | 38 | 91 | 15.475 | 11.912 | 13.162 | 8.394 |
| | S | 9 | 14 | 15 | 7 | 44 | | 12 | 13 | 18 | 10 | 53 | | 9.596 | 13.846 | 11.212 | 8.907 |
| 904 - DVX | N | 7 | 9 | 10 | 5 | 30 | 58 | 8 | 17 | 20 | 5 | 50 | 83 | 10.935 | 6.749 | 6.891 | 12.200 |
| | S | 5 | 11 | 10 | 3 | 28 | | 5 | 14 | 10 | 4 | 33 | | 13.570 | 10.193 | 12.822 | 8.733 |
| TOTAL | | 1,861 | 3,957 | 4,288 | 1,746 | 11,856 | 11,856 | 2,285 | 4,916 | 4,776 | 2,148 | 14,125 | 14,125 | | | | |

A survey was considered “complete” if all of the contractually required information was collected. A survey was considered “useable” if it met 100 percent of the quality assurance and quality control tests that were applied to each record. See Section 1.2.1 for details of a “complete” or “useable” survey. Overall, the total number of “complete and useable surveys” exceeded the contractual requirements by more than 2,200 surveys.

2.2 Methods for Selecting Survey Participants

For the main survey, a random number generator was used to determine which passengers were asked to participate in the survey after boarding a bus. If four people boarded a 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 four 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 four people for the survey.

For the On-to-Off survey, every rider was selected to. See Section 3, On-to-Off Administration Methodology for the On-to-Off survey procedure.

2.3 Other Techniques Used to Manage the Sampling Process

Some of the other techniques that were used to manage the sampling of bus 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 interviewer is on the bus and the findings are discussed with that interviewer 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 four time periods: “AM Peak” time period (6am-9am), “Midday” time period (9am-2pm), “PM Peak” time period (2pm-7pm), and “Evening” time period (7pm-11pm). These four time periods correspond to time periods that are used for regional travel demand forecasting. 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 6 of this report.

Figure 2-1 below shows the estimated ridership by time period. Figure 2-2 on the following page shows the number of On-to-Off surveys that were collected by time period, and Figure 2-3 shows the number of main surveys that were collected by time period.

Figure 2-1. Estimated Ridership by Time Period (April-May 2014)



Figure 2-2. Number of On-to-Off Surveys Collected by Time Period

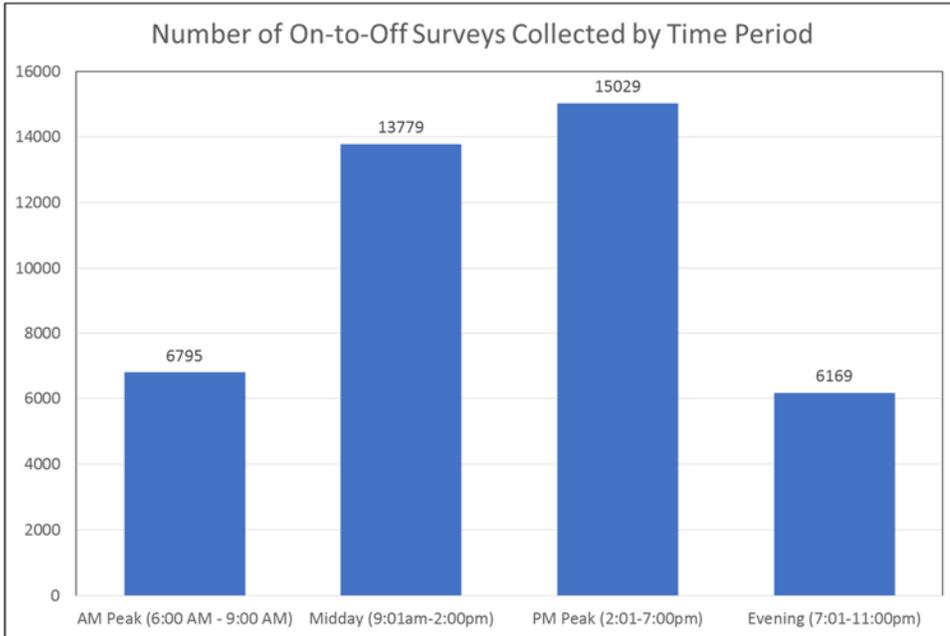
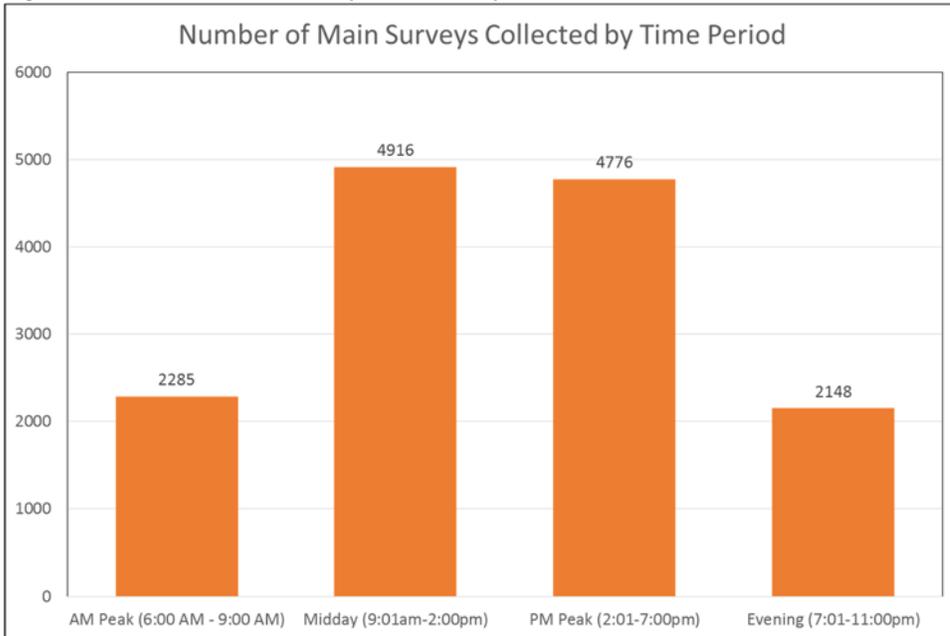


Figure 2-3. Number of Main Surveys Collected by Time Period



Before administering the Main Survey using an interviewer and a tablet PC, an On-to-Off Survey was conducted on the routes. An On-to-Off Survey is meant to capture the ridership flow of the bus route. In-other-words, the On-to-Off Survey captures where the individual rider boarded the bus and the corresponding location where the rider alighted. This allows for a more comprehensive understanding of the true ridership flow of the route, which then allows the Main Survey data to be more accurately expanded.

3.1 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. The RTC staff also attended this training session to familiarize with the survey administration process and meet with the recruited surveyors. During this training session, surveyors were taught how to operate the tablet PCs and the On-to-Off software, execute the On-to-Off surveying procedures, and deal with various situations that could be encountered during their surveying period.

The surveyor training was conducted in a classroom style setting in a BTC Transit Center Conference Room. The classroom provided ETC Institute a quiet and convenient location to train its team efficiently. The training provided to all personnel who participated in the administration of the On-to-Off Survey to ensure that they were fully prepared for the project is described below:

- Overview of the on-board survey objectives
- On-to-Off equipment/software overview and training
- On-to-Off barcode administrating procedures
- One-on-one tutoring/mock interview with an ETC Institute supervisor

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 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.

3.2 ETC Institute On-to-Off Program Procedure

The purpose of the On-to-Off software program is to identify ridership patterns based on an individual's boarding and alighting locations which are used to help develop the sampling plan for the survey. This was accomplished by using ETC Institute's custom Android®-based On-to-Off software which records the latitude and longitude of an individual's boarding and alighting location using a barcode system. ETC Institute barcodes eliminated language barriers, increased ridership participation, and provided more accurate boarding and alighting locations.

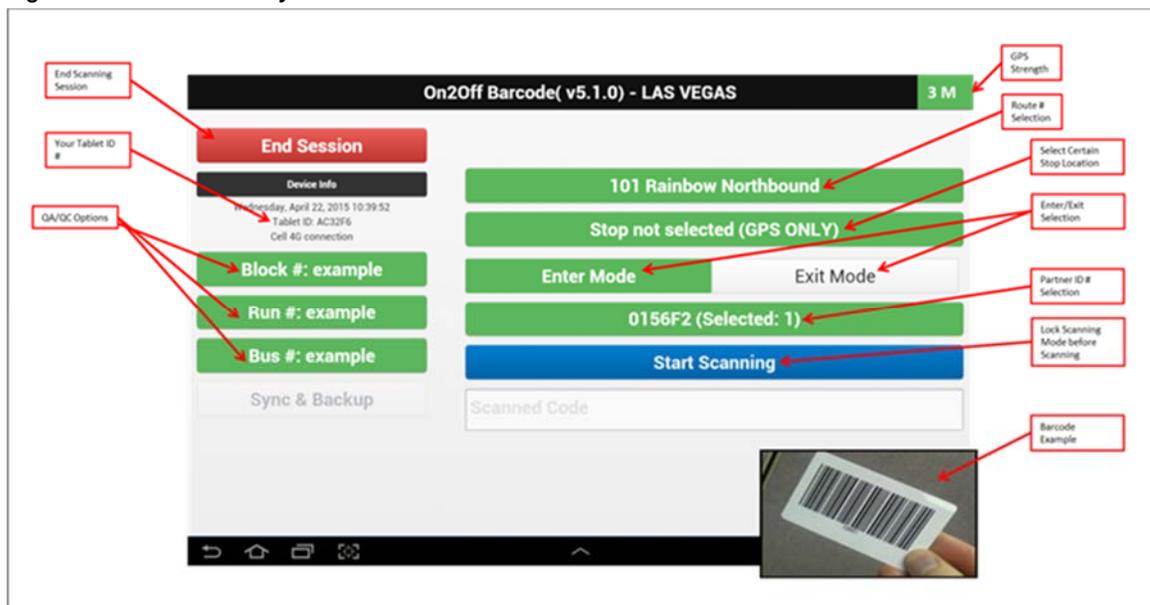
The On-to-Off surveying team used the On-to-Off software with a GPS-equipped tablet PC to record the rider's boarding latitude/longitude, alighting latitude/longitude, time of usage, route used, and inbound/outbound direction.

The On-to-Off software was complemented with a barcode scanning system method as described below:

- Riders were asked to participate in the On-to-Off ridership pattern survey as they entered the bus.
- Riders who agreed to participate were handed a barcode card which was scanned by a surveyor.
- Riders were told to keep the barcode card during the duration of their trip.
- Riders were reminded to hand their cards back to the surveyor as they exited the bus.
- When riders' bus stops were approached, the surveyor took their barcode cards before they exited. The surveyor scanned riders' barcode cards as they departed the bus.
- The software then paired the boarding and the alighting location of each rider based on the unique barcode card each was handed.

A screen shot of the interface of the On-to-Off boarding/alighting software that was used to record the information and a picture of a barcode card is shown in Figure 3-1.

Figure 3 1. On-to-Off Survey Interface Screenshot



3.3 Organization of the Survey Team

The On-to-Off Survey was 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 Survey Team sizes were determined by route ridership levels and bus size (articulated [3+ doors] or standard [1-2 doors]). A typical team consisted of two members, based on a medium to high-ridership level and a standard size bus. On-to-Off teams were typically deployed on at least two buses running in opposite directions. For high-volume routes, teams may

have been deployed on up to four buses on a route. On low-volume routes, teams may have been deployed on just one bus serving the route.

The responsibilities of each of the positions on the On-to-Off teams are described below:

- The **team leader** was responsible for route and direction selection for On-to-Off software, offering riders an opportunity to participate in the survey, scanning barcode cards for boarding riders, answering rider questions, and overseeing On-to-Off operations of his/her bus.
- The **support surveyor** was responsible for collecting and scanning barcode cards for alighting riders, reminding riders to keep their cards ready to hand in to a surveyor when they exited at their bus stop, and answering rider questions.

3.4 Timing of the On-to-Off Survey

The On-to-Off survey was administered during weekdays (Tuesday through Thursday) with the exceptions of holidays and breaks for colleges/schools.

Administration of the On-to-Off Survey began as early as 6 am and continued as late as 11 pm on some routes. This was to ensure that the On-to-Off data would provide the Main Survey with an accurate sampling plan for administration and for the data expansion.

The bulk of the On-to-Off Survey was administered during April 2014 for almost all routes and September 2014 for the 101, SX, and 120, with the exceptions of holidays and breaks for colleges/schools. Some targeted follow-up On-to-Off Surveys were carried out during October 2014 through January of 2015.

4 ***Main Survey Administration Methodology***

The following sections describe the methodology used for the 2014 onboard Main Survey. This methodology includes recruiting and training of interviewers, procedures used for the survey, and organization of the survey teams.

4.1 Recruiting and Training Interviewers

Assembling a team of high quality interviewers was one of the most important steps in the Main 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. The RTC staff also attended this training session to familiarize with the survey administration process and meet with the recruited surveyors. During this training session, interviewers were presented with the following:

- An overview of the on-board 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

In addition to the training provided, the project also required all surveyors to go through a safety training, so that surveyors would be as safe as possible while conducting surveys. 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 Main Survey were released.

4.2 Prior to the Main Survey Administration

Some of the key tasks that were performed by ETC Institute prior to the administration of the survey include:

- Ensured that the stops previously identified matched the route actually being driven.
- Identified large employers and schools along the route, which may impact ridership patterns at certain times of the day.
- Assessed whether a high percentage of the riders do not speak English; if more than 10% of the riders did not speak English, ETC used bilingual interviewers on these identified routes.

4.2.1 Communication

In order to encourage participation in the survey, signs were posted on buses and key bus stations that explained the importance of the survey. The signs were posted on buses during the On-to-Off phase of the survey and throughout the duration of the Main Survey.

4.3 Main Survey Administration Procedure

Prior to administration of the main survey, the results of the On-to-Off survey were reviewed to ensure the survey team fully understood the trip patterns along each route. Some of the specific aspects of the On-to-Off survey data that were reviewed included:

- Whether any pairs of stops along a route account for at least 10% of the one-way trips that were completed on the route during a particular time period.
 - If a high percentage of trips along a given route involved the same set of boarding and alighting pairs, ETC Institute placed additional interviewers on buses to be sure these trips were captured. Without the On-to-Off data, these trips may have been underrepresented using traditional sampling techniques.

4.3.1 Fixed Route Procedure

All routes were classified as *fixed* routes and were surveyed using the tablet PC's. Fixed routes are routes that provide regular/continuous service throughout the day. Interviewers selected people for the survey in accordance with the sampling procedures described in Chapter 2 of this report.

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

- Approached the person who was selected and asked him or her to participate in the survey.
- If the person refused, the interviewer ended 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 on the bus, the interviewer asked the person to provide his/her 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.
- If the person had at least 5 minutes on the bus, the interviewer began administering the survey to the respondent as a face-to-face interview using a tablet PC.

4.3.2 Short Trip Route Procedure

The percentage of boarding/alighting pairs along each route that were "short trips", which means the distance between the boarding and alighting locations were less than one mile.

- If more than 10% of the records from the On-to-Off survey for a given route involved boarding/alighting pairs that were less than one mile apart, additional interviewers were staffed on the route and interviewers were told to conduct the full interview even if the rider said that he/she did not have enough time to complete the survey. The interviewer would then get off the bus with the rider and complete the survey after getting off the bus.

4.3.3 After the Administration of the Survey

Surveys submitted with tablet PCs were reviewed by an ETC Supervisor in real-time using ETC Institute's survey program's on-line database to ensure that the following information had been provided:

- Type of place where the trip began
- Complete address where the trip began
- Mode of access to the transit system
- Boarding location
- Alighting location
- Mode of egress from the transit system
- Complete destination address
- Type of place where the trip ended
- Respondent's home address
- Respondent's employment status
- Respondent's student status
- Respondent's driver's license status
- Respondent's age
- Number of operating vehicles available in the household
- Number of occupants in the respondent's household
- Number of workers (employed persons) in the respondent's household
- Annual household income
- Time of day the survey was completed

If any item listed above was missing or incomplete, the supervisor flagged the record for reviewing. ETC Institute's Project Manager then forwarded all flagged survey records and the corresponding name and phone number to ETC Institute's call center. Interviewers working in ETC Institute's call center then called respondents who had provided their names and phone numbers to retrieve the missing information by phone.

Once survey records were classified as *complete*, meaning all of the required information had been collected, the records were forwarded to ETC Institute's geocoding manager, who then geocoded the home, origin, boarding, alighting, and destination locations.

4.4 Organization of the Main Survey Team

The Main Survey was administered by teams who were directly supervised by an ETC Institute supervisor. The supervisors were responsible for reviewing the performance of each interviewer ensuring that all parts of the surveying 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 interviewers could be evaluated.

Interviewers were typically deployed on at least two buses running in opposite directions. On high-volume routes, interviewers may have been deployed on up to six buses on a route. On low-volume routes, interviewers may have been deployed on just one bus serving the route.

The responsibilities for each of the positions on the Main Survey team are described below.

- The supervisor was responsible for ensuring that interviewers were properly trained, equipping interviewers to conduct surveys, scheduling interviewers, inspecting work, and reviewing the data collected.
- The interviewer was responsible for administering surveys while following surveying procedures.

4.5 Timing of the Main Survey Administration

The Main 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. Administration of the Main Survey began as early as 6 am and continued to as late as 11 pm on some routes.

The bulk of the Main Survey was administered during weekdays (Tuesday through Thursday) during May, September, and October of 2014 with the exceptions of holidays and breaks for colleges/schools. Upon completion of this Main Survey, the analysis of results indicated some gaps regarding the targeted number of response per bus routes. To fill in the gaps, follow-up Main Surveys were carried out in November of 2014 and January of 2015.

Many of the processes described in the first four sections 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.

5.1 Identifying “Complete and Useable” Surveys Procedure

Once a survey had been classified as being complete, meaning all of the required data was provided, the next phase of the QA/QC process was to determine the usability of each survey record. The term useable was used to identify records that passed all of the QA/QC tests that were applied to a record after it was classified as being complete. (A list of required data that was needed to meet the contractual requirements for completeness is provided in Section 1.)

5.1.1 Pre-Processing Tests

The first step in this process involved the application of a series of QA/QC tests that were conducted before the address fields were processed for geocoding. Some of the specific checks that were conducted during the pre-processing phase included:

- Checking for valid *home* street names, city names, and zip codes
- Checking for valid *origin* street names, city names, and zip codes
- Checking for valid *destination* street names, city names, and zip codes
- Checking for *origin* place names that could be matched to a pre-existing list of major destinations that had been previously geocoded
- Checking for *destination* place names that could be matched to a pre-existing list of major destinations that had been previously geocoded
- Ensuring the number of household occupants was greater than or equal to the number of employed members of the household
- Ensuring the number of household occupants was greater than or equal to number of adults in the household
- Ensuring the respondents who indicated that they were employed also reported that at least one member of their household was employed
- Ensuring that bus route names were consistently spelled and coded correctly
- Ensuring that the report dates on which the survey was administered were on a Tuesday, Wednesday, or Thursday
- Ensuring that transfers to a bus route were possible
- Ensuring that transfers from a bus route were possible

- Ensuring that the number of vehicles available to a respondent's household were consistent with the respondent's reported annual household income. Low income families who reported owning many vehicles and high income families that reported no vehicles were flagged
- Ensuring the time of day a survey was completed was reasonable given the published operating schedule for the route
- Ensuring the origin type of place code matched the type of place reported by the respondent
- Ensuring the destination type of place code matched the type of place reported by the respondent

Records that passed all the QA/QC tests described above were forwarded to ETC Institute's geocoding team. Records that did not pass all of the tests were sent to ETC Institute's Survey Records Review Team (SRRT) for further review. The SRRT members then took one of the following actions:

- They corrected the deficiency in record.
- They directed ETC Institute's Call Center to contact the respondent by phone (if a phone number were available) to retrieve additional information or to confirm whether or not their responses were correct.
- They reclassified the record as *incomplete* by assigning a value of "3" for the record's Quality Control Flag. This assignment removed the record from further consideration for the final survey database.

5.1.2 Post-Processing Tests

The next step in this process involved the application of a series of QA/QC tests that were conducted after all five addresses were successfully geocoded. Once all five addresses had been geocoded, the following QA/QC checks were performed to assess the logic and other attributes of the reported trip.

- Ensuring the origin and destination addresses were not the same
- Ensuring the boarding and alighting addresses were not the same
- Ensuring that the respondent did not list the same route as both a "transfer from" and a "transfer to" during their one-way trip
- Checking to be sure the access mode was appropriate given the distance of travel from the trip origin to the place where the respondent initially accessed transit. (For example, if a rider reported that he/she accessed transit by car but the distance from his/her origin to the entry point for transit was less than 0.25 mile, the record would have been flagged for further review. Similarly, if a respondent reported that he/she walked to transit but the distance from the origin to transit was more than 2 miles, the record would have been flagged to check for a missing transfer since 2 miles or more is well beyond typical walk distance.)
- Checking to ensure that the egress mode was appropriate given the distance of travel from place where the respondent exited the transit system to his/her destination
- Reviewing the total distance the respondent traveled on transit compared to the distance the respondent traveled from the origin to the destination for his/her trip. (For example, if a respondent reported traveling 6 miles on transit in order to travel 0.5 mile from the origin to the destination for his/her trip, the record would have been flagged for further review. Similarly, if a respondent reported traveling just 1 mile on transit to complete a 10-mile trip, the records would have been flagged to check for a missing transfer.)

Records that passed all the QA/QC tests described above were forwarded to ETC Institute's SRRT for a final visual review of the trip using the Visual Survey Editor Program (VSEP), which is described in the following section.

Records that were flagged for further review were forwarded to the appropriate section based on the nature of the flag.

- Issues that involved address geocoding assignments were referred to ETC Institute's geocoding team.
- Issues that needed clarification of data were directed to ETC Institute's Call Center (if a phone number was available). The Call Center then contacted the respondent to retrieve additional information as needed.
- All other issues were directed to ETC Institute's SRRT.

Records that were corrected were then forwarded to the SRRT for a final visual inspection using the VSEP. Records that were complete but could have problems with the trip logic or other attributes of the trip were reclassified as *problematic* by assigning a value of "2" as the record's Quality Control Flag. This assignment removed the record from further consideration for the final survey database.

5.1.3 Visual Inspection

The final step of the QA/QC data review process involved a visual inspection of the trip record using the VSEP. The key tasks that were conducted as part of this visual inspection included the sensibility of results for the following areas:

- Key variables of survey trips with very short distances (less than 1 mile for local bus trips and less than 4 miles for express trips)
- Trips with zero transfers given location of boarding and alighting locations relative to the origin and destination
- Trips that reported three or more transfers
- Drive access/egress trips given the distance traveled by car relative to the distance traveled by bus or light rail
- Drive access/egress trips with more than one transfer
- Looking at the origin-to-destination to ensure that it was appropriate for the survey route that was used for the trip

If a record passed all the visual checks listed above, the record was classified as *useable* and tagged for inclusion in the final survey database by assigning a value of "1" as the record's Quality Control Flag.

If a record did not pass all the visual checks, the record was sent back to the SRRT for further review. If the SRRT was not able to resolve the problem that was identified, the record was reclassified as *problematic* by assigning a value of "2" as the record's Quality Control Flag. This assignment removed the record from further consideration for the final survey database.

5.2 Summary of the Data Review QA/QC Process

Among the 15,066 surveys that were originally administered, 14,690 met the contractual requirements for completeness. Of those that were classified as complete, 14,125 passed all the QA/QC tests and were subsequently classified as useable records. Only the useable records (those with a Quality Control Flag of “1”) were included in the final survey database that was expanded and used for the analysis in this report. The results of the QA/QC review are shown in Table 5-1.

Table 5-1. Data Review QA/QC Summary

| Classification | Quality Control Flag Value | Description | # of Surveys | % of All Surveys Administered |
|----------------|----------------------------|---|---------------|-------------------------------|
| Not complete | 3 | Missing one or more pieces of required data | 376 | 2.50% |
| Problematic | 2 | All required data was provided but there was a problem with the trip logic or other attribute of the trip | 565 | 3.75% |
| Useable | 1 | Record passed all QA/QC tests | 14,125 | 93.75% |
| Total | | | 15,066 | 100.00% |

5.3 Communication Prior, During, and After the Data Collection

Prior to the beginning of the data collection, the project managers from RTC, ETC and Parsons met to discuss the sample plan and elements contained in the questionnaire as well as specific data needs for modeling purposes. During the data collection, weekly progress reports were presented to RTC to detail the level of production. Based on the timing of the study a small portion of the OD survey was able to be completed during the spring months after the completion of the on-to-off portion. During the early summer months, ETC processed the OD data thus allowing RTC and Parsons to review the data prior to the fall collection. It was determined during this review that no significant changes were needed for the remainder of the collection. Following the data collection and processing, RTC and Parsons conducted another data review of the final files which resulted in only minor adjustments.

One of the final steps in the project was a presentation of the results to Jim Ryan and Ken Cervenka at the FTA on June 30, 2015. The presentation was a PowerPoint file and consisted of Purposes / Goals, Overview and high level results from the On-to-Off and Origin – Destination collections, Data Expansion Process and Factors, and results from the effort. FTA was pleased with both the process and the results of the survey effort.

Presentations were also made to RTC during two different board meetings. The first presentation occurred on May 28, 2015 in front of the RTC Executive Advisory Committee. The second presentation occurred on August 13, 2015 in front of the RTC Board Meeting. Both of these presentations provided results of the effort and highlighted unique attributes of the Las Vegas Onboard Survey.

The RTC On-Board Transit Survey was expanded by route, by direction, by time of day, and by the boarding and corresponding alighting location of the rider. In order to complete this complex expansion process, 38 Excel files (one per route) were prepared. Most of the Excel files contained 8 worksheets, so nearly 304 worksheets were prepared. Each worksheet was used to develop a set of unlinked expansion factors to translate the survey database to actual boardings using automatic passenger count (APC) data.

Over 2,100 unique unlinked expansion factors were developed for the RTC On-Board Transit Survey. The following sections describe the methodology that was used to develop the unlinked expansion factors.

6.1 Sources of Ridership Data

The source of the APC data came from RTC. The data used to plan and guide the initial On-to-Off collection was APC data from October 2013. The data used to fine tune the collection and conduct the expansion was from April – May 2014, the main on-to-off data collection period.

6.2 Methodology for Calculating Unlinked Expansion Factors

Although RTC collects daily boarding and alighting data by stop, data on the number of trips between stops and segments along routes 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 and segments along each route, an On-to-Off survey was administered to approximately 20% of the passengers on majority of the routes (Downtown/Strip routes were sampled at a 10%).

Most of the Excel worksheets that were prepared contained eight tables. Each table documented a different step in the data expansion process. Each table to calculate unlinked expansion factors are described below:

Table 6-1 shows the results for the On-to-Off Survey that was administered on Route 103, Southbound, during the “PM Peak” time period. Each row in the table identifies the Segments where passengers boarded the bus. The columns in the table identify the Segments where people got off the bus. All Segments used in the data expansion process for all routes were created by RTC. The Segment locations along Route 103 are as follows:

- Segment 1 - Decatur @ Decatur Blvd/Costco (S) through Decatur @ Donnie (S) (includes 17 total stops)
- Segment 2 - Decatur @ Cheyenne (S) through Decatur @ O'Bannon (S) (includes 21 total stops)
- Segment 3 - Decatur @ Sahara (S) through Decatur @ Royal Ridge (S) (includes 12 total stops)
- Segment 4 - Decatur @ Tropicana (S) through Hauck @ Wagon Trail (N) (includes 9 total stops)

Table 6-1. Data Expansion Table Results of On-to-Off Survey

| Segments | ACTUAL RIDERSHIP COUNTS FROM THE ON/OFF SURVEY | | | | |
|----------|--|---|----|----|----|
| | Total | 1 | 2 | 3 | 4 |
| 1 | 21 | 5 | 14 | 1 | 1 |
| 2 | 102 | | 51 | 44 | 7 |
| 3 | 60 | | | 45 | 15 |
| 4 | 4 | | | | 4 |

Table 6-2 shows the distribution of the data in Table 6-1 as a percentage of all boardings for the route. For example, 7.5 percent of all southbound trips during the “PM Peak” on Route 103 board at Segment-1 and end at Segment-2.

Table 6-2. Data Expansion Table Distribution of On-to-Off Survey

| Segments | PERCENTAGE DISTRIBUTION OF RIDERSHIP COUNTS FROM THE ON/OFF SURVEY | | | | |
|----------|--|------|-------|-------|------|
| | Total | 1 | 2 | 3 | 4 |
| 1 | 11.2% | 2.7% | 7.5% | 0.5% | 0.5% |
| 2 | 54.5% | 0.0% | 27.3% | 23.5% | 3.7% |
| 3 | 32.1% | 0.0% | 0.0% | 24.1% | 8.0% |
| 4 | 2.1% | 0.0% | 0.0% | 0.0% | 2.1% |

To develop an initial estimate of the ridership flow on each route based on the Segment-On to the Segment-Off, the total ridership for the route for this time period and direction was applied to the distribution shown in Table 6-2. Table 6-3 shows the initial estimate of ridership from Segment-On to Segment-Off. Based on this estimate, 65 of the southbound trips during the PM peak on Route 103 begin at Segment 1 and end at Segment 2.

Table 6-3. Data Expansion Table Initial Estimate of Ridership Flows between Stations

| Segments | PROJECTED RIDERSHIP BASED ON THE ON-TO-OFF SURVEY | | | | |
|----------|---|----|-----|-----|----|
| | Total | 1 | 2 | 3 | 4 |
| 1 | 97 | 23 | 65 | 5 | 5 |
| 2 | 472 | 0 | 236 | 204 | 32 |
| 3 | 278 | 0 | 0 | 208 | 69 |
| 4 | 19 | 0 | 0 | 0 | 19 |

Since the On-to-Off Survey did not cover 100 percent of the boardings and alightings on the route, the distribution in Table 6-3 was compared to the actual boarding and alighting data collected for each Segment by APCs. The top portion of Table 6-4 shows the APC boardings and alightings for each Segment on the route. The bottom portion of the table shows the difference between the projected boardings and alightings at each Segment (from Table 6-3) and the APC counts.

Table 6-4. Data Expansion Table Actual Boardings and Alightings by Station

| Average Weekday Ridership Provided | Average Weekday Ridership Provided by RTC | | | | |
|------------------------------------|---|-----|-----|-----|-----|
| | Total | 1 | 2 | 3 | 4 |
| ACTUAL BOARDINGS | 866 | 169 | 500 | 179 | 17 |
| ADJUSTED ALIGHTINGS | 866 | 34 | 270 | 392 | 169 |
| DIFFERENCE FROM PROJECTED | | | | | |
| ACTUAL BOARDINGS | 0 | 72 | 28 | -98 | -1 |
| ADJUSTED ALIGHTINGS | 0 | 11 | -31 | -24 | 44 |

In order to develop a more accurate estimate of the ridership flows between segments 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 6-3) and the ridership observed by APCs at each segment (shown in Table 6-4).

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 for each route (such as the data shown in Table 6-3) was multiplied by the ratio of the actual boardings from APCs for each stop by the estimated boardings for each stop. 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 (described above) was applied, the estimated boardings would have equaled the actual 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 actual alightings from APCs for each stop by the estimated alightings for each stop 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 Steps 1 and Steps 2 were repeated sequentially until the difference between the actual and estimated boardings and alightings was zero. Table 6-5 (below) shows that after six balancing iterations in this algorithm, there were no differences between the projected distribution and the actual boardings and alightings.

Table 6-5. Iterative Balance Process

| Segments | Total | DIFFERENCE FROM ACTUAL BOARDINGS | 6th STEP of ITERATIVE BALANCING TO CORRECT DISTRIBUTION OF RIDERSHIP | | | |
|--------------|------------|-------------------------------------|---|------------|------------|------------|
| | | | 1 | 2 | 3 | 4 |
| 1 | 169 | 0 | 34 | 101 | 13 | 21 |
| 2 | 500 | 0 | 0 | 169 | 263 | 68 |
| 3 | 179 | 0 | 0 | 0 | 116 | 63 |
| 4 | 17 | 0 | 0 | 0 | 0 | 17 |
| Total | 866 | 0 | 34 | 270 | 392 | 169 |

The final estimate for ridership flows is shown in Table 6-6 on the following page. To calculate the expansion factors, the final estimate of ridership between major segments shown in Table 6-6 was divided by the actual number of surveys that were completed for trips major segments shown in Table 6-7 on the following page. When factors were high or survey data did not exist for a given cell, segments were combined with adjacent segments.

Table 6-6. Final Estimate of Ridership Flows Between Stations

| FINAL ESTIMATE OF RIDERSHIP FLOWS BETWEEN STATIONS | | | | | | |
|--|------------|-----------------------------------|-----------|------------|------------|------------|
| Segments | Total | Difference from Actual Boardings | 1 | 2 | 3 | 4 |
| 1 | 169 | 0 | 34 | 101 | 13 | 21 |
| 2 | 500 | 0 | | 169 | 263 | 68 |
| 3 | 179 | 0 | | | 116 | 63 |
| 4 | 17 | 0 | | | | 17 |
| Total | 866 | | 34 | 270 | 392 | 169 |
| | | DIFFERENCE FROM ACTUAL ALIGHTINGS | 0 | 0 | 0 | 0 |

Table 6-7. Number of Completed Surveys

| NUMBER OF COMPLETED SURVEYS | | | | | |
|-----------------------------|-------|---|----|----|----|
| Segments | Total | 1 | 2 | 3 | 4 |
| 1 | 19 | 2 | 13 | 2 | 2 |
| 2 | 34 | | 5 | 19 | 10 |
| 3 | 9 | | | 3 | 6 |
| 4 | 1 | | | | 1 |

The next step after creating the weighting factors was to give each record in the Main Survey database a weight factor name based on route, direction, time period, boarding segment, and alighting segment. For example, the weight factor name of “103_S_C_2_4” indicates that the record is from ROUTE 103 (103), going SOUTHBOUND (S), during the PM Peak Time Period (C), the rider boarded at Segment-2 (2), and the rider alighted at Segment-4 (4).

Validating the Expansion

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

Assessment of Expansion Factor Values

The average value of all unlinked expansion factors in the database is 13.34. Of the 14,125 records in the database, 8,956 (63.4% of the sample) have an expansion factor of less than 15 and 12,469 records (88.3% of the sample) have a value less than 25. The highest unlinked expansion factor value is 49.82. The vast majority of the weight factors with values above 30 were routes completed with a smaller sampling plan (4.5%).

This section highlights demographic and trip-related findings from the survey based on the three types of services (Express, Residential, and Downtown/Strip). Two major categories are presented regarding the survey findings: (1) travel/demographic characteristics and (2) travel pattern maps. The findings in this section were expanded using the unlinked weighting factors in the database.

Also, the Service type surveys have been separated in order to provide comparisons between them. The specific routes per service type are listed below:

| EXPRESS ROUTES | RESIDENTIAL ROUTES | | | | DOWNTOWN/STRIP ROUTES |
|----------------|--------------------|-----|-----|-----|-----------------------|
| 501 - MAX | 101 | 110 | 202 | 214 | 301 - Deuce |
| 503 - BHX | 102 | 111 | 203 | 215 | 502 - SDX |
| 504 - SX | 103 | 113 | 206 | 217 | |
| 901 - CX | 104 | 115 | 207 | 218 | |
| 902 - WAX | 105 | 117 | 208 | 219 | |
| 903 - HDX | 106 | 119 | 209 | | |
| 904 - DVX | 108 | 120 | 210 | | |
| | 109 | 201 | 212 | | |

7.1 Travel/Demographic Characteristics

7.1.1 Types of Places Riders are COMING FROM

Figure 7-1a on the following page indicates that for Express Routes, over 46% of trips per day originate from the user's home, over 20% of trips originate from their workplace, over 6% of trips originate from a shopping/eating/dining place, and over 5% trips originate from a Hotel/Casino/Convention Center type of place.

Figure 7-1b on the following page indicates that for Residential Routes, nearly 50% of trips originate from the user's home, nearly 22% of trips originate from their workplace, over 6% of trips originate from a shopping/eating/dining place, and over 4% of trips originate from a place described as other.

Figure 7-1c on the following page indicates that for Downtown/Strip Routes, over 39% of trips per day started from a Hotel/Casino/Convention Center, over 25% of trips originate from their home, nearly 20% of trips originate from a shopping/eating/dining place, and over 7% of trips originate from a recreation/sightseeing/sports event type of place.

Figure 7-1d on the following page indicates that nearly 44% of all transit riders' trips started from the user's home and over 18% of trips originated from the user's workplace.

Figure 7-1a. Types of Places Transit Riders are Coming From (Express Route)

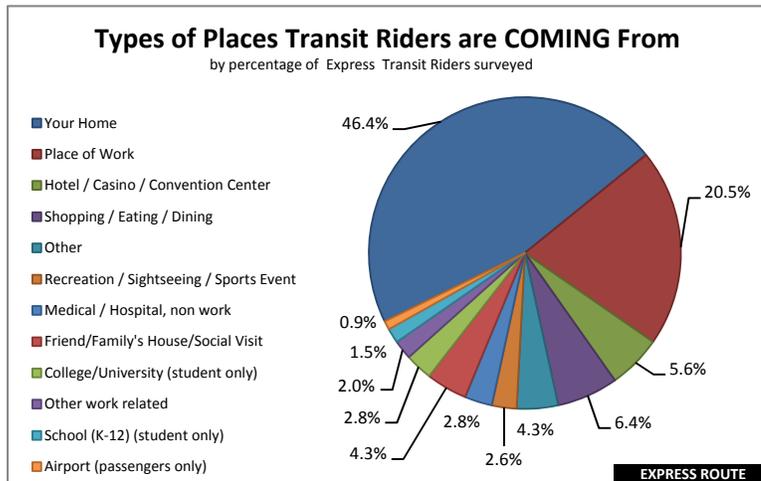


Figure 7-1b. Types of Places Transit Riders are Coming From (Residential Route)

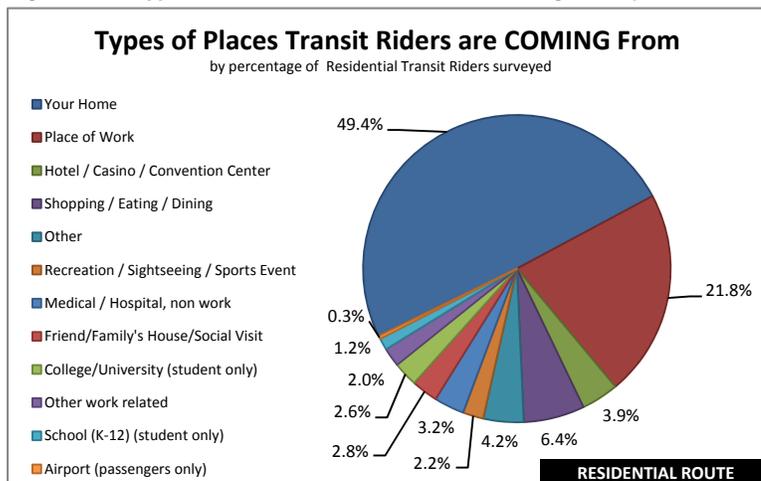


Figure 7-1c. Types of Places Transit Riders are Coming From (Downtown/Strip Route)

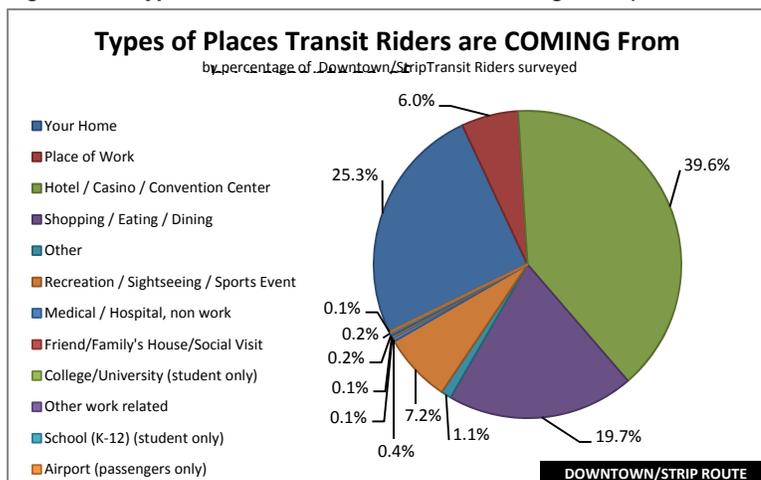
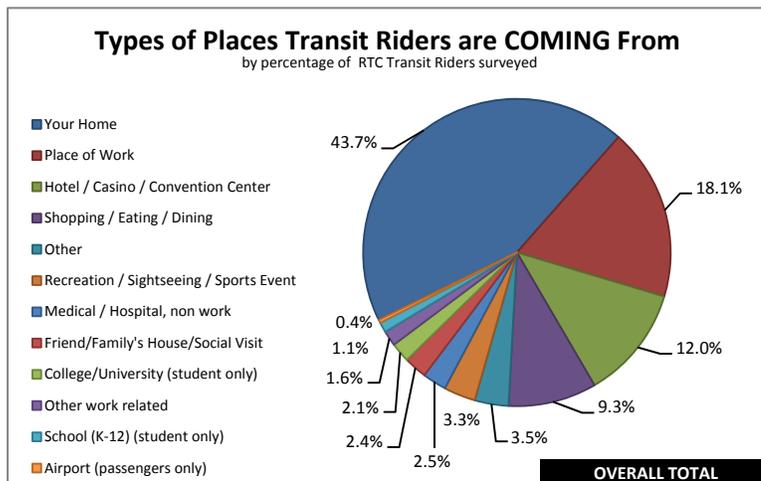


Figure 7-1d. Types of Places Transit Riders are Coming From (RTC Overall)



7.1.2 How Passengers Access Public Transit

A large majority of Downtown/Strip transit passengers (98.3%) indicated that they accessed public transit by walking, compared to 93.9% of Express riders and 96.5% of Residential riders.

Express route passengers (3.1%) were more likely to report accessing public transit by first riding in a vehicle, whether it was driving themselves, being dropped off by someone going someplace else, or riding with others and parking compared to Residential (1.7%) and Downtown/Strip (0.6%) as shown in Figure series 7-2.

Downtown/Strip transit passengers accessed public transit faster by walking and biking, compared to Express Route riders and Residential Route riders as shown in Figure 7-2e.

Figure 7-2a. Mode to Access Public Transit (Express Route)

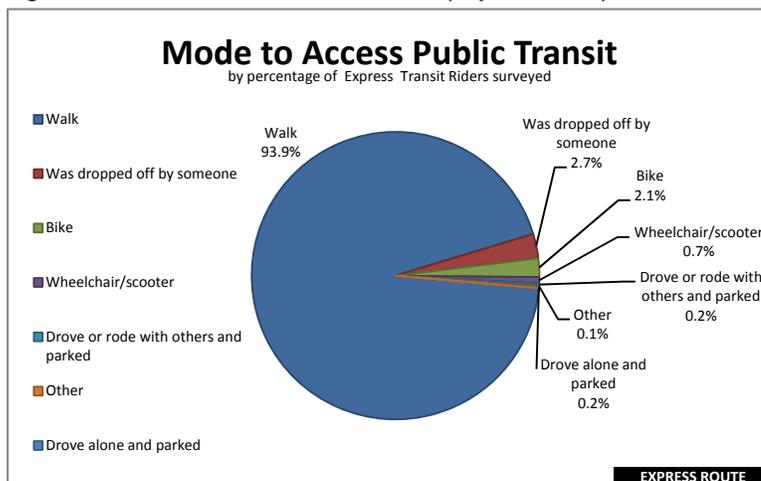


Figure 7-2b. Mode to Access Public Transit (Residential Route)

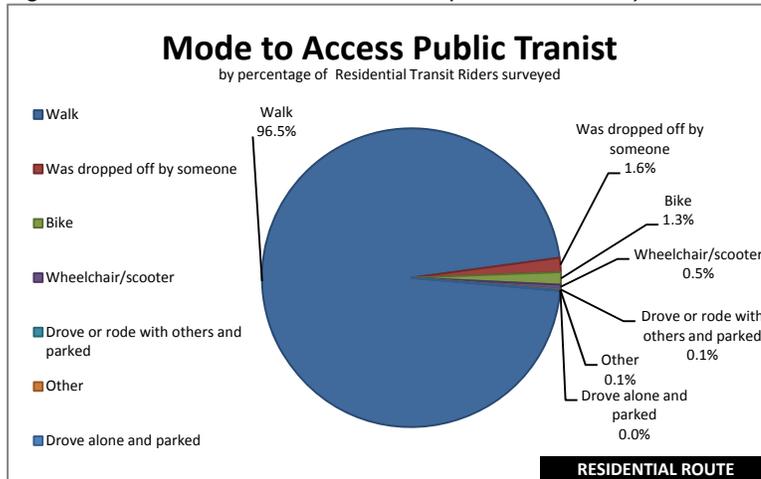


Figure 7-2c. Mode to Access Public Transit (Downtown/Strip Route)

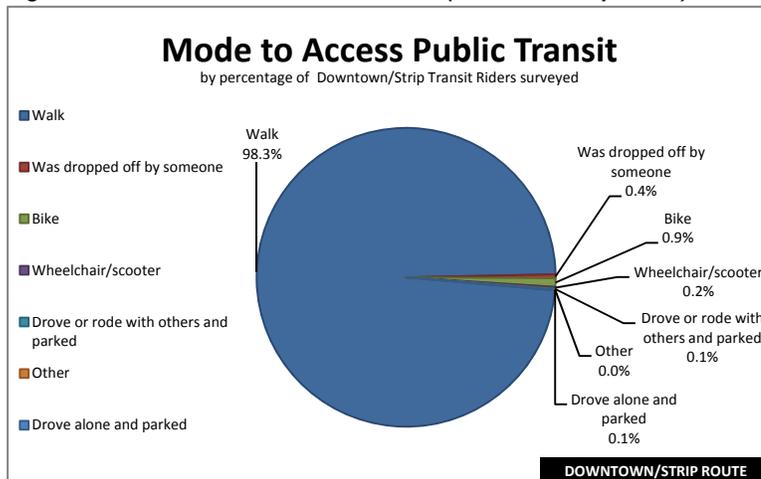


Figure 7-2d. Mode to Access Public Transit (RTC Overall)

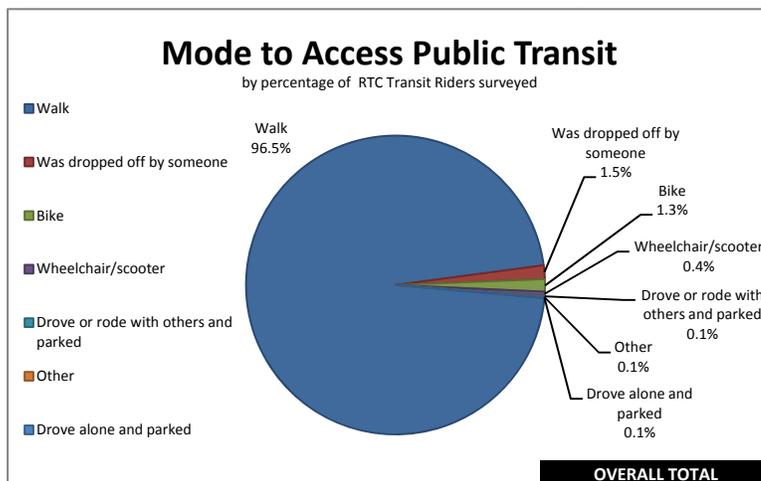
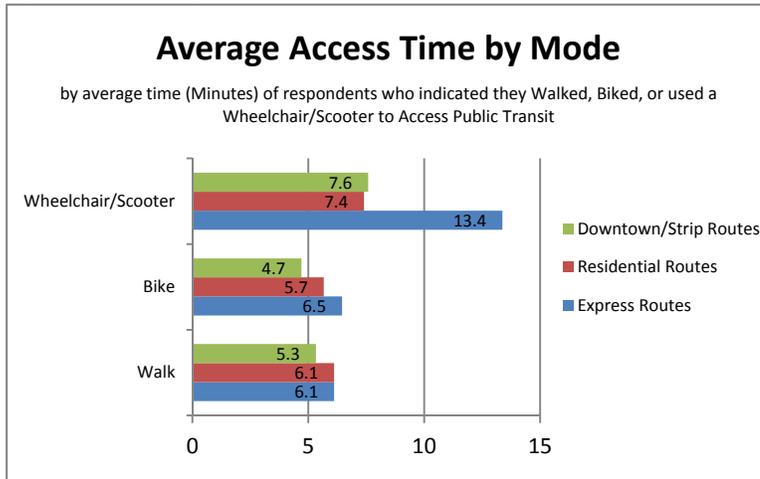


Figure 7-2e. Average Access Time by Mode



7.1.3 Types of Places Riders are GOING TO

Figure 7-3a below indicates that for Express Routes, nearly 38% of trips per day terminate at the user’s home, nearly 21% of trips terminate at their workplace, nearly 9% of trips terminate at a Hotel/Casino/ Convention Center, and 7% of trips terminate at a shopping/eating/dining type of place.

Figure 7-3b on the following page indicates that for Residential Routes, nearly 39% of trips terminate at the user’s home, over 23% of trips terminate at their workplace, over 8% of trips terminate at a shopping/eating/dining place, and over 5% of trips terminate at a place described as other.

Figure 7-4c on the following page indicates that for Downtown/Strip Routes, over 39% of trips per day ended at the Hotel/Casino/Convention Center, over 20% of trips terminate at a shopping/eating/dining place, over 18% of trips terminate at the user’s home, and over 11% of trips terminate at a recreation/sightseeing/sports event type of place.

Figure 7-1d on the following page indicates that for overall RTC, over 34% of trips per day will terminate at the user’s home and over 19% of trips will terminate at the user’s workplace.

Figure 7-3a. Type of Places Transit Riders are Going To (Express Route)

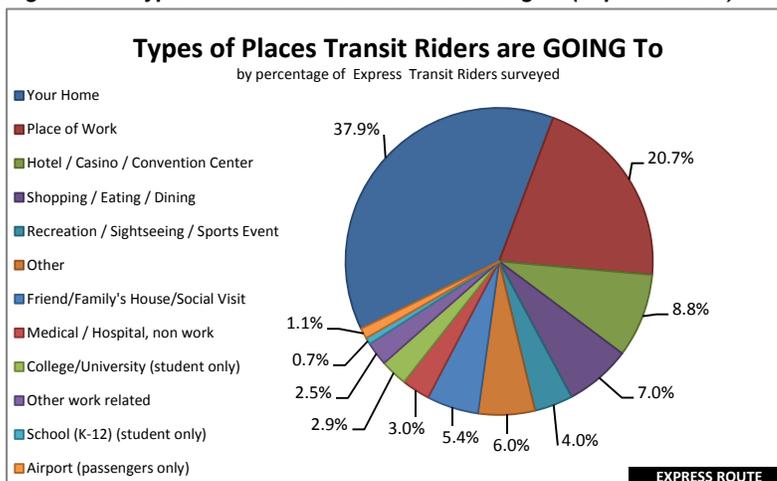


Figure 7-3b. Type of Places Transit Riders are Going To (Residential Route)

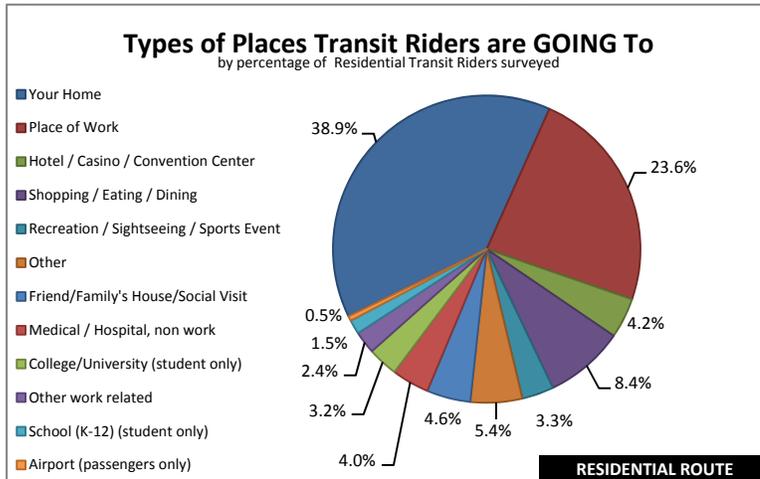


Figure 7-3c. Type of Places Transit Riders are Going To (Downtown/Strip Route)

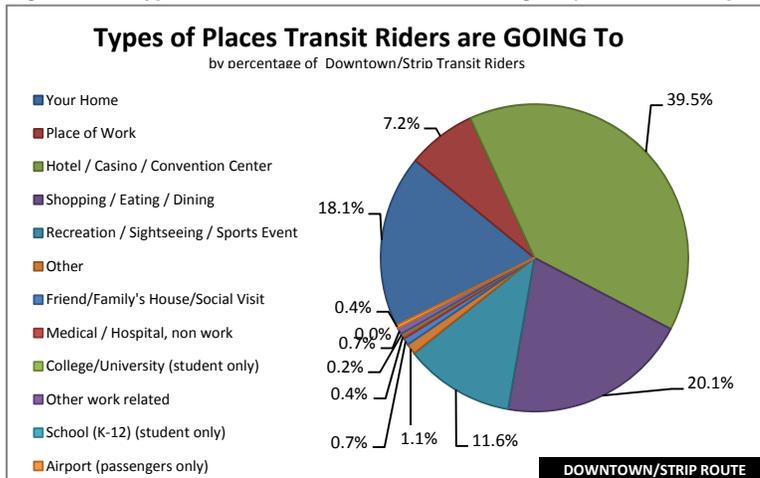
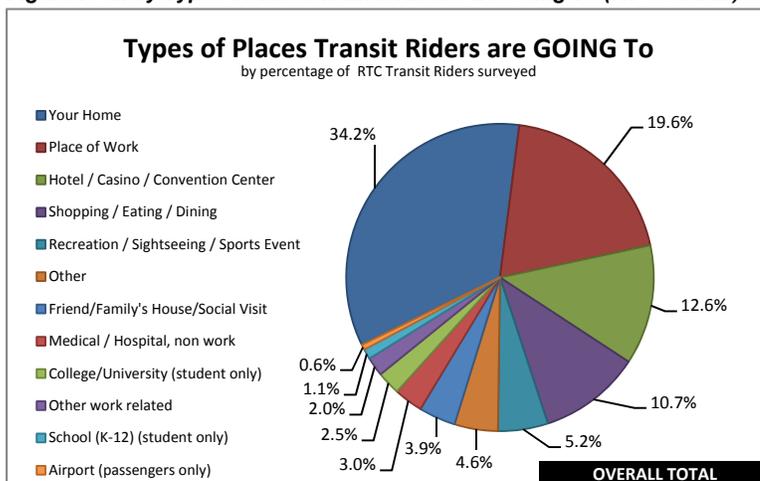


Figure 7-3d. Type of Places Transit Riders are Going To (RTC Overall)



7.1.4 How Passengers Traveled from Transit to Their Final Destination

The majority of Downtown/Strip transit passengers (98.4%) indicated that they walk to their final destination after using public transit, compared to 97.3% of Residential bus riders and 94.9% of Express riders.

Express route passengers (2.2%) were more likely to report reaching their final destination by being picked up by someone, getting in a parked vehicle and driving alone, or getting in a parked vehicle and traveling with others to their final destination compared to Residential (0.9%) and Downtown/Strip route passengers (0.4%) as shown in Figure series 7-4.

Downtown/Strip transit passengers that walk indicated that they accessed public transit faster (4.9 minutes), compared to the walk-time of Express Route riders (5.8 minutes) and Residential Route riders (5.9 minutes). Express Riders using a Wheelchair/Scoter to access Public Transit shows the greatest average time (10.9 minutes) as shown in Figure 7-4e.

Figure 7-4a. Egress Mode to Destination (Express Route)

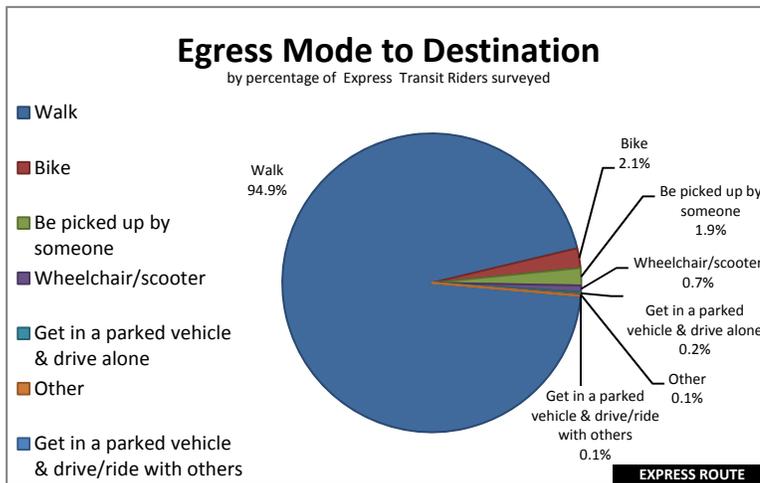


Figure 7-4b. Egress Mode to Destination (Residential Route)

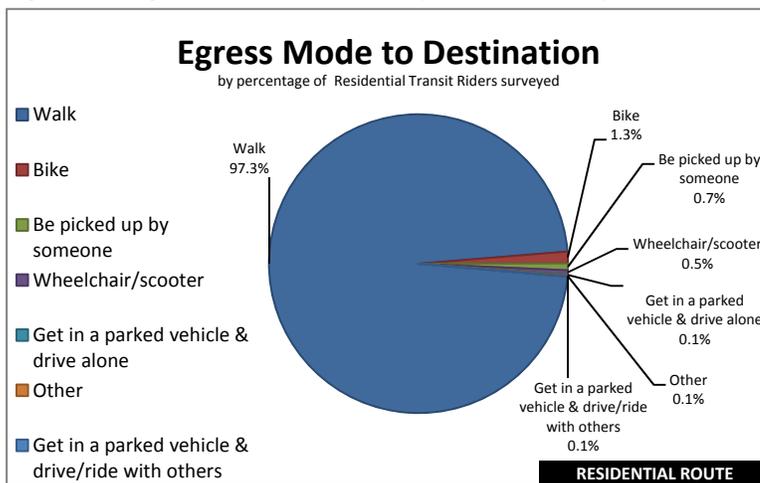


Figure 7-4c. Egress Mode to Destination (Downtown/Strip Route)

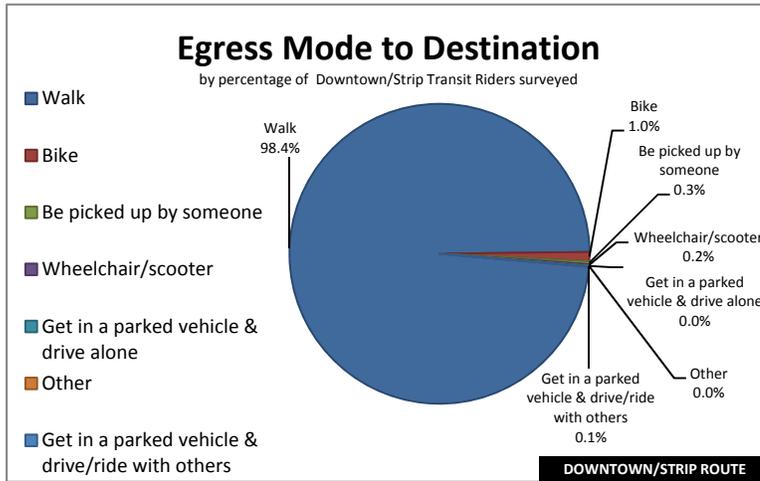


Figure 7-4d. Egress Mode to Destination (RTC Overall)

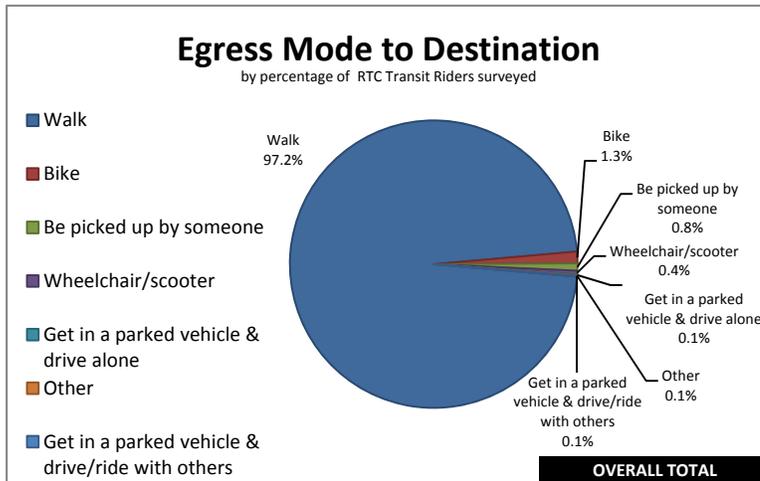
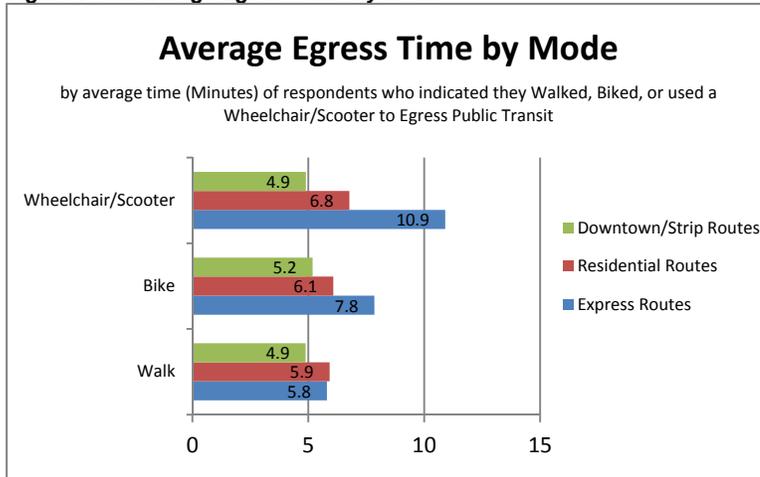


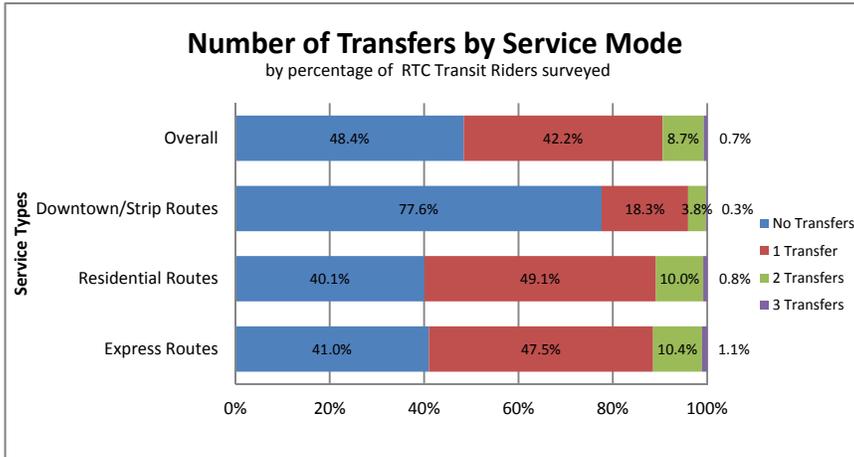
Figure 7-4e. Average Egress Time by Mode



7.1.5 Transfers

Most Downtown/Strip transit riders (77.6%) did not make a transfer along their one-way trip. Conversely, 49.1% of Residential bus riders indicated they would make at least one transfer along their one-way trip, and 47.5% of Express riders indicated they would make at least 1 transfer along their one-way trip. Overall, over half (51.6%) of transit riders indicated they would need to transfer at least once as shown in Figure 7-5 below.

Figure 7-5. Total Number of Transfers



7.1.6 Traveling Group Size

Over seventy-three percent (73.2%) of RTC transit riders indicated that they were traveling alone for their current one-way trip and 23% of RTC passengers indicated they were traveling in a group size of 2-3 people.

Downtown/Strip riders were shown to be the least likely to travel alone (29%). Seventy-one percent (71.0%) of Downtown/Strip route riders indicated they traveled in a group size of 2 or people compared to 13.3% of Express Route bus riders and 14.8% of Residential bus riders as shown in Figure series 7-6 below.

Figure 7-6a. Traveling Group Size (Express Route)

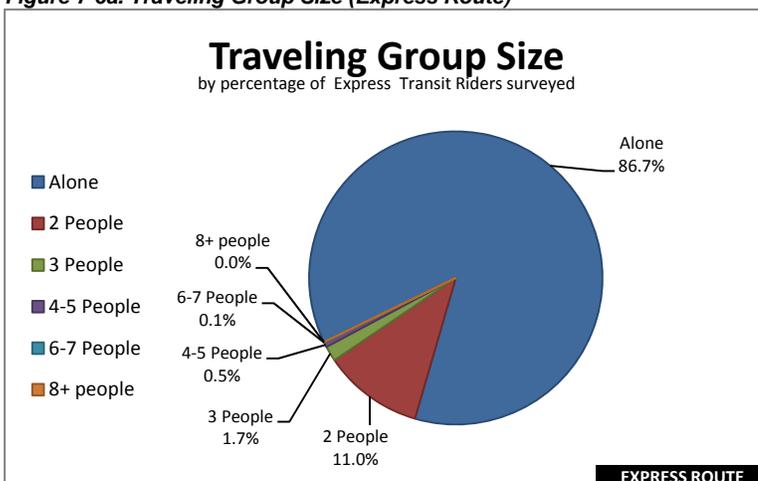


Figure 7-6b. Traveling Group Size (Residential Route)

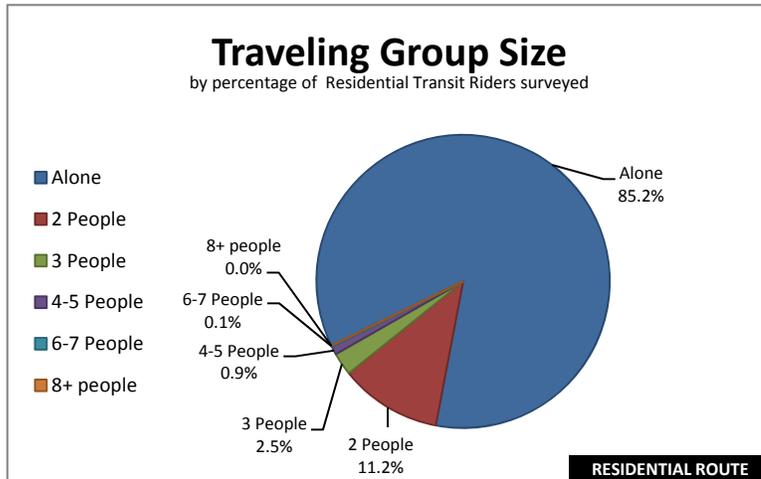


Figure 7-6c. Traveling Group Size (Downtown/Strip Route)

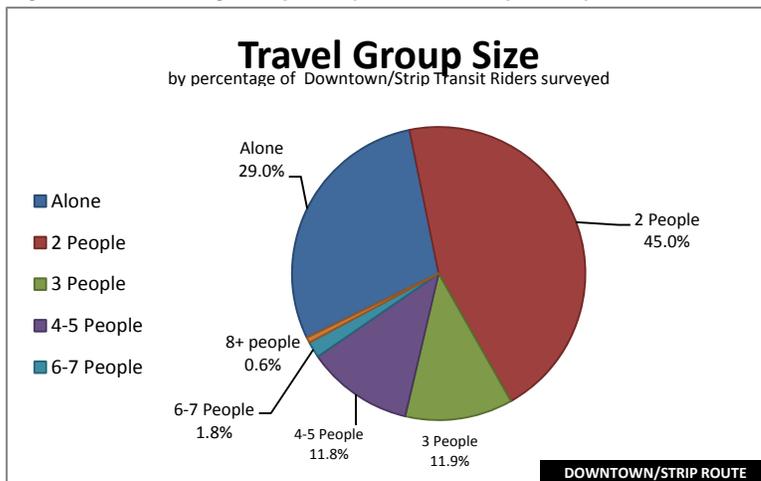
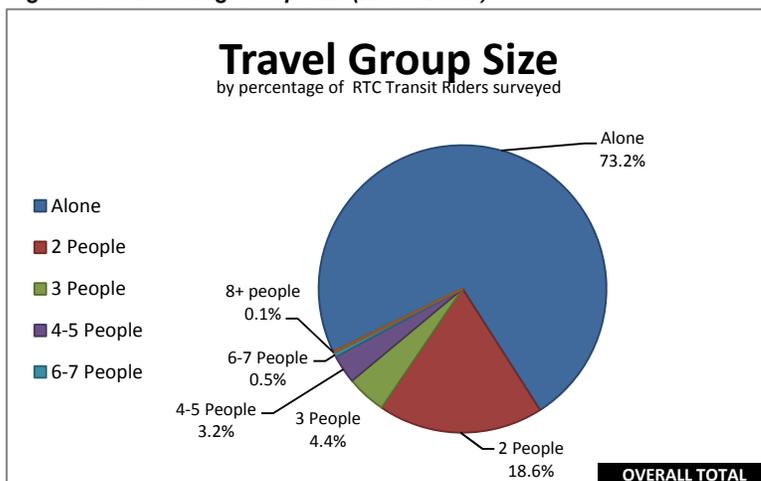


Figure 7-6d. Traveling Group Size (RTC Overall)



7.1.7 Type of Fare Purchased

Over forty-four percent (44.8%) of RTC transit users indicated they purchased a 24 hour ticket, compared to a 30 Day Pass (24.7%) and 15 Day Pass (11.7%). Downtown/Strip route passengers were significantly more likely to purchase a 24 Hour Ticket compared to both Express and Residential Route bus riders. Express/Residential riders were significantly more likely to purchase a 30 Day pass compared to a Downtown/Strip rider as shown in Figure series 7-7 below.

Figure 7-7a. Type of Fare (Express Route)

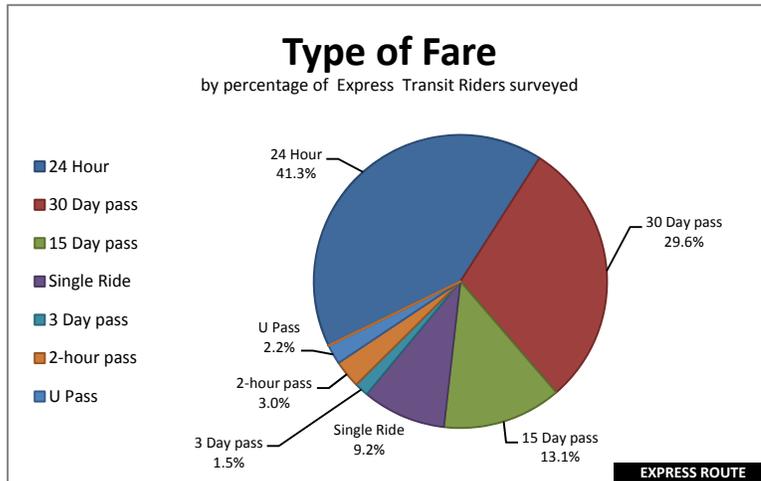


Figure 7-7b. Type of Fare (Residential Route)

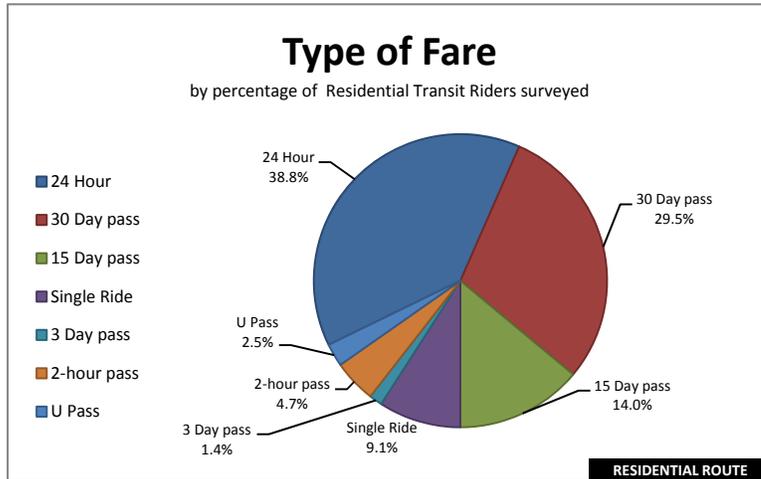


Figure 7-7c. Type of Fare (Downtown/Strip Route)

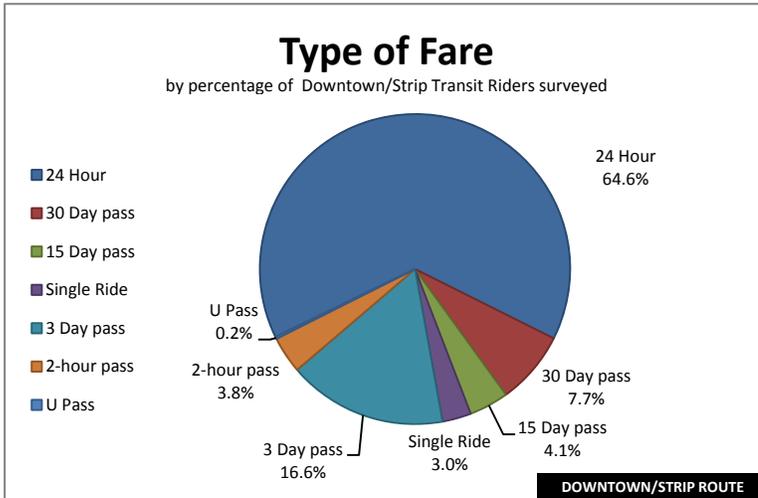
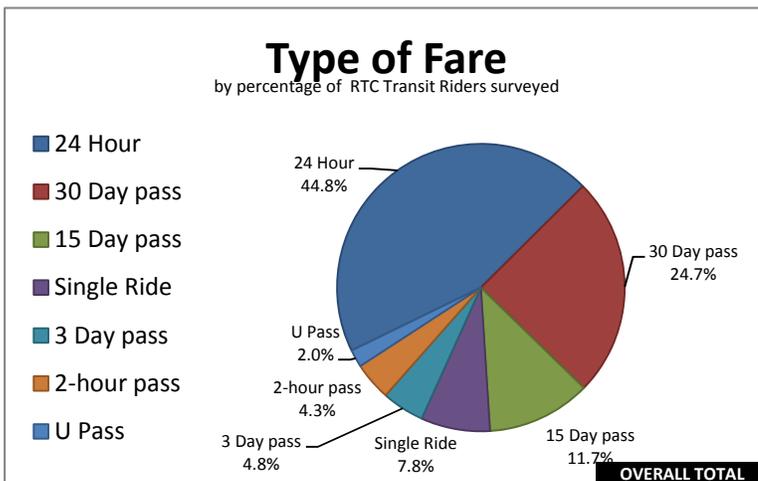


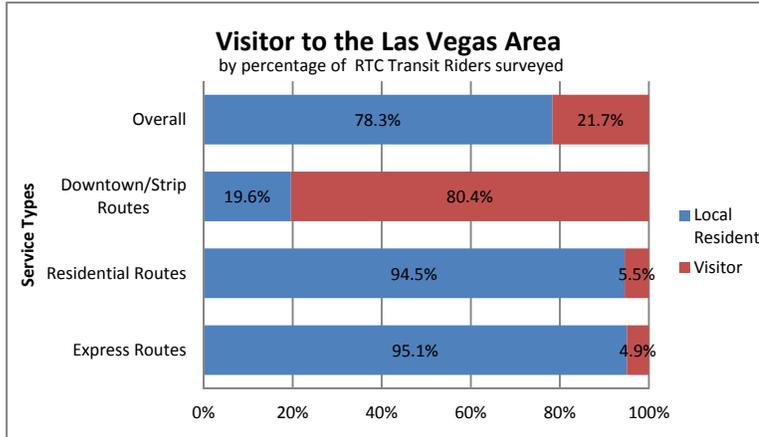
Figure 7-7d. Type of Fare (RTC Overall)



7.1.8 Visitors to the Las Vegas Area

Over seventy-eight percent (78.3%) of RTC transit riders indicated they were local residents. Majority of the Local Residents use Express/Residential Routes. Visitors are significantly more likely to use the Downtown/Strip routes; over eighty percent (80.4%) of Downtown/Strip Routes users are visitors as shown in Figure 7-8 below.

Figure 7-8. Visitors to the Las Vegas Area



7.1.9 Vehicle Availability (Local Residents Only)

Over sixty-seven percent (67.4%) of local RTC transit users do not have a working vehicle available to their household, compared to 22.1% of transit riders with one vehicle and 10.4% of riders with 2 or more vehicles shown in Figure 7-9d on the following page. Figure 7-9e shows nearly seventy-seven percent (76.9%) of RTC transit riders, who had a vehicle in their household, indicated that they could not use a household vehicle to make their trip.

Figure 7-9a. Number of Vehicles Owned by Household-Excluding Visitors (Express Route)

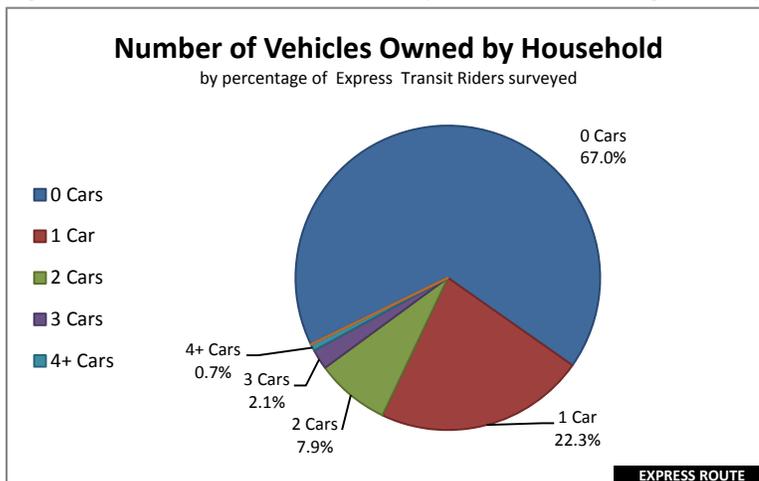


Figure 7-9b. Number of Vehicles Owned by Household-Excluding Visitors (Residential Route)

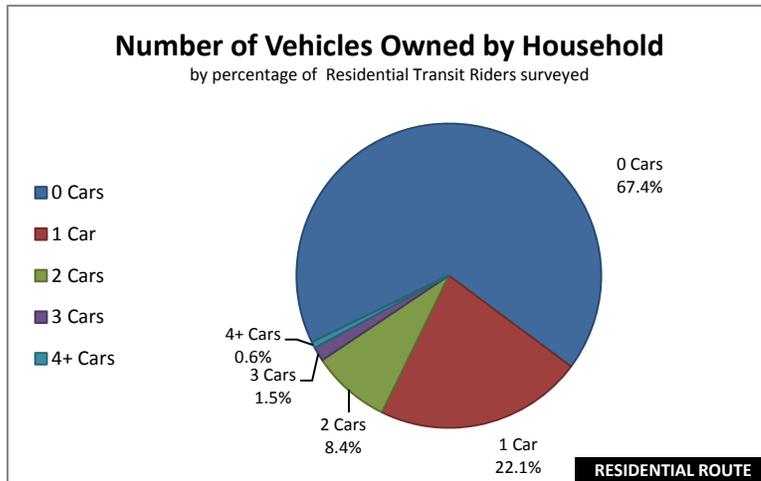


Figure 7-9c. Number of Vehicles Owned by Household-Excluding Visitors (Downtown/Strip Route)

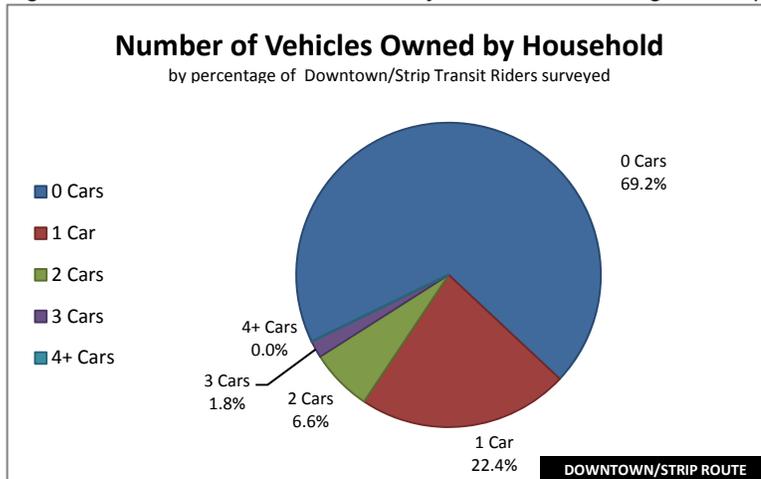


Figure 7-9d. Number of Vehicles Owned by Household-Excluding Visitors (RTC Overall)

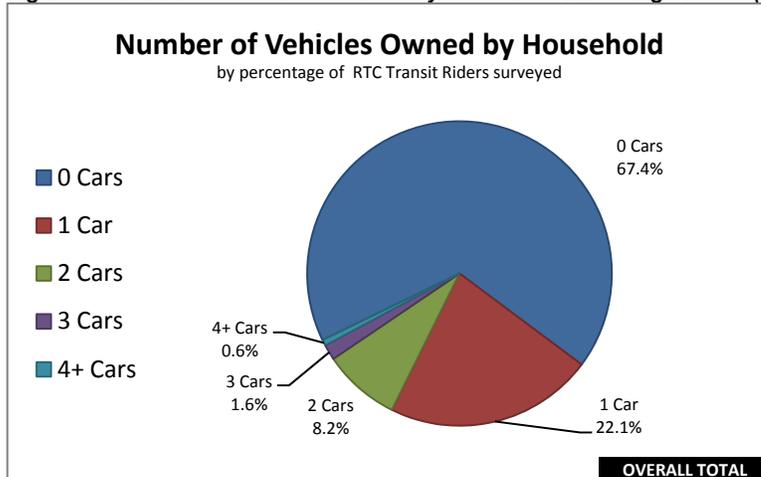
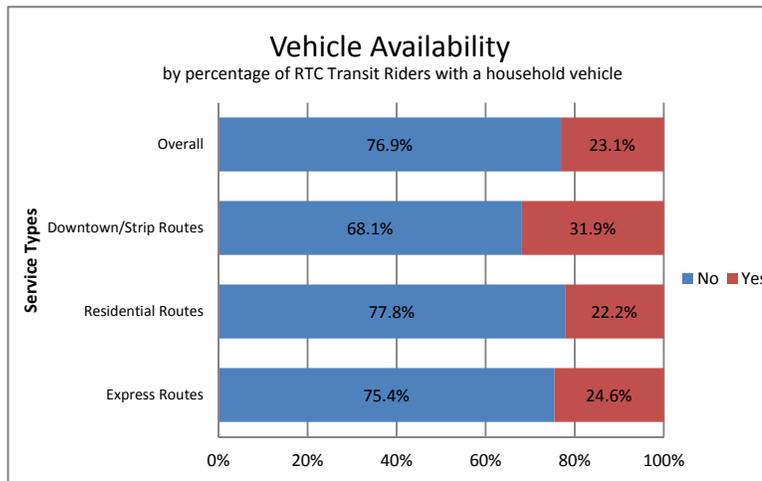


Figure 7-9e. Vehicle Availability-Excluding Visitors (RTC Overall)



7.1.10 Adults in the Household (Local Residents Only)

Of all local transit passengers, over twenty-four percent (24.2%) indicated they live in a household alone. Downtown/Strip route passengers were more likely to live in a household with just one adult than Express or Residential route passengers (32.0% Downtown/Strip vs. 27.0% express vs. 23.0% Residential).

Figure 7-10a. Number of People in Household-Excluding Visitors (Express Route)

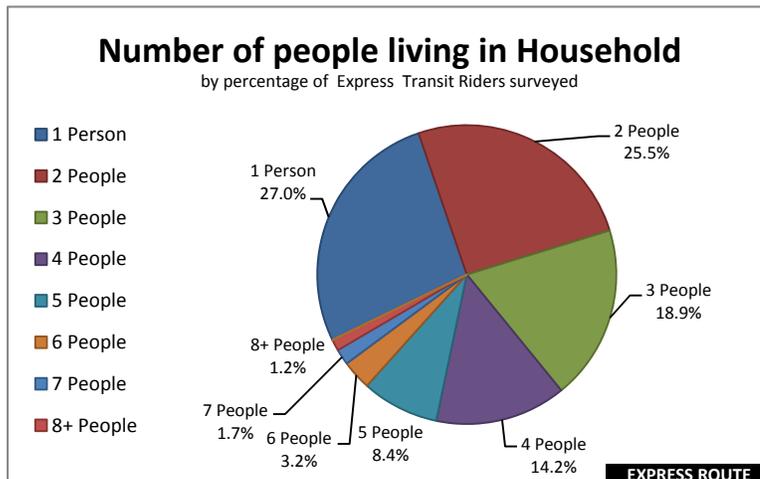


Figure 7-10b. Number of People in Household-Excluding Visitors (Residential Route)

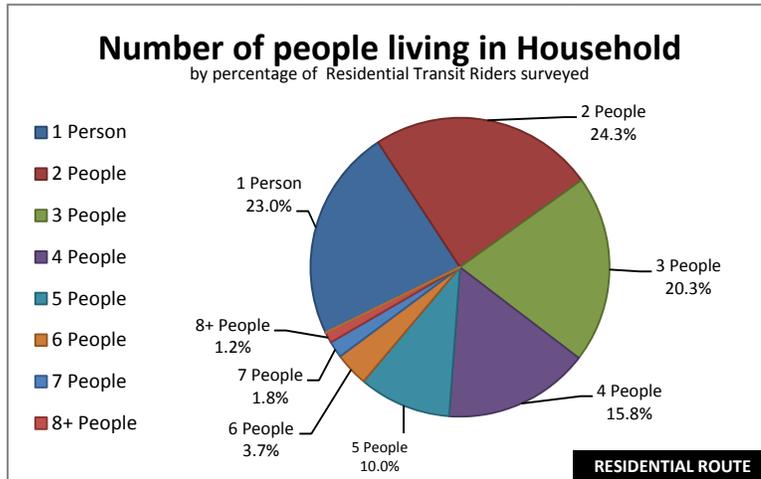


Figure 7-10c. Number of People in Household-Excluding Visitors (Downtown/Strip Route)

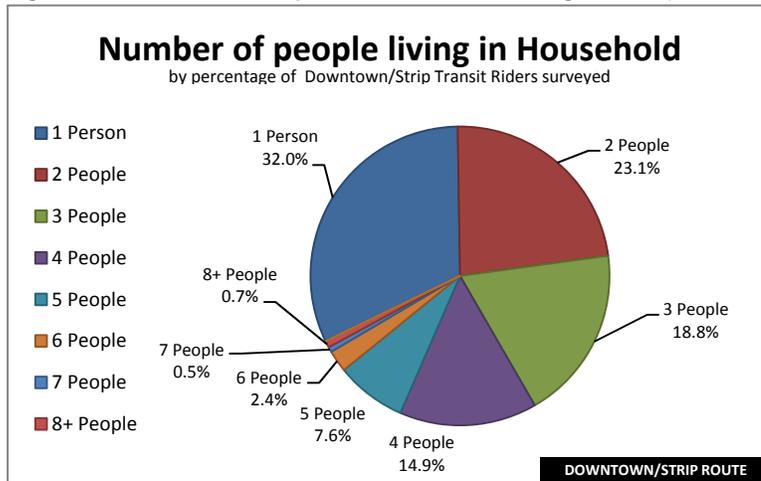
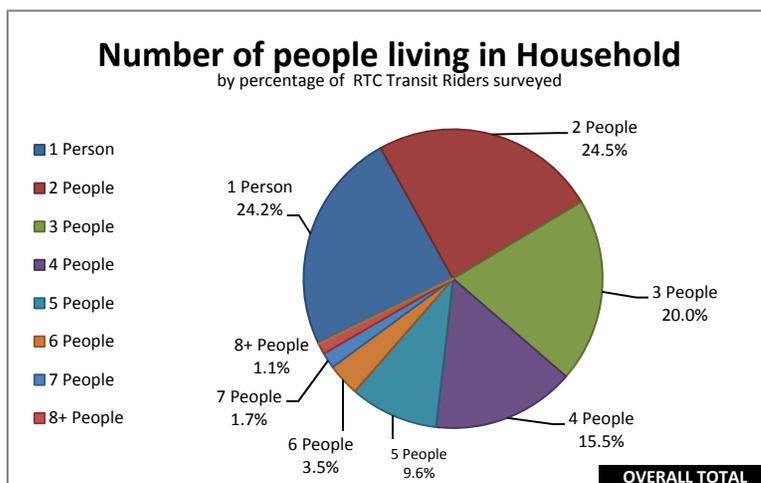


Figure 7-10d. Number of People in Household-Excluding Visitors (RTC Overall)



7.1.11 Employed Adults in Household

Of local transit passengers, over fifty percent (50.2%) reported that their household has two or more members employed on at least a part-time basis. Over 36 percent (36.6%) indicated one household member was employed on at least a part-time basis as shown in Figure 7-11d.

Figure 7-11a. Employed Adults in Household-Excluding Visitors (Express Route)

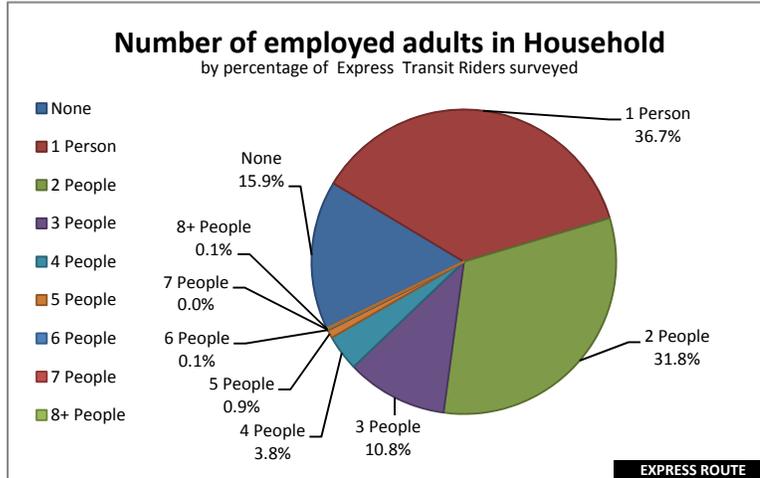


Figure 7-11b. Employed Adults in Household-Excluding Visitors (Residential Route)

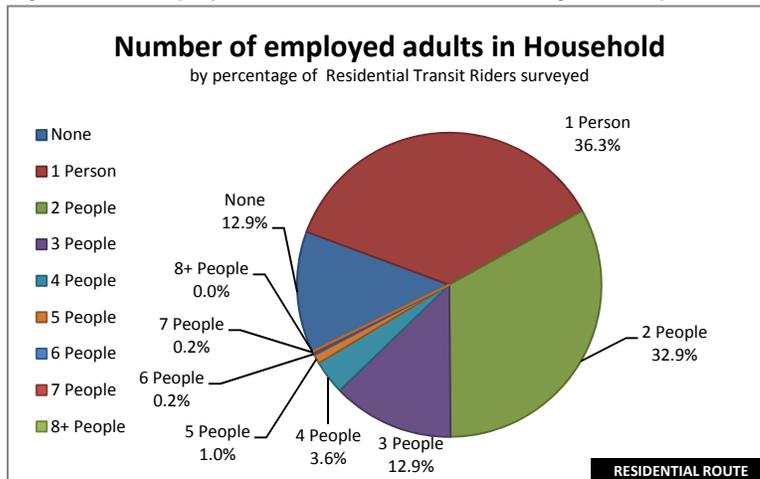


Figure 7-11c. Employed Adults in Household-Excluding Visitors (Downtown/Strip Route)

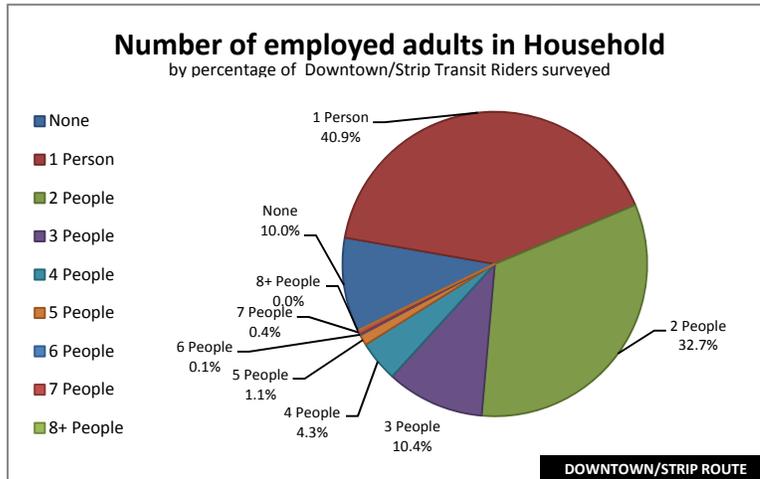
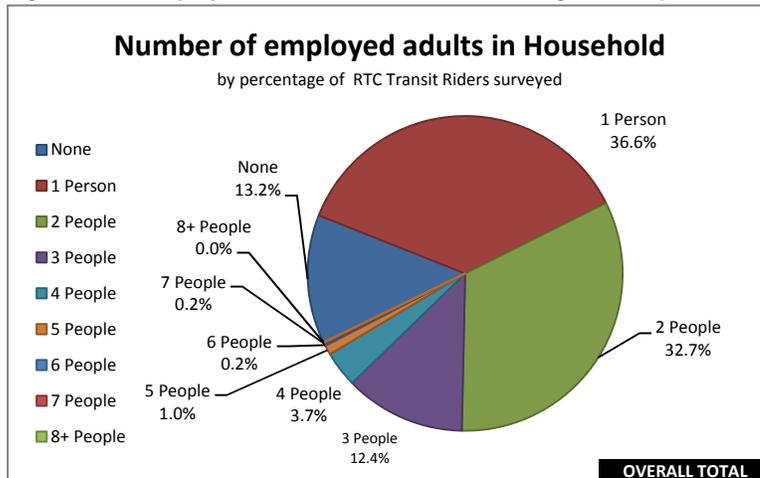


Figure 7-11d. Employed Adults in Household-Excluding Visitors (RTC Overall)



7.1.12 Employed Status of Transit Rider (Local Residents Only)

Over seventy-three percent of local RTC transit riders (73.6 percent) reported that they are employed on at least a part-time basis. Downtown/Strip route passengers were significantly more likely to be employed on a full/part-time basis as compared to Express/Residential route riders. Over eighty-six percent (86.6%) of Downtown/Strip route riders indicated they were employed on a full/part-time basis compared to 72.9% of Residential bus riders and 72.1% of Express bus riders as shown in Figure series 7-12 below.

Figure 7-12a. Employment Status of Respondent-Excluding Visitors (Express Route)

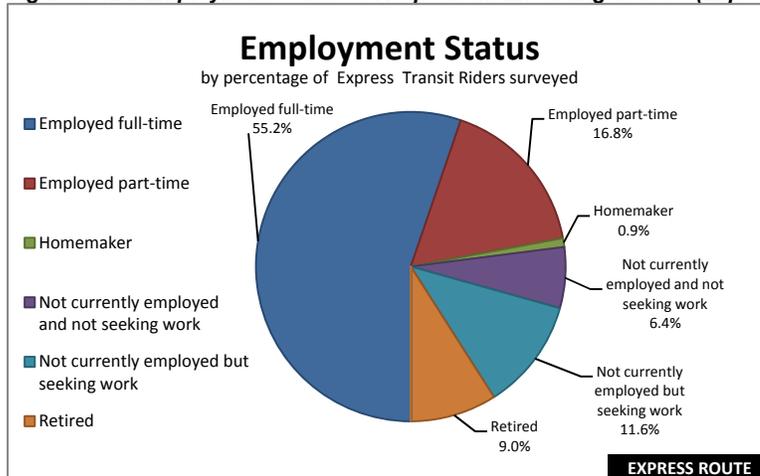


Figure 7-12b. Employment Status of Respondent-Excluding Visitors (Residential Route)

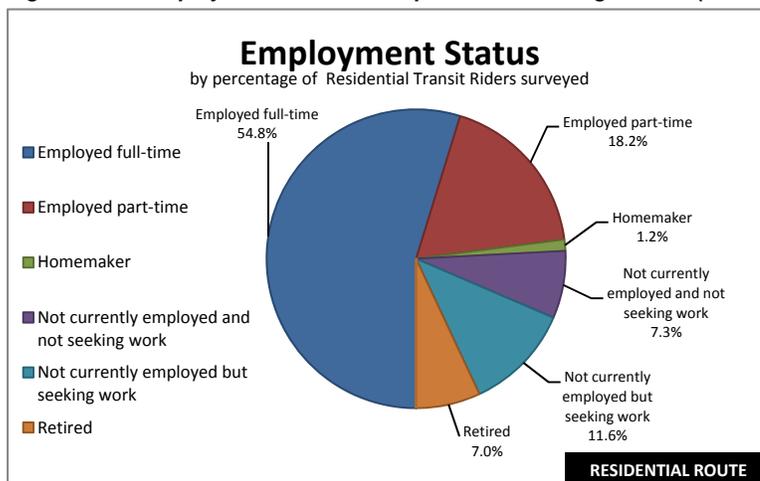


Figure 7-12c. Employment Status of Respondent-Excluding Visitors (Downtown/Strip Route)

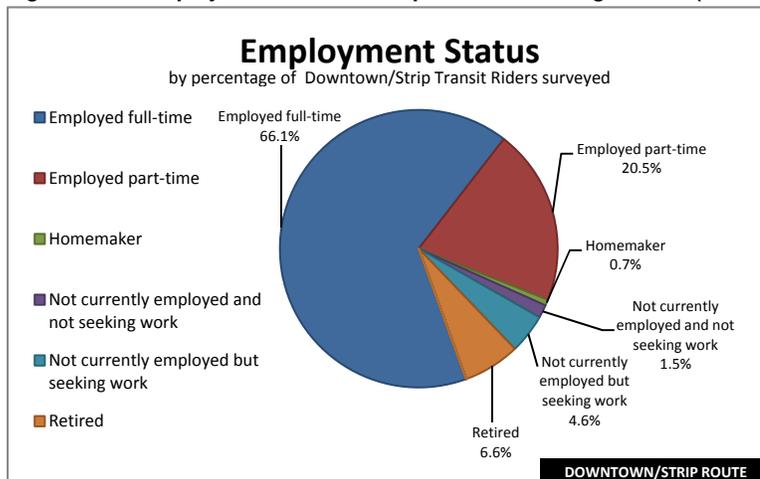
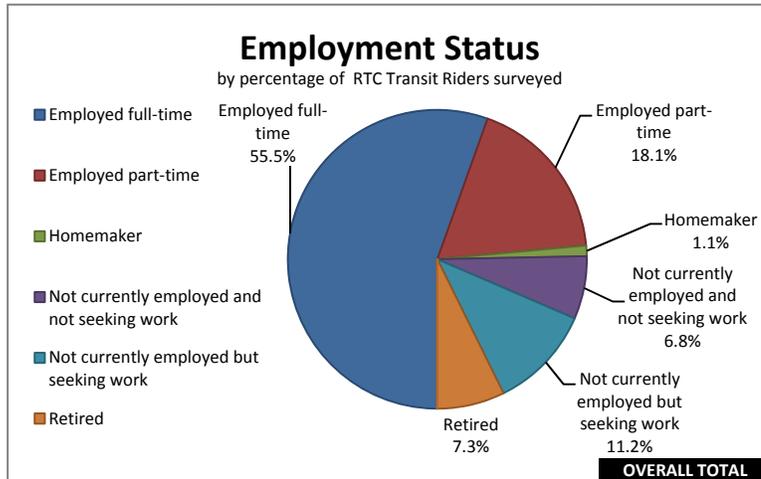


Figure 7-12d. Employment Status of Respondent-Excluding Visitors (RTC Overall)



7.1.13 Student Status

Nearly 14 percent (13.7%) of local RTC transit users are a student of some kind. Downtown/Strip bus riders are less likely to be students compared to any other service (92.9% Downtown/Strip Routes are not students vs. 86.5% Express Routes vs. 85.8% Residential Routes) as shown in Figure series 7-13.

Figure 7-13a. Student Status-Excluding Visitors (Express Route)

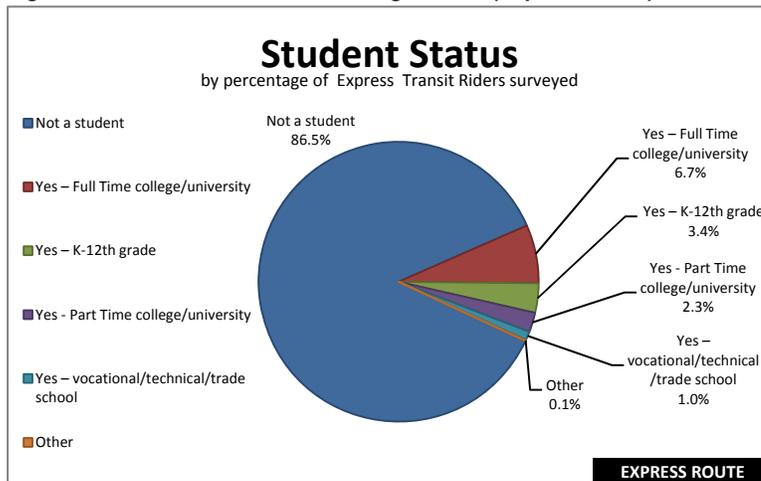


Figure 7-13b. Student Status-Excluding Visitors (Residential Route)

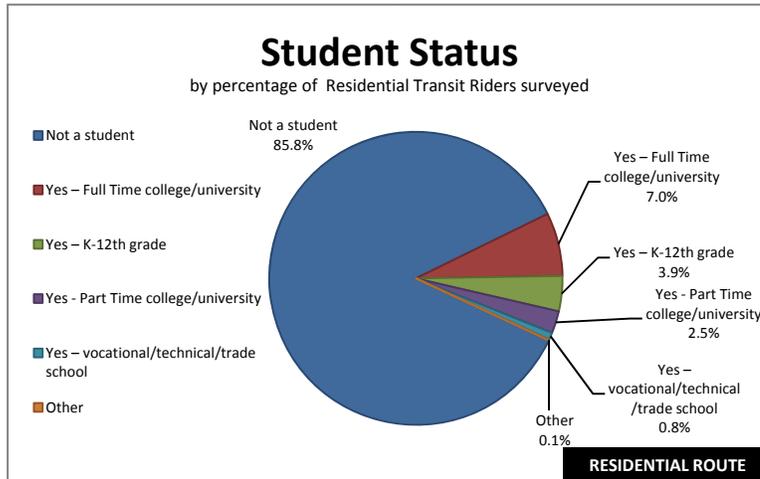


Figure 7-13c. Student Status-Excluding Visitors (Downtown/Strip Route)

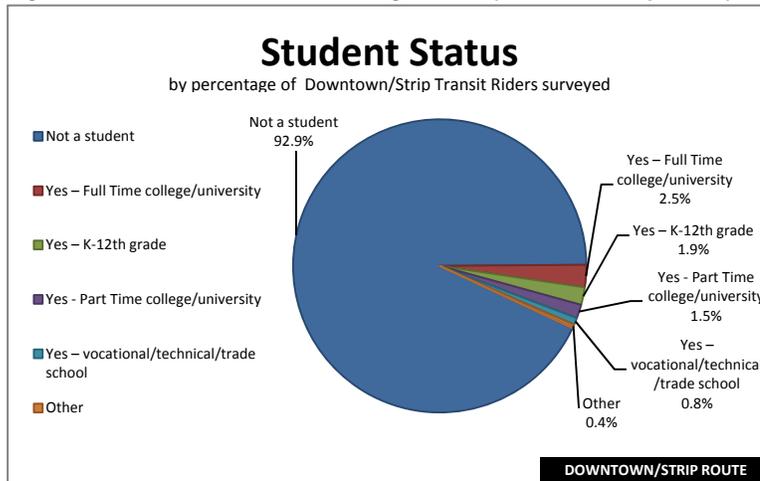
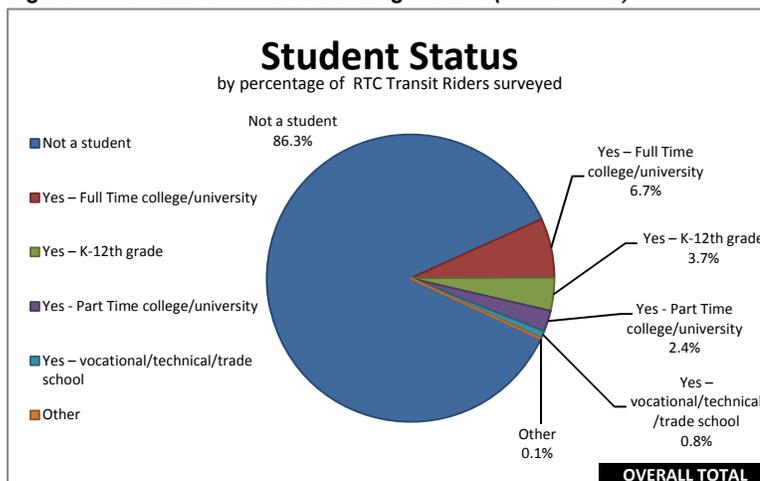


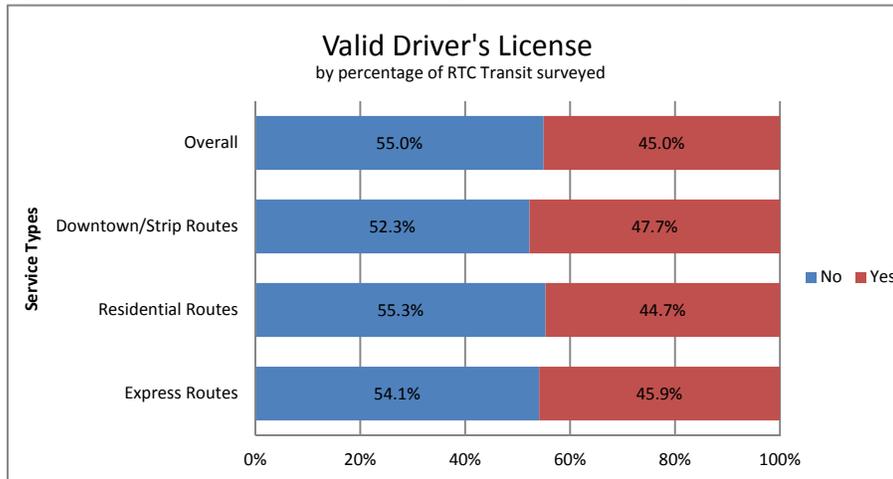
Figure 7-13d. Student Status-Excluding Visitors (RTC Overall)



7.1.14 Driver's License (Local Residents Only)

More than half (55.0%) of local RTC transit riders indicated that they don't have a valid driver's license. Express and Downtown/Strip route passengers were more likely to have a driver's license than Residential route passengers as shown in Figure 7-14 below.

Figure 7-14. Valid Driver's License-Excluding Visitors (RTC Overall)



7.1.15 Age (Local Residents Only)

A majority (69.0%) of all local transit riders indicated that they were between the ages of 18 and 44, 3.5% were under the age of 18 and 27.5% were age 45 or older. Express and Downtown/Strip route passengers were more likely to be over age 44 than Residential route passengers (31.1% Express vs. 33.2% Downtown/Strip vs. 26.2% Residential).

Figure 7-15a. Age of Transit Riders-Excluding Visitors (Express Route)

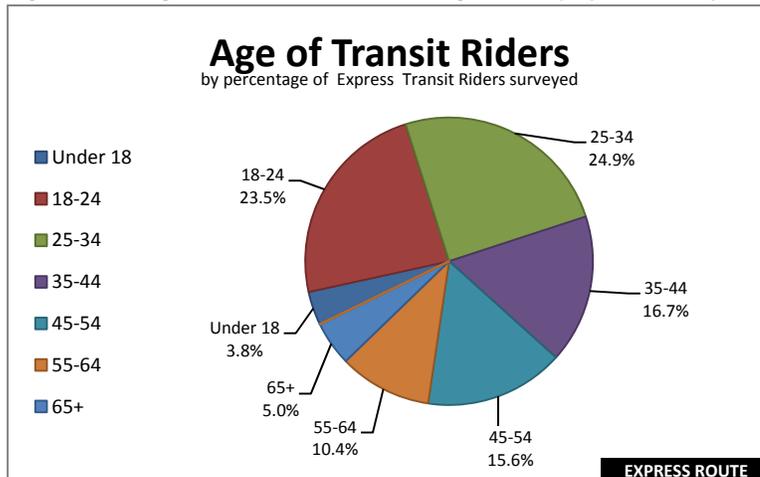


Figure 7-15b. Age of Transit Riders-Excluding Visitors (Residential Route)

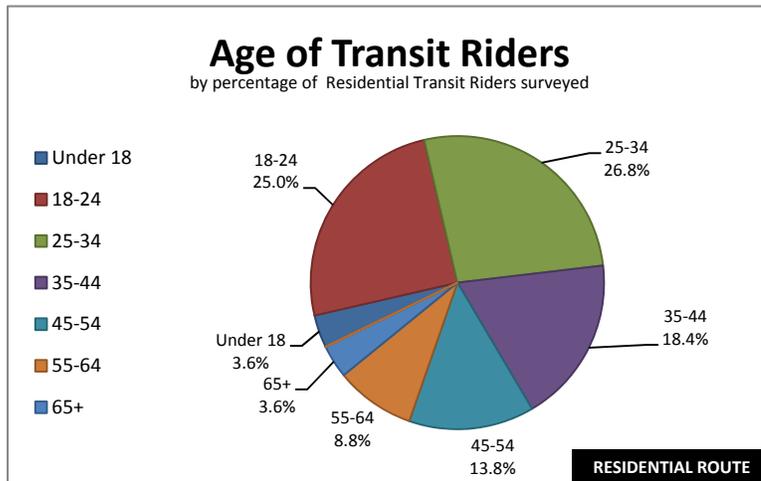


Figure 7-15c. Age of Transit Riders-Excluding Visitors (Downtown/Strip Route)

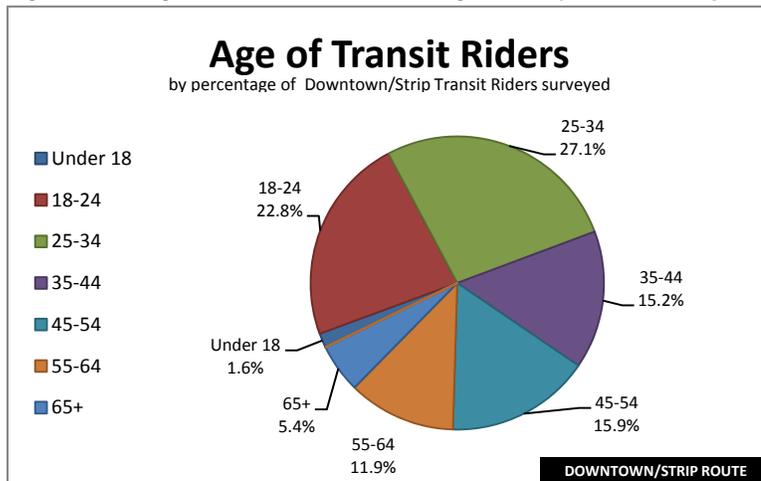
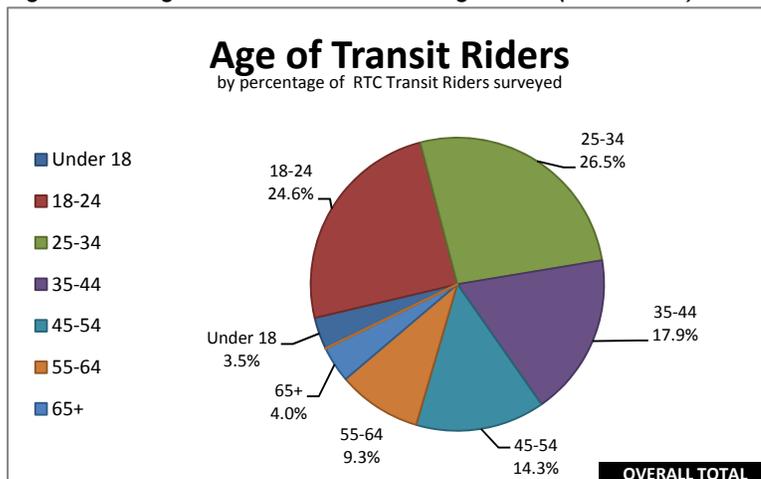


Figure 7-15d. Age of Transit Riders-Excluding Visitors (RTC Overall)



7.1.16 Race/Ethnicity (Local Residents Only)

Thirty-eight percent (38.7%) of all local RTC transit riders identified themselves as White, 35.8% identified themselves as Black/African American, and 22.3% identified themselves as Hispanic/Latino as shown in Figure 7-16d on the following page.

Forty-six percent (46.2%) of Express bus riders identified themselves as White, 35.2% identified themselves as Black/African American, and 16.6% identified themselves as Hispanic/Latino as shown in Figure 7-16a below.

Thirty-seven percent (37.4%) of local Residential bus riders identified themselves as White, 35.7% identified themselves as Black/African American, and 23.5% identified themselves as Hispanic/Latino as shown in Figure 7-16b below.

Thirty-eight percent (38.8%) of local Downtown/Strip bus riders identified themselves as Black/African American, 33.7% identified themselves as white, and 23.0% identified themselves as Hispanic/Latino as shown in Figure 7-16c on the following page.

The following results for Race/Ethnicity are based on a multiple response question. Therefore, results in this section can add up to over 100 percent.

Figure 7-16a. Race/Ethnicity of Transit Riders-Excluding Visitors (Express Route)

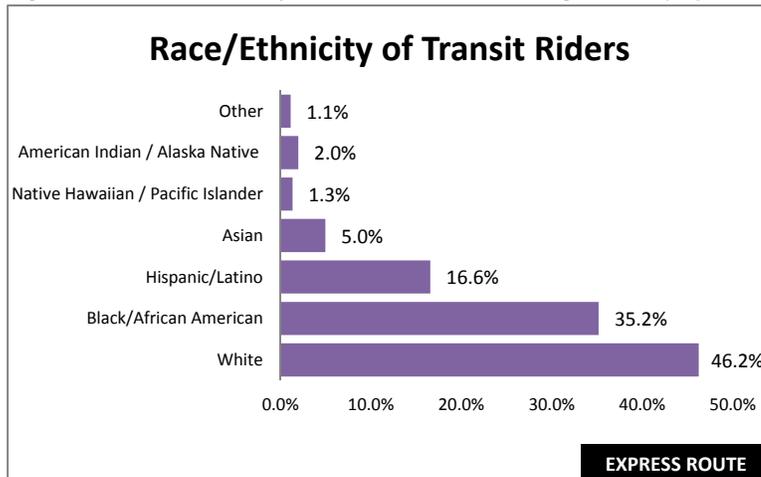


Figure 7-16b. Race/Ethnicity of Transit Riders-Excluding Visitors (Residential Route)

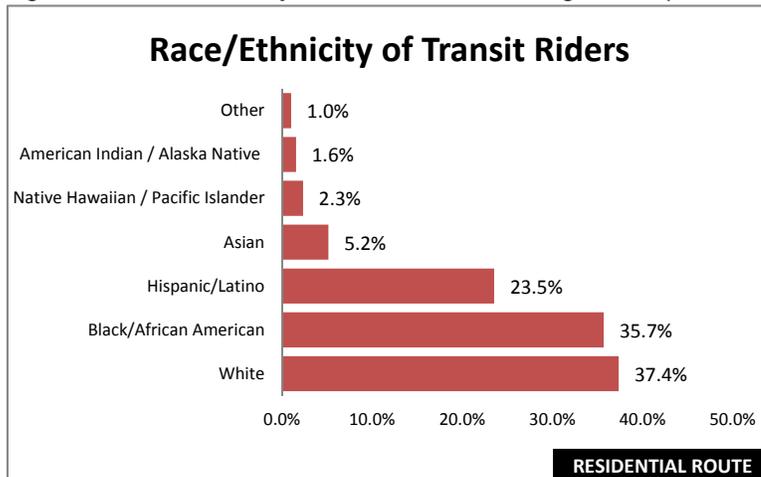


Figure 7-16c. Race/Ethnicity of Transit Riders-Excluding Visitors (Downtown/Strip Route)

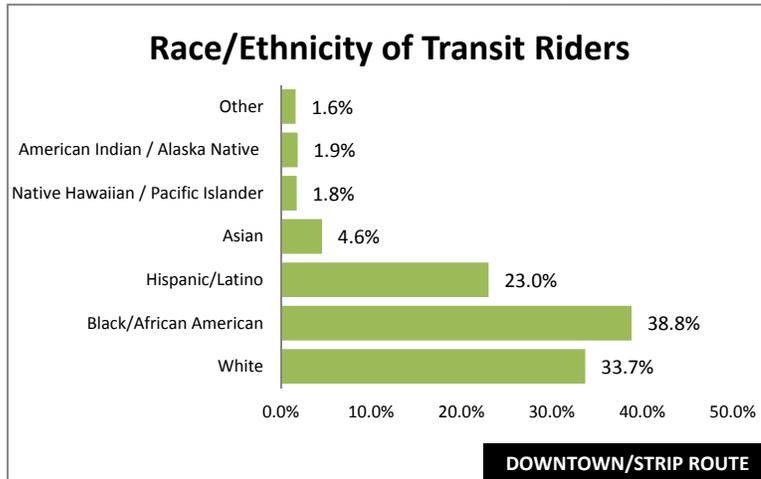
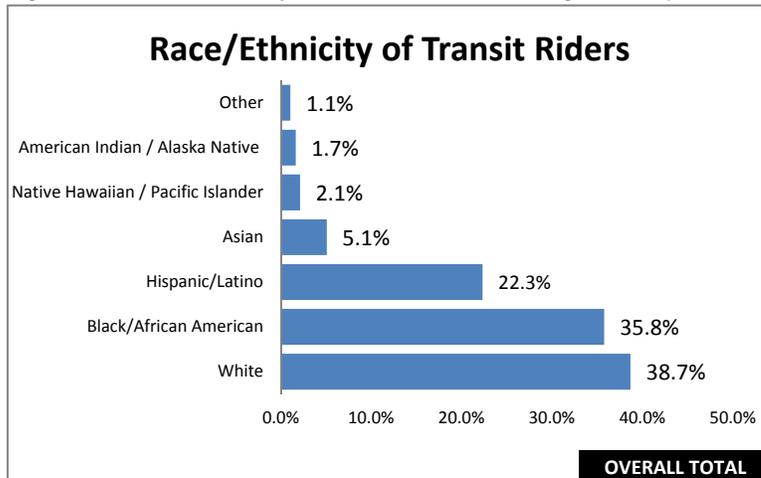


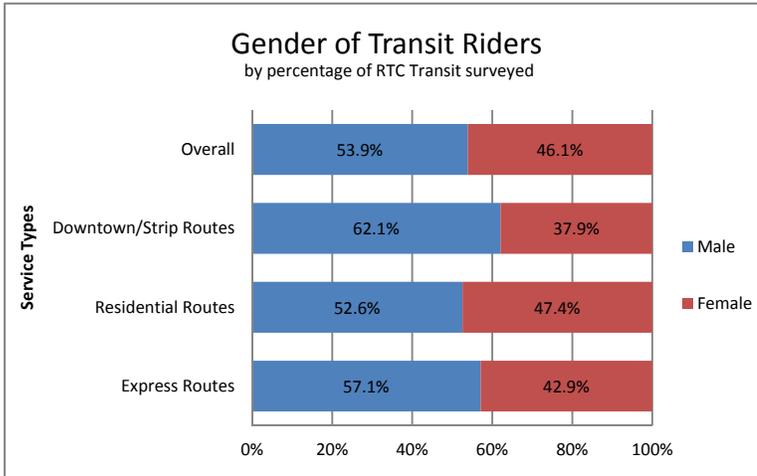
Figure 7-16d. Race/Ethnicity of Transit Riders-Excluding Visitors (RTC Overall)



7.1.17 Gender (Local Residents Only)

Of all local transit passengers, nearly 54 percent (53.9%) were male and over 46 percent (46.1%) were female. There were significantly more male riders on the Downtown/Strip routes than female riders (62.1% vs 37.9%) as shown in Figure 7-27.

Figure 7-17. Gender of Transit Riders (Excluding Visitors)



7.1.18 Income (Local Residents Only)

Of all local transit passengers, 65.0 percent reported annual household incomes below \$40,000. Only 4.0 percent reported an annual household income of \$60,000 or more as shown in Figure 7-18d.

Figure 7-18a. Total Annual Household Income-Excluding Visitors (Express Route)

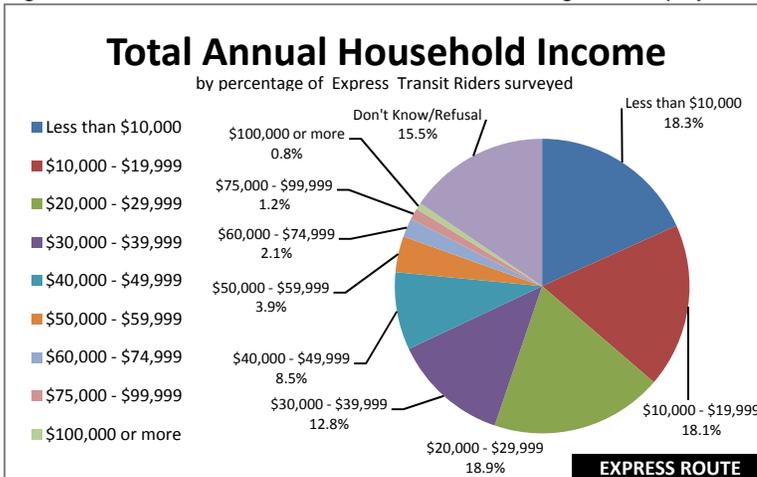


Figure 7-18b. Total Annual Household Income-Excluding Visitors (Residential Route)

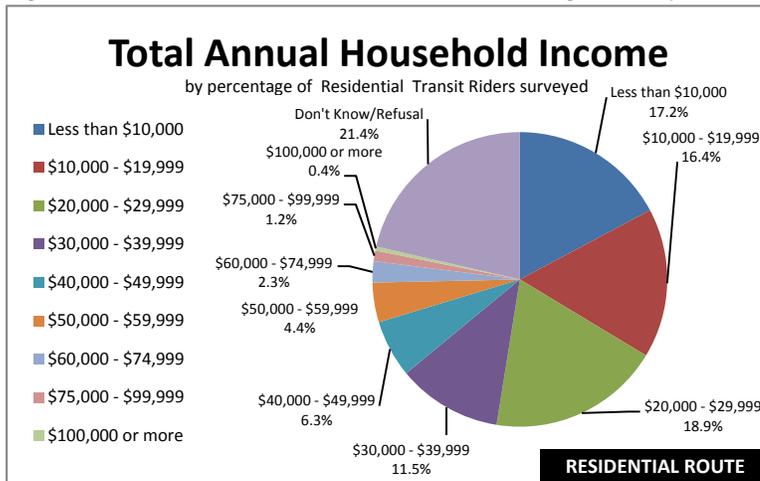


Figure 7-18c. Total Annual Household Income-Excluding Visitors (Downtown/Strip Route)

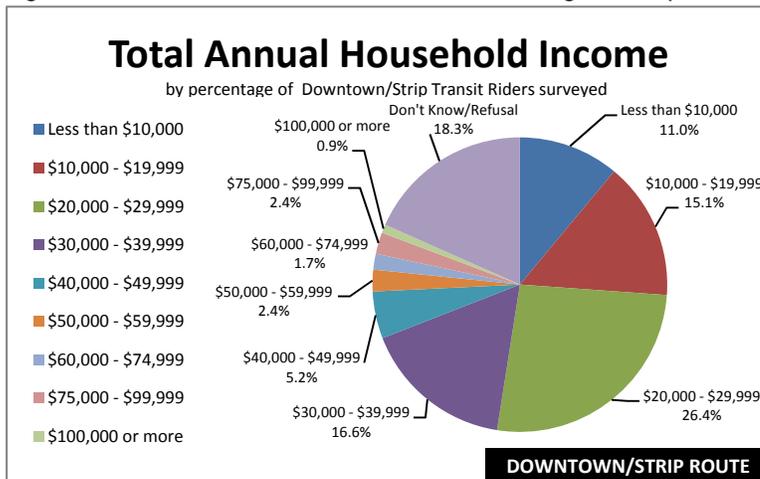
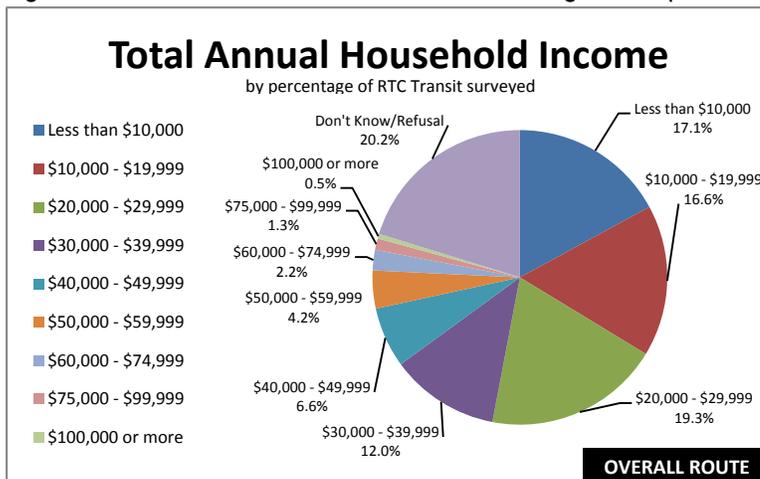


Figure 7-18d. Total Annual Household Income-Excluding Visitors (RTC Overall)



7.1.19 Transit Riders that Speak another Language besides English at home (Local Residents Only)

Nearly twenty-two percent (21.8%) of all local RTC bus riders indicated they spoke a language other than English at home as shown in Figure 7-19a below.

Spanish (77.4%), Tagalog (5.8%), and French (2.1%) were the three most popular Languages spoken at home other than English.

Of those riders that indicated they spoke another language besides English at home, 85.8% indicated they spoke English Well or Very Well as shown in Figure 7-19b below.

Figure 7-19a. Transit Riders that Speak another Language besides English at home (Excluding Visitors)

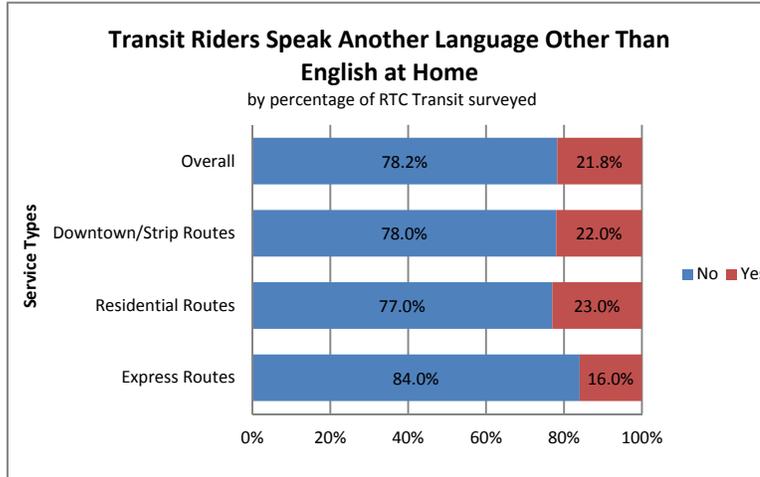
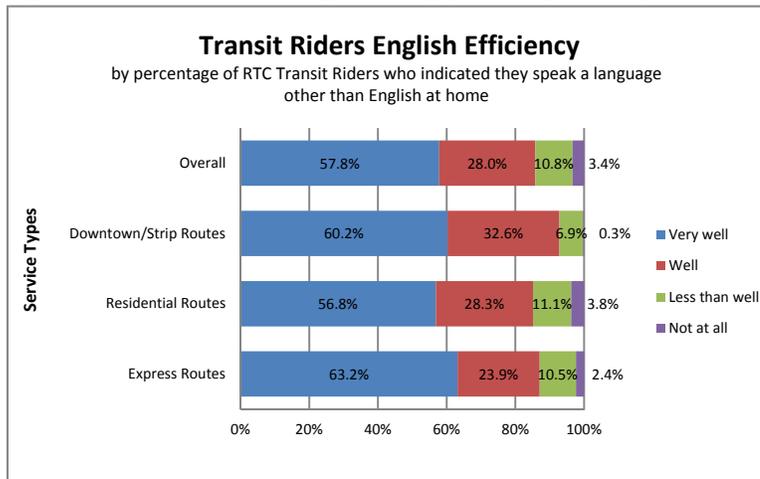


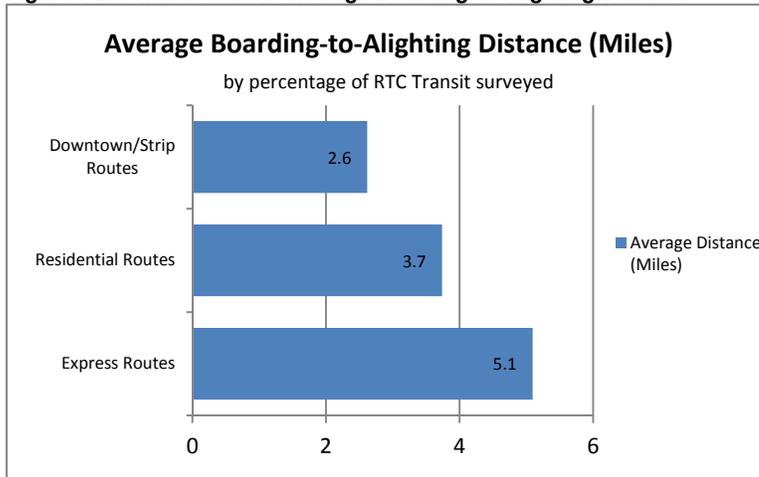
Figure 7-19b. Transit Riders English Ability (Excluding Visitors)



7.1.20 Transit Riders' Average Boarding-to-Alighting Distance

Express Route transit riders, on average, travel twice the distance as Downtown/Strip Route passengers. Express route passengers travel 5.1 miles on average, compared to Residential Routes (3.7 miles), and Downtown/Strip Routes (2.6 miles) as shown in Figure 7-20.

Figure 7-20. Transit Riders' Average Boarding-to-Alighting Distance

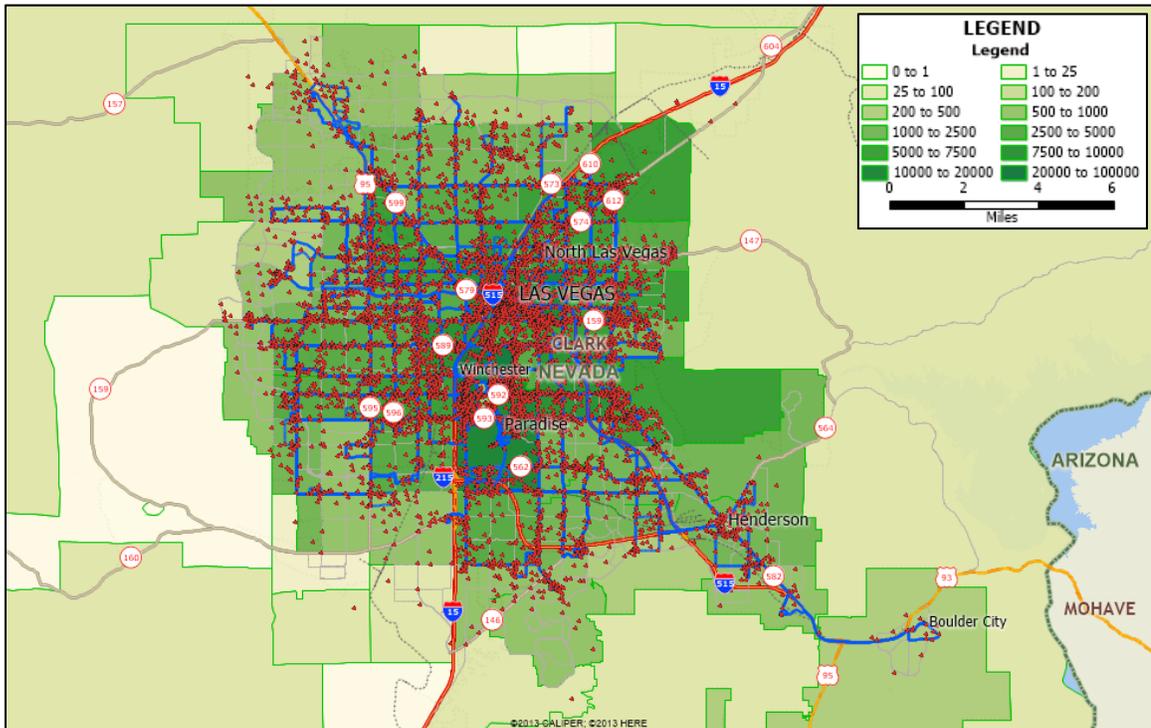


7.2 Travel Pattern Maps

7.2.1 Where Transit Trips Began

In Figure 7-20 below, you can see the visual representation of the study area where the greatest numbers of transit trips began. This is displayed with varying shades of green as indicated in the top right corner of the figure. Each shade of green represents the number of transit riders who indicated their trips began in the corresponding zip code. The blue lines on the figures represent the RTC Bus System and the red dots indicate Origin locations. The red circled numbers on the figures are just indications of major roads.

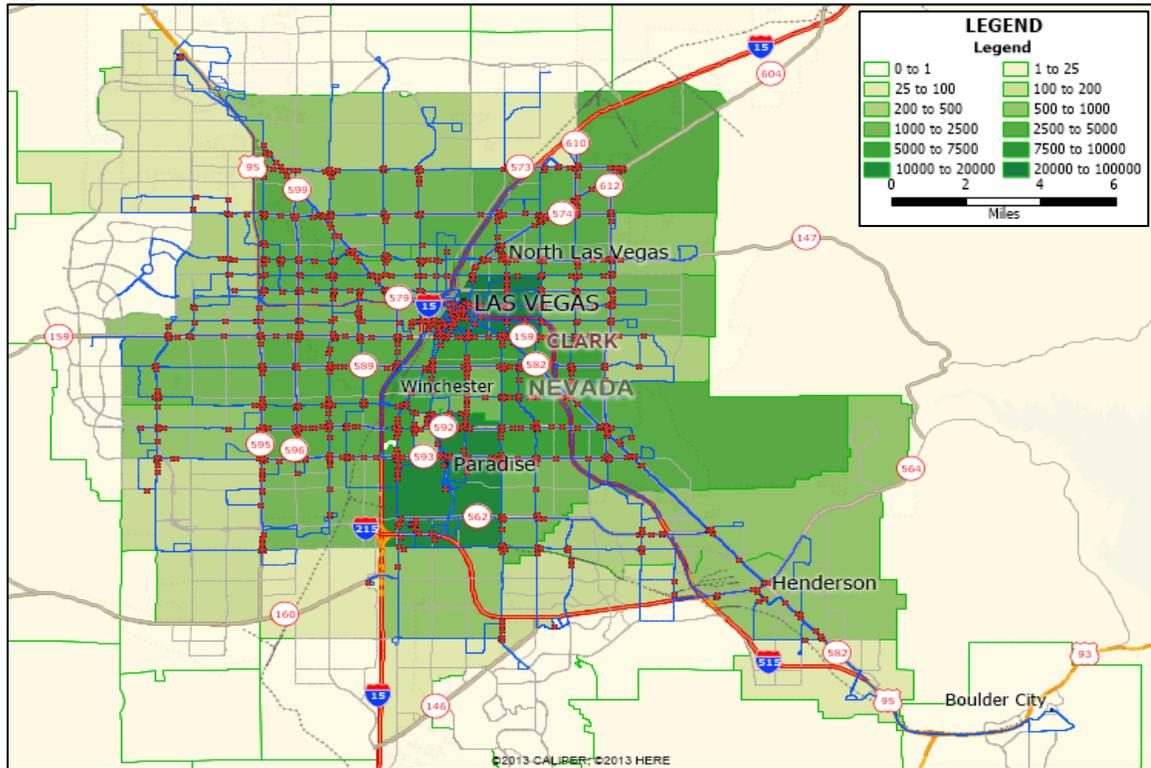
Figure 7-21. Geocoded Map Where Most Transit Trips Originated



7.2.2 Where Transfers Occur

In Figure 7-21 below, you can see the visual representation of the study area where the greatest numbers of transfers occurred. This is displayed with varying shades of green as indicated in the top right corner of the figure. Each shade of green represents the number of transit riders who indicated their transfer occurred in the corresponding zip code. The blue lines on the figures represent the RTC Bus System and the red dots indicate Transfer Locations. The red circled numbers on the figures are just indications of major roads.

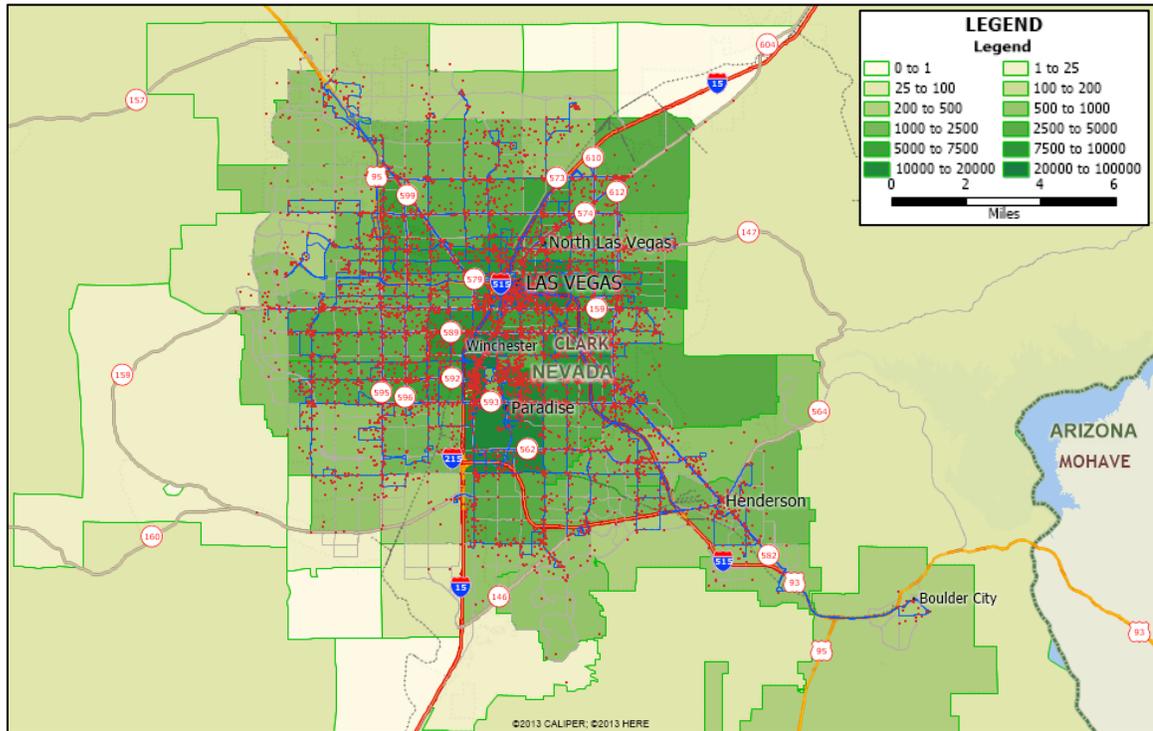
Figure 7-22. Geocoded Map of Where Most Transit Transfers Occurred



7.2.3 Where Transit Trips Ended

In Figure 7-23 below, you can see the visual representation of the study area where the greatest numbers of transit trips ended. This is displayed with varying shades of green as indicated in the top right corner of the figure. Each shade of green represents the number of transit riders who indicated their trips ended in the corresponding zip code. The blue lines on the figures represent the RTC Bus System and the red dots indicate destination locations. The red circled numbers on the figures are just indications of major roads.

Figure 7-23. Geocoded Map of Where Most Transit Trips Ended



Appendix A: Survey Instrument



RTC 2014 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 Las Vegas 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)

- Place of Work
- Other work related
- College / University (students only)
- School K-12 (students only)
- Medical / Hospital, non-work
- Hotel / Casino / Convention Center
- Shopping / Eating / Dining
- Recreation / Sightseeing / Sporting Event
- Airport (passengers only)
- Your **HOME** → Go to Question #4
- Other: _____

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

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

City: _____ State: _____ Zip: _____

4. How did you GET FROM the place in Question #1 TO THE VERY FIRST bus you used for this one-way trip?

- Walk – how long did you walk? _____ # minutes
- Bike – how long did you bike? _____ # minutes
- Wheelchair / Scooter – how long? _____ # minutes
- Was dropped off by someone (answer 4a)
- Drove alone and parked (answer 4a)
- Drove or rode with others and parked (answer 4a)

4a. Where did you board the first bus you used for this one-way trip (Write the nearest intersection / park-and-ride lot below):

5. Where did you get ON this bus?

Please provide the nearest intersection / station name / park-and-ride lot:

GOING TO?

6. What type of place are you

GOING TO NOW?

(the ending place for your one-way trip)

- Place of Work
- Other works related
- College / University (students only)
- School K-12 (students only)
- Medical / Hospital
- Hotel / Casino / Convention Center
- Shopping / Eating / Dining
- Recreation / Sightseeing / Sporting Event
- Airport (passengers only)
- Your **HOME** → Go to Question #9
- Other: _____

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

8. What is the EXACT ADDRESS of this place? (OR Intersection if you do not know the exact address:)

City: _____ State: _____ Zip: _____

9. How will you GET TO your destination (listed in Question #6) after you get off the LAST bus you will use for this one-way trip?

- Walk – how long will you walk? _____ # minutes
- Bike – how long will you bike? _____ # minutes
- Wheelchair / Scooter – how long? _____ # minutes
- Be picked up by someone (answer 9a)
- Get in a parked vehicle & drive alone (answer 9a)
- Get in a parked vehicle & drive/ride w/others (answer 9a)

9a. Where will you get off the last bus you are using for this one-way trip (Write the nearest intersection / park-and-ride lot below):

10. Where will you get OFF this bus?

Please provide the nearest intersection / station name / park-and-ride lot:

11. INCLUDING THIS BUS, how many TOTAL BUSES will you use to make THIS ONE-WAY TRIP?

One, only this bus Two Three Four or more

11a. Please list the BUS ROUTES in the exact order you use them for this one-way trip.

START → → → → → END

1st Bus Route

2nd Bus Route

3rd Bus Route

4th Bus Route

Continue



OTHER INFORMATION ABOUT THIS TRIP

12. What time did you BOARD this bus? _____ : _____ am / pm (circle one)
13. Will you (or did you) make this same trip in exactly the opposite direction today?
 No Yes - At what time did/will you leave for this trip in the opposite direction? _____:_____ am/pm (circle one)
14. How many people (including yourself) are traveling in your group for this one-way trip? _____ people
15. What type of fare did you use for this one-way trip?
- Single Ride 2-hour pass 24-hour 3 Day pass
 15 day pass 30-day pass U Pass

ABOUT YOU AND YOUR HOUSEHOLD

16. Are you a visitor to the Las Vegas area? No Yes (if YES, please skip to after Q27)
17. How many vehicles (cars, trucks, or motorcycles) are available to your household? _____ vehicles
- 17a. [If #17 is more than NONE] Could you have used one of these vehicles for this trip? Yes No
18. Including YOU, how many people live in your household? _____ people
19. Including YOU, how many people (over age 15) in your household are employed full/part-time? _____ people
20. Are you: (check the one response that BEST describes you)
- Employed full-time Employed part-time
 Not currently employed but seeking work Not currently employed and not seeking work
 Retired Homemaker
21. Are you a student? (check the one response that BEST describes you)
- Not a student Yes – Full Time college/university Yes – K - 12th grade
 Yes – Part Time college/university Yes – vocational/technical/trade school Yes – other
- 21a. [If #21 is Yes] Please specify your college/university/school name: _____
22. Do you have a valid driver's license? Yes No
23. What is your AGE? Under 18 18-24 25-34 35-44 45-54 55-64 65+
24. Are you? (check all that apply)
- American Indian / Alaska Native Asian Black/African American Hispanic/Latino
 Native Hawaiian / Pacific Islander White Other: _____
25. What is your gender? Male Female
26. Which of the following BEST describes your TOTAL ANNUAL HOUSEHOLD INCOME in 2013 before taxes?
- Less than \$10,000 \$10,000 - \$19,999 \$20,000 - \$29,999
 \$30,000 - \$39,999 \$40,000 - \$49,999 \$50,000 - \$59,999
 \$60,000 - \$74,999 \$75,000 - \$99,999 \$100,000 or more
27. Do you speak a language other than English at home? No Yes - Which language? _____
- 27a. [If #27 is Yes] How well do you speak English? Very Well Well Less than well Not at all

REGISTER TO WIN \$100

People who submit an accurately completed survey will be entered in a random drawing for one of Ten \$100 cash prizes. You must provide your home address at the beginning of the survey to be eligible.

Your Name: _____

Phone Number: (_____) _____

E-mail address: _____

Thank you for your help!

If you completed this survey before getting off the bus, please return this survey to the survey staff.
If you did not have time to complete the survey during your trip, please return it within 24 hours using the postage-paid envelope that was provided.