Appendix I:

QA / QC Plan

Atlanta Regional Commission On-Board Survey Quality Assurance/Quality Control (QA/QC) Plan

In-Field Quality Assurance / Quality Control

The tablet PCs that are used to collect the Origin Destination (OD) survey data contained an on-screen mapping feature that allow for real-time geocoding of locations based off of: address, intersection, or place searches gathered from feedback of respondents. The respondents then confirm the geocoded location based on the on-screen map that shows the searched address/location via a Google Map indicator icon.

In addition to using the mapping feature to collect the GPS coordinates of major survey locations (home address, origin address, destination address, parking location, boarding location, and alighting location), the tablet PC program also allows the interviewer to walk through each question with the respondent to answer any questions as well as to ensure appropriate interpretation of the survey questions.

Field Supervisor Quality Checks

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

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

Field Supervisor Online Review Tool

In addition to being able to review various breakdowns of data, FS are also able to review each individual record using a visual review tool. This is done in the field to ensure that trip data is being collected accurately for each interviewer. The FS is also able to look up individual records by interviewer in database/spreadsheet form which allows them to call respondents to check on the accuracy of the data collected, as well as the job performance of the interviewer. An example screenshot of the FS' version of this online tool is shown in ***Figure 2*** below.

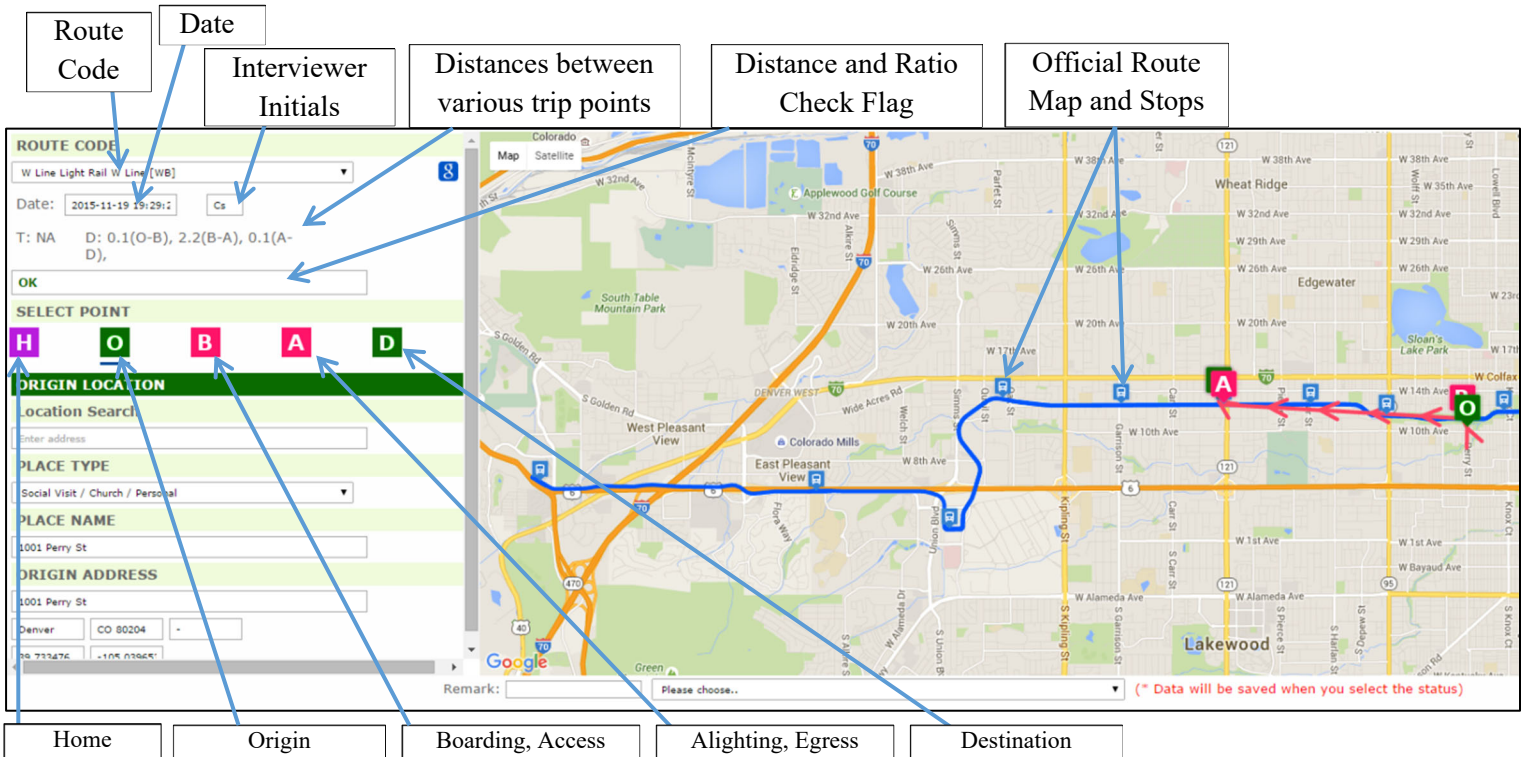

Figure 1

Secret Shopper / Ride Along

FS and secret shoppers also ride on bus routes to gauge interviewers' demeanor, overall behavior, and adherence to protocols during interviews.

Call Center Field Checks

ETC Institute has an in-house call center that conducts random quality control check calls for each transit project. These calls are similar to the calls made by FS, just on a larger scale. The goal of the call is to identify any missing or incorrect elements in the interview as well as gather any feedback regarding the interviewer's job performance during the interview.

Process for Identifying Complete Records

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

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

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

Online Visual Review Tool

ETC Institute has created an online visual review tool that allows for the review of all completed records within the database. This tool shows all components of each individual trip as well as a series of preprogrammed distance and ratio checks as described on subsequent pages. After directions are finalized, the next step is to run each record through the Speed/Distance/Time checks. ***Figure 3*** below shows an example of the online visual review tool. It is very similar to the online visual review tool used by FS, described previously, with the additional functionality of being able to review all aspects of the survey as well as being able to make edits when appropriate.

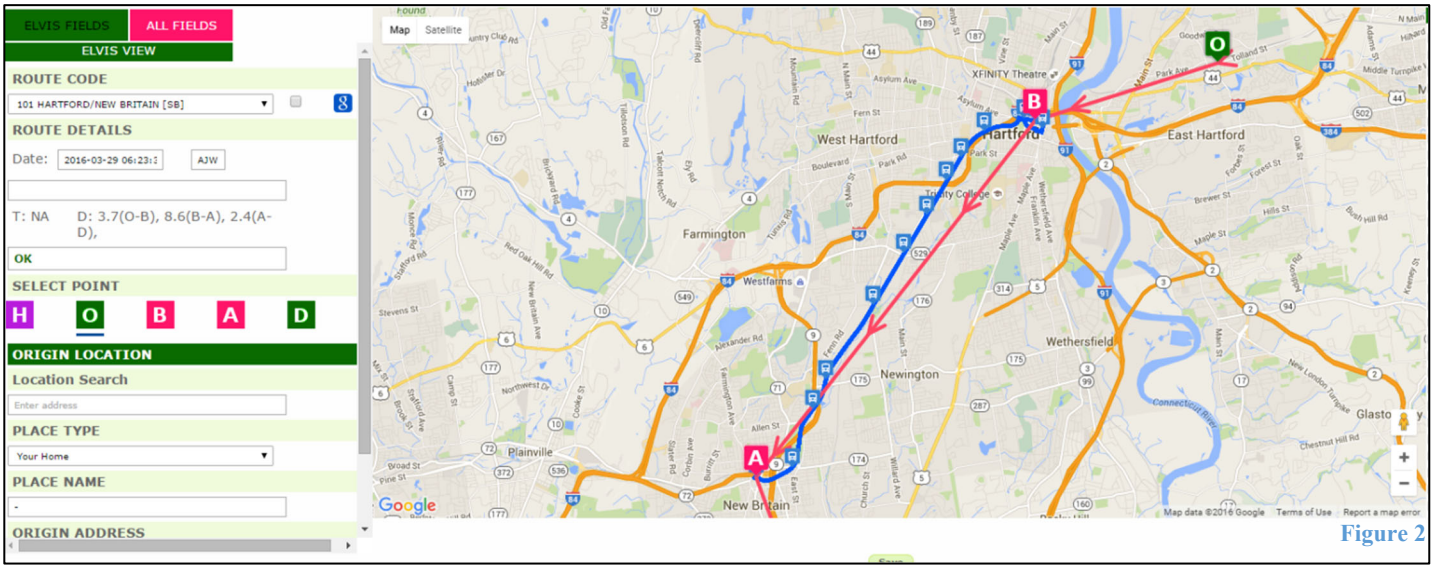

Figure 2

Pre-Processing Distance Checks

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

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

Access/Egress Mode Distance Check

Table 3 shows the distance checks for access (Origin to Boarding) and egress modes (Alighting to Destination).

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

Table 1

Origin to Destination Distance Check

Table 4 shows the distance checks based on the origin and destination locations.

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

Table 2

Boarding and Alighting Distance Check

Table 5 shows the distance checks based on the boarding and alighting locations.

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

Table 3

Pre-Processing Ratio Checks

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

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

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

Third, the distance between alighting and destination is divided by the distance between origin and destination. If the rider has a high ratio, the alighting to destination distance is excessive compared to the origin to destination.

Table 6 describes in more detail the ratio checks used, and the conditions in which a record would be flagged.

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

Table 4

Transit Review Team (TRT)

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

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

Pre-Processing General Issues and Actions

Table 7 below describes the general issues that could occur within a trip where changes may have been appropriate.

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

Table 5

Transfer Issues and Actions

Table 8 below describes the transfer issues that could occur within a trip where changes may have been appropriate.

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

Table 6

Post-Processing Additional Checks

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

Non-trip related checks included:

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

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