Regional On-Board Transit Survey

Final Report

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In association with

PBS&J

DW & ASSOCIATES

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TABLE OF CONTENTS

SECTION 1: OVERVIEW

Purpose of the Survey

The purpose of this survey is to gather updated travel behavior data from transit users in the Atlanta area. The data gathered will be used to recalibrate ARC's mode choice model. The data will also be shared with regional transit operators to help them gain a better understanding of how their services are being used.

Geographic Scope for the Project

The area covered for this study includes: the City of Atlanta and the counties of Clayton, Cherokee, Cobb, DeKalb, Douglas, Fayette, Fulton, Gwinnett, Henry, Rockdale, Barrow, Bartow, Carroll, Coweta, Forsyth, Hall, Newton, Paulding, Spalding, and Walton.

Project Oversight

Oversight for this project is being provided by an advisory team composed of representatives from the ARC, Georgia Regional Transportation Authority (GRTA), the Metropolitan Atlanta Rapid Transit Authority (MARTA) and the Georgia Department of Transportation (GDOT). The advisory team will also incorporate suggestions and recommendations from the Transit Operators Subcommittee (TOS), which is comprised of transit service operators and any sponsor that is eligible for 5307/5340 funds.

SECTION 2: SURVEY DESIGN

ETC Institute developed a survey instrument that was administered as an in-person interview using tablet PC's and printed surveys.

The survey instrument was developed to gather information that will support regional transportation planning needs. The types of information gatherer were divided into two groups. Items that were identified as "required" had to be asked of each respondent. Items identified as "optional" were only asked of respondents if time allowed. Each of the types of information that were gathered on the survey is listed below:

Required Data
- Origin address and type of place
- Transfers to get to the current route from origin
- Mode of access to the transit system
- Boarding address
- Alighting address
- Transfers to get to/from current route to destination
- Mode of egress from the transit system
- Destination address and type of place
- Home address
- Number of autos available in household
- Household size
- Number of adults in household
- Number of workers in household
- Respondent's employment status
- Respondent's student status
- Driver's License status
- Age of respondent
- Annual Household Income
- Time of Day

Optional Data

- Distance/time walked from origin to the transit system (if applicable)
- Park and ride location (if applicable) on either end of the trip
- Distance/time walked from the transit system to destination (if applicable)
- Frequency of transit use
- How often the trip is made
- Fare payment method
- Auto availability for this trip
- Hispanic origin
- Race
- Ability to speak English
- Gender
- Employment address if not provided as an origin/destination
- School address if not provided as an origin/destination
- (if employed) Whether the respondent will go to work later in the day if he/she did not report work as an origin/destination
- (if a college student) Whether the respondent will go to college later in the day if he/she did not report college as an origin/destination

The **trip purpose** was assigned after the interview was completed based on the "types of places" that are reported as the origins and destinations for the trip.   The trip purpose categories that were assigned included:

- Home-Based Work
- Home-Based Shopping
- Home-Based College
- Home-Based School
- Home-Based Medical
- Home-Based Airport
- Home-Based Other
- Non-Home-Based

The survey was administered in both English and Spanish. Copies of the survey instruments are provided in Appendix C.   [Note: questions that were "required" are identified by a square that surrounds the question number.]

SECTION 3: SAMPLING PLAN

In order to ensure the distribution of completed surveys mirrored the actual distribution of riders through the region's rail system, ETC Institute worked with each of the transit operators in the region to gather accurate ridership for each bus route and rail station in the Atlanta area. Overall, the sampling goal was to obtain completed surveys from approximately 10% of the transit boardings in the region or 44,000 completed surveys based on average daily boardings of 440,000. ETC Institute established specific goals for (1) the distribution of surveys along each route and (2) the distribution of surveys between rail stations as described below.

RAIL SYSTEM SAMPLING PLAN

For the RAIL sampling plan, ETC Institute used the average weekday ridership between stations as a guide for setting the sampling goals for each station. The sampling goals for the rail system were further refined by setting targets for the number of surveys to be completed based on the station of entry/exit.   The purpose of this refinement was to ensure that the types of trips represented in the sample reflect the types of trips that are actually being completed. The table below shows an example of the number of trips that entered and exited the rail system at various rail stations.

Average Weekday Rail Ridership Between Selected Stations

ENTRY_STATION	EXIT STATION						
	Airport	Arts Center	Ashby	Avondale	Bankhead	Brookhaven	Buckhead
Airport	0	253	33	143	33	162	195
Arts Center	263	0	47	87	23	113	83
Ashby	52	66	0	38	77	10	19
Avondale	174	113	33	0	24	11	33
Bankhead	56	38	66	27	0	8	11
Brookhaven	163	148	8	10	7	0	9
Buckhead	172	97	15	33	8	14	0

Therefore, in addition to completing surveys with at least 10% of the riders at each station, ETC Institute also managed the sample to ensure that the distribution of completed surveys between stations was within 10 or 10% of the actual number of trips that are completed between stations (whichever was larger).   For example, if there were 253 trips between Airport Station and Arts Center Station on a typical weekday as shown in the table above, ETC Institute tried to obtain at least 25 completed surveys (10% of the actual) that entered the rail system at Airport Station and exited the system at Arts Center Station as shown in the table on the following page.

An example of the sampling plan for the seven stations that were selected for this example is provided on the following page.

Sample Sampling Plan for MARTA Rail System

	EXIT STATION						
ENTRY STATION	Airport	Arts Center	Ashby	Avondale	Bankhead	Brookhaven	Buckhead
Airport	0	25	3	14	3	16	20
Arts Center	26	0	5	9	2	11	8
Ashby	5	7	0	4	8	1	2
Avondale	17	11	3	0	2	1	3
Bankhead	6	4	7	3	0	1	1
Brookhaven	16	15	1	1	1	0	1
Buckhead	17	10	1	3	1	1	0

The usage of Tablet PC's to collect the data allowed the survey team to monitor the distribution of completed surveys in the field, which improved the research team's ability to reach these goals while in the field.

BUS SYSTEM SAMPLING PLAN

In order to ensure that the distribution of completed surveys mirrored the actual distribution of riders using the region's bus system, ETC Institute worked with the region's transit operators to gather daily ridership data by stop for each of the fixed routes that were included in the survey.

The table below shows a portion of the ridership data from 6 stops along MARTA Route #1. As the table shows, the number of riders who board at some stops was much higher than others. For example, at stop #3, a total of 412 riders boarded on a typical weekday compared to just 4 riders at stop #4. If riders were being surveyed while the bus is moving along a route, it would have been easy to under-represent riders who boarded at stops such as stop #3 because of the practical limitations of administering surveys when large numbers of people board a bus at single location.

BUS ROUTE SAMPLING PLAN:

ROUTE: MARTA 1

(ridership counts for Northbound Direction Only)

STOP DESCRIPTION	AVG DAILY BOARDINGS BY STOP	AVG DAILY ALIGHTINGS (OFF) BY STOP
1. EDGEWOOD AVE SE COURTLAND	3	6
2. EDGEWOOD AVE SE PEACHTREE	27	7
3. MARIETTA ST NW BROAD ST N	412	45
4. IVAN ALLEN BLVD WILLIAMS	4	1
5. IVAN ALLEN BLVD CENTENNIA	5	15
6. IVAN ALLEN BLVD LUCKIE ST	6	58

In order to prevent high volume stops from being underrepresented, ETC Institute managed the number of completed surveys by stop or segment along each bus route. Stops along each route were organized into sampling segments along each route with the goal of completing surveys with at least 10% of the riders in each segment. Rail stations and stops with more than 100 daily riders were not grouped with other stops. These locations were stand-alone segments.

The actual number of completed surveys for each segment is shown in Appendix F. While the initial sampling goals were managed for the overall day, the data expansion plan was further refined by time of day (morning peak, evening peak, and non-peak periods). The data shown in Appendix F shows the final ridership data and the number of completed surveys for each route and route segment by time of day.

SECTION 4: TEAM ORGANIZATION AND SURVEY ADMINISTRATION PROCEDURES

ORGANIZATIONAL STRUCTURE OF SURVEY TEAM

The survey was administered by four teams who were directly supervised by the project manager. The key individuals who oversaw data collection in the field are listed below. All of these people had at least three years of experience managing on-board surveys in the field.

- Project Manager – Chris Tatham
- Asst Project Manager – Norris Anderson
- Team Leader 1 – Aaron Hekele
- Team Leader 2 – Nick Jones
- Team Leader 3 – Grace Grimm
- Team Leader 4 – Dr. Robert Cicerone

Each team leader supervised 20 interviewers.   Teams 1, 2, and 3 focused their efforts on the administration of surveys on bus routes. Team 4 focused its efforts on the administration of surveys on trains.

Leadership Group. The leadership group consisting of the project manager, assistant project manager, and 2-3 data entry personnel were centrally positioned to all teams each week. The leadership team's location provided easy access to the rail stations and each of the bus routes that were surveyed to allow the project manager to conduct regular inspections and to allow team members to regularly report their progress during the day. For example, during the pilot test, the leadership group was centrally located at a coffee shop that was within walking distance of all bus routes and rail stations that were being surveyed each day. The selection of bus routes to be surveyed each week was carefully planned to ensure the leadership group could directly interface with all routes as they were being surveyed.

Bus Teams. Teams 1, 2, and 3 administered the survey to riders on an average of 2-3 routes per day.   In most cases, interviewers were assigned to conduct surveys on every other bus operating on each route. For example, if there were two buses assigned to the route, interviewers administered surveys on 1 bus. If there were 6 buses operating on a route, interviewers conducted surveys on 3 buses, etc.   If only one bus was assigned to a route, interviewers rode that bus. Interviewers were evenly distributed throughout the bus route to ensure good coverage throughout the day.

Bus Team Member Responsibilities. The responsibilities for team leaders and interviewers are briefly described below.

- Team Leader.
    o Ensure interviewers were properly trained and equipped to conduct surveys
    o Assign work
    o Inspect work
    o Download data from interviewers
    o Submit data to the project manager

- Interviewers – at least two interviewers were assigned to each bus
    One interviewer conducted boarding and alighting counts.
    The other interviewer(s) administered the survey.
    Interviewers shifted responsibilities after their assigned bus completed a full route. This allowed the team leader and project manager to compare differences in the data collected from each interviewer to allow early detection of interviewer bias.

After each interviewer completed a full route, the interviewer checked-in with the team leader, who down-loaded the data collected from the interviewers tablet PC.

Rail Team. Team 4 administered the survey at each rail station. The team focused on a group of 4-6 adjacent stations per week. Each day the team focused on 1 or 2 specific stations, but interviewers "floated" to other stations within the assigned group of stations as needed. The "floating" occurred if a respondent did not have time to complete the survey. In this case, the interviewer boarded the train with the respondent and completed the survey. The interviewer would then exit the train at the next station. The interviewer would then administer a survey to another rider in the opposite direction to return to the station that was the focus that day's surveying efforts.

At each station, interviewers were assigned specific zones within the station in which to work. As passengers entered an interviewer's zone, they would be randomly selected to participate in the survey.

Rail Team Responsibilities. The responsibilities for team leaders and interviewers are briefly described below.

- Team Leader.
    o Ensure interviewers were properly trained and equipped to conduct surveys
    o Assign work
    o Inspect work
    o Download data from interviewers
    o Submit data to the project manager

- Interviewers – 15-20 were assigned to each station.
    o Administer survey in accordance with the sampling procedures described in Section 4
    o Check-in with the team leader each hour to down load data collected

SURVEY ADMINISTRATION PROCEDURES

Timing of the Survey. The survey was administered during weekdays (Monday-Friday) from in October 2009 thru January 2010 with the exception of the Thanksgiving and winter school breaks from Nov 17-29 and December 19-January 10. The time of day that the survey was administered coincided with the hours that each route was operational 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. In most cases, the surveys were administered from 6:00am – 7:00pm.

The project manager coordinated with each transit agency to verify the hours of operation for each route and the number of buses that were assigned to each route one week before the survey was scheduled to be conducted. Final staffing assignments were made at that time to ensure that an adequate number of interviewers were assigned to each route.

Sampling Procedures. To ensure that a random sample of riders were selected for the survey, the following procedures were followed by interviewers.

- o **Rail System**. Each of the interviewers was assigned a specific zone within the station to work. The zones were established to provide coverage for entire station based on the number of interviewers who were assigned to work at the station. For rail passengers, every third person who entered an interviewer's zone was asked to participate in the survey.

- o **Bus System**. Since the number of people who boarded at each stop varied and there was a potential for bias in the sequence in which people board a bus (e.g., older people are allowed to get on first), a random number generator was used to determine which passengers were asked to participate in the survey. If 5 people boarded the bus, the tablet PC randomly generated a number from 1 to 5. If the answer was 2, the second person was asked to participate in the survey. If 3 people boarded the bus, the tablet PC randomly generated a number from 1 to 3. If the answer was 1, the first person was asked to participate in the survey, and so forth. Once the interviewer completed a survey, the interviewer used the random number generator to select the next person to participate in the survey based on the number of people who boarded at the stop that immediately followed. At bus stops that had a high volume of riders, the interviewer asked every third person who arrived at the stop.

General Administration Procedures.

- • **Prior to the Administration of the Survey**. The team leader for each route conducted a physical reconnaissance of the route. This review included:

  - o Ensuring that the stops previously identified matched the route actually being driven
  - o Identifying large employers/schools along the route, which may impact ridership patterns at certain times of the day
  - o Assessing whether a high percentage of the riders did not speak English; if more than 10% of the riders did not speak English, provisions were made to have a bilingual interviewers on the route.

- o Preparing ridership count worksheets; these worksheets were used to record boarding and alighting data at each stop along the route.

- **During the Administration of the Survey**. With the exception of surveys that were completed by people who made short-trips (see below), surveys were administered under the direct supervision of an interviewer. Most surveys were administered using a tablet PC. The interviewer read questions from the tablet PC and recorded the respondent's answers. In some situations, the interviewer would provide the respondent with a hard copy of the survey which was completed in the presence of the interviewer. If a hard copy of the survey was completed, the interviewer reviewed the printed survey and debriefed the respondent to ensure all of the information on the survey was properly completed. The hard copy of the survey was then entered into the tablet PC to ensure that the quality of the data provided on paper met the same standards maintained by surveys collected electronically.

Special Procedures for Short-Trips. The tablet PCs were programmed to ask each person selected to participate in the survey whether or not they had at least five minutes to complete the survey (the average length of the survey during the pilot test was just under 5 minutes).

- If a rider did NOT have five minutes, the interviewer asked the rider to provide the name of the place where the rider was (1) getting on and (2) getting off the train or bus and recorded the information in the tablet PC. The interviewer then gave the rider a printed copy of the survey which could be completed by mail or on the internet. The interviewer also recorded the (1) serial number of the printed survey, (2) route/station name, and (3) time of the survey. This allowed the research team to match surveys that were returned by mail or over the Internet to the recorded information that was originally provided by the respondents. By doing this, the research team was able to ensure that the trips that were completed by mail/Internet actually matched trips that would have been captured in the field if the respondent had had enough time to complete the interview.

- If the person had at least five minutes, the interviewer proceeded with the administration of the full survey. If after beginning the full survey, the interviewer realized that the respondent did not actually have time to complete the full survey, the interviewer tried to complete all of the remaining "required" questions before the interview was terminated. If the interviewer did not have time to complete all of the "required" questions, the interviewer gave the respondent a printed version of the survey that could be returned by mail or on-line as described above.

SECTION 5: GEOCODING PROCESS

Each ARC transit survey record attempts to descriptively convey information about five physical locations: trip origin, trip destination, where the transit user boarded the transit vehicle, where he or she exited the bus or train, and the home/residence location of the transit user. For the survey to be of use to the underlying transit system modeling effort, the geographic coordinates of all five locations were determined through geocoding.

Effective geocoding depends mainly on the initial quality of location data. Opportunities for spelling errors in field-recorded addresses were minimized in order to achieve high hit rates and credible geocoding results. The ARC survey instrument, which was set up on a portable Tablet PC, was configured with lists of place names relevant to the study area, which were instantly and transparently accessible during survey acquisition. These pre-configured lists contained city and county names, street names, bus stop names and train station names. Each inventoried bus stop on the list was linked to its own unique System ID number which was captured automatically and transparently during the survey. The System ID was subsequently used in post-processing to automatically retrieve pre-recorded geographic coordinates of the bus stop.

Survey records were geocoded in batches as they arrived from the field, after initial high-level cleanup and file formatting. The geocoding process comprised several steps which were followed both sequentially and iteratively, based on quality checks. Both automated and manual processes were used to identify the coordinates of reported locations.

After the initial cleanup of location data, addresses were geocoded using the TransCAD GIS geocoding routines and Caliper's latest available nationwide street centerlines. Addresses which failed to geocode in this step were subsequently processed inside a geocoding utility published by a commercial mapping provider, using their up-to-date street centerlines.

The remaining non-decodable addresses were then manually corrected and geocoded again using the same software and reference databases. At this point any remaining addresses were corrected and geocoded manually using online mapping resources such as the following:

- Google Maps
- MapQuest
- Yahoo Maps
- Bing Maps
- the USGS Geographic Names Information System (GNIS)
- custom web-based geocoding routines such as GetLatLon or Geocode.com

The manual process utilized two or more different mapping systems at the same time to reduce error rate.

The geocoded results were checked for errors recursively, until all five locations within a record were completely geocoded or until a record was declared unfit for further processing. Error checks included comparing attributes derived from the geocoded coordinates to those recorded during the field survey, e.g. city name. Quality checks also comprised proximity tests between the geocoded boarding or alighting locations and the line segment representing the bus route; these tests and corrections were performed with custom scripts developed for this project in GISDK (TransCAD). Distances between each consecutive pair of trip points were also computed as a basis of logic checks used to flag records for further (typically manual) verification and correction.

Once a batch of geocoded records successfully completed error checking, the location coordinates were converted from decimal degrees to the State Plane Coordinate System (NAD83, GA West1002, feet) for further processing and error checking at the transit system model level. Records flagged through this process were manually reviewed and corrected.

SECTION 6: QA/QC PROCEDURES

The Atlanta Regional Commission received a quality data set that will aid their efforts to find solutions to the region's transportation issues. Quality assurance was practiced in all phases of the Atlanta Onboard Survey, from data collection to making eleventh hour 'completeness' requirements where valid responses for the following list of variables constituted a full and 'complete' survey trip:

- Origin address and type of place
- Transfers (all routes used) to get to the current route from origin
- Mode of access to the transit system
- Boarding address
- Alighting address
- Transfers (all routes used) to get to from current route to destination
- Mode of egress from the transit system
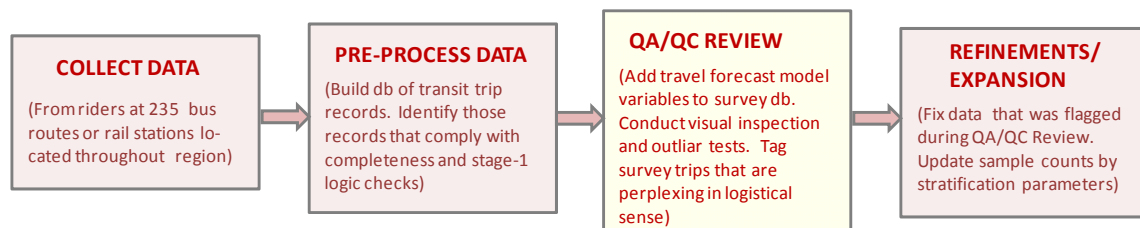- Destination address and type of place
- Home address

- Number of autos available in household
- Household size
- Number of adults in household
- Number of workers in household
- Respondent's employment status
- Respondent's student status
- Driver's License status
- Age of respondent
- Annual Household Income
- Time of Day

Most of the QA/QC Review reported on in this section pertained to the process of refining text strings in the address variables and their conversion to X,Y coordinates.

In the simple flowchart of onboard survey activities depicted in Figure 7.1 below, the QA/QC Review is highlighted in the third box.

<div align="center">

Figure 7.1 –
QA/QC REVIEW IN OVERALL SURVEY PROCESS

</div>

COLLECT DATA	**PRE-PROCESS DATA**	**QA/QC REVIEW**	**REFINEMENTS/ EXPANSION**
(From riders at 235 bus routes or rail stations located throughout region)	(Build db of transit trip records. Identify those records that comply with completeness and stage-1 logic checks)	(Add travel forecast model variables to survey db. Conduct visual inspection and outlier tests. Tag survey trips that are perplexing in logistical sense)	(Fix data that was flagged during QA/QC Review. Update sample counts by stratification parameters)

Beyond the QA/QC Review box highlighted above, the ETC Team incorporated significant measures in the Data Collection, Pre-Processing and Refinements/Expansion phases that contributed to assure quality. It began with the training, instructions and monitoring of interviewers in the data collection process. During Pre-Processing, constant efforts were made to scrub and clean address or location information, as well as assure logical relationships between related household characteristic variables. Toward the end of the survey process, in the Refinements/Expansion phase, efforts were made to fix those trip records that were flagged for logistical reasons.

Several travel forecast model variables, calculated from survey data, were added to the survey data during the QA/QC Review which aided in assessing the logistical sensibility of each trip. These variables were "Trip Purpose", "Number of Transfers" and "Distance" (straight line between origin and destination).

Pre-Process Phase

In between Data Collection and the QA/QC Review phase the following checks were performed:

- All required fields were filled with valid data for that field. Much of this was controlled in the field as a consequence of input restrictions that were set on the tablet PCs used to gather data. For example, interviewers were not able to proceed to the next screen until a valid answer for required questions is provided.

- Place names and street addresses were properly and consistently spelled

- The number of household occupants was greater than or equal to the number of employed members of the household and the number of adults in the household

- Number of household occupants was greater than or equal to the adults in the household

- Number of workers was greater than the household size

- Number of household vehicles was consistent with the household income and number of workers

- Household income responses appeared consistent with annual household income and other household characteristics

- Distribution of the results by individual interviewer. This was done to identify biases in the sampling procedures that were performed by interviewers.

Once the completeness and logic checks were done, the following addresses were geocoded to X,Y coordinates.

- Home address

- Origin address

- Destination address

- Boarding address

- Alighting address

- Employer address (if provided)

- School address (if provided)

Once the completeness, logic checking and X,Y coordinate assignments were done, the data were submitted to another member of the ETC Team for the QA/QC Review.

QA/QC Review Phase

Survey trips were reviewed using database and mapping techniques that highlighted inconsistent or outlier trip characteristics. In particular, those characteristics pertaining to a survey trip's appearance and logistics were assessed in this phase of the onboard survey. The following kinds of logistical inconsistencies were identified in this phase:

- Inappropriate boarding or egress locations in relation to the surveyed transit route, origin trip end and destination trip end

- Inappropriate origin or destination locations in relation to the surveyed transit route or rail station, access mode and egress mode

- Inappropriate trip leg detail in relation to the origin, destination, transit route or rail station surveyed, access mode and egress mode

Logistics Checking Process

The objective of the QA/QC Review phase was to assign each survey trip with one of three (3) trip quality designations. These were:

- '1' – indicating logistical characteristics were consistent

- '2' – indicating logistical characteristics were not consistent with each other but could be corrected easily

- '3' – indicating logistical characteristics were not consistent with each other and probably could not be corrected easily

Several new survey trip file variables were derived from the pre-processed data set and added to the survey trip file prior to beginning the QA/QC Review. These were:

- Model trip purpose;

- Straight line distance between origin and destination

- Number of transfers between transit legs of the trip.

Assignment of quality control tags to survey records was accomplished by passing each one through a two-step inspection process. The first was to create a Profile Report file and the second was to perform a critical analysis of survey trips in a Map Tool. The first step, a Profile Report of trip characteristics from riders surveyed on a particular bus route or at a specific rail station, contained frequency distributions of key survey variables like:

- access type

- walk access distance

- trip purpose

- trip distance (straight-line)

- number of transfers

- household size

- number of workers in the household

- household income and autos available

These were reviewed by the QA/QC team with the intention of identifying upper and lower thresholds. These thresholds were used in the trip visualization process to query groups of survey trips for extra investigation.

Another variable was created by the ETC Team strictly for quality control purposes during the QA/QC Review. This was referred to as the 'Ratio Test' variable. The value of the Ratio Test was calculated from the ratio formed by the survey trip's path distance to the straight-line origin-destination distance. The path distance was computed as the sum of three separate distances. These were: (1) distance from the origin point to the boarding location; (2) distance between the boarding and alighting locations; and, (3) distance from the alighting point to the destination. Generally, a ratio above 2.5 indicated there could be a trip logistic issue. There were, however, valid reasons for this ratio to be much higher in some cases.

A Profile Report summary created from a batch of 191 survey trips surveyed at MARTA's Five Points Station is presented in Table 7.1. In addition to the report summary of frequency distributions, profile report files contained lists of survey trip identification numbers that were sorted by 'trip distance' (straight-line) and 'Path Ratio'.

Table 7.1 – QA/QC Profile Report
(MARTA's Five Points Station)

Sample Name:	5P			Route Name:	MARTA Rail - Five Points		
Transit Operator:	MARTA						
No. of Samples[1]:	191				Service Type:	Rail	
No. of Samples[2]:					Survey Date:		1/13/2010

TRIP PURPOSE		TRANSFERS				ACCESS/EGRESS MODES		
Types	Freq.		Survey	Model		Mode	Prod.	Attr.
HBW	60	No.	Freq.	Freq.		Types	Freq.	Freq.
HBSch	13	0	105	73		Drive/Wlk.	1	2
HBCol	8	1	65	56		Pick Up/Drop Off	43	16
HBSh	9	2	20	34		Carpool	1	3
HBMed	2	3	1	14		Drv. Alone	28	2
HB_Airport	2	4	0	0		Walk	117	167
HB_Other	61	5	0	0		Bike	1	1
NHB_Airport	8	6+	0	0				
NHB	28							
Unknown	0							
Total	191	Total	191	177		Total	191	191

WALK TIMES (Prod.)			WALK DISTANCES (Prod.)		O-D DISTANCE (SL)	
	Survey	Model		Survey		
Range (Min.'s):	Freq.	Freq.	Range (Miles)	Freq.	Range (Miles)	Freq.
0	0	13	0.0 -0.125	41	0	6
0 - 3.0	23	3	0.125-0.25	55	0 - 5.0	61
3.0 - 6.0	55	18	0.25 -0.50	17	5.0 - 10.0	39
6.0 - 10.0	21	40	0.50 -0.75	3	10.0 - 15.0	46
10.0 - 15.0	16	37	0.75 -1.00	1	15.0 - 20.0	12
15.0 - 20.0	2	2	1.00 -1.50	0	20.0 - 25.0	8
20.0 - 30.0	0	0	1.50 -2.00	1	25.0 - 30.0	5
30.0+	1	0	2.000+	0	30.0 - 40.0	3
					40.0+	11
Total	118	113	Total	118	Total	191

WALK TIMES (Attr.)			WALK DISTANCES (Attr.)		MODELED O-D TRIP TIME	
	Survey			Survey		
Range (Min.'s):	Freq.		Range (Miles)	Freq.	Range (Min.'s)	Freq.
0	0		0.0 -0.125	74	0	18
0 - 3.0	44		0.125-0.25	73	0 - 20.0	20
3.0 - 6.0	62		0.25 -0.50	12	20.0 - 30.0	15
6.0 - 10.0	33		0.50 -0.75	7	30.0 - 40.0	14
10.0 - 15.0	25		0.75 -1.00	1	40.0 - 60.0	23
15.0 - 20.0	4		1.00 -1.50	1	60.0 - 80.0	25
20.0 - 30.0	1		1.50 -2.00	1	80.0 - 100.0	20
30.0+	0		2.000+	0	100.0 - 120.0	21
					120.0+	21
Total	169		Total	169	Total	177

HOUSEHOLD CHARACTERISTICS								
Annual		HH		No.		No.		
HH Inc.	Freq.	Size	Freq.	Workers	Freq.	Autos	Freq.	
$0 - $10K	37	1	23	0	17	0	60	
$10K - $20K	21	2	56	1	51	1	62	
$20K - $30K	27	3	45	2	102	2	54	
$30K - $50K	48	4	36	3+	21	3+	15	
$50K - $75K	31	5+	31					
$75K+	27							
Total	191	Total	191	Total	191	Total	191	

The second step of the QA/QC Review process was to analyze spatial characteristics of individual survey trips superimposed on a regional route system map. The Map Tool features travel desire lines and trip end points associated with batches of trips that were surveyed on a particular bus route or at a specific rail station. The route structure and rail stations of the regional transit system are displayed in the background of the visual tool. Trip quality designations of 1, 2 or 3 were assigned to survey trips during this step. A batch of transit trips that were surveyed at the Peachtree Center Station are displayed in the mapping tool is shown in Figure 7.2.

Figure 7.2 – Visual Evaluation Tool
(Travel Desire Lines and Endpoints of Trips Surveyed at MARTA's Peachtree Ctr. Station)
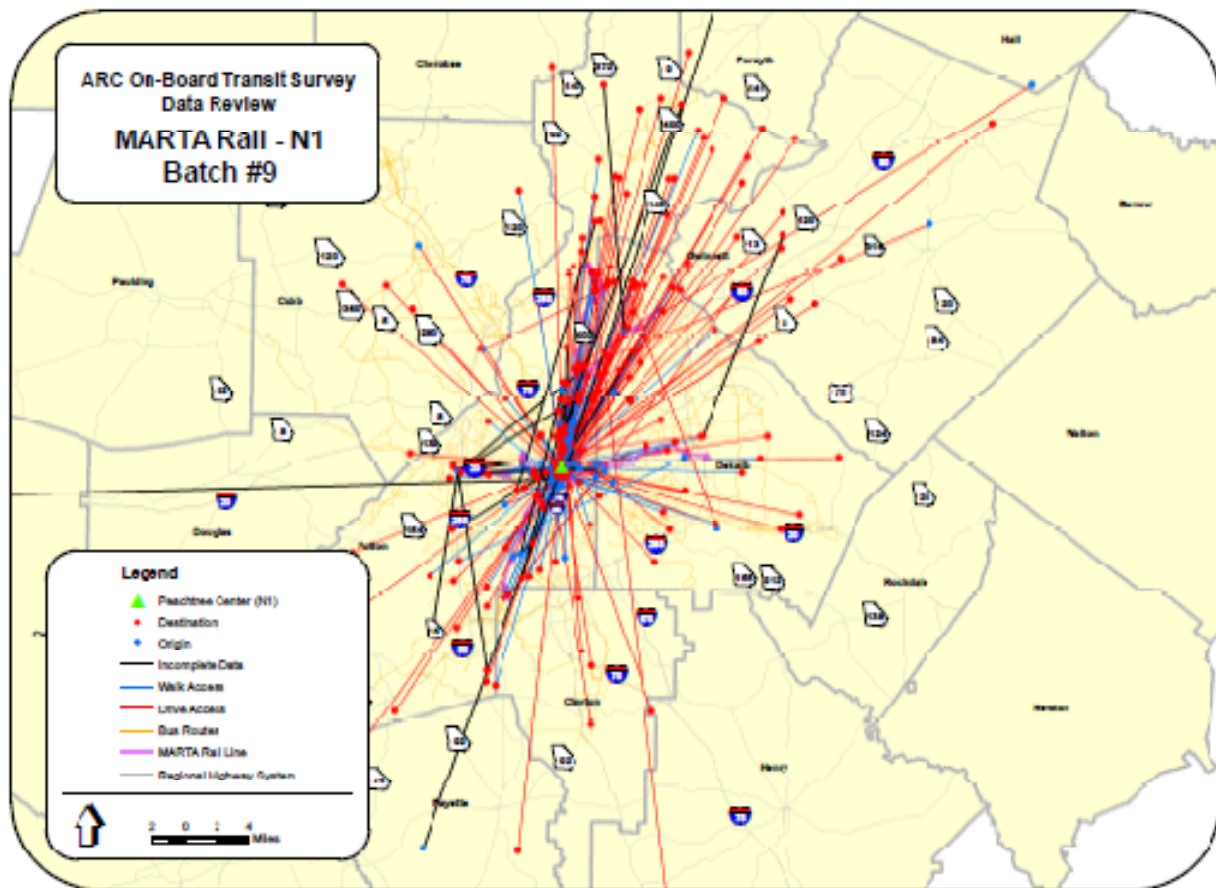
Travel desire lines are color-coded based on transit access characteristics. This particular map also highlights those survey trips that were deemed to be logistically insensible. Walk access trips are displayed blue lines, drive access with red lines and logistically insensible trips in black. The regional transit system faintly shows in the background of the figure. The bus routes, rail lines and stations were vital features on the map which aided in determining the logistical sensibility of a survey trip.

In order to keep the project moving forward, a very important feature of the Map Tool inspection was to identify specific survey trips for critical analysis through a stepwise process. Although all trips were screened during creation of the Profile Report and their travel desire lines posted by the Map Tool, only a subset of survey trips were actually selected for critical review.   The query and analysis steps employed in the Map Tool review process are listed below.

- Visually inspect and examine key variables of survey trips with short distances (short for local bus and rail was < 1.0 mile; for express bus it was 3.0 to 5.0 miles depending on transit provider)

- Visually inspect and examine key variables of survey trips with large path ratios (generally those > 2.5)

- Visually inspect spatial sensibility and key variables of walk access trips with zero transfers

- Visually inspect spatial sensibility and key variables of walk access trips with three or more transfers

- Visually inspect spatial sensibility and key variables of drive access trips with zero transfers

- Visually inspect spatial sensibility and key variables of drive access trips with three or more transfers

- Tag any drive access survey trips that reported 'Drive Alone' from the origin and 'Drive Alone' to the destination

- Investigate logistic sensibility of any other O-D travel desire line that merits inspection based on trip distance and spatial orientation with respect to the highlighted survey route

- Tag all survey trips with a quality designation of 1' complete; '2' inconsistent but easily fixed in our opinion; or '3' inconsistent and probably difficult to fix

- Tag all survey trips having a quality designation '2' or '3' with a brief diagnostic note

Refinements/Expansion Phase

It was in this stage of the overall onboard survey process that location variables, trip detail, transfer and access mode responses were checked and refined to reconcile the '2' or '3' quality designations. Diagnostic messages attached to the logistically questionable trips were used by the survey team members to try and fix or remediate the logistical issue. According to the diagnostic messages there were a variety of causes behind problematic survey trips, but the actual defect usually pertained to the string of text identifying an 'Origin', 'Destination' or 'Home' location. Refinements to location addresses, in turn, produced new trip end locations and travel desire paths. In most circumstances, revised travel desire lines and trip ends formed by the newly cleaned location variables produced reasonable spatial characteristics.

Another common example of flagged trips involved transit riders who were going to or coming from the airport but whose origin or destination was outside metropolitan Atlanta.   A number of survey trips were identified as having one trip end outside of the Atlanta region but without an X,Y coordinate. A good example would be a survey trip whose destination address was a place or street address in New York, NY. This kind of survey trip response was usually obtained from riders who were interviewed at one of the MARTA rail stations. It was evident that these were local transit trips whose destination was Atlanta Hartsfield-Jackson International Airport. The geocoding of these survey records was updated so that the X,Y coordinates associated with the alighting and destination locations reflected the Airport Station and Atlanta Hartsfield-Jackson International Airport, respectively.

SECTION 7: DATA BASE DESCRIPTION AND DATA EXPANSION PROCESS

Overview of the Database

The final database contains 57,616 records. Each of the records contains a "RECORD_USE_CODE_NEW" that identifies the quality and usability of the record. The Record Use Codes are briefly explained below:

- A code of "1" means the record met contractual requirements for completeness, passed more than 50 QA/QC checks that were not performed in GIS, and passed all QA/QC checks that were performed when the record was visually reviewed in GIS.   There are 43,703 records with a Recode Use Code=1, which represents approximately 10% of the region's average daily ridership of 440,000. Records with a Record Use Code=1 are the only records that were included in the expanded database.

- A code of "2" means the record met contractual requirements for completeness, passed more than 50 QA/QC checks that were not performed in GIS, and passed most of the QA/QC checks that were performed when the record was visually reviewed in GIS.   While these records were generally considered to be acceptable and useful for most modeling applications, the visual review of the record in GIS identified one or more minor errors.

  The most frequent error involved concerns about the reported mode of access/egress given the distance traveled from the Trip Origin/Destination to/from transit (e.g., the destination was 15 miles from the last reported transit route, but the respondent indicated he/she walked from transit). Records with a USE CODE=2 were not expanded, but they should be acceptable for most future planning studies. There are 5,154 records with a Use Code=2.

- A code of "3" means the record met contractual requirements for completeness but the record did not pass one or more of the QA/QC checks that were not performed.   The records contain valuable information related to the demographic profile of transit riders and other trip information, but there are one or more severe problems with the trip that should keep the record from being used for other purposes.   There are 1,267 records with a Use Code=3.

- A code of "4" means the record did NOT meet contractual requirements for completeness. These records are missing one or more pieces of critical information. The two types of information that were most frequently missing were the respondent's HOME ADDRESS and INCOME. The records contain valuable information related to the demographic profile of transit riders and other trip information, but since one or more of the contractually required fields is missing, these records were not included in the expanded database.

- A code of "5" identifies short trip records. These records were generally collected at the beginning of the project when interviewers were taking more time to complete the survey.   For respondents who did not have time to complete the survey, we gathered their boarding and alighting locations and gave them a survey with a postage paid envelope. Records with a USE CODE of 5 were never returned in the mail.

- A code of "6" identifies DUMMY records. DUMMY records were created to simulate the RAIL trips that were NOT captured between certain stations. These trips account for less than 3% of all rail trips and generally involved situations where fewer than 20 trips occurred between two stations. The DUMMY records may be useful for future data expansion and or modeling applications, which is the reason they have been included in the database.

A complete listing of the variables and the codes for each variable is provided in the Data Dictionary, which is shown in Appendix E of this report.

Data Expansion Process

Rail Data Expansion Process.   Appendix G contain five tables that show the process for expanding the completed rail surveys for the following time periods: (1) AM Peak 6-10am, (2) PM Peak 3-7pm, and NON-PEAK – all other hours .

Of the 4,332 individual combinations of station-to-station trips by time of day, the sampling goals were met in 99.7% of the areas (or 4,317 of the 4,332 areas).   The five tables that were prepared for each time period are described below:

- Table 1: Shows the actual distribution of completed surveys that were used in the expanded unlinked trip database for each time period.   The numbers shown in this table reflect the number of respondents who got ON and OFF the train at each of MARTA's rail stations.

- Table 2: Shows the <u>actual ridership</u> between each rail station by time of day. This information was collected by MARTA's Breeze system. Since some entries and exits were not identified, due to bad swipes at one end of the trip or other reasons, the ridership counts shown in this table were about 15% lower than the actual ridership (which is the reason Table 3 was developed).

- Table 3: Shows the adjusted actual ridership between stations by time of day. Table 3 adjusts the distribution shown in Table 2 upward to account for "unknown" trips that were not clearly coded to both a station of entry and exit by time of day. The TOTALS in table 3 reflect the systemwide totals reported by MARTA in the agency's systemwide roll-up for the rail system on a typical weekday in October 2009.

- Table 4: Shows the actual gap between the number of surveys that were completed and the numerical goal we set for each cell in the sampling matrix. The original goals for the survey we set for the entire day, so the fact that a very good distribution was obtained for each time period (AM PEAK, PM PEAK, and NON PEAK) shows how well the survey administration procedures were followed by interviewers in the field.

- Table 5: Shows the multipliers (unlinked trip expansion factors) that were used to expand the unlinked trips. Only 15 cells did not meet the original sampling goals that were set for the project.

Bus Data Expansion Process. Appendix F contains tables for each bus route in the region that shows the process for expanding the completed bus surveys for the following time periods: (1) AM Peak 6-10am, (2) PM Peak 3-7pm, and NON-PEAK – all other hours. The 6-step process that was used to develop the expansion factors for unlinked bus trips is briefly described below:

- Table 1 shows the actual distribution of completed surveys for various stops/segments along each route for one of three specified time periods.

- Table 2 shows the distribution of completed surveys as a percentage of total boardings for each of the segments/major stops along the route.

- Table 3 shows the actual boardings (ONs) and actual alightings (OFFs) for each segment/major stop along the route.

- Table 4 shows the estimated boardings (ONs) and actual alightings (OFF) by segment/major stop. The survey boarding distribution in table 2 was used as the basis for estimating this distribution since the linked data for ONs and OFFs on the bus system in not available.

- The last table contains the weighting factors for unlinked trips.

# SECTION 8: CHARACTERISTICS OF TRANSIT RIDERS AND SELECT FINDINGS

Household Size

More than half (51.2%) of transit riders surveyed are from 2 or 3 person households. Over 30% of those surveyed are from households with 4 or more persons. 18.3% of those surveyed are from single person households. Table 2 and Figure 2 show the distribution of transit riders by household size.

Table 2 - Household Size

Persons	Percent
1 person	18.3%
2 person	29.0%
3 person	22.2%
4 person	16.0%
5 person	8.1%
6 or more person	6.4%

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Figure 2 - Household Size
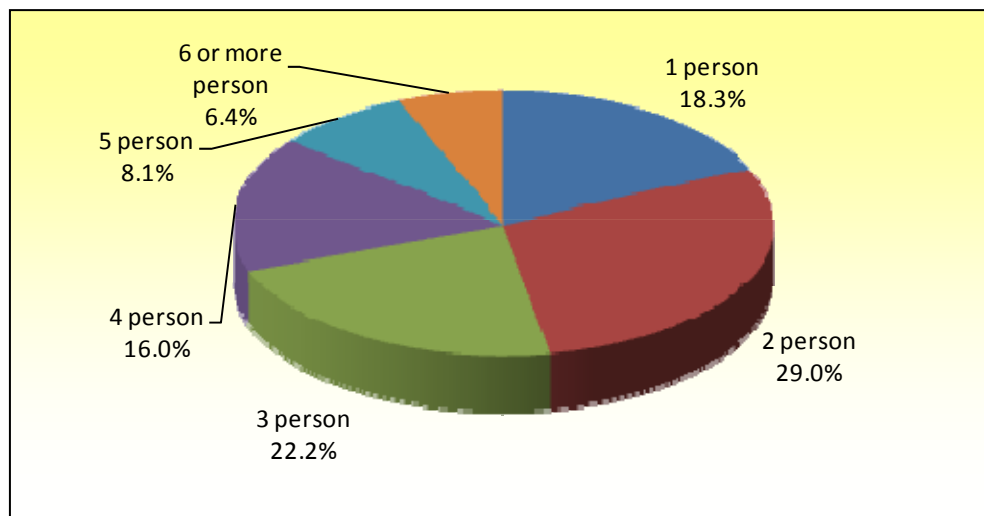
Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey
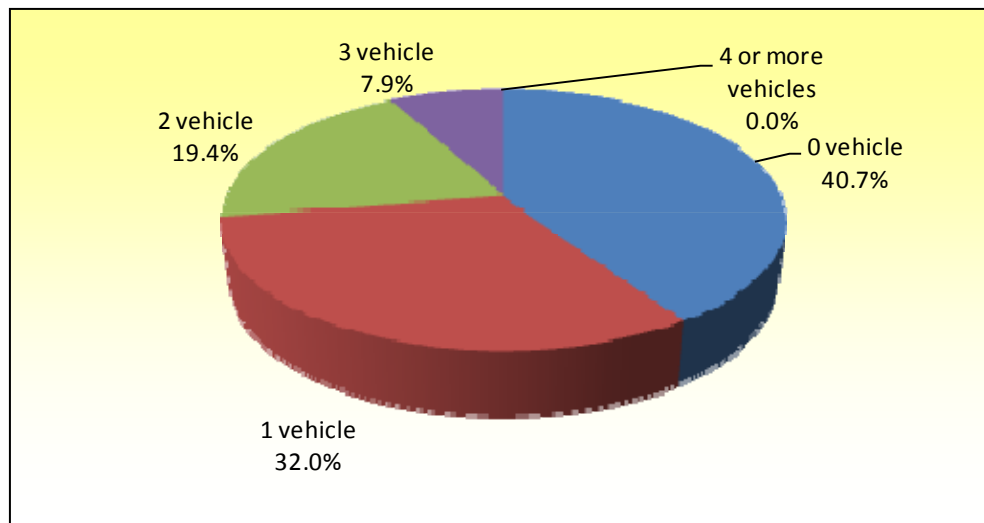
Vehicle Availability

Over 40% of transit riders surveyed indicated that they have no access to a vehicle. Almost a third (32%) have access to one vehicle, and about 27% have access to multiple vehicles. None of the transit riders surveyed indicated access to more than 3 vehicles. Table 3 and Figure 3 show the distribution of riders surveyed by vehicles available.

Table 3 -
Vehicle Availability

Vehicles	Percent
0 vehicle	40.7%
1 vehicle	32.0%
2 vehicle	19.4%
3 vehicle	7.9%
4 or more vehicles	0.0%

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Figure 3 -
Vehicle Availability

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Vehicle Available for Use Today

The on board survey asked if respondents could have used an available vehicle for their trip today. The answers are summarized in Table 4. Consistent with the vehicle availability question; over 40% of those surveyed have no access to a vehicle. Of the remaining 60%, over half said that they could have used an available vehicle for their trip – making them transit riders by choice. Table 4 and Figure 4 show vehicle availability for use.
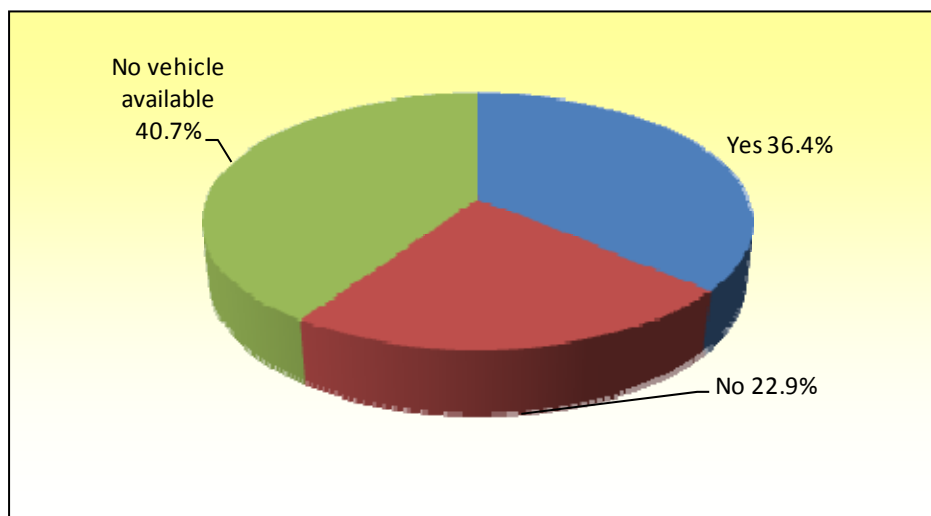
Table 4 -
Vehicle Available for Use Today

Answer	Percent
Yes	36.4%
No	22.9%
No vehicle available	40.7%

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Figure 4 -
Vehicle Availability for Use Today

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Employed Persons per Household

Most (52.9%) of the transit riders surveyed are from households with 2 or more employed persons. Households with no employed persons represented only 8.6% of those surveyed. The most frequent responses were those for two worker households (39.3%), and one worker households (38.6%). Table 5 and Figure 5 show the number of employed persons per household.

Table 5 -
Number of Employed Persons in Household

Employed Persons	Percent
0 person	8.6%
1 person	38.6%
2 person	39.3%
3 person	10.1%
4 person	2.3%
5 person	0.7%
6 person	0.5%

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Figure 5 -
Number of Employed Persons in Household
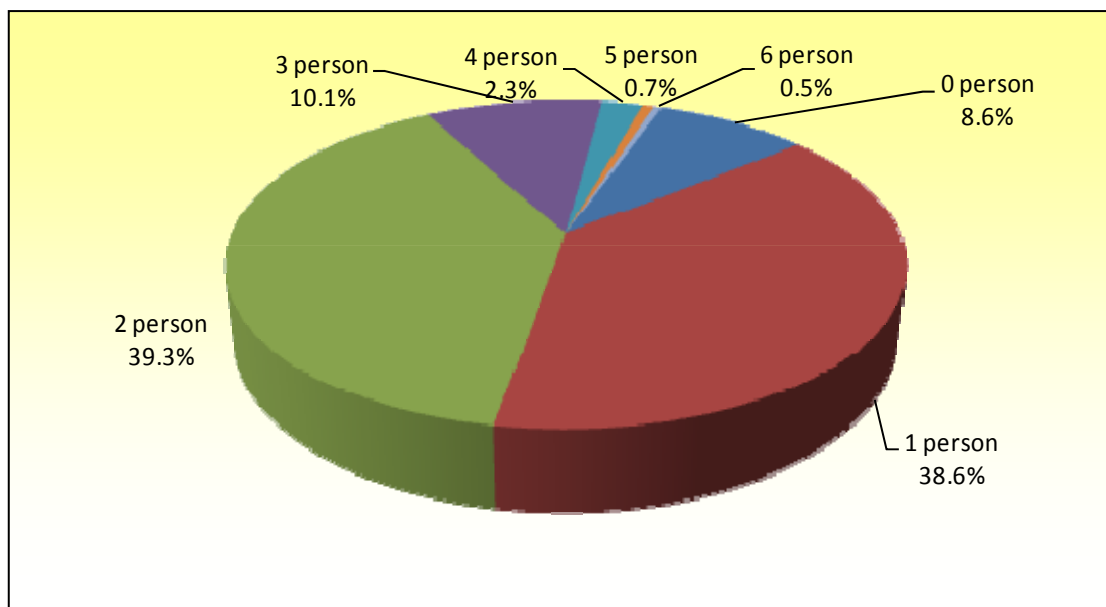
Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Employment Status

Almost three-fourths (74.5%) of all the riders surveyed indicated that "Yes" they were employed. The remaining fourth (25.5%) of riders indicated that they were not employed. Table 6 shows the employment status of the survey respondents.

Table 6 -
Employment Status

Answer	Percent
Yes	74.5%
No	25.5%

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Student Status

Slightly less than a third (30.6%) of all the riders surveyed indicated that they were students. The majority of the riders (69.4%) indicated that "No" they were not students. Table 7 shows the student status of the survey respondents.

Table 7 -
Student Status

Answer	Percent
Yes	30.6%
No	69.4%

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Driver's License

Seventy-one percent (71%) of all transit riders surveyed indicated that they have a driver's license while 29% indicated that they did not have a driver's license. So a large majority of those surveyed taking transit are able to drive a vehicle. Table 8 shows the respondents' driver's license status.

Table 8 -
Driver's License Status

Answer	Percent
Yes	71.0%
No	29.0%

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Age

Over 50% of those transit riders surveyed are between 18 and 34 years old; with those between 18 and 24 years old representing the largest single group at 26.3%. Respondents under age 18 years old and those 65 years old or older represented only 5.9% of transit riders surveyed. Table 9 shows the age distribution of transit survey respondents, and Figure 9 depicts the age distribution in a graph.

Table 9 -
Age Distribution

Age Range	Percent
under 18	3.8%
18-24	26.3%
25-34	25.2%
35-44	18.3%
45-54	15.7%
55-64	8.6%
65 or older	2.1%

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Figure 9 -
Age Distribution
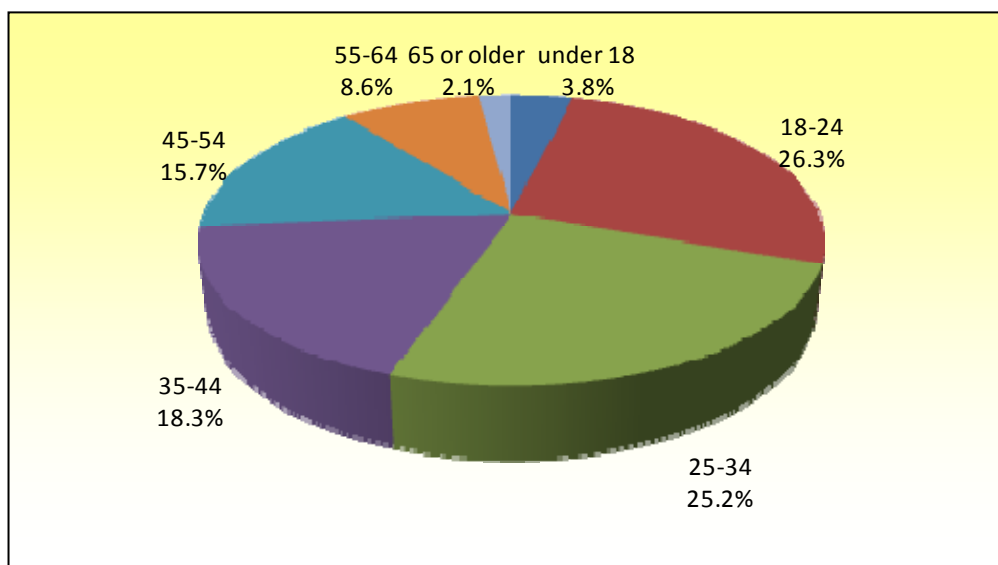
Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey
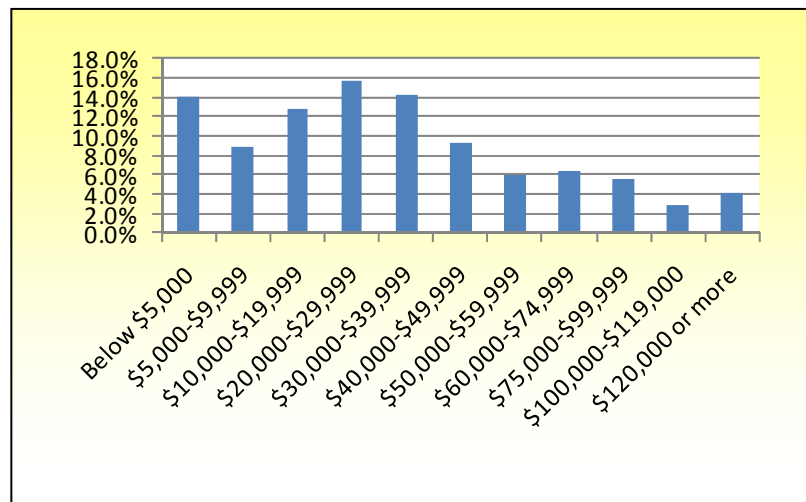
Income

Total household annual income of transit riders ranged considerably. The most frequently reported income category was $20,000 to $29,000 per year. The range of $30,000 - $39,999 was the second largest income range while below $5,000 was the third largest segment. Over a third of the transit riders (35.7%) have a total annual household income less than 20,000 while 12.6% had a total annual household income over $75,000. Table 10 shows the income distribution of those transit riders surveyed. Figure 10 provides a bar chart showing the distribution of income among the transit riders surveyed.

Table 10 -
Income Distribution

Annual Income Range	Percent
Below $5,000	14.0%
$5,000-$9,999	8.9%
$10,000-$19,999	12.8%
$20,000-$29,999	15.7%
$30,000-$39,999	14.3%
$40,000-$49,999	9.3%
$50,000-$59,999	6.0%
$60,000-$74,999	6.4%
$75,000-$99,999	5.6%
$100,000-$119,000	2.9%
$120,000 or more	4.1%

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Figure 10 -
Income Distribution

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Income by Gender

Annual income by gender shows some disparity between males and females with a higher percentage of females in the lower income categories and a lower percentage in the high income categories. Table 11 and Figure 11 compare the distribution of males and females by income category.

Table 11 - Income Distribution by Gender

Annual Income Range	Male	Female
Below $5,000	12.5%	15.5%
$5,000-$9,999	7.7%	9.9%
$10,000-$19,999	11.3%	14.1%
$20,000-$29,999	15.1%	16.2%
$30,000-$39,999	14.7%	13.9%
$40,000-$49,999	9.8%	8.8%
$50,000-$59,999	6.2%	5.9%
$60,000-$74,999	6.9%	5.9%
$75,000-$99,999	6.4%	4.8%
$100,000-$119,000	3.8%	2.1%
$120,000 or more	5.5%	2.9%
No Response	0.1%	0.0%

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Income Distribution by Gender
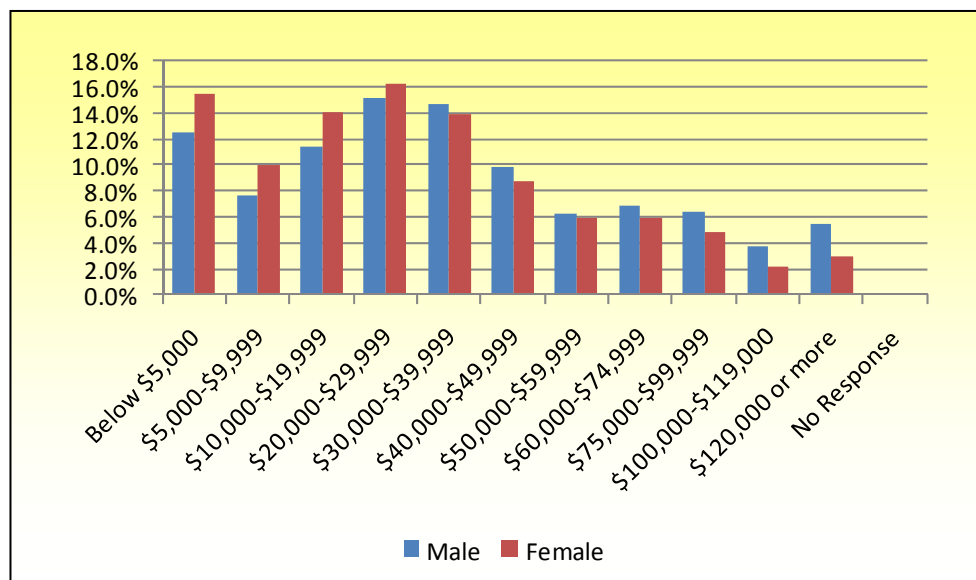
Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

RACE

More than 70% of transit riders surveyed identified themselves as African American /Black. Almost 21% of riders surveyed identified themselves as White. Those identifying themselves as Asians, American Indians, and Other represented more than 8% of riders. Table 12 provides the distribution of race provided by survey respondents and Figure 12 provides the same information in a pie chart.

Table 12 - Racial Composition

Answer	Percent
White	20.8%
Black/African American	70.8%
Asian	2.1%
Other	5.5%
American Indian	0.8%

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Figure 12 – Racial Composition
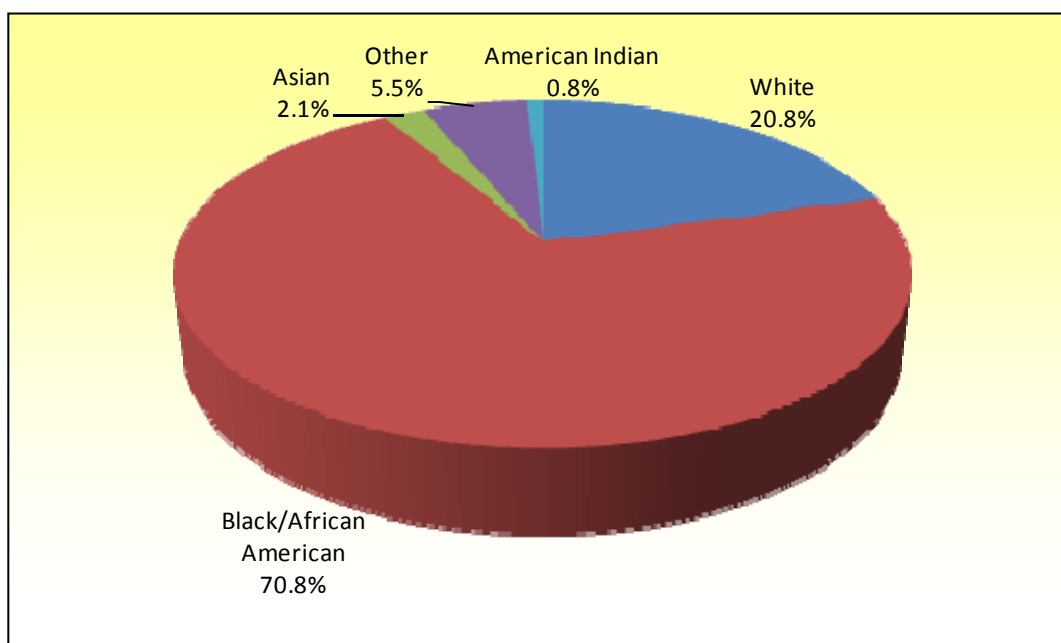
Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Gender

A slight majority (51.6%) of those transit riders are female. Table 13 shows the gender break down of survey respondents.

Table 13 -
Gender

Answer	Percent
Male	48.4%
Female	51.6%

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Breeze Card

Over 89% of those transit users surveyed responded that "Yes" they had used a Breeze Card to pay their fare. Only about 11% of those surveyed did not use a Breeze Card. Table 14 shows Breeze Card use among respondents.

Table 14 -
Breeze Card Use

Answer	Percent
Yes	89.1%
No	10.9%

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Type of Fare

Nearly 75% of transit riders surveyed use a transit pass to pay their fare. Most often riders use either a 7-Day Pass or a Monthly Pass for their fare. Among riders surveyed, less than 10% paid their fare in cash. Student, Youth and Faculty fares account for about 4.5% of fare payments. Table 15 shows the distribution of fares by type.

Table 15 -
Transit Fare Category

Fare Type	Percent
1-Day Pass	7.4%
7-Day Pass	31.2%
10 Trip Pass	2.9%
20 Trip Pass	3.1%
30-Day Pass	25.0%
31-Day Pass	3.8%
40-Ride Pass	0.4%
Half-Fare 65+	1.3%
Half-Fare 10-ride	1.2%
Half-Fare Out of District	0.2%
Local to Express Upgrade	0.0%
Round-Trip Fare	4.2%
Single One-Way Fare	4.8%
Student Weekly Pass	0.6%
U-Pass Faculty/Staff	1.8%
Youth One-Way	0.0%
U-Pass Student	2.1%
CASH	7.6%
Other	1.8%
Don't Remember	0.6%

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Agency Issuing Fare

Most riders surveyed report that MARTA issued their transit fare. MARTA accounted for nearly 86% of fares issued to those riders surveyed. GRTA accounted for about 1.6% of fares, CCT about 1.5% of fares, Gwinnett County 0.7% of fares, and C-Tran about 0.5% of fares among those surveyed. 2.1% of those surveyed indicated that another agency than those listed provided their fare, and 7.6% of those surveyed provided no response to the question of which agency supplied their fare. Table 16 shows the distribution of fares issued by agency.

Table 16 -
Agency Issuing Fare

Agency	Percent
MARTA	85.9%
GRTA	1.6%
C-TRAN (CLAYTON)	0.5%
CCT (COBB)	1.5%
HALL	0.0%
GWINNETT	0.7%
Other	2.1%
CHEROKEE	0.0%
No Response	7.6%

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Trip Purpose

The majority of the trips have one end of the trip at home. Slightly less than half (44.7%) of the transit riders use the regional transit service to go to work. The next largest trip purpose (15.3%) is home-based other (HBO). HBO trips consist of a variety of trip purposes such as errands, recreational, eating out and going to church. Non-home based trips are the third largest (10.3%) trip purpose. Neither end of the trip originates at home. Table 17 lists the percentage trip purpose of riders for the entire region's transit service while Figure 17 graphically shows the distribution of trip purpose.

Table 17 -
Trip Purpose

Purpose	Percent
Home-Based Work	44.7%
Home-Based Other	15.3%
Non-Home Based	10.3%
Home-Based College	8.4%
Home-Based School	7.7%
Home-Based Shopping	7.1%
Home-Based Medical	4.1%
Home-Based Airport	1.4%
Non-Home Based Airport	0.9%

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Figure 17 -
Trip Purpose
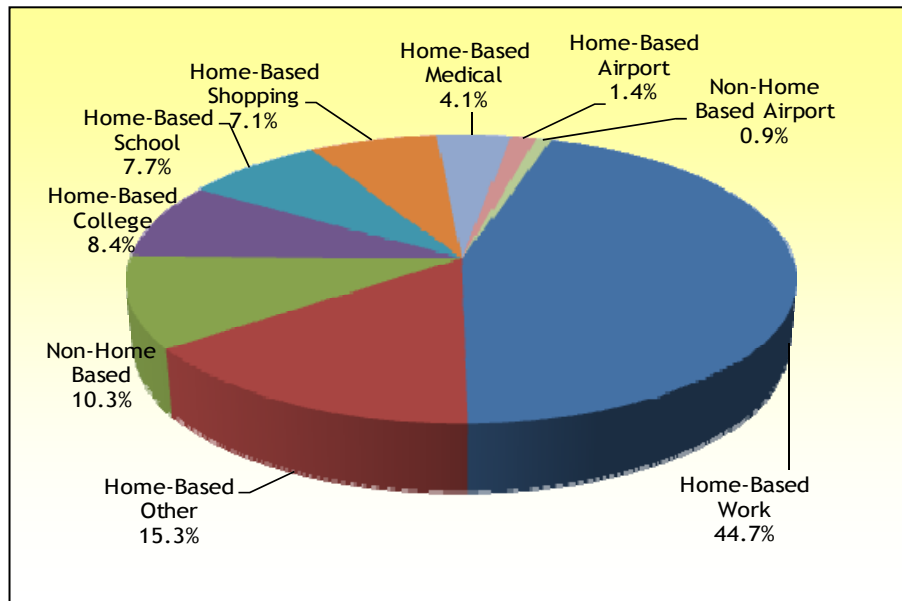
Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Types of Places Where Transit Riders Are Coming From

Table 18 lists the types of places that transit riders are coming from in the region before they board the transit service. Half of the transit riders are coming from home while almost one-fourth are coming from work. Almost five percent (5%) of transit riders are coming from either school/daycare or college/university establishments.

Table 18 -
Types of Places that Transit Riders are Coming From

Place of Origin	Percent
Home	51.7%
Work	22.2%
School/Daycare	4.7%
College/University	4.4%
Store/Retail	3.9%
Medical	2.7%
Another Home	2.1%
Restaurant	1.1%
Bank/Other Office	1.0%
Airport	0.9%
Hotel	0.5%
Recreation	0.4%
Place of Worship	0.2%
Other	4.2%

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

How Transit Riders Accessed Transit at the Start of their Trip

Almost three-fourths (72%) of those surveyed indicated that they got to transit for the start of their trip by walking; 11% drove a car and parked and 14% were dropped-off by someone else who drove a vehicle.

Table 19 -
How Transit Riders Get to Transit Service

Mode of Access to Transit	Percent
Walked	72.4%
Dropped Off	14.0%
Drove Alone	10.6%
Rode in a vehicle for part of the trip and walked/biked rest of the way	1.8%
Carpooled/Vanpooled	0.9%
Bicycle	0.3%

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Figure 19 shows how income influences the mode of access for transit patrons. Transit riders with lower annual household incomes were significantly more likely to walk to transit service than those with upper incomes. The figure below shows that 79% of those surveyed with annual household incomes of less than $20,000 walked to transit compared to 55% of those with annual household incomes of $75,000 or more. Transit riders with incomes of $75,000 or more per year were significantly more likely to drive and park their car than transit riders with annual household incomes below $20,000.

Figure 19 -
How Income Influences the Mode of Access for Transit Patrons
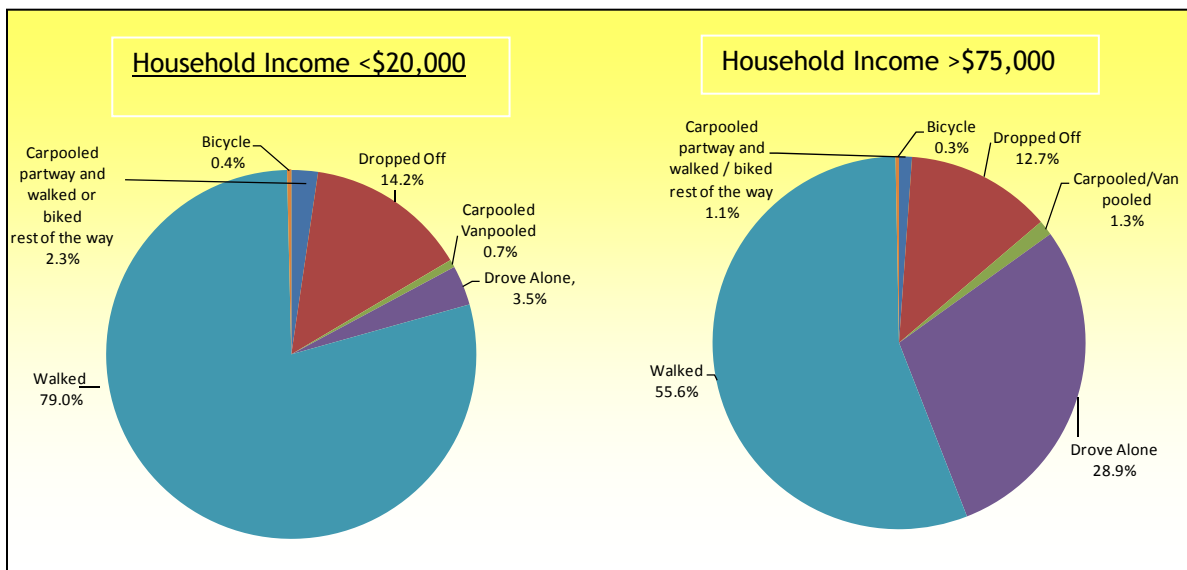
Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Riders who indicated that they had walked to the start of their transit trip were asked how far they had walked and how long it took them.   More than half (53%) of those who walked, indicated that they walked less than 1/8 mile or less than one block. Over a quarter of the transit riders who walked to transit walked between 1/8 and ¼ a mile or one to two blocks. The majority (91%) of the walk access trips to transit were less than ½ mile or five to eight blocks.

Table 20 -
How Far Did Transit Riders Walk to Access Transit Service

Walk Distance to Transit	Percent
Less than 1/8 mile	53.0%
1/8 - 1/4 mile	26.9%
1/4 - 1/2 mile	11.3%
1/2 - 3/4 mile	4.5%
3/4 - 1 mile	1.5%
1 - 1 1/2 miles	1.7%
1 1/2 - 2 miles	0.5%
Greater than 2 miles	0.5%

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Table 21 lists the percent of transit riders by the reported travel time to walk to transit at the start of the transit trip. Seventy-one percent (71%) of the transit riders who walked to transit reported that their walk time was five minutes or less. Almost 100% reported that their walk time was 20 minutes or less. The average weighted walk time reported for the initial access to transit was 5.8 minutes.

Table 21 -
How Long did it Take Transit Riders to Walk to Transit Service

Reported Travel Time to Access Transit	Percent
5 minutes or less	70.6%
10 minutes or less	90.4%
15 minutes or less	96.4%
20 minutes or less	98.4%

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

County of Trip Origin

This measure reflects where the trip originated and not necessarily where the transit rider lived or which transit provider the trip was made on. Sixty-one percent (61%) of the transit trips in the region originated in Fulton County while 25% of the trips originated in DeKalb County. Five percent (5%) of the transit trips county of origin was Clayton County. Almost four percent (4%) of the transit trips originated in Cobb County and three percent (3%) originated in Gwinnett County.

Table 22 -
County of Trip Origin

Origin County of Trip	Percent
Fulton	60.6%
DeKalb	25.2%
Clayton	5.3%
Cobb	3.8%
Gwinnett	2.7%
Henry	0.4%
Douglas	0.3%
Fayette	0.3%
Forsyth	0.3%
Rockdale	0.2%
Newton	0.1%
Cherokee	0.1%
Coweta	0.1%
Paulding	0.1%
Hall	0.1%
Spalding	0.1%
Outside Region	0.2%

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Where Transit Riders Are Going To

Over a third (37.1%) of the trips completed by transit riders in the region involves a return trip to the rider's home. Thirty percent involved a trip to work while almost seven percent of the trips are to shopping and or retail facilities. Approximately eleven percent (10.4%) of the transit trips are to school/daycare or a college or university establishments. Table 23 shows the types of destinations for transit riders for the entire region.

Table 23 -
Types of Destinations Transit Riders Are Going To

Types of Destination Places	Percent
Home	37.1%
Work	28.3%
Store/Retail	6.5%
Other	5.8%
College/University	5.6%
School/Daycare	4.8%
Another Home	3.8%
Medical	2.5%
Airport	1.4%
Bank/Other Office	1.3%
Restaurant	1.3%
Recreation	0.7%
Hotel	0.4%
Place of Worship	0.4%

Source: ETC Institute June 2010 – Atlanta Regional Commission
Regional On-Board Transit Survey

Figure 20 shows the distribution of trip destinations for the lower and higher household income groups. Using transit to go home was the most dominant destination by both segments of transit riders. Transit riders with higher annual household incomes were significantly more likely to use public transportation to go to work than transit riders with lower incomes. The chart below shows that 38% of those surveyed with annual household incomes of $75,000 or more were going to work compared to 20% of those with annual household incomes less than $20,000. Transit riders with incomes under $20,000 per year were significantly more likely to use public transit for non-work related activities including shopping and social/personal business than transit riders with annual household incomes above $75,000.

Figure 20 -
Destination Locations by Household Income
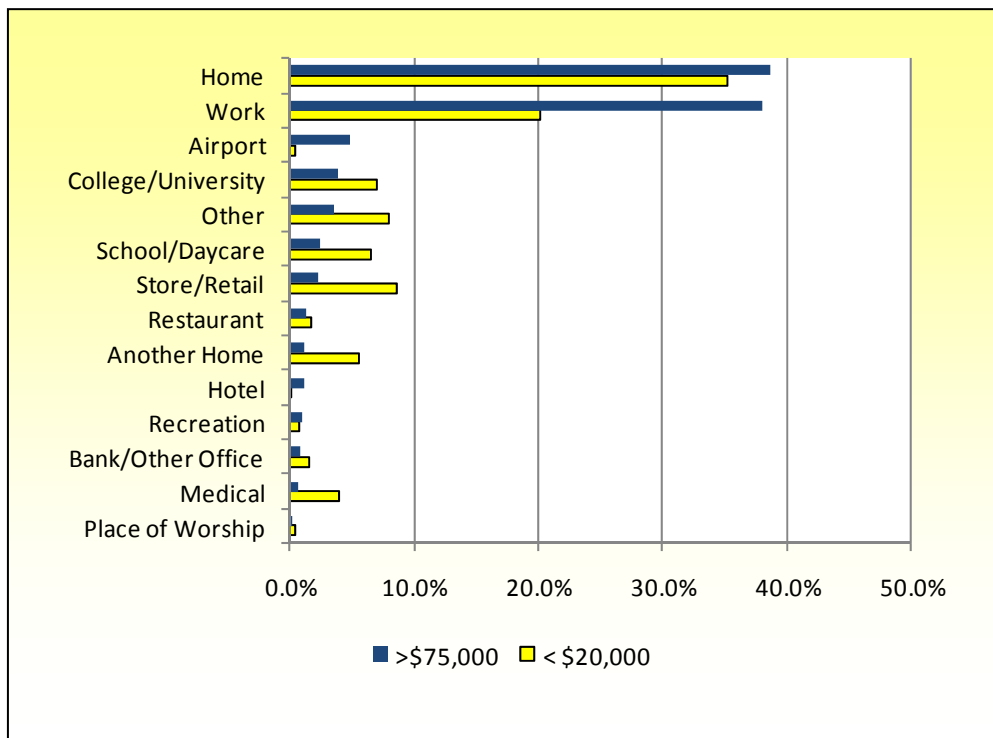
Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

How Transit Riders Egressed from Transit to Complete their Trip

Eighty percent (80.6%) of those surveyed indicated that they walked from transit to reach their final destination. Approximately nine percent (8.5%) either drove a car and another nine percent (8.6%) were picked up by someone else who drove a vehicle. Table 24 lists the distribution by mode of egress for transit riders to reach their final destination.

Table 24 -
How Transit Riders Egressed from Transit

Mode of Access From Transit	Percent
Walked	80.6%
Dropped Off	8.6%
Drove Alone	8.6%
Rode in a vehicle for part of the trip and walked/biked rest of the way	1.1%
Carpooled/Vanpooled	0.9%
Bicycle	0.3%

Source: ETC Institute June 2010 – Atlanta Regional Commission
Regional On-Board Transit Survey

Trip Distance

Table 25 lists the percent of trips by the length of the transit trip. The trip distance was calculated in GIS using the straight line airline distance between the trip origin and destination. One-third of all of the trips are between one and five miles. The next largest group of trips (27.9%) is between five and ten miles while 16.5% of the trips are between ten and fifteen miles. Almost twenty percent (20%) of the transit trips are fifteen miles or greater in length.

Table 25 –
Trip Distance

Purpose	Percent
<.500 Mile	0.7%
.500- 0.999	2.4%
1.000 - 4.999	33.5%
5.000 - 9.999	27.9%
10.000 - 14.999	16.5%
15.000 - 19.999	8.7%
20.000 - 24.999	5.1%
25.000 - 29.999	2.5%
30.000 - 34.999	1.0%
35.000 - 39.999	0.5%
40.000 - 44.999	0.3%
45.000 - 49.999	0.1%
50.000 - 74.999	0.2%
>75.000 - 99.999	0.0%
>100.000	0.2%
Unknown	0.6%

Source: ETC Institute June 2010 – Atlanta Regional Commission
Regional On-Board Transit Survey

Table 26 lists the percent of trip by distance by purpose. The percentages in each column represent the percent of trips by distance for each purpose. Twenty-six (26.2%) percent of home-based work (HBW) trips are between one to five miles while 27.8% of HBW trips are between five to ten miles. Another twenty percent of the HBW trips are between 10 and 15 miles while 11.5% of the trips are between 15 and 20 miles. Thirteen percent of the HBW trips are greater than 20 miles in length.

A larger share of the home-based other, home-based school, home based shopping and home-based airport trips had trip distances less than five miles. Home-based medical trips had the longer trip distances. Almost half of the home-based airport trips are less than five miles in length while the non-home based airport trips are longer.

Table 26 -
Trip Distance by Purpose

Distance	Home-Based Work	Home-Based Other	Non-Home Based	Home-Based College	Home-Based School	Home-Based Shopping	Home-Based Medical	Home-Based Airport	Non-Home Based Airport
<.5 Mile	0.2%	1.3%	0.4%	0.2%	1.5%	1.3%	0.0%	1.9%	0.0%
.50 - 0.99	1.0%	3.3%	3.0%	1.4%	5.5%	1.7%	0.0%	5.9%	0.0%
1.00 - 4.99	26.2%	42.5%	39.3%	31.1%	51.7%	42.3%	4.1%	40.6%	1.7%
5.00 - 9.99	27.8%	29.2%	29.3%	24.5%	24.2%	32.1%	9.4%	30.8%	36.0%
10.00 - 14.99	19.7%	12.6%	15.4%	18.6%	10.0%	13.7%	22.0%	11.7%	22.8%
15.00 - 19.99	11.5%	5.6%	7.1%	10.6%	3.6%	4.8%	17.5%	4.2%	16.7%
20.00 - 24.99	6.8%	2.6%	3.0%	7.2%	1.6%	2.3%	15.5%	2.5%	8.2%
25.00 - 29.99	3.4%	1.2%	1.1%	3.5%	0.4%	1.1%	10.7%	0.7%	5.3%
30.00 - 34.99	1.5%	0.2%	0.2%	1.0%	0.3%	0.3%	9.6%	0.2%	2.7%
35.00 - 39.99	0.6%	0.2%	0.3%	0.3%	0.2%	0.0%	4.5%	0.0%	0.0%
40.00 - 44.99	0.4%	0.3%	0.1%	0.2%	0.0%	0.0%	1.6%	0.0%	0.4%
45.00 - 49.99	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%
50.00 - 74.99	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	3.8%	0.0%	0.1%
>75.00 - 99.99	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%
>100.00	0.1%	0.2%	0.0%	0.2%	0.1%	0.0%	0.4%	0.1%	4.1%
Unknown	0.4%	0.6%	0.7%	1.1%	0.7%	0.2%	0.2%	1.2%	0.4%

Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Where are Transit Trips Beginning

Another way of looking at trip origins and destinations is to evaluate the trip end densities. This analysis was performed on the unweighted or unexpanded data. The number of unweighted survey trips by origin location was tabulated by ARC traffic analysis zones (TAZs). In this tabulation an origin is simply the location where the rider began his/her transit trip. The relative concentration of origin trip ends throughout the region is illustrated in Figure 21 using a thematic map of count ranges. TAZs containing the highest numbers of trip origins were largely found in Fulton and DeKalb counties. This is denoted by varying shades of blue. The largest number of origins was in the TAZ containing Grady Memorial Hospital and part of Georgia State University in the City of Atlanta. Almost 1,000 riders began their trips there. Clayton County, where Atlanta's Hartsfield-Jackson International Airport is located, also had several TAZs with high origin counts.

Figure 21 –
Trip End Density Map (Origins)
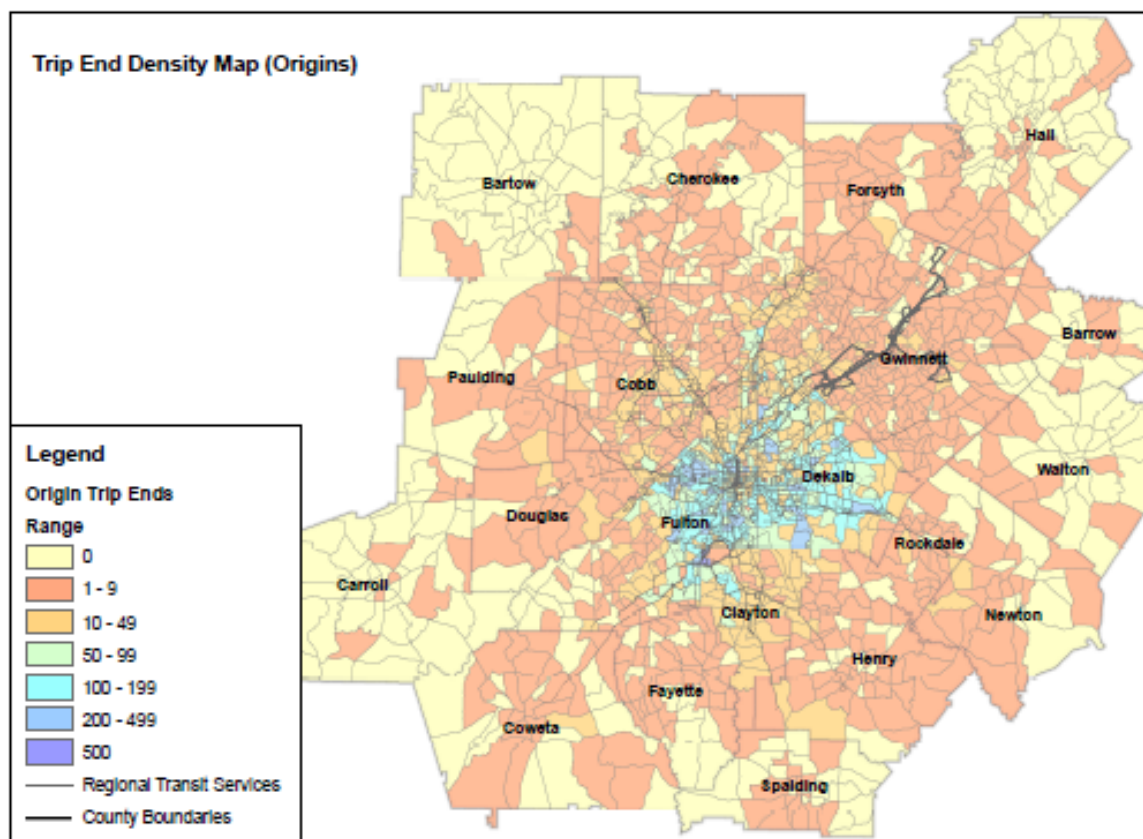
Source: ETC Institute June 2010 – Atlanta Regional Commission Regional On-Board Transit Survey

Where are the Transit Trips Destinations

Unweighted survey trips by destination location were tabulated by ARC TAZ. Destinations, in this context, are simply the locations where surveyed riders ended their trip. The relative density of destination trip ends throughout the region is illustrated in Figure 22 using a thematic map of count ranges.   Those zones containing the highest concentrations of destinations were largely found in Fulton and DeKalb counties. The highest zone counts are denoted by varying shades of blue. The largest number of destinations was in the Hartsfield-Jackson International Airport traffic analysis zone in Clayton County. Over 1,100 riders ended their trips there.

Figure 22 –
Trip End Density Map (Destinations)
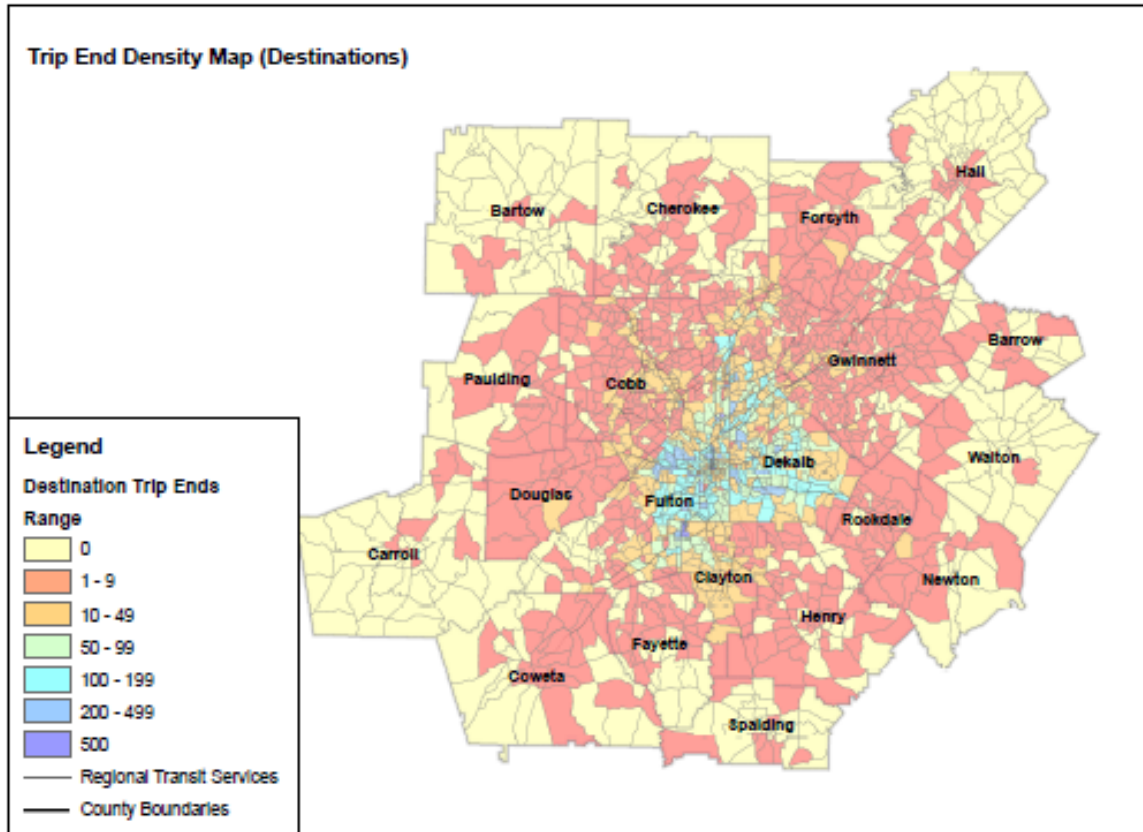
SECTION 9: LIMITATIONS OF THE DATA

Limitations of the Data

Although the sampling and completeness goals for this survey were met or exceeded in all areas, the survey database does have limitations. The limitations listed below are intended to provide guidance to persons who will use data from this survey to conduct analysis in the future. The list is not all inclusive, and anyone using the database should consider other limitations that are common to databases that area obtained from random or stratified random sampling.

- **Weekend travel patterns are not represented in this database**. This survey did not include weekend trips. Although weekend trips may have similar characteristics to trips completed during weekdays, this survey only included trips that were completed Monday through Friday.

- **Special event travel patterns are not represented in this database**. This sampling plan was desired to capture data from transit users on a typical weekday. In order to ensure the data reflected a "typical" weekday, routes were not surveyed on days that special events were conducted along the route.

- **Low volume route data may not be statistically representative of individual low volume routes**. Since many low volume routes have unique characteristics, the data for low volume routes may not be representative of the routes that were not included in the sample. Every effort was made to select a representative cross-section of low volume routes, but caution should be used for any routes that have fewer than 50 completed surveys.