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LIST OF APPENDICES*

***Note: The following appendices are available on the TRB web site by searching for TCRP Web-Only Document 57.**

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AUTHOR ACKNOWLEDGMENTS

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ABSTRACT

This report documents a study to develop a transit advertising audience measurement model or methodology and presents a recommended approach for measuring the Opportunity to See advertising displayed on the exteriors of buses and other surface transit vehicles, as well as internal transit advertising displayed inside buses, railcars and transit stations. Fieldwork was conducted in three transit systems: Atlanta's MARTA, Chicago's CTA and Portland, Oregon's TriMet, including tracking of bus exposures to other vehicle occupants, and rider intercept surveys. The report presents a series of methodologies for each component of transit advertising (bus exteriors, bus interiors, railcar interiors, station concourses and station platforms). The described methodologies include equations, sample calculations and sample worksheets. In addition, an eye-tracking study was conducted on the New York MTA subway and bus system to test two proposed approaches to estimating actual viewership scores. The report also presents a road map for full-scale implementation of transit advertising audience measurement.

EXECUTIVE SUMMARY

INTRODUCTION

Sale of advertising in public transit facilities and vehicles is a nearly $1 billion industry generating approximately $500 million annually to transit authorities. Yet transit advertising revenue (which is part of the Out-of-Home category) represents approximately one-half of one percent of total U.S. ad expenditures. The other 99.5 percent of advertising revenues goes to television, radio, billboards, the internet, newspapers, magazines, and other media.

The American Public Transportation Association (APTA), as a service to its transit agency members, has set out to **boost transit's share of national advertising expenditures**. To assist with this effort, APTA has established an ad revenue task force representing dozens of transit agencies throughout the country. The goal of this task force is to increase transit advertising sales and revenue.

A key impediment to increasing transit advertising revenues is the **lack of a credible audience measurement system** that can demonstrate the value of transit advertising to potential advertisers. The implication is that the development of a transit audience measurement system would put transit on par with more successful media such as television and radio in the eyes of advertisers and media planners. These more lucrative media enjoy independent audience measurement systems that assure advertisers and media buyers of credible audience reach and frequency information. Prospective advertisers rely heavily on audience measurement information to decide where to advertise, to determine whether they are reaching the target audience and to justify the cost effectiveness of their media purchases.

Research was needed to **define and validate an audience measurement system for transit advertising**. The resulting research builds upon recent work that developed and tested an audience measurement system for traditional out-of-home advertising such as billboards and transit shelters (i.e., the Traffic Audit Bureau's "Out-of-Home Ratings", formerly known as "Eyes On").

This report documents the resulting study and analyses conducted by Peoplecount, with input from the Traffic Audit Bureau for Media Measurement in an advisory capacity. Methods are developed for measuring the various segments of transit advertising media, **including bus exteriors, bus and railcar interiors, and in-station advertising**.

Around the world, the gold standard of out-of-home media metrics comprises three components:

- **Opportunity-to-See (OTS) Measures** – Accurate estimates of the entire universe of people who have an opportunity to see the advertising medium. OTS metrics are derived independently from audience-centric reach-frequency-demographic estimates and include some type of "traffic" count;
- **Likelihood-to-See (LTS) Ratings** – A "rating" or index expressing the average percentage of the OTS audience that actually looks at the advertisement; and

- **Reach-Frequency-Demographic Ratings** – The LTS audience is then expressed as the number of unique individuals (Reach), the average number of times each individual sees the advertisement in a given time period (Frequency), and a breakdown of the age, sex and other demographic characteristics of this audience.

The methods developed in this report concentrate on the first of these three components: the **Opportunity to See.** Furthermore, a pilot study of eye-tracking techniques was conducted to explore the application **of Likelihood-to-See** ratings. The scope of the report confines itself to development of practical methodologies and illustrative examples – actual audience ratings for transit media are not developed.

FINDINGS

As the purpose of this study was to develop a "methodology" to measure transit advertising (i.e., a series of algorithms or methods used to estimate the audience of various components of advertising media displayed in public transit systems), the "Findings" are, in fact, the methodologies ultimately recommended. Thus, we include an overview of the various methodologies in this Summary, but have refrained from providing specific numbers, graphs, equations, fieldwork results or insights, as they are documented in the main body of the report.

Peoplecount conducted fieldwork in three transit systems: Atlanta's MARTA, Chicago's CTA and Portland, Oregon's TriMet, including riding of buses and counting vehicles passing and being passed by the bus, as well as 2,500 rider intercept surveys. These independently collected data, in addition to data and information obtained from the transit authorities themselves, were compiled and analyzed to develop and test specific methods to measure the audiences of each sector of transit advertising.

Opportunity to See Surface Vehicle Exterior Advertising

The term "surface vehicle exterior advertising" includes bus sides, bus backs, full bus wraps, light rail or streetcar exteriors, and possibly train exteriors or wraps (if viewed from surface streets). The audience of exterior bus advertising comprises:

- occupants of **other vehicles** and
- **pedestrians** on sidewalks.

Using the data collected in the field, Peoplecount developed algorithms to estimate advertising exposures to pedestrians and occupants of other vehicles using **known local data** including Annual Average Daily Traffic (AADT) volume, posted speed limit, road classification, known bus stop locations and travel times. The final methodology is applied using the following approach:

- Data on bus stop locations, bus routes and stop-by-stop schedules are obtained from the transit authority (preferably in the General Transit Feed Specification (GTFS) format, but could also be GPS readings or outputs from bus scheduling software);
- The local road and traffic characteristics are assigned to bus stop locations;
- The exposure of the bus exterior advertisements to pedestrians and vehicle occupants are calculated using the equations developed, and are specific to each road section between two bus stops, and for each bus run throughout the average week. **Each bus side (left, right, front, back) is calculated separately**, including only the traffic and pedestrian streams that have an opportunity to see that side;
- In this manner, exposures to pedestrians and vehicle occupants are estimated for all the bus routes operated by a transit system. Because the operation of individual buses is unpredictable from day to day (depending on the route assigned), the exposures of all active buses operating out of a particular garage are amalgamated and an **average weekly Opportunity to See** is estimated for each bus side in that garage.
- Sample calculations and worksheets are provided in the main body of the report for illustration purposes.

Opportunity to See Rider-Targeted Advertising

Other than surface vehicle exteriors (and rail exteriors where they operate on at-grade or elevated rights of way), all other transit media are directed to riders of the transit system. Algorithms are developed to predict Opportunity-to-See exposures of internal transit media at the following **levels of granularity**:

- Bus/surface vehicle interiors – by bus garage
- Subway/train vehicle interiors – by line or line group (sharing common railcars)
- In-Station advertising – by station and location category (i.e., platform versus concourse)

As riders transfer from vehicle to vehicle or pass through transit stations in the course of their transit trip, they are exposed to various forms of transit media. As all of the above media types are **measured using ridership data**, a series of worksheets are devised to illustrate the data inputs required and the series of simple calculations needed to arrive at an Opportunity-to-See estimate for each combination of location type and media type within the transit system.

Converting Opportunity to See (OTS) Exposures to Likelihood-to-See (LTS) Ratings

The Opportunity-to-See (OTS) calculations presented herein for rider-targeted advertising estimate the entire realm of people that would come into contact with a particular class or type of advertising medium within the transit system. However, a particular passenger in the system does not always have the actual opportunity to see every advertising poster available in a particular transit vehicle or station.

Visibility adjustment indices (VAIs) must be applied to convert OTS to LTS. Ultimately, the VAI scores applied will be a blend of two components:

- The **real proportion** of advertising posters that an average passenger encounters in each part of the transit system (or "Structural OTS"), considering where passengers tend to walk, congregate, sit or stand, the distance and angle of visibility, the configuration of the advertising relative to the advertising vehicle, etc. For example, if there are 30 advertising cards displayed along the length of a bus, perhaps only 20 of them on average would even be within the plausible viewing area of the typical transit rider;
- The **likelihood-to-see ratio** (or VAI – Visibility Adjustment Index), when the advertisement is within viewing range, given the typical eye movements of the passenger in that particular circumstance. For example, perhaps the typical rider actually notices 60 percent of the advertisements to which (s)he is exposed. **Any future eye-tracking and visibility research must consider both components of the VAI index.**

Reach-Frequency-Demographics

To compare transit media with both traditional outdoor advertising and other media, the Likelihood-to-See (LTS) ratings (i.e., the number of actual weekly viewers) are ultimately subdivided into bins of demographic characteristics including sex, age, ethnicity and income.

Furthermore, the LTS estimates are expressed as the product of two parameters: **reach** (the number of different individuals who are likely to see a given advertisement in a given time period) and **frequency** (the average number of times these individuals are likely to see the same advertisement over the given time period). The product of the two parameters, Reach x Frequency, is the gross visibility-adjusted circulation, also termed LTS. In the case of transit advertising, frequency would depend on the amount of duplication of the same trip. Development of a comprehensive reach-frequency-demographic model is transit system-specific, or at least market-specific.

CONCLUSIONS

- **Feasibility:** The development of a transit advertising audience measurement system is feasible from the standpoints of data availability, mathematical and modeling knowledge and capabilities, stakeholder interest and buy-in, and economics.
- **Granularity:** Bus exterior and interior advertising audiences should be measured as an average weekly exposure per bus, averaged **by bus garage** (to account for unpredictable bus assignments and maintenance routines). Likewise, railcar exterior and interior advertising audiences should be expressed as average weekly exposures per railcar, averaged **by rail line group** (i.e., all the rail or subway lines that share a common pool of railcars). Station advertising audiences can be measured to the level of **individual station**, further subdivided by station **concourse** and **platform** areas.

- **Bus Exterior Advertising Audience Measurement:** A data-intensive, detailed approach is developed to estimate the opportunity to see exterior transit vehicle advertising. The proposed methodology is quite practicable using either available GTFS or GPS data and/or detailed bus schedules, along with mapped nationwide base data such as traffic and pedestrian counts.
- **Rider-Targeted Transit Advertising Audience Measurement:** Transit system ridership data can be acquired from the transit authority and expressed in consistent units of average weekly ridership (accounting for any daily and seasonal ridership variations). A series of worksheets can be set up (similar to examples provided in the Appendix of the main report) to carry out the simple calculations. For transit systems with a **rail component,** the calculations and variations in available data can become more complex and would likely require the assistance of a vendor or consultant such as Peoplecount to help collect, interpret and analyze the ridership and system data consistently.
- **Eye-Tracking Research:** The video camera technique is recommended for filming in situations where the viewer is moving, such as in stations and at street level for exterior buses. While the passenger is on board transit vehicles, however, the eye camera technique is best for replicating the viewpoint of stationary passengers inside buses and railcars.

RECOMMENDATIONS

- **Ongoing Stewardship:** Responsibility for implementation and ongoing maintenance of a transit media audience metrics system must be assigned and funded. Upon industry consultation and review of alternatives, it is recommended that this role be fulfilled by the Traffic Audit Bureau for Media Measurement (TAB), as out-of-home media audience metrics is their core competency.
- **Further Eye-Tracking Research Required:** Further eye-tracking research is required to develop Visibility Adjustment Indices (VAIs) for the various sizes, types and placements of transit media. It is recommended that the transit media industry further explore the alternatives of funding original eye-tracking research in the U.S. versus licensing already-existing VAI data from other countries.
- **Implementation:** The transit media industry must fund a further implementation plan to apply the data collection, methodologies and algorithms to specific transit systems. Traditionally, transit media vendors would be expected to fund this process. To ensure full buy-in and universal acceptance from media buyers, it is necessary to **encourage most or all transit systems to participate**. As such, additional funding from other sources (e.g., APTA or other industry associations, media buyers, transit systems, government resources) would be beneficial.
- **Implementation Schedule:** Based on the flow of funding, a relatively quick implementation across all major transit advertising markets (if not nationwide) is recommended. A roll-out schedule of between one and three years is preferred.

- **Implementation Software:** The proposed methodology for estimating the audience of exterior bus advertising is data-intense and lends itself to a software application. Using robust GIS software and mapping tools (such as ArcGIS), software can be created to automatically process bus travel data (such as GTFS data files, GPS readings or other common bus schedule and routing data inputs). It is recommended that the ongoing project steward (such as the Traffic Audit Bureau) investigate the feasibility of developing such software to assist in the estimation of OTS audiences for exterior bus advertising. Otherwise, the TAB has found that, by licensing its data to third-party vendors who produce media buying and planning software, commercial software or custom data sets can be developed for software platforms already used by media planners/buyers.
- **Traffic and Pedestrian Count Mapped Database:** To implement the proposed methodology for estimating bus exterior advertising exposures, traffic and pedestrian count data are required for each bus stop. It is recommended that the implementation software described above include an imbedded mapped database of traffic, pedestrian and road infrastructure data. It is further recommended that the TAB enhance its existing in-house traffic and pedestrian count database (already compiled for billboard and transit shelter audience ratings) by developing a Traffic Intensity Model to generate estimates.
- **Transit Contracts:** To ensure universal application and usage of the industry-wide transit audience metrics system, it is recommended that transit agencies issuing RFPs to media vendors consider stipulating its use as a mandatory part of contractual reporting and delivery. Furthermore, transit authorities may want to consider the benefits of longer duration contracts in terms of the incentive for vendors to invest in research and measurement.
- **Standardization of Ridership Data:** Transit ridership is measured in vastly different ways from system to system, including a plethora of fare collection technologies, passenger counting technologies, and modeling and estimation techniques. Some transit systems count transit vehicle boardings and alightings directly while others count station entries and exits. Estimation of cross-platform transfers is often difficult. It is recommended, recognizing the limitations of existing technology and economics, that transit agencies attempt to develop a common currency of transit ridership, similar to the AADT traffic count in road traffic.
- **Standardization of Origin-Destination Surveys:** It is strongly recommended that the public transit industry consider **standardizing the survey questions** of passenger origin-destination surveys and the coding of results. The report includes suggested data items to be collected for optimal application of transit advertising audience measurement.
- **General Transit Feed Specification (GTFS) Data:** For any major transit systems that are not yet participating in the Google Transit data standardization initiative, it is strongly recommended that **GTFS data be developed and released for public use**.

- **Reach-Frequency-Demographics:** Media planning software includes reach-frequency-demographic breakdowns of the audience impression data, which must be modeled for individual transit systems. It is recommended that modeling of R-F-Demos across the country proceed with the assistance of a qualified vendor using nationally available datasets such as Census data, the National Household Transportation Survey (NHTS) and the American Community Survey (ACS).
- **Education:** Especially among general planners and non-transit specialists, there will be a need to continually educate buyers to understand and demand the new metrics in their purchasing contracts. This role should be taken on by the Traffic Audit Bureau.

CHAPTER 1 BACKGROUND

PROBLEM STATEMENT

Sale of advertising in public transit facilities and vehicles is a nearly $1 billion industry generating approximately $500 million annually to transit authorities. Yet transit advertising revenue (which is part of the Out-of-Home category) represents approximately one-half of one percent of total U.S. ad expenditures. The other 99.5 percent of advertising revenues goes to television, radio, billboards, the internet, newspapers, magazines, and other media.

The American Public Transportation Association (APTA), as a service to its transit agency members, has set out to boost transit's share of national advertising expenditures. To assist with this effort, APTA has established an ad revenue task force representing dozens of transit agencies throughout the country. The goal of this task force is to increase transit advertising sales and revenue.

Research results from recently completed TCRP Report 133 "Measures to Increase Transit Industry Advertising Revenues" indicate that opportunities exist for expanding transit advertising revenue:

> *"Market conditions suggest that transit advertising is well positioned to grow. The outlook from organizations that track media trends is that the shifting of dollars out of traditional media and into non-traditional formats will continue. In particular, out-of-home media, the category that includes transit advertising, will remain one of the fastest growing sectors of advertising spending."* (Alper, 2009, p. 1)

Further, TCRP Report 133 indicates that a key impediment to increasing transit advertising revenues is the lack of an audience measurement system that can demonstrate the value of transit advertising to potential advertisers. Other more pervasive media, such as radio and television, have standardized audience measurement systems. These standardized audience measures are successful because they give media buyers confidence that ads will cost effectively deliver messages to the target audiences.

Surveys of media buyers and advertisers conducted for TCRP Report 133 indicate that the absence of credible and accepted audience measurement data limits the sale of transit advertising. The implication is that the development of a transit audience measurement system would put transit on par with more successful media such as television and radio in the eyes of advertisers and media planners. These more lucrative media enjoy independent audience measurement systems that assure advertisers and media buyers of credible audience reach and frequency information. Prospective advertisers rely heavily on audience measurement information to decide where to advertise (e.g., television versus radio versus internet versus transit), and to determine whether they are reaching the target audience, and to document the cost effectiveness of the money they invest in advertising to reach a particular audience.

Research was needed to define and validate an audience measurement system for transit advertising. The resulting research built upon the findings of TCRP Report 133 and other recent work that developed and tested audience measurement systems for out-of-home advertising.

Contract TCRP-B39, "Audience Measurement for Transit Advertising", was awarded to Peoplecount, with input from the Traffic Audit Bureau for Media Measurement in an advisory capacity, and from specialist suppliers Micromeasurements Inc. and Perception Research Services.

STATE-OF-THE-PRACTICE SCOPE OF WORK

The initial task undertaken was to comprehensively review and summarize the current state of the practice in audience measurement for transit advertising, both globally and domestically. Accordingly, the following tasks were undertaken and are subsequently summarized in this chapter:

Comprehensive Review of Current Systems

- Compiled comprehensive, global research conducted by the Traffic Audit Bureau documenting out-of-home measurement practices around the world, supplemented with updated reviews, and highlighting the practices related directly to transit advertising. Specifically, the information gathered includes: metrics used for audience measurement; methods of data collection and modeling; identification of current users of the audience measurement system; how the measurement system was deployed, tested and validated; how the measurement system was funded and maintained; and what was the impact on advertising sales;
- Undertook a literature review identifying the latest trends and breakthroughs in out-of-home and transit advertising audience measurement;
- Reviewed ESOMAR's "Global Guidelines on Out-of-Home Audience Measurement" (ESOMAR, 2009) to understand global best practices and ensure compliance;
- Conducted a comprehensive review of current data collection practices among U.S. transit authorities (both through fare collection systems and through supplementary ridership surveys);
- Consulted with the Traffic Audit Bureau for Media Measurement to confirm current practices and trends among transit media buyers and sellers.

Interview Media Buyer/Planners and Sellers

- To glean the most information from media buyer/planners and sellers while being respectful of their busy schedules, the two-part process comprised online surveys followed by telephone interviews;
- Designed a questionnaire survey that was administered online after review and approval by the TCRP. The questionnaire was designed to cover basic numeric or multiple choice answers ;
- Compiled a contact list of media buyers and planners in the U.S. (including the buyer members of TAB's Transit Committee) who frequently buy transit advertising (and those who do not, for comparison);

- Administered the online survey, asking respondents to identify themselves and consent to a telephone follow up;
- Followed up with a number of respondents by telephone to elaborate on the survey answers and requested qualitative or anecdotal details.

REVIEW OF GLOBAL TRANSIT AUDIENCE MEASUREMENT PRACTICES

Most of the global information gathered came directly from interviews and/or detailed e-mail exchanges conducted by the Traffic Audit Bureau. The countries contacted were only those with at least an actively funded plan in place for measuring any aspect of transit advertising, namely: Spain, the Netherlands, Finland, Switzerland, Australia, Ireland, and the United Kingdom. Following are the salient findings from each country.

Spain

- GeoMetro study was jointly funded by the top buyers/sellers/advertisers of the area in 2006 to study metro audiences in Madrid and Barcelona;
- The primary emphasis was to understand how riders move into and throughout the stations, in relation to the layout of each station, and the opportunity for “contact” with advertising panels at specific locations within the station;
- Riders were tracked through the stations with GPS. Over 8,000 people were interviewed and/or tracked;
- Station maps were digitized in a very time-consuming and expensive process;
- Using the data collected from interviews and GPS tracking, coupled with station layouts, the flow of people was modeled;
- For mid and small towns, additional interviews are being used to model rider paths through the transit system;
- All buyers, sellers, and researchers involved in advertising for underground transit are considered as users of the system, provided they pay for the necessary software. The system is integrated into all other OOH media type measurement to facilitate comparison shopping. The industry’s goal was that transit be used and handled as any other format, thus enabling the audience delivery of a bus to be compared with the bus shelters of the same line.

Netherlands

- In the Netherlands, the process of audience measurement for all out-of-home media is still under development through a Joint Industry Commission (JIC). It is an important goal that transit follow the same schema as the rest of the traditional OOH media already measured;
- The thought process operates using the following metrics: the total audience flow minus the people who cannot see the ad equals an opportunity to contact (OTC) the panel. OTC minus the people who do not see the panel due to modeling equals Visibility Adjusted Contact (VAC);
- Data collection is currently underway, although no information is being made public about this exercise;
- A working group of agencies and sellers was created to fund, maintain, and develop metrics.

Finland

- Finland has adopted a Visibility Adjusted Contact model similar to the Netherlands'. To estimate audience flow, Finland made use of government resources that measure volume along with travel surveys. The purpose of the travel surveys was to overlay demographics onto the volume measures along with duplication of trips. The outsides of buses and trams are in the current audience measurement system today. Next, the industry intends to include advertising on the inside of buses and trams;
- Traffic flow data is a key metric of the Finnish system (presumably for bus exteriors). The challenge for Finland is pedestrian flow data, which is rarely available;
- The work was done largely by private consultants who have not been forthcoming with information. Furthermore, it has been reported that individual media sales companies did not have enough resources (people and money) for this initiative because there was no central organization who first investigated the data availability. The Finnish Outdoor Advertising Association only administers the updates, while the individual companies that own the system have all the expertise internally;
- Finland created a working group of agencies and sellers to fund, maintain, and develop new metrics as needed.

Switzerland

- Swiss research firm SPR+ (founded privately by two OOH advertising providers) completed an in-progress study on street traffic patterns for traditional OOH and soon after expanded the thinking to a Railway Station Study. Metrics used were a combination of detailed digital maps of the largest railway stations, electronic survey counters, GPS monitored trip paths, panel location data, and modeling methods based on that data;

- The entire dataset fits on something called a track segment, which is a collection of pathways that a traveler may take. Each track segment has the same measurements applied to it. The goal of this project was to provide information that can be linked to existing OOH research;
- Detailed digital maps of railway stations were created, depicting each corridor, entrance and exit, and any storefronts, etc. Electronic devices were used to count station entries and exits. 46% of all possible track segments were counted, and the rest modeled;
- Finally, the panels are assigned to specific track segments and the modeled trip path results are weighted based on characteristics of the panel's location;
- A user group provided input and ensured that the original tenets held true. Deployment occurred via software called SPR+ Expert, which calculates all relevant media math within and between media types.

Australia

- The Australian Outdoor Media Association, made up of buyers, sellers, and advertisers, has in February 2010 introduced an industry-wide measurement system known as Measurement of Outdoor Visibility and Exposure (MOVE);
- Owned by the OMA and its five largest OOH media members, MOVE provides audience measurement data for all main outdoor formats including roadside, transport (railway stations, airports, etc.) and shopping centers;
- Using variables such as the size of the face, illumination and speed with which an audience is passing, a Visibility Index (VI) score is applied against each face. The VIs are used to convert total audiences - that is the Opportunity to See (OTS) results - to actual audiences (the LTS contacts). Eye tracking studies were conducted using specialized eyewear;
- MOVE is deployed via a web-based system that is directly accessible by media agencies and outdoor media companies (members of the OMA). Media agencies were provided with six months' free access to the system following its launch.

Ireland

- Following market research to understand the needs of the advertising community, Ireland's Outdoor Media Association formed the Joint National Outdoor Research (JNOR) project to provide audience delivery data for the OOH industry. A Visibility Contact approach similar to that of the Netherlands and Finland was used;
- The JNOR made use of travel surveys to understand trip paths and trip frequency. They also collected traffic volume data and modeled pedestrian "footfalls", mainly by taking actual counts around the Dublin area and finding footfall patterns. This was originally done for traditional, static OOH locations but has since been expanded to include bus sides and trains;

- A separate OTS model was created to ascertain the encounter rate between buses, pedestrians, and drivers throughout the week. Approach and dwell times at junctions, walking and vehicle speeds were studied in the Dublin area;
- The visibility factors used were re-engineered from a Dublin/Helsinki/ Stockholm model, taking into account the different poster sizes on the Dublin (and Belfast) bus fleet;
- Cover and Frequency Audience System (CAFAS) software is a stand-alone system available through the OMA.

United Kingdom

- Postar is an organization (formed as a JIC) funded by the industry, directly and through other trade bureaus, to measure audiences for OOH;
- Postar is currently reviewing its transit measurement. They have already adopted a visibility study that takes total audience circulation and translates it to those that are actually noticing the media type, similar to the U.S. Out-of-Home Ratings approach (formerly known as "Eyes On");
- Postar have outfitted respondents with GPS devices. By merging these results with digitized maps of stations (a laborious and expensive undertaking), they hope to model journeys through each tube station. It is Postar's intention that each board will have an average of five respondents passing it;
- The trip path results are then used along with circulation data gathered by other means to estimate audience volume flow paths. "Other means" can include data from the government or from the underground authorities. For example, the London Underground collects entry and exit data electronically by quarter hour for all its stations. It also undertakes origin-destination studies and other user research;
- Obtaining accurate and usable inventory data from the media owners was a real challenge. They underestimated the task and thus overran the original time plan for this input by at least a year;
- The visibility adjustment scores were already completed much earlier, using the picture methodology. The picture methodology is a term coined here that describes respondents being shown various pictures containing road segments with boards on them of varying types. Pictures are shown to respondents for six seconds and their eye movements are tracked;
- The goal in the U.K. is to extend the use beyond the immediate research. To that end, they intend to invest in software that will make the data attractive to a broader user group – mainstream agencies and clients. The common entry point for data will be via a software system provided by Cuende Infometrics and Telmar.

Summary and Key Insights

As most of these efforts are in their infancy stage at best, there was **no real measurable impact on sales other than qualitative feelings of the users.** Upon review of the information provided by the various organizations, **key similarities** emerged across many countries, including:

- The process of gathering accurate, usable data from transit authorities and advertising vendors is a huge challenge. It is either not available in the digital map format needed, or the panel locations are not accurate enough or both. Most countries ran into timeline and cost difficulties here.
- Defining the trip paths riders take through the transit system is a necessary step if the desire is to report results at the individual panel level. To fully understand a panel-level circulation, and in particular to provide eye tracking results to said board, a method needs to be undertaken to model the likelihood of where people are walking within each network of hallways within each station of the transit system. Methods here vary, but it is a key component and the most costly in time and money.
- In many instances, the resulting research required more iteration, or more time to understand and interpret the results, than was initially planned. Committees regularly had to regroup to understand the data, revise expectations and make adjustments.
- It is important to develop a system that can compare transit directly with other OOH measures to facilitate cross-platform purchases. This means the methodology among the various OOH sectors should be consistent.
- There is no one way to do this research. Every country has different approaches with different types of oversight. The most popular process used is to first define an opportunity to see and adjust it by a visibility contact to ascertain a true audience. This is similar to the Traffic Audit Bureau's approach to out-of-home media measurement in the U.S.
- A key metric is the approach taken by transit authorities to understand their total circulation. The use of ridership surveys or GPS tracking is an expensive proposition.
- Oversight by technical and business groups is essential to produce a system that holds up to both research community scrutiny and practical business needs. It is possible to "over research" this work if the level of detail undertaken by some countries is judged objectively.

GLOBAL STANDARDS FOR OUT-OF-HOME AUDIENCE MEASUREMENT

The "gold standard" that out-of-home advertising associations globally are now striving to meet is documented in the publication by ESOMAR (a world association of research professionals) entitled "Global Guidelines on Out-of-Home Audience Measurement" (ESOMAR, 2009).

The Traffic Audit Bureau's Out-of-Home Ratings methodology (formerly known as "Eyes On" conforms to these guidelines, and it is intended that the methodology being developed for transit advertising audience measurement will also meet the ESOMAR guidelines.

Specifically, the guidelines call for the following approach:

- "A clear statement of the geographic area and population being surveyed;
- An accurate list of the type, position and visibility of all display panels being measured;
- A survey of individuals' behavior;
- An estimate of the number of people in the target universe passing every panel;
- An adjustment of the gross numbers to correct for the likelihood that a panel will be seen;
- Additional traffic count or movement data at roadside level not derived from the survey data;
- The level of sophistication of each of these elements will depend on the information available in a given market and the money available to conduct the measurement."

Most important of the above points are the need for visibility adjustment factors (i.e., eyes on), and the need for traffic data independent of the survey data.

DATA COLLECTION PRACTICES AMONG U.S. TRANSIT AUTHORITIES

Throughout the second quarter of 2010, Peoplecount conducted numerous interviews with personnel from many of the top U.S. transit authorities to discern the current state of fleet and ridership data collection in the industry. A total of 18 transit authorities were contacted (see Appendix A for a complete list) and each was asked a series of questions aimed at determining the sophistication of their data collection practices. Questions focused on general fleet information such as size, extent and composition, as well as on the availability of GPS data from surface vehicles such as buses and spatially referenced route and transit stop data (i.e. GIS data layers). Additionally, a series of questions focusing on efforts to collect passenger counts, and methodologies for collecting ridership breakdown and passenger origin and destination data were posed. The response to each of these questions has been summarized in **Appendix A**.

Fleet and System Data

It was found that the data collected or maintained by the various transit authorities as it pertains to fleet and route characteristics are generally consistent among the major transit authorities. All could consistently provide the fleet size and vehicle type, citing peak utilization, number of spares and total active transit vehicles, expressed by bus garage or rail line.

Of the 18 transit authorities polled, only LADOT Transit (the smaller of two transit authorities operating buses in the City of Los Angeles) did not maintain a GIS data layer outlining their bus routes and stops. Additionally, all transit authorities could consistently provide data on route lengths. There appears to be a general trend toward tracking bus fleets with GPS units as all authorities questioned either already tracked a significant portion of their fleet through GPS or were in the midst of implementing such a system.

- A rich source of publicly available data is submitted to Google by individual transit authorities to enable public transit route planning on Google maps. These data, known as **General Transit Feed Specification (GTFS)**, consist of a series of related tables listing in detail the routes, trips, stop locations and stop times of bus and rail schedules. GTFS data are available in a standardized format for most major transit systems and are easily downloadable from either of two central data repositories (http://code.google.com/p/-googletransitdatafeed/wiki/PublicFeeds and www.gtfs-data-exchange.com). Of the 18 transit authorities polled only three (LA DOT Transit, MARTA in Atlanta and SANDAG in San Diego) did not post GTFS data in the data repository.

Passenger Volume Data Collection

More variation was found in the methodologies and technology used for tracking ridership by rail line or bus route. The methods used varied from simple cash fare boxes on buses that provided total ridership by route, to manually counting riders boarding and alighting at each bus or rail stop or station platform, to the use of smart card readers that tracked boardings only, to automatic passenger counters (APCs), which are devices installed in the doorways of buses that track the number of passengers boarding and exiting the vehicle at each stop. Most authorities periodically perform manual counts of passengers boarding and exiting both their buses and trains at each stop or station and there is a trend (on buses at least) of installing APC equipment in a bid to eliminate manual counting of passengers.

For transit authorities that operate both bus and rail fleets, the stricter controls on passenger flows inherent in rail travel often result in more comprehensive data collection for the rail component of the system. For example, systems such as Atlanta's MARTA require that rail riders swipe a card upon entering and exiting a rail station. This provides valuable information to the transit authority in terms of station-to-station origin-destination matrices that quantify the boardings, alightings and time stamps of transit trips. This in turn provides solid information on station usage and enables estimates of cross-platform transfers.

Ridership Surveys

For the purposes of defining a demographic profile of their customers, all transit authorities surveyed conduct **general ridership surveys**, either annually or bi-annually, using a combination of on-board and telephone surveys. In addition to gathering general demographic data such as age, sex, income and ethnicity, the surveys often pose questions on service satisfaction, awareness of, and reasons for using or not using transit.

Origin-destination (O-D) data (i.e., where passengers begin and end their journeys) are collected less uniformly and, certainly in the case of buses, less frequently than general ridership data. These data are collected in two ways. Collection can be through on-board surveys that, due to the logistics and sample size required, are usually done system-wide only every 5 to 10 years. Instances of new construction often dictate that affected routes are sampled more frequently. Data collected through these surveys includes home address, origin stop, destination stop and final destination. Results are often geocoded for the purposes of mapping the data. Additionally, as mentioned above, O-D data is also occasionally available through daily ridership counts on rail systems that employ a swipe or tap system for in/out movements. Besides MARTA, Miami-Dade Transit (Metro Rail), BART and the Seattle Metro LRT all have the capability of providing O-D data from fare collection systems.

CURRENT U.S. TRANSIT ADVERTISING AUDIENCE MEASUREMENT PRACTICES

Current practices in transit advertising audience measurement, mainly in the United States and, to some extent, Canada, were reviewed by the project team and are summarized below.

There is no singular source of audience measurement data for transit advertising, partly because there are multiple media formats that fall under the transit media umbrella such as bus sides, subway/rail station posters, bus/train interiors, transit shelters and benches, fare cards and schedules.

To deliver audience measurement metrics to their advertising clients, transit advertising sales contractors utilize a portfolio of solutions to quote audience metrics such as circulation or impressions, reach/frequency, audience profile, and cost-value proposition (CPM).

TEAM (Daniel Mallett Associates)

Provides estimates of audience delivery of exterior bus posters

TEAM is a statistical model based on survey data from five markets applied to a variable set of census data to deliver projections for county-level analysis. It provides a fair estimate of market impressions and reach/frequency estimations using regression analysis. It has a number of limitations including:

- small original sample (five markets) and age of original model (1980s);
- out-of-county commuters are excluded;
- it does not account for ad size;
- it does not factor for seasonality or illumination;
- based on size and population density of market, not specific to the transit system.

Ridership (APTA or Transit Authority)

Measures audience in closed systems (bus interiors, rail stations and rail interiors)

Almost every transit system is able to provide detailed ridership data and demographics that can be extrapolated into opportunity-to-see circulations. Besides the obvious issue of equating circulation in the vehicle or station with an advertising impression, limitations of ridership data include:

- collection methods and survey questions vary by transit system;
- service areas do not always evenly align with media markets, and riders are often generated through transfers from other commuter systems not adjacent to the point of entry.

Out-of-Home Audience Ratings (Traffic Audit Bureau)

Measures stationary outdoor posters such as billboards and transit shelters

The new Out-of-Home Ratings audience measurement methodology (formerly known as "Eyes On") was developed for the industry by a consortium of outdoor companies, media companies and research experts. It is at the vanguard of media measurement models, using sampling and measurement data to determine circulation and adjusting for exposure to determine actual impressions and ratings. Furthermore TAB's out-of-home database has been designed to consider the geographic delivery of a campaign through its reach and frequency system. Further integration into market audience data allows advertisers to build detailed media plans based on these actual audience measures. **Appendix B** summarizes the Out-of-Home Ratings audience research and implementation program.

Digital OOH Audience Measurement Guidelines (DPAA)

Provides framework for measuring and comparing audience impressions

The DPAA (Digital Place-Based Advertising Association) provides guidelines for measuring audience metrics of digital signage, allowing for ad length, frequency of insertion, audience dwell time, etc. This guideline document is not an actual measurement model or methodology. Rather, it requires measurement of three components: audience exposure (or Opportunity to See) in the vicinity of the screen, average dwell time and notice (i.e., the percentage of the potential audience that actually saw the screen). The document does not propose specific measurement techniques or statistical accuracy.

These guidelines are most easily applied to digital displays in closed systems such as bus and train interiors and bus or train stations. It still requires independent certification of the measurement variables. As digital out-of-home (DOOH) advertising is still an emerging medium, it is not yet incorporated into TAB's Out-of-Home Ratings, TEAM or other ridership data.

Market Data (Scarborough)

Measures quantitative and qualitative audience profiles and consumer behavior.

Scarborough asks a number of transit related questions in their surveys. These data can be cross-tabbed against consumer behavior and intent to make general statements about the attitudes and behaviors of transit riders, commuters on surveyed highways, etc. It is best used in combination with rigorous audience measurement data.

Summary and Key Insights

Because there is no prevailing method many sales organizations resort to "guesstimating" audience exposures for premium route vehicles such as historic vehicles, tourist lines, etc. Impressions are often extrapolated from circulation data at fixed points on the route, or other available sources. Unfortunately none of these methods follow an accepted protocol and accuracy varies widely.

The outdoor advertising industry (through TAB) has been rigorous about audit compliance and requires each display to be certified. There is no comparable audience measurement certification for bus or rail media, so even if the data are from independent third-party sources, it appears to be self-reported, thereby diminishing its value as an accepted currency.

CURRENT U.S. TRANSIT MEDIA BUYING AND SELLING PRACTICES

Transit Media Buyer/Planner Survey

Peoplecount invited 195 media buyers and planners to respond to an online survey, of which 105 (54%) answered all or part of the survey. Candidates were compiled through customer lists of transit sellers as well as TAB's agency members. Agencies of various sizes were represented, as were generalists, out-of-home specialists, national buyers and local buyers. A detailed summary of the responses to the Transit Media Buyer/Planner Survey is provided in Appendix C.

Key findings of the survey include the following:

- Transit media buyers most often choose transit advertising for the mass reach, lack of traditional outdoor in the area and ability to target geographically or demographically;
- Transit media buyers most often cite the inability to target, unsuitability to client or campaign and lack of budget as the main reasons why transit advertising is not chosen after consideration;
- 72 percent of media buyers/planners disagreed with the statement "Transit media has a credible audience measurement system";
- Many transit media buyers expressed several times throughout this survey the wish for better targeting abilities, both demographically and geographically;
- 78 percent of buyers would prefer Out-of-Home Ratings (formerly known as "Eyes On") as the currency for measuring transit advertising;
- 24 percent of media buyers currently develop their own transit media audience numbers in-house, including manipulating or discounting of audience metrics provided by the seller;

- 69 percent of media buyers cited audience measurement as the one tool that would allow them to recommend more transit media. Of those, 68 percent prefer Out-of-Home Ratings measurement, or "the same as traditional outdoor", while the remainder have no preference and would take ANY credible audience measurement system;
- Most buyers/planners use commercial software such as IMS, Nielsen, Arbitron or Telmar for planning other media. There is a wide range of preferred software delivery systems for transit audience metrics. Most respondents would prefer to use an existing tool rather than a separate stand-alone system. Many buyers would like to be able to compare other media side-by-side, or at least other out-of-home media;
- The online survey was very long, and some respondent fatigue was noted as the percentage of unanswered questions increased towards the end. To the respondents, some of the questions appeared to be redundant and so were not answered twice.

Transit Media Buyer/Planner Interviews

About 40 buyer/planner respondents provided contact information, and about one-quarter of these consented to participate in a further in-depth telephone survey to have them elaborate on their survey responses. The interviews did not add any new information, as most reiterated their survey responses. They were useful in providing anecdotal comments, including the following:

> *"I don't understand the [transit] methodology - they [sellers] do not explain where their numbers come from – it feels like it is voodoo - no explanation as to where these numbers come from.-To compete with TV we need to be where they are at - I think they are hiding something when they don't disclose the methodologies."*

> *"I just finished with [buying transit in] six different cities and every one had a different size. I would like to see standardization in sizes across the industry. I would take money out of radio, TV or print if transit were as simple to buy and more standardized."*

> *"Miami has a 22-mile rail line that has 12 stations and they won't let me specify where my ad goes – I would pay a premium to get exactly the location I want."*

> *"[I'm not confident in the transit audience data] because I usually don't get a number, and if I do get a number, there's no methodology behind the number. Numbers have to be asked for - they aren't provided upfront. I'd like to see something similar to Eyes On, with a methodology behind it so I can go in and explain it to a client.-If I can't explain where the number came from, the client won't buy into the numbers provided, so it limits the amount that I can spend on transit."*

> *"Transit is easy to buy. I buy in showings or a geographic footprint like Manhattan only. -It's a blanket scatter shot medium. From a time point of view transit is quicker and easier to buy - easy to buy because it is a blanket - mass reach.-It's not that accountable - big leap of faith - there is no control when buying buses - they know it's a messy medium; there is slush in it."*

> *"[My ideal picture of a transit measurement system] would have audience numbers by location, by stop, discreet demographics by stop, ability to combine stops into areas, get all stops within a certain zip code and combine them all into a reach-frequency for that particular area. I'd like to be able to put it into IMS, Strata, Telmar and it would work with all of them."*

Full details of the media buyer/planner interview responses, as transcribed by the interviewer (not word-for-word transcripts) are provided in Appendix D.

Transit Media Sales Contractor Survey

Peoplecount invited 91 media sellers to respond to an online survey, of which 61 (67 percent) answered all or part of the survey. Candidates were provided through the major transit media vendors. A mix of general out-of-home sales reps, transit sales reps, other sales executives, and national versus local vendors responded. A detailed summary of the responses to the Transit Media Seller Survey is provided in Appendix E.

Key findings of the survey include the following:

- Transit media sellers cited “lack of knowledge or familiarity with the medium” as the most common reason why buyers do not choose transit media. Transit buyers did not share this perception;
- Transit media sellers would prefer to avoid targeted buys in favor of mass buys across the transit system. The sellers prefer to discourage “cherry picking” (i.e., allowing selection of particular locations). This is contrary to the buyers’ attitudes, who would prefer MORE demographic and geographic targeting;
- Transit media sellers agree with the buyers that lack of a credible audience measurement system is the single biggest barrier to more transit sales;
- Transit media sellers are not specific about the tool or format of the audience measurement system, as long as it is credible and accepted. About a quarter did specify Out-of-Home Ratings (formerly known as “Eyes On”), integrated into the same tools as are used for Outdoor. Many of the sellers were unfamiliar with commercial media planning software, tending to use in-house systems or simple tools such as spreadsheets.

Transit Media Sales Executive Interviews

Discussions were held with senior executive representatives of three of the nation’s largest transit media sellers, namely CBS Outdoor, Titan and Lamar Advertising. These discussions were in New York with both Peoplecount and TAB personnel in attendance.

Context of Interviews. The current TCRP-B39 study will conclude at the end of 2011. Beyond the scope of this study will be the application of the methodologies developed to individual transit systems and to roll out demographic-reach- frequency data by transit system, both of which require additional funding. The Traffic Audit Bureau has been working with transit advertising industry representatives to begin estimating the subsequent scope of work and additional funds required. The industry, particularly the media sellers, voiced the need to further educate the TAB and Peoplecount on their specific business requirements, so that next-phase costs might be better defined.

Summary of Insights. After meeting separately with CBS, Titan and Lamar, it was clear that the transit sellers do not require the level of detailed sign-by-sign ratings originally envisioned. Specifically, the following information was gleaned from the Transit Seller executive interviews:

- Transit is thought of as a mass-reach medium, where it is bought to supplement traditional OOH purchases. This works best when the message does not have an exact need for a specific location and the message can "float" around the marketplace capturing new impressions due to its wide geography;
- Sellers do not usually allow buyers to cherry-pick locations. Instead, the buyer is given a package to represent a certain level of "weight" in the market, and is assigned a cross-section of locations, wherever they may be in the market. This means that, from a buying and selling point of view, each location is treated as the same, no matter the size or specific location within a buy;
- Some sellers will not allow the buyer to segment a market to target below the transit system level by, for example, purchasing only one bus garage or one subway line. Others have been open to that idea. Although some local or ethnic buys can be done using smaller geographies, managing most buys at a hyper-local level (i.e., poster by poster) would be very difficult to allocate correctly;
- Sellers consider bus advertising as a separate medium from rail. Rail would include commuter trains, subways, and their stations;
- Transit shelters are also considered part of the transit media. They differ from other transit vehicles because, like traditional billboards, they are presented as viable solutions when the buy requires specific areas of location. Incidentally, transit shelters are already provided with Out-of-Home Ratings measures;
- Advertising sales contracts with transit operators are sometimes short. According to a 2004 survey of 36 large and medium transit agencies, "contracts most commonly provide for a 3-year term with two 1-year options. Some contracts provide for options for 1, 3, or 5 years, usually in 1-year increments" (Schaller, 2004, p. 26). Overall, 84 percent of transit agencies surveyed reported contract lengths of five years or less. Admittedly, it is unknown whether this pattern holds true today, and it is acknowledged that some agencies such as BART in the San Francisco area issue 10-year contracts, and some have been known to be as long as 15 years. In general, transit media sales executives expressed the concern that **short contract durations (especially those with one-year renewal increments) discourage the sales contractors from making major investments in infrastructure or research;**
- Software used to reference transit reach-frequency should be by transit system and allow operators to select their own market definitions, perhaps by county. CBSA or DMA might be too large a market definition, given the limited coverage of the transit systems versus the greater market geography as a whole. Buyers, however, do want CBSA or DMA as market definitions;

- The circulation numbers currently provided by any operator for rail are not usually questioned, given the confidence buyers have in transit organizations' own ridership counts. Bus exterior advertising circulation estimates, however, are less likely to be trusted or understood;
- It may be helpful to learn what a full bus wrap delivers as "eyes on" rating , if only to understand what the upper level can be for a bus. Other bus formats most important to measure are kings and tails;
- Subway media types most popular are one and two sheets;
- There is no need to plot where each sign location is within the station. The sale is based on number of impressions of the total package, and each sign within a location is currently assumed to have the same average number of impressions.

Summary

- Exterior bus advertising is thought of as a "moving billboard" that reaches a mass audience across a wide geographic area. Furthermore, transit systems often allocate buses across different routes. Therefore, bus exteriors should be measured at the bus-garage level (for large systems with multiple bus garages), or across the entire system for smaller fleets;
- Opportunity-to-see measures for smaller media (such as transit vehicle interiors and "two-sheet" posters in stations) should be quoted at the "package" level, attributing average circulations to, for example, entire stations or, for vehicle interiors, entire subway lines or bus garages. These packages are sold to a limited number of advertisers, assuring repeated postings within a station or transit vehicle;
- It is important to track at smaller or custom levels of geography. Unlike TV, radio, print or traditional out-of-home advertising, transit systems are limited in their geographic coverage. Therefore, using standard market definitions such as DMA (Designated Market Area) or CBSA (Core Based Statistical Area) can be misleading as a single transit system would not usually cover the entire market (except perhaps for commuter bus or rail systems). For this reason, it is necessary to include smaller geographies such as counties in any database that is developed for transit media planning and buying;
- Geography is also important for reach-frequency calculations, requiring an understanding of rider habits and origin-destination. How to generate R-F while thinking of the transit system as one large geography is an open issue.

FEASIBILITY OF A U.S. TRANSIT MEDIA AUDIENCE MEASUREMENT SYSTEM

- Looking at the experiences in transit media measurement globally, difficulties tended to arise when researchers placed undue emphasis on distinguishing exact circulations, poster by poster within transit stations, an exercise which tended to bog down and prolong the entire process. Based on this feedback, as well as the desires of the media vendors and buyers, it is recommended that most basic in-station posters be measured at the station level (except perhaps a few very large and complex stations, where further study could provide some differentiation within the station);

- According to the responses of both the buyers and vendors, the need for improved transit media metrics has been confirmed, and there is definitely the will and interest within the industry to develop improved audience metrics. At a recent meeting of industry leaders (both buyers and vendors) held by the Traffic Audit Bureau, interest was expressed in expanding the Out-of-Home Ratings research to include other out-of-home media. Transit was identified as the number one priority for expansion. Thus, the stakeholders appear to be aligned on this issue;
- In particular, the overwhelming agreement is to produce "something similar to outdoor advertising", many explicitly citing Out-of-Home Ratings (formerly known as "Eyes On") as the desired currency. Media planners and buyers, in particular, expressed the desire to be able to compare directly with traditional outdoor advertising offerings rather than have a stand-alone system;
- Most transit systems appear to provide useable system and ridership data, and the extent and sophistication of data collection is constantly evolving. Thus, most major transit systems in the U.S. have a wealth of information, fairly consistently collected across systems, which will provide a strong basis for measurement of rider-targeted media;
- A methodology for measuring exterior bus advertising is applicable to most transit systems, and is seen as a missing component of current transit system metrics. The Conclusions and Recommendations section of this report addresses a solution for applying the measurement methodology to individual transit systems. For those transit properties with all or many buses tracked by GPS, it is entirely feasible to develop software that will interpret GPS data and produce advertising exposure calculations. For smaller systems without GPS, the process would be more manual and might require technical assistance, but is still entirely feasible.

Having, through this extensive State-of-the-Practice evaluation, reviewed and appraised current transit advertising industry practices both globally and domestically, it was thus agreed among industry stakeholders and the TCRP oversight committee that development of a transit advertising audience measurement system is **feasible** from the standpoints of:

- Data availability;
- Mathematical and modeling knowledge and capabilities;
- Stakeholder interest and buy-in; and
- Economics.

CHAPTER 2 RESEARCH APPROACH

WORK PLAN SUMMARY

Using the input of the comprehensive, global and domestic research and the interview results, a detailed work plan was formulated to develop and test the proposed transit advertising audience measurement system. In the process, data needs are defined and explicitly identified. The work plan, which is described in further detail later in this section, comprises the following major tasks:

Develop Fieldwork Plan

- Three markets were selected in which to conduct fieldwork related to the estimation of both bus exterior and transit system interior advertising, namely: Atlanta (MARTA), Chicago (CTS) and Portland, OR (TriMet). Approvals were gained from the individual transit authorities for access to their systems;
- For the purpose of estimating the audience of bus exterior advertising from other vehicle occupants, a survey was designed to ride two selected bus routes from each of the three markets and record encounters of other vehicles in both the opposing and same directions of traffic;
- To provide consistent, comparable data on transit rider origin, destination, trip purpose, frequency of travel and other parameters, rider intercept surveys were conducted in the three markets;
- A specific scope of work was formulated to conduct an Eye Tracking Pilot Study in New York on the MTA system, including an extensive process to gain approval from the MTA;

Fieldwork and Data Collection

- The Atlanta MARTA, Chicago CTS and Portland TriMet fieldwork was conducted in January to April of 2011 according to the plan summarized below;
- Eye Tracking fieldwork was conducted in March and April of 2011 in New York's MTA system.

Surface Vehicle Exteriors

- Peoplecount has already developed a complex algorithm to estimate the audience of vehicle-based advertising from other vehicle occupants, which required calibration to reflect how the split between same-direction and opposing traffic was affected by the unique movement of buses in traffic;
- Two surface transit routes in each of the three markets (total six routes) were selected for detailed observation. Two surveyors rode each bus route for most of an operating day, including AM and PM Peaks (i.e., six days total observation). The surveyors recorded the number of vehicle encounters past the bus at five minute intervals (separated into opposing direction, and left and right same-direction traffic flows). The surveyors carried a GPS unit to record the route and driving times;

- Additional information regarding the selected bus routes was collected from the transit authorities, including a list of bus stops on the route, their latitudes and longitudes and bus schedule information.

Internal Ridership-Targeted Advertising

- Other than surface vehicle exteriors, all other transit advertising targets its riders as the audience. Thus, data collection efforts were common to all remaining advertising types;
- Collected all available information from transit authorities in the selected test markets related to system route maps and schedules, ridership, origin-destination data, rider demographics, system metrics and fleet characteristics;
- Collected information specific to the selected transit systems from the media vendors related to the types and formats of advertisements, typical placement, number of faces, and presence of digital signage;
- To supplement data from transit authorities, Peoplecount set out to conduct 2,500 rider intercept surveys in total among the three test markets (over 2,800 were actually completed). The survey questions included basic demographics, origin-destination, travel patterns, travel frequency and recall/notice of various transit advertising media. Within the selected test markets, the surveys were taken at various points throughout the transit system;
- Results of the intercept surveys were entered in a database and the results analyzed.

Develop Audience Measurement Algorithms

Throughout this task, the focus was on developing generalized algorithms or procedures (also termed "methodologies") and expressing calculation methods based on the data inputs ultimately required. Except as illustrative examples from the field data collection phase, it was not intended that any one entire transit system would have these algorithms applied across its entire system.

Outdoor Signage

Outdoor signage such as transit shelters and benches (also known as Street Furniture) are already measured by the Traffic Audit Bureau's state-of-the-art Out-of-Home Ratings audience measurement system. As such, outdoor signage, whether static or digital, was not addressed in this project.

Surface Vehicle Exteriors

- A considerable amount of time was spent analyzing the data gathered from the on-board field tests and developing a mathematical model to estimate exposures to other vehicle occupants that is relevant to the stop-start characteristics of bus operations. Specifically, road characteristic parameters were used as input to known equations that theoretically predict traffic density and average operating speed under various traffic conditions. Several iterations and statistical analyses were used to assess the applicability of these known equations. The final data analysis included the following investigations:

  - Correlation of theoretical versus actual vehicle densities;
  - Sensitivity of theoretical vehicle density calculations to certain road characteristic assumptions such as travel speed and directional split;
  - Final confirmation of the bus exterior circulation model and estimate of accuracy, expressed for each side of the bus.

- The number of pedestrians exposed to the exterior bus ads was quantified using data already collected during the TAB Pedestrian Model study, by calibrating the existing Peoplecount pedestrian model to account for the relative motion of the bus and the people walking.

- Each side of the bus (i.e., left, right, back, front) was treated separately, depending on which components of the traffic and pedestrian streams apply.

- The "granularity" or level of differentiation of one exterior bus ad versus the next is an important issue. It is proposed that the audience estimates be reported by bus garage.

- The resultant methodology can be adapted to exterior bus **digital signage** by incorporating the average duration of each advertising message in a play list or video loop, and understanding the average viewing time of the screen, which would differ for vehicle occupants versus pedestrians, and by time of day, depending on average operating speeds (of both the bus and other vehicles). Given the number of potential variables and the relative rarity of this type of digital signage, it would be best to customize these calculations for each particular transit system's exterior mobile digital signage installations.

Internal Ridership-Targeted Advertising

- Using the results of the 2,800 surveys, combined with the various sources of data collected from the transit authorities and the relevant media sales contractors, algorithms or procedures (also termed "methodologies") were developed to illustrate how to apply the known parameters of a specific transit system to estimate gross OTS audiences for each transit advertisement type/placement combination. The resulting procedures are presented in a "worksheet" format.

- For example, a methodology for estimating the average number of interior ads that each passenger is exposed to on a bus was derived. Thus, using bus passenger ridership data, total number of interior bus ads, and average ad exposure per rider, the average impressions per interior bus ad can now be estimated.

- In a similar fashion, methodologies for interior train/subway advertising and in-station advertising were derived.

- The “granularity” or level of differentiation of one poster versus the next is an important issue. It is proposed that, going forward, the audience estimates will be reported to the following levels of precision:
    - Bus interiors - by bus garage
    - Train interiors – by transit line (or group of transit lines if railcars are pooled)
    - In-Station – by station, differentiating concourse level and platform level locations.
- Any of these methodologies can be adapted to **digital signage** by incorporating the duration of each advertising message in a play list or video loop, and understanding the average dwell time in the vicinity of the screen, which would differ by the particular segment of the transit system.

Refine Needed Data Resources

- Upon completion of the data collection and modeling phases, Peoplecount re-evaluated the usefulness, application and sustainability of the various data sources used and any gaps in existing data that may exist.

Conduct Follow-Up Consultation

- Consult with industry stakeholders including transit media buyer/planners, sales contractors and out-of-home advertising audience measurement specialists to confirm the validity of the proposed audience measurement methodologies and, more importantly, to ensure a feasible plan for ongoing follow-up work and implementation.

THREE-MARKET FIELD TEST

Background

Peoplecount, in consultation with the TCRP oversight committee, the TAB and its Transit Committee, and participating media sales contractors, selected three markets/transit systems for fieldwork. Market selection was based on the following criteria:

- Chicago was selected because it was the foundation market for the original TAB Out-of-Home Ratings fieldwork. Therefore, there is a rich set of data already collected which was useful for this project, particularly numerous pedestrian counts;
- As Chicago CTA transit media is sold by Titan, it was desired to find two markets that are sold by the other two predominant vendors: CBS Outdoor and Lamar Advertising;
- It was desired to have another top-10 market as well as a medium-sized city;
- The transit systems should be fairly typical in their operation;

- Other pilot markets in the TAB Out-of-Home Ratings project, for which there is also extensive data collected, include Philadelphia, Atlanta, San Francisco and Houston. It was desirable to select one of these markets;
- It was desired to choose markets in different parts of the country with different climates;
- It was desired to select transit systems that have fairly comprehensive and sophisticated programs of in-house data collection, including GPS tracking of buses.

In considering all of the above criteria, the markets of Atlanta (MARTA – sold by CBS Outdoor), Chicago (CTA – sold by Titan) and Portland, OR (TriMet – sold by Lamar Advertising) were selected.

Purpose and Scope of Fieldwork and Data Collection

To develop a method for estimating exposures of **bus exterior advertising** to other vehicle occupants, a field test was designed to capture raw data for modeling purposes. The purpose of this fieldwork was to collect a sample of vehicle traffic data on operating buses including travel speed, bus location, encounters with vehicles in the opposing direction of traffic, and encounters with vehicles in the same-direction of traffic (left and right sides of buses separately). Accordingly, two bus routes in each of Atlanta (MARTA), Chicago (CTA), and Portland, OR (TriMet) were selected. Two surveyors rode each bus route over most of an operating day, including AM and PM Peaks, recording GPS readings with a hand-held GPS unit, opposing direction vehicle counts (in 5-minute increments), and same-direction vehicle counts (left and right sides separately, in 5-minute increments). By synchronizing the GPS unit's clock with the surveyor's time keeping, the traffic count increments could be attributed to exact sections of road and exact times of day and operating speeds.

To develop methods to estimate exposures to internal transit **rider-targeted advertising**, over 2,800 rider intercept surveys were conducted in the three markets for the purposes of gathering a database of comparable and uniform trip and demographic data. The surveys were designed to "hook into" existing origin-destination data collected by the transit authorities by including similar overlapping questions.

In addition, the following available data were collected from the three transit systems' markets:

- **Transit System Data Collection** – Obtained all data from transit authorities, at the most detailed level available, related to:
    - system route maps and GIS map layers
    - ridership counts (by line, bus route and station)
    - origin-destination surveys
    - rider demographics
    - system metrics
    - fleet characteristics, including bus garage assignments, and
    - specific media products sold.
- **Third-Party Data Collection** – Reviewed relevant third-party data, including:

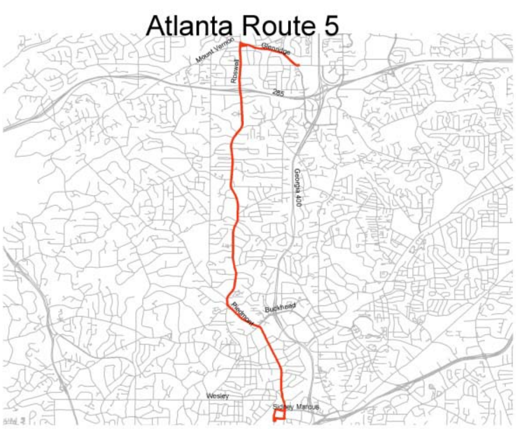
- Road network and traffic count data for the six bus routes surveyed;
- U.S. Census data (both standard tables and Journey-to-Work data); and
- Pedestrian data previously collected by Peoplecount.

Bus Exterior Exposure Observations

Peoplecount had two surveyors riding **six bus routes** (two in each of the three test markets) for a full day each (comprising **78 bus runs**, or one-way trips, in total). The bus routes were selected to provide a variety of road types, traffic volumes, land uses and densities.

The two surveyors rode each bus route over most of an operating day, including AM and PM Peaks, counting the number of vehicles passing, or being passed, by the bus in both the opposing and same directions of travel (left and right sides separately), recorded in 5-minute increments. At the same time, a GPS unit was carried by one surveyor to record the time and bus position in 10-second increments.

The purpose of this data collection over six full operating days was to develop a mathematical model to predict the exposure of buses to other vehicle occupants while accounting for the start-stop operation of buses in the traffic stream. The six bus routes surveyed and highlights of the observations are summarized in Figure 1 to Figure 6.



Statistics:

Survey Route:	Piedmont Rd NE/Morosgo Dr NE to Roswell Rd NE/Glenridge Dr NE	
Route Length:	5.8 miles	
Number of runs:	14	
Average speed:	13.2 mph	
Vehicle counts:	Opposing direction	10,905
	Left side, same dir	2,816
	Right side, same dir	237
Exposure Ratios:	Opposing direction	78%
	Left side, same dir	20%
	Right side, same dir	2%

Figure 1: Summary of Survey Results from Atlanta Bus Route 5

Statistics:

Survey Route:	Peachtree St SW & Alabama St SW to Peachtree Rd NE & Wesley Rd NW	
Route Length:	5.4 miles	
Number of runs:	10	
Average speed:	8.8 mph	
Vehicle counts:	Opposing direction	8,163
	Left side, same dir	2,551
	Right side, same dir	47
Exposure ratios:	Opposing direction	76%
	Left side, same dir	24%
	Right side, same dir	<1%

Figure 2: Summary of Survey Results from Atlanta Bus Route 110

Statistics:

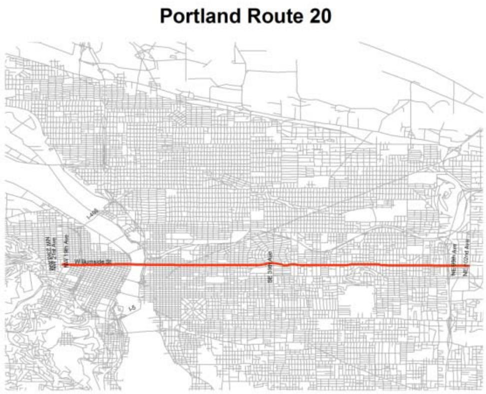
Survey route:	N. Michigan Ave & E. Superior St to S. King Dr & E. 35th St	
Route Length:	4.8 miles	
Number of runs:	14	
Average speed:	8.4 mph	
Vehicle counts:	Opposing direction	10,824
	Left side, same dir	3,846
	Right side, same dir	187
Exposure ratios:	Opposing direction	73%
	Left side, same dir	26%
	Right side, same dir	1%

Figure 3: Summary of Survey Results from Chicago Bus Route 3

Statistics:

Survey route:	N. Fairbanks Crt & E. Ontario St to W. Chicago Ave & W. Grand Ave	
Route Length:	4.4 miles	
Number of runs:	14	
Average speed:	7.7 mph	
Vehicle counts:	Opposing direction	7,917
	Left side, same dir	2,333
	Right side, same dir	85
Exposure ratios:	Opposing direction	77%
	Left side, same dir	23%
	Right side, same dir	1%

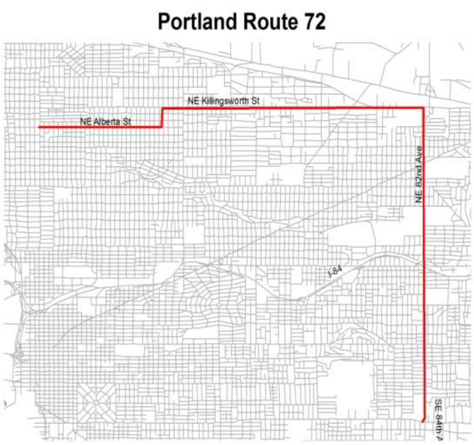
Figure 4: Summary of Survey Results from Chicago Bus Route 66



Statistics:

Survey route:	W. Burnside St & NW 19th Ave to E. Burnside St & SE 102nd Ave	
Route Length:	5.8 miles	
Number of runs:	11	
Average speed:	11.9 mph	
Vehicle counts:	Opposing direction	4,609
	Left side, same dir	1,482
	Right side, same dir	25
Exposure ratios:	Opposing direction	75%
	Left side, same dir	24%
	Right side, same dir	<1%

Figure 5: Summary of Survey Results from Portland Bus Route 20



Statistics:

Survey route:	NE ML King Jr Blvd & NE Alberta St to SE 82nd Ave & SE Powell Blvd	
Route Length:	8.7 miles	
Number of runs:	12	
Average speed:	13.1 mph	
Vehicle counts:	Opposing direction	7,422
	Left side, same dir	1,871
	Right side, same dir	54
Exposure ratios:	Opposing direction	79%
	Left side, same dir	20%
	Right side, same dir	1%

Figure 6: Summary of Survey Results from Portland Bus Route 72

Passenger Origin-Destination Intercept Surveys

Peoplecount proposed using a combination of ridership and origin-destination data available from transit authorities, supplemented with results of ridership surveys conducted by Peoplecount, and transit system data such as number of buses, route-miles and other system measures, to formulate a series of algorithms for estimating audiences of the various combinations of vehicle interior and in-station advertising types.

The proposed fieldwork included the gathering of at least 2,500 rider intercept surveys by Peoplecount, distributed across the transit systems in the three test markets. These rider intercept surveys were conducted at various key transit hubs throughout the respective transit systems.

The transit authorities themselves collect extensive origin-destination data via rider surveys, but the exact data collected and format are different for each transit authority. The most recent O-D survey data was acquired from each of the three transit authorities. Nevertheless, it was desired to have one current, homogeneous dataset across all three markets for the purposes of methodology development. A sample survey form is provided in **Appendix F**. A summary of the surveys undertaken is presented in Table 1.

Table 1: Summary of Peoplecount Origin-Destination Survey Program

Transit System	# Surveys Completed	Survey Period	# Survey Days	# Survey Locations
Atlanta MARTA	1,229	February 2011	4	19
Chicago CTA	1,027	March-April 2011	5	30
Portland TriMet	577	February 2011	4	53
Total	**2,833**		**13**	**102**

The surveys were designed to hook into existing ridership/origin-destination data collected by the transit authorities, by using similarly worded, overlapping questions. The Peoplecount surveys included questions on the following:

- Basic demographics (age/sex/home zip code);
- Details of the current one-way transit trip such as:
  - Trip purpose
  - Exact start and end points in the transit system
  - All routes and transfer points used (in order)
  - Frequency of this exact route (per month)
- Average number of transit trips per month.

In each of the cities, surveyors were sent to major transit hubs throughout the market to interview riders as they waited on platforms or disembarked from trains. In an attempt to increase response rates, surveyors would board the train with the respondent if a survey was underway when the train arrived to avoid interrupting the survey prematurely. This had the positive effect of distributing the surveyors throughout the system and thus greatly increased the number of survey locations in each market as surveyors would simply complete any on-board surveys, disembark at the next station and continue surveying at the new locale.

A summary of the survey responses across the three transit systems can be found in **Appendix G.**

EYE TRACKING PILOT STUDY

Background

The term "Eyes On", formerly used in the U.S. by the Traffic Audit Bureau (TAB) to describe the currency now used to measure standard outdoor advertising audiences (now termed "Out-of-Home Ratings"), refers to audience metrics that are adjusted to estimate the percentage of each advertisement's exposure (also termed "circulation" or "Opportunity to See" (OTS) that actually sees the advertisement. The percentage of people in the vicinity of the advertisement who actually see the board is called the board's true audience. Likewise, the percentage of the potential audience who actually view or notice transit advertising is considered as that advertisement's noting score. The noting score is thus the percentage applied to a board's Opportunity to See to estimate a true audience measure.

Through the media buyer and planner surveys conducted by Peoplecount, it was learned that "true audience" is the valued currency that media buyers want to trade against. Eye tracking research produces the noting scores that enable gross circulation numbers like transit ridership to be converted to "likely-to-see" audience estimates.

The purpose of this Eye Tracking Pilot Study was to explore and test measurement techniques for determining if and how often a person's gaze alights on a transit advertising display. The results of this pilot study serve to lay an important pivotal and foundational piece for the eventual full study of transit measurement. In preparation for devising a Scope of Work to conduct the Eye Tracking Pilot Study for transit media, the Traffic Audit Bureau heavily researched two proven approaches.

The objective of the Eye Tracking Pilot Study was to compare and contrast two proven measurement techniques to determine which is better suited to measure transit advertising's true audience. It was imperative to perform this pilot study because there are currently two predominant schools of thought worldwide, uncovered during our best practices research, on how this eye tracking research should be conducted. The two techniques studied here are dubbed the "video camera technique" and the "eye camera technique".

Video Camera Technique

- Tests of eye tracking for traditional outdoor advertising (used in TAB's Out-of-Home Ratings methodology) made use of a video camera technique, in which video recording of real road sections that contained various types and placements of outdoor advertising was done from the viewpoint of both the driver and the pedestrian. Survey subjects were then shown the film snippets in a laboratory setting (without being told the purpose of the test), and their eye movements were tracked;
- Data were amalgamated by type and placement of outdoor advertising, and average "visibility adjustment indices" (VAIs) were calculated, reflecting the average percentage of the audience that

actually notices a particular size, type or placement of signage (with drivers and pedestrians scored separately);

- This pilot test for transit media involved filming road traffic scenes from a pedestrian's viewpoint that include buses in the traffic mix, as well as walking paths through subway stations and segments of different trips on buses and rail cars from a sitting and standing position. The video footage was edited and spliced together and eye tracking was tested in a separate laboratory setting by asking respondents to view the video.

Eye Camera Technique

- The mobile eye camera technique has been used with favorable results in other countries, particularly in Australia for their MOVE OOH advertising metrics system. This technique involves outfitting survey participants with a special set of glasses with a small camera attached and a video recorder on their belt. The subjects ride the buses and railcars while the camera and recorder measure their eye movements. The tape is later reviewed by eye tracking experts to analyze whether and to what degree the user noticed advertising.
- EYE Corporation is a global outdoor advertising company based in Australia that participated in Australia's MOVE Audience measurement team. In August 2010, EYE USA conducted an eye tracking study in U.S. malls to test the visibility of their mall advertising. Personnel from the Traffic Audit Bureau were invited to attend these field tests, which made use of specialized eyewear and live field tests (as depicted in Figure 7).
- Specialist vendors, Micromeasurements Inc. and Perception Research Services (PRS), conducted the Eye Tracking Pilot Study. Micromeasurements Inc. provides specialized videography for eye tracking, while PRS provides the eye camera technology, measurement, and eye tracking expertise. Both Micromeasurements Inc. and PRS previously worked with TAB on the original Out-of-Home Ratings study for outdoor billboards, and the same personnel from both organizations were involved in this pilot study for transit media. The TAB acted as coordinators and advisors.

Figure 7: Mobile eye-tracking camera used in EYE mall advertising test

Purpose and Scope

The purpose of the Eye Tracking Pilot Study for transit is to test these two measurement techniques on signage placed inside and outside of buses and commuter trains, and inside transit stations. The end product will be an understanding of the following:

- Whether the video camera or eye camera technique is most appropriate to capture pedestrian and transit rider eye movement and its viewing of transit advertising media. "Appropriateness" was assessed based on the following findings:
    - Understanding the technological advantages and disadvantages of each technique;
    - Understanding the logistical and cost advantages and disadvantages of each technique; and
    - Understanding whether the video camera technique or the eye camera technique better captures the true Likelihood To See (LTS) that a stationary passenger may have, as determined by reviewing the field of view of the video camera footage (a simulation) as compared to that of the eye camera (a realistic measure of human field of view);
- What methodological and logistical changes, if any, would be needed to incorporate overall before the full study is conducted; and
- For outside bus ad viewing, whether the video camera technique adequately captures noting scores.

Study Design

Circulation measures (i.e., Opportunity to See or OTS) are the necessary foundation in developing audience metrics, but it must be clear from the start what percentage of the audience has a likelihood to see (LTS) each piece of signage. Much of this calculation falls outside the scope of the eye tracking pilot test, but the eye tracking techniques tested will provide the foundation to determine which technique (or blend thereof) is appropriate going forward. The transit advertising industry (via the TAB's Transit Committee) has already indicated that it intends to continue the eye tracking research in 2011 and 2012.

Study Route

For this pilot study, the Metropolitan Transportation Association (MTA) of New York City granted permission to make use of a live bus and live subway route for both filming and the use of a mobile eye camera. The MTA also granted permission to film and use mobile cameras at two subway stations: the 51st Street station and portions of Grand Central Terminal. The idea was to test **identical routes using both camera techniques** and compare the results.

A route in midtown Manhattan was selected with the following criteria in mind:

- The route had to incorporate walking on sidewalks (for exposure to bus advertising), riding of buses, riding of subways, and walking in all areas of a station;
- The route had to be shorter than a half hour to accommodate the battery life of the eye tracking recorder;
- The route had to incorporate within that half hour sufficient allocation to each type of travel to allow the eye camera respondent sufficient opportunity to notice all the signage presented to them and to allow the video camera technician sufficient opportunity to collect usable footage for the video camera technique;
- The route was approved by the MTA and, by their stipulation, could not be tested during rush hours;
- The outdoor walking portions of the route had to be heavily traversed by buses that all follow a common route, so that the eye camera respondent does not have to wait long for a bus and can record sufficient exposure to passing buses;
- The route had to contain enough transit media signage of different types and angles to capture a broad range of typical transit media placements and viewing angles;
- Ideally, the route's starting and ending points needed to be near TAB's offices, as they were used as a staging area to house respondents when they were not being tracked, and as an area to set up, calibrate and store the eye camera equipment.

The eye camera technique employed survey participants wearing the eye camera headgear to travel the route. On a separate day, a trained video camera technician also filmed signage along that same route from the perspective of a transit rider. To comply with the above criteria, the route selected for both the eye camera and video camera techniques is as follows (as illustrated in Figure 8):

- Start on Madison and 40th Street;
- Board either the M1, M2, or M4 bus that stops frequently at that location and sit or stand in a random spot that the respondent would normally choose;

- Exit bus near 51st Street, a trip of 11 blocks;
- Walk two city blocks to the 51st Street station;
- Walk down the stairwell on the SW corner, enter the station and proceed to the platform to board the #6 local train downtown. Respondents were directed toward the front of the platform and told to wait for the next train;
- Respondents enter the subway car and sit or stand in a random location of their choice as they normally would;
- Respondents exit the #6 train at Grand Central Terminal, ascend the main stairwell and follow the tunnel connecting the subway exit to the terminal exit at 42nd and Vanderbilt, underneath the Lincoln Building;
- Respondent walks back to Madison Avenue and 40th Street.

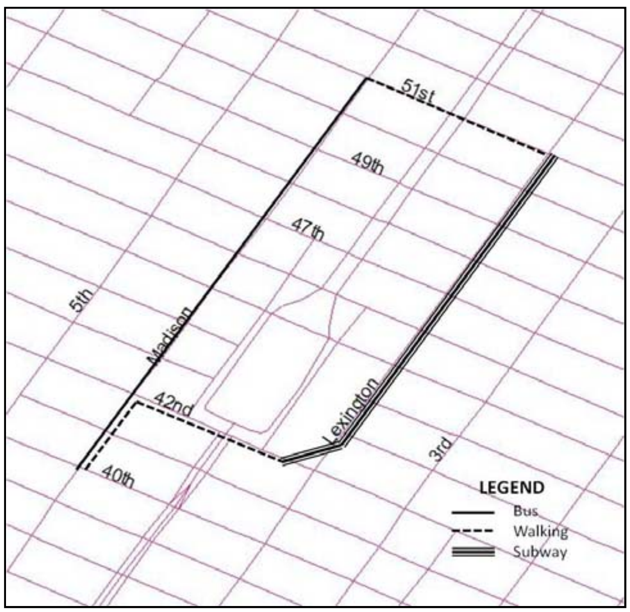


Figure 8: NY MTA Transit Route Used for Eye Tracking Studies

The transit media advertising signage along this route was as follows:

- An opportunity to see exterior front and side bus advertising while waiting to board the bus, looking parallel and to the right;
- An 11-block opportunity to view interior bus advertising in front and to either side parallel;
- An opportunity to pass other buses while traveling toward the subway station;
- An opportunity to see concourse-level station advertising along the walls, to the side, to the left, to the right, and head-on;

- An opportunity to see platform advertising to the side and head-on while waiting for the train;
- An opportunity for two stops to see interior subway (rail) advertising;
- An opportunity to see in-station advertising in Grand Central Terminal, comprising unique station-domination signage, standard one- and two-sheet posters in corridors and common areas, with parallel, right side, left side, and head-on angles; and
- One final opportunity to see exterior bus advertising while walking.

Video Camera Recording Technique

The above-described route was videotaped using a high quality video camera and specialized lens that simulates the full range and angle of normal human vision, the same camera technique and lens angle as was used for the original eye tracking study for standard billboards. The intention is to record, from the pedestrian's perspective, what is typically in their field of view while walking along city streets being exposed to exterior bus advertising. The transit rider's field of view when walking through transit stations and riding inside buses and rail was also recorded. The idea is to have the camera view simulate as closely as possible the pedestrian's or transit rider's opportunities to see transit media while they are performing these activities.

The video camera used is a state-of-the-art Sony High-Definition 3CCD video camera with a flo-pod stabilizing bar (also known as a "gimbal stick") from Verizoom. The lens angle was set at a 72-degree field of view to roughly approximate the normal human range of vision. Both the lens angle and the video camera used are critically important. If the lens angle is too wide, the picture will take on a "fishbowl" effect where objects straight ahead appear further away and objects to the side appear closer than actual. If the lens angle is too narrow, objects that would be visible in normal eye gaze situations may be cut off from the video. The video camera used must be of sufficient quality to allow the viewer to read the copy of advertising, road signs, or any other image that people would normally be able to read in real life situations. A video camera not up to the task may experience blurring and be a distraction.

Furthermore, it was discovered in the original eye tracking study that the use of a gimbal stick is required to film while walking as a pedestrian. Gimbal sticks allow the user to hold the camera steady enough to approximate the normal steadiness of one's eyes when walking. Normally, filming while walking distracts a viewing respondent because the camera jumps around too much. When using a gimbal stick, the slightest puff of wind can move the camera ever so slightly so that the image would list to the left or right. This phenomenon was corrected by taping small weights to either side of the camera. These details were corrected during the original eye tracking study done for traditional billboards, and applied again here. Thus, the combined past experience of Micromeasurements Inc., PRS and TAB was invaluable in saving both time and money on this pilot study.

The video camera technician was asked to film along Madison Avenue and the side streets of 38th and 41st Streets to capture buses moving toward the camera, away from the camera, traveling across from the left to the right (on the near side of the street), and traveling across from the right to the left (on the far side of the street). The technician filmed all of these elements while walking and while standing.

The video footage approximated what a typical pedestrian might be doing while buses are coming and going. The technician also filmed in-station advertising as it appears to the right, the left, head-on, and parallel views as people walk (and stand) at station platforms, walk through station corridors, and walk through common areas. Finally, the technician filmed inside buses and trains from a sitting position and standing position, facing to the side and to the front. This method allows us to cover signage from a head-on and parallel view.

A staff member was assigned by the MTA to accompany the Micromeasurements' videographer, and TAB personnel who were observing, inside the bus, rail, and stations to deflect any inquiries. There were indeed several inquiries by MTA employees along the way, and only one inquiry from a passenger during the full day of in-transit filming.

After all of the videotaping was completed, the HD tapes were sent to Perception Research Services. PRS worked with TAB to edit certain parts of the videotaped routes and splice them together for respondent viewing. Video clips were selected that represented as clearly as possible all the media types and viewing perspectives that were desired to be measured. Clips were discarded if the image was too blurry, too bouncy, or did not in some way represent a natural viewing opportunity. Learning from the original eye tracking study was invaluable and resulted in the following stipulations:

- That the final edited videotape shown to respondents be no longer than 15 minutes. After this time the viewer becomes fatigued;
- That there be a wide enough "gap" between videotaped views, allowing the HD viewing screen to fade to black for a couple of seconds. This allows the respondent to adjust and be ready for the next view;
- That there be enough tape taken before (two seconds) and after the advertising that is measured, so that the respondent once again has enough time to adjust to the videotaped surroundings; and
- That many different views be included in a random fashion, so that the purpose of the study is not obvious to the respondent. Some clips that were used included many types of transit advertising while others included just one. It was important to avoid any pattern to the clips used.

The resulting edited and spliced video was shown to respondents in a mall intercept study, where eye tracking equipment is set up in a specially designed room. The respondents are shown the footage on a large high-definition screen and asked to imagine they are walking or standing while their eyes are exposed to whatever is shown on the screen. Eye tracking equipment, mounted on the floor, measures where their gaze settles on the screen. Floor mounting eye tracking equipment is preferable because there is nothing to impede natural head or eye movement.

For this pilot study, a modest sample of 34 respondents was recruited in a New Jersey mall, where PRS has an eye tracking laboratory facility. Respondents were screened simply on whether they were over 18 or wear glasses or contact lenses, and were paid modestly for their services. Prior eye tracking studies confirmed that different demographic groups behave similarly in this environment, as do subjects from different parts of the country. Nevertheless, an even distribution of male and female respondents was recruited.

Respondents were shown the high-definition videotape on a wide, high-definition screen in a slightly darkened windowless room. They were told that they were simply testing eye tracking of people for the purposes of traffic control.

Eye Camera Technique

The eye camera technique uses recruited respondents to actually walk and ride along the preselected route. They are outfitted with a special camera fixed on eye glasses that record all their eye movements onto a recorder, as depicted in Figure 9 and Figure 10. This recorder is also carried by the respondent. With a researcher trailing behind them, the respondent completes the route. The result is a video recording of one complete run of the selected route for each respondent.

19 survey participants were selected to test the eye camera technique. All participants were simply told that they were taking part in a traffic study. The respondents met the researchers at the start of the survey route, where they were fitted with the eye camera headgear and the recorder pack by a trained PRS eye tracking specialist. The eye camera was calibrated to the wearer's eye movements through a series of directed eye gazes on a standard calibration chart. The results were taken over two and one half days. The weather was fair and was not a factor on any of the survey days.

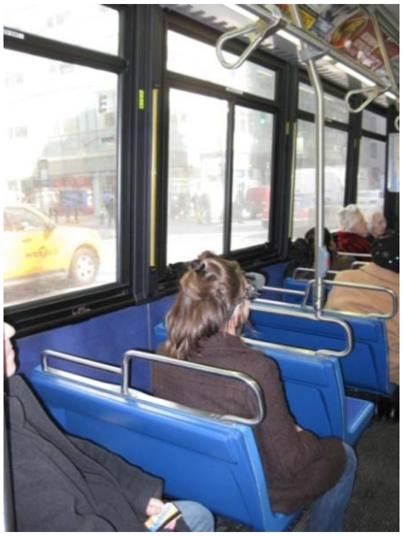


Figure 9: Survey Participant Wears Eye Camera Headgear on NYC MTA Bus

Figure 10: Survey Participant Wears Eye Camera Headgear on NYC MTA Subway Platform

CHAPTER 3 FINDINGS AND APPLICATIONS

Through the background information gleaned from the State-of-the-Practice research (as documented in the background section of this report), particularly the surveys and interviews with transit media buyers and sellers, it was confirmed that the transit advertising industry is interested in establishing audience metrics for transit media that is **equivalent to the Traffic Audit Bureau's Out-of-Home Ratings** that are currently in place for standard billboards and transit shelters. Around the world and, indeed, as expressed in ESOMAR's guidelines (ESOMAR, 2009), the gold standard of out-of-home media metrics comprises three components:

- **Opportunity-to-See (OTS) Measures** – Accurate estimates of the entire universe of people who would have a legitimate opportunity to see the advertising medium. OTS metrics should be derived independently from audience-centric reach-frequency-demographic estimates and should include some type of "traffic" count;
- **Likelihood-to-See (LTS) Ratings** – A "rating" or index expressing the average percentage of the OTS audience that actually looks at the advertisement;
- **Reach-Frequency-Demographic Ratings** – The LTS audience is then expressed as the number of unique individuals (Reach), the average number of times each individual sees the advertisement in a given time period (Frequency), and a breakdown of the age, sex and other demographic characteristics of this audience.

The following section describes the methodologies that are recommended for use to quantify the three components of transit media audiences.

OPPORTUNITY-TO-SEE METRICS

Generalized algorithms or procedures (termed "methodologies") to estimate the Opportunity to See (OTS, also known as "circulation") surface vehicle exterior and internal transit system advertising have been developed. The calculation rules are expressed based on the data inputs ultimately required. Except as illustrative examples from the field data collection phase, it is not intended at this stage that any one entire transit system will have these algorithms applied across its entire system. This section provides a description of the resulting transit media audience measurement methodologies for the various components of public transit media.

Through the background information gleaned from the State-of-the-Practice review (as documented in Chapter 1 of this report), the current practices of buying and selling transit advertising in the U.S. were defined, yielding the following insights:

- Exterior bus advertising is thought of as a "moving billboard" that reaches a mass audience across a wide geographic area. Transit systems often allocate buses across different routes. Therefore, **bus**

exteriors should be measured at the bus-garage level (for large systems with multiple bus garages), or across the entire system for smaller fleets (or where fleets are shared among garages);

- Because of the varying nature in the operation of specific buses from day to day (as they are often assigned routes somewhat randomly) it is necessary to measure the exposure of bus exteriors at the vehicle or route level and amalgamate to the garage or depot level to reflect the average operation of any bus assigned to that garage (including spare buses);
- Opportunity-to-see measures for smaller media (such as transit vehicle interiors and "two-sheet" posters in stations) should be quoted at the **"package"** level, attributing average circulations to, for example, entire stations or, for vehicle interiors, entire subway lines or bus garages. These packages are sold to a limited number of advertisers, assuring repeated postings within stations or transit vehicles;
- "Landmark" in-station media or station dominations located at a limited number of stations can be measured at the station level;
- Since small-sized transit media are being quoted at the package level, it is not necessary to assign location-specific OTS measures to specific posters within the station. Such detailed measurement is not necessary, as the media are sold in packages across multiple stations. Furthermore, measuring or modeling transit rider walking paths through stations is laborious and extremely costly;
- In-station media can be broadly categorized as either platform level or concourse level. Platform-level media can potentially be seen by any transit rider who enters, exits or transfers at that particular station, whereas concourse-level media are usually only seen by those who enter or exit at that station.

Opportunity to See Surface Vehicle Exterior Advertising

Approach

The term "surface vehicle exterior advertising" includes bus sides, bus backs, full bus wraps, light rail or streetcar exteriors, and possibly train exteriors or wraps (if viewed from surface streets). For brevity, **the term "bus" will be used generically** as the most common surface vehicle type.

The audience of bus exterior advertising comprises:

- occupants of **other vehicles** and
- **pedestrians** on sidewalks.

The audience of bus exteriors is the most complex audience component of transit media to measure as:

- it comprises the general public, not just transit riders;
- the advertisements are constantly moving throughout the market;

- the audience is also moving; and
- individual buses have complex operations, often being assigned to different routes each day.

Prior to this current project, Peoplecount worked with the Traffic Audit Bureau to develop a mathematical model to predict the viewership of a vehicle moving in traffic from **other vehicle occupants.** Applying the principles of traffic flow theory, the model has already been tested by comparison of videotape counts taken on over 1,800 miles of roadway. The model has already been scrutinized and approved by the outdoor advertising industry, and is currently used by TAB members to measure the audience of mobile billboards and truckside advertising. The algorithm is incorporated into a software product called TAB MARG, which analyzes GPS records and calculates the as-delivered audience circulation.

This model needs to be **recalibrated to specifically relate to bus operations.** The vehicle-based audience is estimated using a model whose inputs include commonly available road and traffic data. As a bus does not move through traffic at the same pace as a standard car or truck (i.e., it is **stopping and starting more frequently**), the model was calibrated to account for this movement pattern using the data collected in the three test markets of Atlanta, Chicago and Portland, OR, as described previously.

Furthermore, Peoplecount has developed a model to **predict the exposure of bus exteriors to pedestrians on sidewalks.** Starting with static 24-hour pedestrian counts (or estimates thereof) the mobile pedestrian exposure model accounts for the motion of the bus and its travel time over given sections of road. From a previous project with the TAB in 2007, Peoplecount already collected extensive pedestrian counts on sidewalks from a moving vehicle (captured through video-based face-recognition counting software) along more than 640 miles of sidewalk in seven major U.S. cities. This provided a sufficient database to develop the mobile pedestrian model to account for the moving vehicle.

Each side of the bus is exposed to different components of the traffic and pedestrian streams, as listed in Table 2 and illustrated in Figure 11.

Table 1: Traffic and Pedestrian Components of Bus Exposure

Side of Bus	Traffic Component	Pedestrian Component
Left	- Opposing direction - Same-direction passing on left - Cross streets left	- Sidewalk left
Right	- Same-direction passing on right - Cross streets right	- Sidewalk right
Front	- Opposing direction	- Sidewalk left + right (walking towards)
Back	- Same-direction passing on left - Same-direction passing on right	- Sidewalk left + right (walking towards)

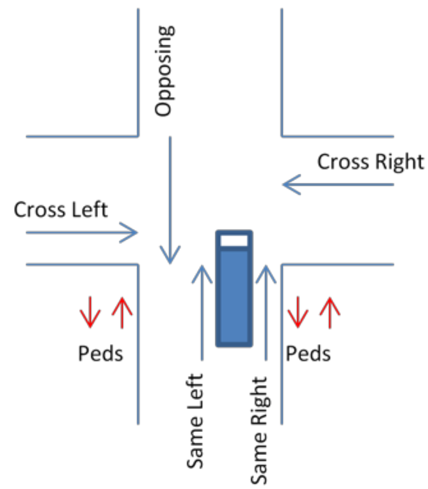


Figure 1: OTS Traffic Streams Contributing to Bus Exterior Advertising Audience

The recommended methods to estimate each of these components are described in the following subsections.

It is acknowledged that **train wraps** are generally targeted to passengers in stations, but may to a limited extent also be exposed to external audiences on outdoor rights-of-way. A similar algorithm can potentially be used to quantify exterior train exposures, depending on available information regarding the extent of exposures to specific road sections. Application of the following algorithms to exterior train advertising on dedicated rights-of-way (i.e., not on public roadways carrying mixed traffic) can be addressed on a system-by-system basis, as each transit system is unique in this regard.

Estimating Exterior Bus Ad Exposures to Vehicle Occupants in the Opposing Direction

A considerable amount of time was spent analyzing the data gathered from the on-board field tests and **calibrating the vehicle exposure model** (which predicts the exposure of moving vehicles to **other vehicle occupants**) to reflect bus operations. Data analysis has included the following investigations:

- Comparison of theoretical versus actual vehicle densities;
- Sensitivity of theoretical vehicle density calculations to certain road characteristic assumptions such as travel speed and directional split;
- Comparison of vehicle exposures from the opposing versus same-direction traffic streams; and
- Final confirmation of the bus exterior circulation model and estimate of accuracy. Each side of the bus (i.e., left, right, back, and front) can be predicted separately, depending on which components of the traffic and pedestrian streams apply.

The **"granularity"** or level of differentiation of one exterior bus ad versus the next is an important issue. Given the typically detailed level of ridership data, bus routing and scheduling information (often supported by GPS tracking) and road network and traffic data that are available, bus exterior advertising circulations could, in theory, be estimated by bus route. However, the practice of interchanging buses on different routes precludes this. It is proposed, therefore, that the audience estimates would be **calculated at the bus route level, but amalgamated and reported by bus garage.**

The **generic algorithm** previously developed by Peoplecount to estimate the exposure of a typical moving vehicle to occupants of **other vehicles in the opposing traffic stream** is as follows:

Equation 1: $$OTS = 2 \times \Delta t_{thru} \times V_{opp} \times LF$$

Where:

OTS = "Opportunity to see"
= *exposure to opposing traffic* ***in a given road section*** *[people 18+]*

Δt_{thru} = *average travel time of bus through the specific road section [hours]*

V_{opp} = *hourly traffic flow of opposing traffic stream [vehicles/hour/dir.]*
= *AADT/2 × Month factor x Day factor x Hour factor*

LF = *Load Factor*
= *number of people age 18+ per vehicle (approximately 1.5 nationwide)*

Essentially, the travel time and hourly volume components are simply apportioning the daily 24-hour traffic count to reflect the time interval along the section of road, and the Load Factor converts the vehicle count to a person count. The factor of 2 arises by assuming that the traffic is divided evenly on both sides of the road and the two streams of traffic are traveling at the same speed towards each other, thereby in essence doubling the number of encounters of vehicles with each other.

Obviously, this assumption is rarely true in real traffic situations, but was essential as directional splits and travel time by time of day are not universally available traffic parameters. However, the resulting OTS of the algorithm is meant to be amalgamated with that of other road sections over the course of one or more operating days, so that imbalances in traffic and travel speed tend to cancel each other out over the course of the day. The algorithm has previously been shown to have an accuracy of **between ±5 and ±10 percent.**

To test and calibrate this algorithm, this equation was applied to the six bus routes for which passing and same-direction vehicle counts had been performed in the three field test markets. While performing the counts, the surveyors also carried GPS units, thereby recording accurate time and location data throughout the day.

Table 2 summarizes the results of calculating the opposing-vehicle OTS using Equation 1 and compiling the values by route for the entire day observed. The modeled vehicle exposures are then compared with the actual vehicle counts taken in the opposing direction of travel and the difference is calculated.

Table 2: Modeled vs. Actual Opposing Direction Traffic on Six Bus Routes (First Round Using Equation 1)

Route	City	# Runs	Opp. Traffic (Model)	Opp. Traffic (Actual)	Diff.
5	Atlanta	14	14515	10905	+33.1%
110	Atlanta	10	11303	8163	+38.5%
3	Chicago	14	15586	10824	+44.0%
66	Chicago	14	9521	7917	+20.3%
20	Portland	11	8869	4609	+92.4%
72	Portland	12	10792	7422	+45.4%
Totals		**75**	**70586**	**49840**	**+41.6%**

As expected, the **start-stop operation of buses affects the rate of exposures to oncoming traffic.** Specifically, while the bus is stopped, it encounters fewer vehicles from the oncoming direction of traffic, so **Equation 1 overestimates** the exposure to oncoming vehicles. Clearly, the previous factor of 2 needed to be adjusted downward to account for bus stop-start operations. The factor of 2 was originally derived from the equation:

Equation 2: $$\boldsymbol{Factor = \left(1 + \frac{v_{thru}}{v_{post}}\right)}$$

Where:

d = *distance or length of road section [miles]*

Δt_{thru} = *average travel time of bus through the specific road section [hours]*

v_{thru} = *average speed of bus through road section [mph]* $= d/\Delta t_{thru}$

(d and Δt_{thru}: **From GPS**)

v_{post} = *posted speed limit [mph]*

When vehicles travel in free flow conditions at or near the posted speed, the factor in Equation 2 equals 2. In order to adapt the algorithm to more closely simulate the slower movement of buses through traffic, the factor shown in Equation 2 was adopted, replacing the 2 in Equation 1 as follows:

Equation 3: $$\boldsymbol{OTS = \left(1 + \frac{v_{thru}}{v_{post}}\right) \times \Delta t_{thru} \times V_{opp} \times LF}$$

The ratio of travel speed to posted speed that was observed during the field trials (gleaned from GPS data) ranged from 0.16 to 0.41 and averaged 0.29. Equation 3 was applied to the exact routes, days and travel times recorded during the field tests, amalgamated by route and compared with the actual counts, as summarized in Table 3 (expressed as **vehicles** rather than people).

Table 3: Modeled vs. Actual Opposing Direction Traffic on Six Bus Routes (Final Using Equation 3)

Route	City	# Runs	Opp. Traffic (Model)	Opp. Traffic (Actual)	Diff.
5	Atlanta	14	9581	10905	-12.1%
110	Atlanta	10	6981	8163	-14.5%
3	Chicago	14	9633	10824	-11.0%
66	Chicago	14	5806	7917	-26.7%
20	Portland	11	5905	4609	+19.8%
72	Portland	12	7368	7422	-0.8%
Totals		**75**	**45273**	**49840**	**-9.2%**

The modified equation was previously tested on a full day of driving and recording in Canada, and was determined to more accurately reflect congested traffic conditions than the original equation, with an error rate of ±4 percent for that particular road test. Similar to the bus movements, this modified equation makes allowance for travel speeds below the posted speed limit.

At this stage, other variables were explored to examine whether there are any other significant influences over opposing-vehicle exposure and/or better ways of predicting the known actual count values. Various levels of data amalgamation were considered, including by block, by count station, by travel direction, by run and by route. Various relationships including linear, logarithmic, inverse and exponential were considered.

It was determined that Equation 3, amalgamated to more than one travel day over multiple routes provides accurate estimates of opposing-vehicle exposure within ±10 percent. The model is not intended to be accurate at the granularity reported above (i.e., less than one operating day per route), but needs to be amalgamated over time or over multiple routes. Past experience has shown that amalgamation of a week of vehicle operation is sufficient to yield accuracy of the model to within 5 percent of actual counts.

Estimating Exterior Bus Ad Exposures to Vehicle Occupants in the Same Direction

In the **same direction** of travel as the bus**,** vehicle occupants are also exposed to exterior bus advertising as they pass the bus on the left (predominantly) or on the right (occasionally). As there is no known way of theoretically modeling passing traffic without using extremely detailed traffic and road configuration data, the methodology (borne out by previous Peoplecount work in the U.S. and Canada) is simply an **empirical** approach,. From past studies, it is known that the ratios of passing and following traffic (expressed as a percentage of the opposing traffic) for **vehicles driving with the regular traffic stream** are:

- Passing Traffic (left side): 7.5% of opposing traffic
- Passing Traffic (right side): minimal (not studied)
- Passing + Following Traffic: 10% of opposing traffic

In the case of buses, intuitively one can expect a **higher percentage of passing vehicles on the left side** as compared to a vehicle that keeps pace with the traffic stream. The average travel speeds recorded during the field trials (from the GPS output) ranged from 8 to 15 miles per hour. The fieldwork conducted in the three test markets has yielded the counts of **same-direction traffic** as summarized in Table 5.

Table 4: Observed Same-Direction Traffic as Percent of Opposing Traffic

City	Route	# Runs	Actual Opposing	Same Dir Left	Same Dir Right	% Same Left	% Same Right
Atlanta	5	14	10905	2816	237	26%	2.2%
Atlanta	110	10	8163	2551	47	31%	0.6%
Chicago	3	14	10824	3846	187	36%	0.6%
Chicago	66	14	7917	2333	85	29%	1.7%
Portland	20	14	5222	1591	27	30%	0.5%
Portland	72	12	7422	1871	54	25%	0.7%
Totals		**78**	**50453**	**15008**	**637**	**30%**	**1.3%**

Thus, it is recommended that the above factors (30% for left and 1.3% for right) be applied to the calculated opposing traffic exposures to estimate same-direction exposures.

Estimating Exterior Bus Ad Exposures to Vehicle Occupants on Cross Streets

Exposures of the bus to vehicle occupants from cross streets were not explicitly counted during the fieldwork phase due to complications of capturing accurate cross-traffic counts during the quick passage through an intersection, while maintaining the opposing direction and same-direction counts assigned to each surveyor. Furthermore, literature searches did not reveal any research that had been done to estimate traffic waiting at cross streets.

Nevertheless, using some basic assumptions of intersection spacing and typical cross-traffic behavior, exposures to cross traffic were estimated, as summarized in Table 6.

Table 5: Estimation of Exposures to Cross-Street Traffic

Parameter	Arterial Road	Collector Road	Local Road	Totals
Average no. of intersections per mile	1	3	16	
Assumed cross traffic per intersection:				
No. lanes	3	2	1	
No. of vehicles in queue that can see bus	3	3	2	
% of intersections with queued traffic	100%	75%	25%	
Avg no vehicles exposed to bus per intersection	18	9	1	
Average opposing traffic per mile (Peoplecount field tests)				1400
Average cross street as % of opposing traffic (per side of intersection)				**1%**

Various iterations and alternatives of the above assumptions continuously yielded similar results of 1.0 to 1.2 percent of opposing traffic per side of the street. Intersection spacings of 15 to 20 blocks are typical in urban areas. In suburban areas, even if block spacing becomes longer, the width of cross streets becomes wider accordingly. As this is a relatively small factor, it is recommended to adopt it as a conservative estimate of cross-street traffic.

It is acknowledged that this assumption only applies to surface vehicles. For elevated railways or monorails, a much larger number of cross-street vehicles might see the side of the train, and not just those cars waiting at an intersection. Some transit systems, especially rail, have extensive elevated structures: these would include Chicago, New York, BART, as well as monorails. Elevated structures tend to have significant cross-street OTS. Nevertheless, it is not possible to arrive at universal methods to quantify this component of the audience, as each market, structure and vantage point is unique in terms of the presence of external rail advertising, visibility, presence of surrounding traffic and pedestrians, height and angle of viewing, etc.

Estimating Exterior Bus Advertising Exposures to Pedestrians

In 2007, while developing a pedestrian activity model as input to the Traffic Audit Bureau's Out-of-Home Ratings audience metrics, Peoplecount recorded 320 route-miles of **mobile pedestrian counts** across seven cities. Vehicle-mounted cameras (shown in Figure 12) recorded pedestrians on both sidewalks from a moving vehicle, which were analyzed by special face-recognition software to produce mobile pedestrian counts by block.

Figure 2: Vehicle-Mounted Cameras Record Mobile Pedestrian Counts

Circuits of the same routes on which static pedestrian counts were recorded were repeated through the course of eight days across seven cities. Collecting pedestrian data using both static counters and mobile counters simultaneously thus enabled the development of a relationship between the two.

To calculate the exposures of a moving bus to pedestrians on sidewalks, a model was developed that is premised on the availability of a 24-hour pedestrian count for each section of road on a given bus route. That is, the stationary pedestrian count is the primary input to predicting the mobile count. The stationary pedestrian counts should include both sidewalks and both walking directions (plus any stationary pedestrians).

Daily pedestrian volumes can be obtained by conducting manual or automatic counts, but this process is usually laborious and expensive, especially over the long distances of a bus network. To that end, Peoplecount previously developed a pedestrian intensity model that predicts daily pedestrian volumes on sidewalks. The pedestrian model was developed for the TAB as part of the Out-of-Home Ratings audience metrics. As such, while some of the details are proprietary, a description is provided here for understanding of **one option** for estimating the 24-hour pedestrian counts that form the **basis of the mobile pedestrian exposure model** developed for exterior buses, as described later in this subsection.

Pedestrian Intensity Model to Predict Stationary Pedestrian Volumes. The Pedestrian Intensity Model previously developed by Peoplecount predicts 24-hour average pedestrian counts over sections of road. It is applicable on a nationwide basis, with emphasis on high pedestrian activity areas such as the Central Business Districts of major cities.

Eight pedestrian study areas of approximately 60 to 80 blocks each, comprising a range of land-use types, development densities, vehicular traffic rates, and street grid configurations were constructed across seven major U.S. cities. To establish daily pedestrian patterns, four continuous 18-hour counts were conducted per study area using automatic pedestrian counting equipment. Block-by-block short-term manual counts were also conducted on the same day. Additionally, each route was circled between 6 and 8 times during the course of the day by a vehicle equipped with mobile video equipment.

Pedestrian counts were summarized hourly and short-term counts were expanded to produce an estimated daily pedestrian count for each city block in the eight study areas. City blocks were then amalgamated into count stations to match the availability of vehicular counts and smooth out the micro-variations in pedestrian volume data. Table 7 summarizes the extent of the eight pedestrian study areas.

Table 6: Summary of 2007 Pedestrian Study Areas

City	Route Length (Miles)	# of Blocks
Atlanta	5.0	75
Chicago North	5.0	66
Chicago South	4.5	71
Dallas	4.9	79
Los Angeles	5.1	44
New York	4.8	65
Philadelphia	4.1	77
San Francisco	4.3	73
TOTALS	**37.7**	**550**

A number of independent variables were collected to be tested as inputs to the static pedestrian model. These variables were grouped into three categories: Spatial, Census and Local variables.

- **Spatial variables** – Using specialized software, a spatial analysis map was created and analyzed for each study area. These maps produced a series of spatial parameters measuring various definitions of network connectivity, integration and sight distance, which were examined as inputs to the model.
- **Census variables** – Census data were collected by census tract. Data included residential, employment and transportation characteristics of each study area. These variables were used by to calculate pedestrian density.
- **Local variables** – Characteristics describing street-level surroundings were tested, including road class, traffic patterns, block length, presence of transit, and directionality (i.e., one-way versus two-way).

Pedestrian density is a parameter derived by Peoplecount, combining the daytime population of a census tract (i.e., residential plus employment population) and its split of non-driving transportation mode choices. Areas with high daytime populations and a higher percentage using public transportation and walking (rather than driving) are more likely to have higher pedestrian counts. The model subdivides cities into areas based on one of four pedestrian density categories (as outlined in Table 8), with each category being treated uniquely.

Table 7: Pedestrian Density Categories

Category	Pedestrian Density (1,000/sq.mi.)
Low-Low Density	0 – 10
Low Density	>10 – 40
Medium Density	>40 – 330
High Density	>330

Pedestrian counts were assigned to urban, non-freeway count stations only. For the two low-density categories, a range of default pedestrian values are derived, with local adjustment factors applied. Complex regression equations are applied to the medium- and high-density areas.

Statistical analysis of actual counts and variables was conducted to determine which variables were best predictors as input to the model. Once determined, the variables were used to create estimated counts that were compared against the actual counts. The final variables used include pedestrian density, traffic count, a spatial connectivity measure, sight distance, road class, presence of transit and directionality. Figure 13 confirms the model's agility in capturing the range of pedestrian volumes and in only a few instances did it tend to over- or under-predict the amplitude.

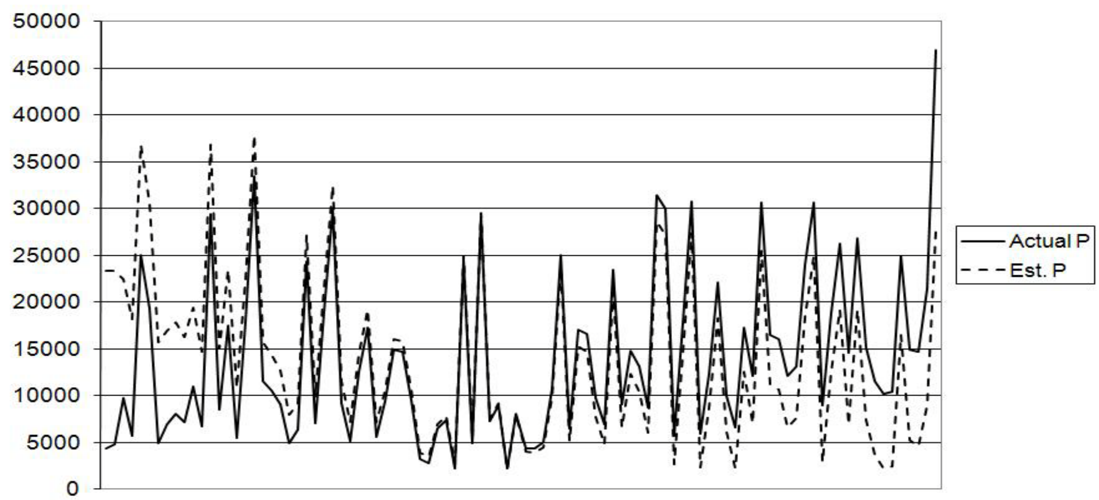


Figure 3: Actual versus Modeled Pedestrian Volumes (Stationary Counts)

Converting Stationary Pedestrian Counts to Mobile Pedestrian Exposures. The current pedestrian model developed for transit media measurement begins with the premise that **24-hour**

pedestrian counts already exist for each relevant road section in the bus network, whether through counting or modeling. Specifically, the pedestrian counts or estimates assumed to be available are **mid-block counts**, as pedestrians tend to cluster at intersections and the pedestrian count is higher due to pedestrians originating from side streets.

The purpose of the mobile pedestrian model is to estimate the pedestrian exposures of a single bus passing through a specific count station (i.e., a section of road comprising one or more blocks over which the street traffic is relatively constant), and amalgamating these measures over entire bus routes, then over entire bus schedules, then over entire bus fleets operating out of a particular bus garage. Intuitively, the first task is to take the 24-hour pedestrian count and apportion it to account for the specific travel time that the bus requires to traverse that count station at that time of day. This base data could be gleaned from GPS bus-tracking data (preferred) or estimated via bus schedules.

From the initial TAB pedestrian model, a series of **hourly pedestrian factors** were derived from 32 different 18-hour counts taken across seven cities. For surveyor convenience and safety, the six hours from midnight to 6:00 AM were not counted as, other than a few entertainment district areas, pedestrian traffic tends to be minimal. Therefore, the 18-hour count was used to approximate the full 24-hour count, assuming the early-morning pedestrian counts to equal 0. Table 9 summarizes the 18-hour factors developed previously.

Table 8: Pedestrian Count Hourly Breakdown

Start Hour	% of 18-hours
6	2.3%
7	5.0%
8	6.4%
9	6.2%
10	5.0%
11	5.7%
12	8.5%
13	7.2%
14	5.6%
15	6.1%
16	6.7%
17	9.6%
18	6.9%
19	4.8%
20	3.4%
21	5.0%
22	2.7%
23	2.9%
18-Hr Total	**100.0%**

Thus, the number of pedestrians for one given passage by a bus through a section of road can be approximated by Equation 4:

Equation 4: $$P = \Delta t_{thru} \times P_{24}\, X\, Ped\ Hour\ Factor$$

Where:

P = *Pedestrian count along a given road section for a specific time interval*

Δt_{thru} = *average travel time of bus through the specific road section [hours]*

P_{24} = *Daily mid-block pedestrian volume on a given road section (peds/day)*

Ped Hour Factor = *proportion of daily traffic in the specific hour of the bus trip*

While this equation would give a good approximation of average mid-block activity across the road section, it is likely to underestimate the pedestrian exposures as the bus passes through intersections, where pedestrians tend to gather while awaiting green signals or at bus stops.

The **mobile counts** collected from the moving vehicle were recorded block by block, spanning from the centerline of one cross street to the centerline of the next. Therefore, the mobile counts include pedestrians arriving at the intersection from side streets whereas Equation 4 does not. The relationship between the actual mobile counts collected and those approximated by Equation 4 are illustrated in Figure 4. The actual and modeled mobile counts were amalgamated up to the level of a "run" (i.e., one circuit of the original 60-75 block study area), typically representing an hour or less of driving time.

The correlation is fairly good at this level of amalgamation and the trend line clearly shows that the modeled pedestrian count (using Equation 4, which is based on mid-block counts) is averaging about 74 percent of the actual count.

At this stage, other variables were explored to examine whether there are any other significant influences over mobile pedestrian exposure and/or better ways of predicting the known actual count values, in particular average travel speed of the vehicle and pedestrian density (i.e., pedestrians/100 feet). Various levels of data amalgamation were considered, including by block, by count station, by run and by route. Various relationships including linear, logarithmic, inverse and exponential were considered.

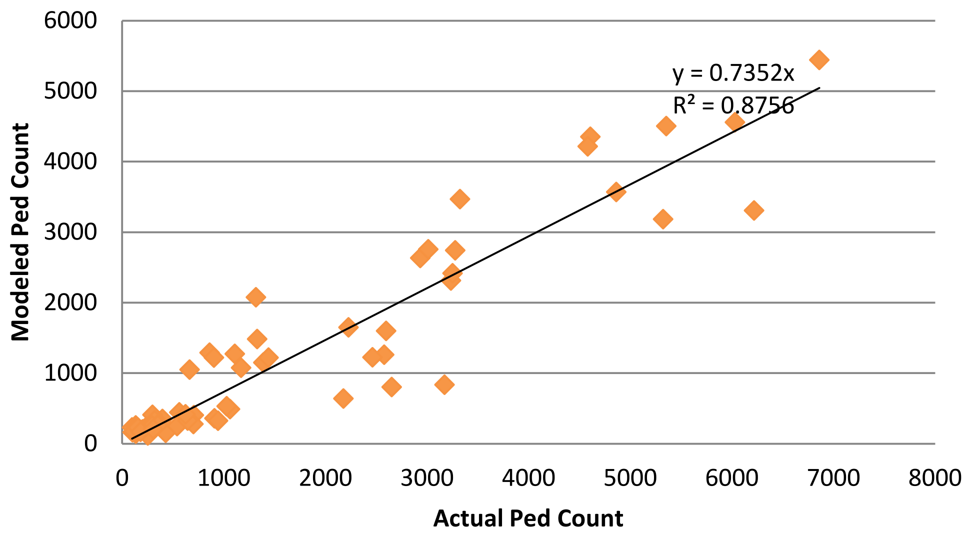


Figure 4: Actual vs. Modeled Ped Count by Run

It was determined that Equation 4, amalgamated to the level of one travel day per route provides the most accurate estimates of mobile pedestrian exposure, as illustrated in Figure 15. At this level of amalgamation, the predictions are quite good, again showing that the modeled mobile counts that are based in Equation 4 using mid-block counts as input are trending at about 75 percent of the mobile counts that include intersection crossing volumes as well.

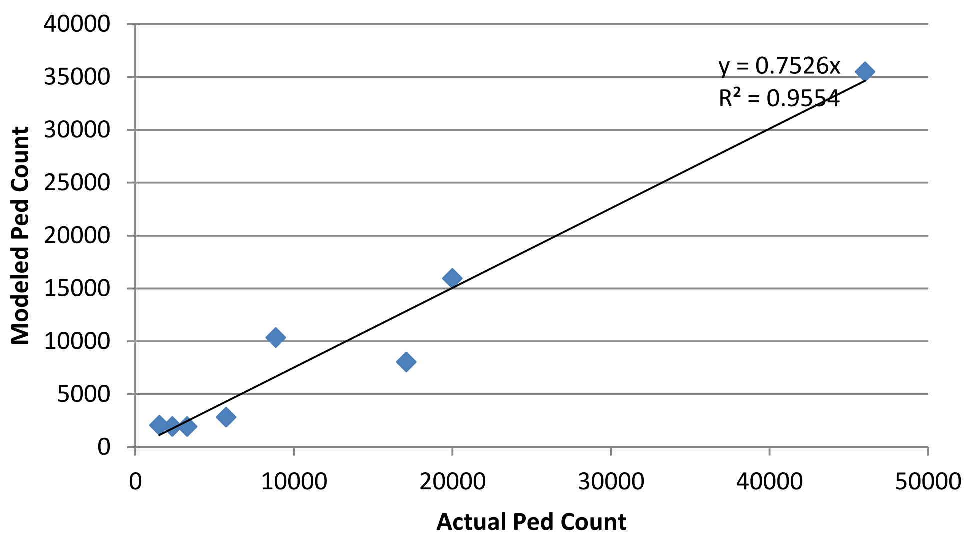


Figure 5: Actual vs. Modeled Ped Count by Travel Day

Peoplecount conducted a literature search looking for any previous research that correlates or compares mid-block and intersection pedestrian volumes. Furthermore, sources of raw data were sought for use in estimation and requests were made on the list serve of the Association of Pedestrian and Bicycle Professionals, to which Peoplecount belongs. There were no sources of such data forthcoming. Thus, to the extent known, the extensive data collected by Peoplecount using the static and mobile counting techniques are, in fact, a satisfactory resource for comparing mid-block versus intersection pedestrian volumes.

Therefore, based on the trend line in Figure 5, adding a factor of (1/0.75) or 1.33 to Equation 4 is recommended to account for the congregation of pedestrians at intersections and their origins from side streets that are not already counted in the mid-block volumes. Equation 5 is the final equation for estimating pedestrian exposures to a mobile vehicle.

Equation 5: $$\boldsymbol{P = 1.33 \times \Delta t_{thru} \times P_{24}\, X\, Ped\ Hour\ Factor}$$

Equation 5 estimates the total pedestrian exposure over the road section from **both sidewalks and both walking directions.** Over the course of a day, it is assumed that pedestrian volumes by walking direction will equalize, so a 50/50 split is assumed for direction of travel. To split pedestrians by side of the street, again a 50/50 split is assumed. Although individual road sections may not always have an equal split of pedestrians by sidewalk, over the course of all the amalgamated runs and routes, it is assumed that the 50/50 split is an adequate estimate.

As with the traffic exposure model, this equation would be applied for each road section in a bus route for a specific run time, and all sections of the bus route and all bus runs in the schedule would be amalgamated. Finally the activity of the fleet is amalgamated across all buses operating out of a specific garage to yield an average pedestrian exposure per bus. **Subsequent sections in Chapter 4 of this report will discuss the seemingly onerous task of performing such detailed calculations and will recommend a feasible and economical solution for implementation.**

Sample Calculation of Bus Exterior OTS

Transit Authority:	CTA
Garage Name:	Chicago
Route No.:	125
Trip No.	46275912
Stop Sequence No.:	4
Day Type:	Weekday
Frequency:	5 days/wk
Road Section:	N. Michigan Ave from E. Superior St to E Ontario St (stop is n/o E. Ontario St)
Road Class:	A3
Time of Day:	8:09 AM

Opposing Direction OTS (Vehicles)

$$OTS = \left(1 + \frac{v_{\text{thru}}}{v_{post}}\right) \times \Delta t_{thru} \times V_{opp} \times LF \qquad \textbf{(Equation 3)}$$

Where:

OTS = *"Opportunity to see"*
= *exposure to opposing traffic* ***in a given road section*** *[people 18+]*

Δt_{thru} = *average travel time of bus through the specific road section [hours]*

V_{opp} = *hourly traffic flow of opposing traffic stream [vehicles/hour/dir.]*
= *AADT/2 × Month factor(MF) x Day factor(DF) x Hour factor(HF)*

$AADT$ = *Average Annual Daily Traffic (24-hour, two-way count, average day)*

MF = *Month Factor (adjusts AADT to that of a specific month (default of 1.0 for year-round operation)*

DF = *Day Factor (adjusts AADT to an average weekday or weekend day)*

HF = *Hour Factor (proportion of daily traffic in the specific hour of the bus trip)*

LF = *Load Factor (number of people age 18+ per vehicle (approximately 1.5 nationwide))*

Known:

v_{thru} = 5 mph (average through section, including stop time)

v_{post} = 35 mph

Δt_{thru} = 0:01:41 (0.028 hr)

AADT = 38,200

MF = 1.0

DF = 1.046 (road class specific)

HF = 0.059 (road class specific)

LF = 1.43 (Chicago-wide)

$$OTS = \left(1 + \frac{5}{35}\right) \times 0.028 \times \frac{38200}{2} \times 1 \times 1.046 \times .059 \times 1.43$$

$$Opposing\ Direction\ OTS = 55$$

$$Same\ Left = .3 \times OTS = .3 \times 55 = 17 \qquad \textbf{(Table 5)}$$

$$Same\ Right = .013 \times OTS = .013 \times 55 = 1 \qquad \textbf{(Table 5)}$$

$$Cross\ Right\ or\ Left = .01 \times OTS = .01 \times 55 = 1$$

Pedestrian OTS

$$P = 1.33 \times \Delta t_{thru} \times P_{24}\, X\, Ped\ Hour\ Factor \qquad \textbf{(Equation 5)}$$

Where:

$\boldsymbol{P}$ = *Pedestrian count along a given road section for a specific time interval*

Δt_{thru} = *average travel time of bus through the specific road section [hours]*

$\boldsymbol{P_{24}}$ = *Daily mid-block pedestrian volume on a given road section (peds/day)*

Ped HF = *proportion of daily traffic in the specific hour of the bus trip*

Known:

Δt_{thru} **=** 0:01:41 (0.028 hr)

$\boldsymbol{P_{24}}$ **=** 53,200

Ped H F = 0.064

$$P = 1.33 \times 0.028 \times 53200 \times 0.064 = 127$$

$$P\ (1\ side) = 127/2 = 64$$

$$P\ (1\ dir'n) = 127/2 = 64$$

Total Weekly OTS per Bus Side

Left = (Opposing + Same Left + Cross Left + P (1 side)) x Weekly Frequency
= (55 + 17 + 1 + 64) x 5 = 685

Right = (Same Right + Cross Right + P (1 side)) x Weekly Frequency
= (1 + 1 + 64) x 5 = 330

Front = (Opposing + P (1 dir'n)) x Weekly Frequency
= (55 + 64) x 5 = 595

Back = (Same Left + Same Right + P (1 dir'n)) x Weekly Frequency
= (17 + 1 + 64) x 5 = 410

In this manner, the OTS of each road section between two bus stops is calculated, the sections are amalgamated to a run, the runs are amalgamated to a route and the routes are amalgamated by garage.

Opportunity to See Rider-Targeted Advertising

Approach

Other than surface vehicle exteriors (and rail exteriors where they operate on at-grade or elevated rights-of-way), all other transit media are directed to riders of the transit system. Algorithms have been developed to predict OTS of internal transit media at the following **levels of granularity**:

- Bus/surface vehicle interiors – by bus garage
- Subway/train vehicle interiors – by line or line group
- In-Station advertising – by station and location category

For the purposes of using a clear, consistent terminology, Peoplecount has dubbed the above units of the transit system as **"nodes"**. Riders pass from node to node in the course of their transit trip, thus being exposed to various forms of transit media. A "line group" is defined as one or more subway or rail lines that share a common pool of railcars.

As all of the above media types are measured using ridership data, a series of worksheets have been devised to illustrate the data inputs required and the series of simple calculations needed to arrive at an Opportunity-to-See estimate for each combination of location type and media type within the transit system. These worksheets are provided in **Appendix H** and are relatively self-explanatory, using Chicago CTA for sample calculations (noting that these calculations are for illustrative purposes only and may lack the precision that would be afforded the actual calculations during the implementation phase). The following sections outline the step-by-step data requirements and calculations for each segment of the transit system. It may be useful for the reader to follow along with Appendix H while reading these sections.

In all cases, the gross OTS is being calculated; at this point, there is no consideration of Likelihood-to-See (LTS) ratios. Thus, all the passengers in a bus or railcar have the Opportunity to See every bus card in that vehicle; all people entering or exiting a particular rail station have the opportunity to see all concourse-level media; and all people entering, exiting or transferring at a particular rail station have the opportunity to see all platform-level media.

While it is recognized that it is indeed unlikely that passengers would actually be able to see all the media displayed in these transit system segments, the assignment of VAI scores and/or an additional OTS fraction will be addressed in implementation discussions in Chapter 4 of this report.

Opportunity to See Interior Bus Advertising

For interior bus advertising, given that audience estimates are being reported by bus garage, the process generally involves:

- Amalgamating the gross ridership of each bus route that is fed by the particular bus garage;
- Calculating an average ridership per bus assigned to that garage (comprising all active buses in the fleet, including active spares);
- Obtaining information from the media seller on the types of media displayed, typical packages sold for each media type and the distribution of panels in a sold package within the fleet.

The detailed calculation for estimating the OTS of interior bus advertising is outlined on Page H-1 and described below:

Data Required. The data used as inputs to this calculation are to be assembled ahead of time, namely:

- *From the transit authority* – Average weekly ridership by bus route; number and name of all bus garages in system; assignment of routes to bus garages; number of active buses assigned to each bus garage including active spares;
- *From the media sales contractor* - Number of different media configurations of bus interiors in system (and whether the configurations are randomly distributed through the transit system or specific to one or more bus garages); total number of buses displaying each internal media configuration; name and size of each media type displayed in the bus interior; number of posters per bus of each media type in that particular bus configuration; names of different packages sold in that market for each bus interior media type; number of posters per bus allotted to each package; number of buses in package;
- *Derived data* – In the example on Page H-1 using CTA system data, all the data were available in the required format and the consultant did not derive or estimate any data, except to total the bus route ridership by bus garage. If, however, the transit system has not estimated bus ridership by route, estimates would be derived using the system's origin-destination data. Otherwise, system-wide bus ridership could be used and audience exposures would then be undifferentiated across the system.

Calculate Average Ridership per Bus. For each bus garage in the system, total the ridership of the individual bus routes being fed by that bus garage and divide by the total active bus fleet (including spares) to obtain an average ridership per bus. If a specialized segment of the fleet exists that only operates on limited routes (for example, articulated buses), this calculation could be performed for that segment of the fleet only (although it is only meaningful if particular interior bus advertising packages are then confined to this fleet segment; otherwise there is no need to differentiate). Ridership is expressed in individual bus trip legs, meaning that riders can take more than one bus and may be counted twice system-wide.

Calculate Weekly OTS per Media Package. By multiplying the average number of each type of media poster per bus by the number of active buses assigned to each garage, a total inventory is calculated by bus garage. The media sales contractors have already defined a number of packages of that particular media type that are typically sold in the market, in this case "25", "50" and "100" package coverage. Each package is defined by the number of posters per bus and number of buses per fleet that is being purchased. Assuming the package to be distributed evenly across all bus garages, an average OTS per poster is calculated.

In this example, a package constitutes only one unit of a particular advertiser displayed per bus, with the exception of the Brand Bus package where the entire bus is dedicated to a single advertiser. If a transit media seller includes multiple incidents of the same advertisement within a single bus, it should be noted that the OTS would not be multiplied accordingly, as the total bus ridership is already included in the OTS and is not double-counted. Instead, this would be handled in the Visibility Adjustment Index (VAI) as having a correspondingly greater likelihood to see when multiple instances are present.

Opportunity to See Interior Railcar Advertising

For interior rail advertising, given that audience estimates are being reported by rail or subway line (or line group if railcars are shared), audience estimation generally involves:

- Amalgamating the gross ridership of each rail line in the particular line group (or for each station in the line group if the ridership is not expressed by line);
- Calculating an average ridership per railcar assigned to that line group (comprising all active railcars in the fleet, including active spares);
- Obtaining information from the media seller on the types of media displayed, typical packages sold for each media type and the distribution of panels in a sold package within the fleet.

The detailed calculation for estimating the OTS of interior rail advertising is outlined on Page H-3 and described below:

Data Required. The data used as inputs to this calculation are to be assembled ahead of time, namely:

- *From the transit authority* – Average weekly ridership by rail line (or, if not available, station-by-station usage as a surrogate); an understanding of how railcars are allocated among rail lines in order to define the number of rail line groups (which can be named for convenience; in this case CTA dedicates its railcars to a particular line); number of active railcars assigned to each rail line group including active spares;
- *From the media sales contractor* - Number of different media configurations of rail interiors in system (and whether the configurations are randomly distributed through the transit system or specific to one or more rail lines); total number of railcars displaying each internal media configuration; name and size of each media type displayed in the railcar interior; number of posters per railcar of each media type in that particular railcar configuration; names of different packages sold in that market for each railcar interior media type; number of posters per railcar allotted to each package; number of railcars in package;
- *Derived data* – In the example on Page H-3 using CTA system data, the consultant amalgamated the average weekly ridership by rail line to obtain total rail trips across the system. A transfer rate of 1.00 was applied to indicate that transfers were included in the ridership data provided by CTA.
- ***Calculate A*verage Ridership per Railcar.** For each rail line group in the system, total the ridership of the individual rail lines (or stations) included and divide by the total active railcar fleet (including spares) to obtain an average ridership per railcar. If a specialized segment of the fleet exists that only operates on limited routes, this calculation could be performed for that segment of the fleet

only (although it is only meaningful if particular interior bus adver**tising packages are then confined to thi**s fleet segment; otherwise there is no need to differentiate). Ridership is expressed in individual rail trip legs, meaning that riders can take more than one train and may be counted twice system-wide.

Calculate Weekly OTS per Media Package. By multiplying the average number of each type of media poster per railcar by the number of active railcars assigned to each rail line group, a total inventory is calculated by rail line group. The media sales contractors have already defined a number of packages of that particular media type that are typically sold in the market, in this case "25", "50" and "100" packages. Each package is defined by the number of posters per railcar and number of railcars per fleet that is being purchased. Assuming the package to be distributed evenly across all rail line groups, an average OTS per poster is calculated.

In this example, a package constitutes only one unit of a particular advertiser displayed per railcar, the exception again being the Brand Train. If a transit media seller instead includes multiple incidents of the same advertisement within a single railcar, the OTS would not be multiplied accordingly, as the total rail line ridership is already included in the OTS and is not double-counted. Instead, this would be handled in the Visibility Adjustment Index (VAI) as having a correspondingly greater likelihood to see when multiple instances are present.

Opportunity to See Station Advertising

Station advertising comprises advertising faces located on platforms, in corridors, on stairways and in common areas. For the purposes of estimating advertising exposures to station advertising, stations are characterized by two placement types: platform (i.e., trackside) and concourse (i.e., all other common areas). The distinction is that platform advertising is exposed to passengers transferring from one train to another whereas concourse advertising generally targets only those transit riders who are entering or exiting the rail or subway system at that particular station.

The methodology for estimating the Opportunity to See station advertising is premised on deriving separate estimates of concourse-level and platform-level ridership volumes by station, a process that generally involves:

- Acquiring station usage and/or origin-destination data from the transit authority at the most detailed level available;
- Filling in any missing station usage data by estimating or modeling to include average weekly station entries, exits and transfers;
- Obtaining information from the media seller on the types of media displayed by station (including trade names and sizes), the placement category of the poster within each station (or relative distribution of concourse versus platform locations), typical packages sold for each media type and the distribution of panels in a sold package within the stations.

The detailed calculation for estimating the OTS of station advertising is outlined on Pages H-5 to H-17, and described below:

Data Required. The data used as inputs to this calculation are to be assembled ahead of time, namely:

- *From the transit authority* – System map identifying stations, lines and transfer points; average weekly station usage (ideally, entries, exits and transfers; if not available, use available station usage counts supplemented with origin-destination data);
- *From the media sales contractor* – Media inventory list by station and placement type (i.e., concourse or platform) including media description, trade name, size and number of units by station; names of different packages sold in that market for each station media type; number of units allotted to each package;
- *Derived data* – In the example on Pages H-5 to H-17 using CTA system data, the consultant used average weekday cross-platform transfer data by station supplied by the transit authority and apportioned it by average weekly station entries to estimate the average weekly number of passenger transfers per station, thereby allowing separate estimates of OTS for concourse-level versus platform-level transit media. A transfer rate of 1.21 was derived from the data, implying that the average rail rider uses 1.21 trains per one-way transit trip. ***Calculate We*****ekly OTS per Station and Placement Type.** For each station in the system, total the average weekly usage of the individual stations, distinguishing concourse level (station entries + station exits only) versus platform level (station entries + transfers + station exits).

Calculate Weekly OTS per Media Package. Considering each media type/placement type combination separately, list the number of posters per station, count the number of stations in which the particular media type is shown and total the weekly OTS for only those relevant stations and placements. Unlike the previou**s** bus and railcar interior examples, some station media packages on the CTA system may include more than one poster per station. However, since the total station population is already included in OTS calculations, these people are not double-counted except in multiple station visits throughout the week. Thus, the OTS maxes out at the total of all relevant stations. Nevertheless, as each poster is assumed to have equal opportunity to be viewed (on average across the sales package), the OTS per poster remains constant. Again, multiple instances of the same advertisement in one station would be handled in the Visibility Adjustment Index (VAI) as having a correspondingly greater Likelihood to See (LTS) when multiple instances are present. Converting OTS calculations to LTS is discussed further in Chapter 4 (Implementation).

Opportunity to See Exterior Bus Advertising

For exterior bus advertising, the audience is composed primarily of non-riders, i.e. other vehicle occupants and pedestrians on the sidewalk. For this reason, the method for calculating OTS for exterior bus advertising differs significantly from that for interior or in-station advertising and involves:

- Amalgamating the various GTFS data tables (or equivalent bus schedule data) to produce a single detailed table by weekday and weekend showing every route, trip, weekly trip frequency, stop name and geographic coordinates as well as stop times at each stop for each trip that is associated with a particular bus garage;
- Assigning each bus stop to its appropriate road section (to assign required road and traffic attributes to each stop) using the geographic coordinates provided with the GTFS data;
- Calculating travel times and distances between each pair of stops for each route/trip combination;
- Applying the appropriate, hourly, day type and vehicle occupancy load factors to each record in the table;
- Determining the total number of buses assigned to each garage (comprising all active buses in the garage, including active spares);
- Obtaining information from the media seller on the types of media displayed, typical packages sold for each media type and the distribution of panels in a sold package within the fleet.

The detailed calculation for estimating the OTS of exterior bus advertising is outlined on Page H-18 to H-23 and described below:

Data Required. The data used as inputs to this calculation are to be assembled ahead of time, namely:

- *From the transit authority* – GTFS data (or equivalent detailed bus schedule data); number and name of all bus garages in system; assignment of routes to bus garages; number of active buses assigned to each bus garage including active spares; number and name of all bus models by bus garage;
- *From the media sales contractor* – Name, number and size of each media type potentially placed on each side of every bus model in system (and for media that can be found on more than one bus side, whether the media placement is randomly distributed by bus side or can be purchased by specific bus side); names of different packages sold in that market for each bus exterior media type; number of posters per bus allotted to each sales package; number of buses in package;
- *Derived data* – In the example on Page H-18 to H-23 using CTA GTFS data, the consultant used the geographic coordinates of each stop provided in the GTFS Stops table and through the use of Geographic Information System (GIS) software and an underlying street-centerline road network, spatially joined each bus stop to the section of road on which it resides. The purpose was to assign to each bus stop a road class, posted speed limit, one-way designation, annual average daily traffic count (AADT) and 24-hour pedestrian volume from the road network (the AADT and 24-hour pedestrian volume were previously gathered or estimated by the consultant, while the remaining attributes were provided by the street-centerline road network vendor). The consultant assembled a detailed route/trip table for each garage and day type (weekday or weekend) combination from the

GTFS data, calculated all travel times and distances between bus stops and assigned all necessary road and traffic attributes. For each record in the detailed route/trip table the consultant then calculated weekly OTS estimates for each of the OTS traffic streams outlined earlier in Figure 11. If the transit system has not provided GTFS data then GPS data or other detailed scheduling data would be used as a surrogate.

- **Calculate Average OTS per Bus Exterior.** For each bus garage in the system, total the weekly OTS traffic streams from the detailed route/trip table for each garage and apportion the total weekly OTS from the individual traffic streams to a total weekly OTS on the left side, right side, front and back of all buses belonging to that bus garage and divide by the total active bus fleet (including spares) to obtain an average weekly OTS per bus side by garage.
- **Calculate Weekly OTS per Media Package.** By multiplying the average number of each type of media poster per bus side by the number of active buses assigned to each garage that carry that particular media poster on that side, a total inventory is calculated by bus side and garage. The media sales contractors have already defined a number of packages of that particular media type that are typically sold in the market, in this case "25", "50" and "100" packages. Each package is defined by a number of posters per bus and number of buses per fleet that would be included in the media package purchased. Assuming the package to be distributed evenly across all bus garages, an average OTS per poster is calculated. In this example, as with many exterior media packages for vehicles, consideration must be given to the fact that a media poster that can be placed on either the street-side or curb-side of a bus will garner vastly different OTS totals depending on which side of the bus the poster is placed. A poster placed on the curb-side of a bus will only be visible to pedestrians walking on that side of the bus and any vehicles that pass the bus on the right side or that approach the bus from a cross street on that side, whereas a poster placed on the street-side is exposed to far more vehicular traffic from the opposing direction. Knowing this, separate left- and right-side weekly average and total OTS values were calculated for each qualifying media type by garage. Assuming that the posters are randomly distributed on both sides of the bus, it was necessary to create packages of "25M" and "50M" (M representing a mix of street-side and curb-side panels) that carried a weighted OTS that lay somewhere between the left side and right side OTS, depending on the mix of available posters in each garage.

In this example, a package constitutes only one unit of a particular advertiser displayed per bus, the exception being the Brand Bus package where the entire bus exterior can be dedicated to a single advertiser. It should be noted that if a transit media seller includes multiple incidents of the same advertisement on a single bus, the OTS would not be multiplied accordingly, as the total bus exposure is already included in the OTS and is not double-counted. Instead, this would be handled in the Visibility Adjustment Index (VAI) as having a correspondingly greater likelihood to see when multiple instances are present. This principle would also apply to bus wrap media, which is visible from multiple directions.

ANALYSIS OF EYE TRACKING PILOT STUDY RESULTS

Analysis of Video Camera Technique

Using the pre-prepared video footage of the transit route described earlier, trained PRS eye tracking researchers conducted mall intercept studies where subjects were recruited to view the videos while their gaze was tracked through special equipment as described previously.

After all respondents had viewed the film, each eye gaze was then counted and amalgamated with other respondents' results to estimate the percentage of people who "noticed" each advertisement encountered. Specifically, all responses were coded manually with the use of video editing software to determine fixations on specific areas of interest. A fixation is recorded when the eyes stop for a predetermined period of time. Each video contains a "point of regard" (POR) crosshair identifying where the respondent is looking at any given time. Each time the POR crosshair stops on an area of interest for 1/10 of a second, the coder marks a fixation for that area of interest. These fixations are tabulated manually to provide noting and re-examination scores on each area of interest.

In a full-scale study, a set of these resulting percentages, termed Visibility Adjustment Indices or VAIs, would be produced for each transit media product type. The VAI would thus express the average percentage of the total potential audience who would actually look at, for example, a two-sheet poster on a platform in a transit station. Each noting score was summarized by board type. For example, if there was noticing of one or more boards out of a line of in-car cards, in-car cards in general were credited with noting.

Insight from the Video Camera Technique

The following insights were gleaned from the eye tracking pilot study using the video camera technique:

- The original TAB-recommended filming technique and parameters, first specified and followed in the eye tracking study for standard billboards, still mainly hold true for transit. During the filming inside buses and trains, there were some difficulties keeping the camera steady. More work would need to be done on how to **stabilize the camera on moving vehicles** during the full study, if this technique is used going forward;
- One benefit of filming in advance and testing the footage in a private space, is that it does not attract unwanted attention from other people as compared to wearing the headgear in a public setting;
- Great care and time has to be allowed to secure approvals of officials to use live buses and trains for filming. The approval process at the MTA was onerous (almost six months) and caused a significant delay in the completion schedule of this study;

- It is imperative during all videotaping days to have the accompaniment of a transit official to deflect questions from other employees;
- It is imperative to include in the video footage some segments that contain little or no advertising to disguise from respondents the true reason for the study; and
- The video footage should be constructed so that all riding footage is together and all walking footage is together to allow the respondent to more easily make the transition.

The results by location for the video camera technique are included in Table 10. It is important to note, however, that the original purpose of this study was to determine which technique is most feasible. The results, while a factor, are of secondary importance at this juncture. The sample size is insufficient to put any quantitative stock in these results.

Table 9: Noting Scores of Transit Media Using Video Camera Technique

MEDIA TYPE/PLACEMENT	% NOTING	% RE-EXAMINED
STATION PLATFORM		
Platform board	53%	15%
Exit board	70%	21%
Right side boards	88%	29%
Boards straight ahead	100%	68%
Exit boards on right	94%	35%
SUBWAY CAR (STANDING)		
Banners (left)	71%	35%
Banners (right)	68%	30%
Placards (left)	56%	41%
Placards (right)	21%	6%
SUBWAY CAR (SEATED)		
Banners	82%	62%
Placards	71%	53%
BUS INTERIOR		
Banners on upper left	85%	50%
BUS EXTERIOR		
Near side - left to right	100%	9%
Far side - right to left	74%	3%
Rear	6%	0
Front	3%	0
Outside right side of bus	38%	6%
Outside left side of bus	6%	3%
Outside rear side of bus	6%	0

Advantages and Limitations of Video Camera Technique

The video camera technique proved once again to be very accommodating for recreating the walking sensation that a respondent needs to have when viewing the video. The respondents' eye movements, as they did in the prior drivers' and pedestrian study, reacted as a normal person would when walking the route. Eye movements thus were successfully judged as natural. This finding was not a surprise as this was the reason the original study incorporated this design. It also hints at the major advantage of this design being that it can be easier to directly compare results alongside results of static billboards when the research design is the same or similar.

The impact of having the camera pointed in specific directions for the viewer to see was both a positive and a negative. It was a positive because it allowed the study to consider images that were properly defined and most importantly allowed each respondent to have the exact same experience. In this way, respondents can be better judged individually as well as collectively. It was a negative because by pointing the camera at something the researcher is dictating the area where the respondent should look. This was judged as not a concern by the TAB during the original driver and pedestrian study of static billboards because the driver presumably already has a limited area to look anyway, and the pedestrian was always walking and, presumably, looking forward most of the time. In either case, the camera was moving while the board was static.

The difficulty with measuring transit advertising is that in reality the board could be static or moving, and the pedestrian or rider can also be static or moving when given the opportunity to see a transit advertisement. This limitation is most pronounced when videotaping the interiors of railcars or buses. The camera is operating in a closed space already and cannot capture all of the items that a static pedestrian can have an opportunity to see. The camera instead focuses on one or a handful of sections of a bus or subway and is a poor substitute for the unlimited head movement a static pedestrian can employ. Related to this limitation is that a static pedestrian may in real life choose not to look up, but rather look down to read a book or doze. Watching a videotape takes away this real option.

Analysis of Eye Camera Technique

The researchers ended up with 13 useable videotapes taken from the eye cameras of 19 separate subjects. Afterward, the researcher examined the results and calculated the percentage of respondents who actually noticed the advertisements in question.

Perception Research Services compiled the eye fixation results using the same 0.1 second gaze length criterion as was applied to the laboratory videotape subjects. The results were compiled and summarized for the transit media types sought to be measured. These results are listed in Table 11, with the cautionary reminder that the original purpose of this pilot study was merely to determine which technique is most feasible. The actual VAI scores, while a factor, are of secondary importance at this juncture. The sample size is insufficient to put any quantitative stock in these results.

Table 10: Noting Scores of Transit Media Using Eye Camera Technique

MEDIA TYPE/PLACEMENT	% NOTING	% RE-EXAMINED
STATION		
Board above subway entrance staircase	46%	46%
Corridor down stairs to platform	77%	46%
Corridor - station exit (left side boards)	62%	38%
Corridor - station exit (right side boards)	85%	54%
Station domination - left side boards	77%	69%
Station domination - right side boards	92%	85%
Platform	92%	77%
Cross-platform	77%	77%
SUBWAY CAR		
Banners (left)	85%	85%
Banners (right)	77%	69%
Placards (left)	54%	54%
Placards (right)	62%	62%
BUS INTERIOR		
Banners (left)	38%	38%
Banners (right)	46%	31%
Placards (left)	23%	23%
Placards (right)		
BUS EXTERIOR		
Front	15%	15%
Outside right side of bus	23%	8%

Advantages and Limitations of Eye Camera Technique

Major advantages are the same with any field study: it is the best way to simulate and measure real-life situations. Respondents operated exactly as any pedestrian would in unpredictable ways. The second major advantage is that it gives a truer measure of advertising exposure and noticing in cases where the pedestrian is not moving, like in a bus or railcar, or waiting at a platform. There is no predetermined dictation, as with a video camera, to force the respondent to look in certain directions. Finally, the last major advantage is that the eye camera does not suffer from issues of video quality that a video camera brings (for example, poor camera angle, shaky video, awkward movements). This comes into play particularly on buses and railcars.

The major disadvantage of incorporating this technique is that it is not the same as the original eye tracking methodology and thus may be more difficult to directly compare these results to the static billboard results. It is not impossible, but it is more difficult.

The other major disadvantage is that the researcher cannot control what the respondent has an opportunity to see. This is true of any experiment done in the field versus a laboratory. It becomes much harder to standardize the results. In this case, the respondents were allowed to look anywhere they chose, up, down, straight ahead, at nothing or at everything. The presence of advertising in their normal field of view was, therefore, not a guarantee. Nevertheless, exposing the participants to the identical environment and transit route, thus providing a consistent experience (minimally controlled) provided common areas of interest, regardless of exactly how the participant reacted.

Other disadvantages are related to equipment failure and failure rates. In one case, the recorder did not operate properly. In another case, the respondent absentmindedly brushed her hair out of her eyes and tilted the eyewear, causing all measurement thereafter to be incorrect. All of her results had to be discarded. This technique is also more expensive than the video camera technique because of the inordinate time needed to spend with each respondent, the failure rates, and the difficulty recruiting respondents. Nevertheless, the technology is improving rapidly and this option becomes more viable as time goes on.

REACH-FREQUENCY-DEMOGRAPHICS

To compare transit media with both traditional outdoor advertising and other media, the Likelihood-to-See (LTS) ratings (i.e., the number of actual weekly viewers) will ultimately be subdivided into “bins” of demographic characteristics including sex, age, ethnicity and income.

Furthermore, the LTS estimates are expressed as the product of two parameters: **reach** (the number of different individuals who are likely to see a given advertisement in a given time period) and **frequency** (the average number of times these individuals are likely to see the same advertisement over the given time period). The product of the two parameters, Reach x Frequency, is the gross visibility-adjusted circulation, also termed LTS. In the case of transit advertising, frequency would depend on the amount of duplication of the same trip.

Development of a comprehensive reach-frequency-demographic model is transit system-specific, or at least market-specific, and is considered beyond the scope of this study. Reach-frequency-demographic modeling will be addressed in Chapter 4 under the discussion of implementation.

SUMMARY OF DATA NEEDS

To facilitate a smooth implementation of the methodologies developed to measure exposure to transit vehicle exterior and interior advertising as well as to in-station advertising, it is recommended that, where possible, **data collection and reporting methods be standardized across transit authorities.** This section summarizes the ideal data needs required to execute detailed calculated of OTS audience estimates for transit advertising on surface vehicle interiors and internal transit system advertising. Data required in subsequent phases of the implementation plan for transit advertising audience measurement, including development of Visibility Adjustment Indices (VAIs) and Reach-Frequency-

Demographic modeling are not addressed in this section, but will be addressed in Chapter 4 of this report under the discussions of implementation.

Surface Vehicle Exterior OTS

Bus System Data

To accurately estimate the external vehicle advertising impressions garnered by a transit authority's fleet of buses, it is critical to have detailed and accurate knowledge of the characteristics of the fleet and system. Specifically, the following pieces of data are needed to characterize bus operations:

- **Fleet -** number of buses, both active and spares, and their allocation to specific bus depots or garages;
- **Routes** - knowledge of the bus routes traveled, ideally, as GIS data layers such as a line file of bus routes and latitudes and longitudes of bus stops;
- **Schedule -** data regarding the scheduling of buses, ideally via GPS tracking, but otherwise through detailed understanding of bus schedules and bus allocation;
- **Ridership** – ideally via detailed passenger counts, but otherwise estimated through origin-destination surveys. Ridership for at least a full year should be used in order to calculate audience exposures for an **average week of the year.**

Data related to inventory allotment, such as bus assignment to specific bus garages and the routes served by that fleet's segment, including both active and spare vehicles, are relatively simple to track; industry-wide efforts to standardize these measures would be useful. For example, precise definitions of what constitutes active and spare buses could be established, as well as an understanding of the use of spares. Reporting of exterior bus advertising OTS at the bus garage level dictates that bus allocation be clearly defined.

More and more transit authorities are implementing a variety of **GPS technology** as a data tool to augment their bus operations. GPS data are used to track the precise location of each bus, to determine travel time between stops, to track boardings by stop (if the GPS data are tied in with the fare box or on-board passenger counting) and to enable the automatic voice annunciation system (AVAS) to call out upcoming stops. The ability to track where a vehicle is at each point during its operating day provides a great opportunity to determine the vehicle's daily exterior advertising OTS and is a primary component of the transit exterior advertising model. However, in order to implement the exterior bus audience measurement model in the most cost-effective way, GPS data will ultimately be needed in one (or at best a few) standardized formats, including agreed-upon maximum time intervals between GPS readings. Using GPS to accurately track the activity of buses on each route thus enables automated processes to quantify vehicular and pedestrian advertising impressions for exterior-mounted transit advertising.

Alternatively, the **GTFS data** (General Transit Feed Specification) looks like a promising alternative to GPS readings as it is consistent, generally available in major markets, easily downloaded, with manageable file sizes. This dataset comprises data records by route, trip, day type (i.e., weekday, Saturday and Sunday), and stop-by-stop scheduled times for every run of the operating day. The only disadvantage of this dataset is that it represents an ideal bus schedule as opposed to the live tracking of real bus operations. Regardless of the underlying data source, such files could potentially be automatically processed through map-based software. The specifics of implementation of such a system are discussed in Chapter 4 of this report.

In the course of collecting detailed data from the transit systems in which fieldwork was undertaken, the GPS systems of Atlanta MARTA, Chicago CTA, Portland, OR TriMet and New York MTA were examined. In these four markets, disparities were found in the GPS data that were collected. For example, the CTA in Chicago captures GPS data from all of its bus fleet. Among the data fields collected are: date, time, speed, latitude and longitude, collected at 30-second intervals. MARTA in Atlanta collects much of the same data but at two-minute intervals. MARTA buses also record a GPS reading anytime a passenger gets on or off the bus, and counts the corresponding volumes of entries and exits via Automatic Passenger Counting (APC) equipment. TriMet's data collection interval is the most frequent, with data collected every second; however, neither TriMet nor the CTA tie in passenger counts to GPS readings as MARTA does. Surprisingly, the New York MTA is only now beginning to experiment with GPS tracking of buses. In fact, only the B63 route in Brooklyn has actually been tracked as part of their new Bus-Time initiative pilot project. The aim is to roll out GPS tracking across Staten Island by the end of 2011, with the rest of the city at some point in the future.

As discussed in Chapter 4 of this report under Implementation, GPS data can be used, where available, as input to automated systems that use bus position and travel speed to estimate exposures to pedestrians and other vehicle occupants.

Calculating bus interior OTS is more straightforward than calculating exterior OTS as it is entirely dependent on ridership. For bus interiors, this entails knowing the number of passengers traveling on routes operated by buses, aggregated to the bus garage level. While most transit authorities allocate specific bus routes to a single bus garage, there are exceptions to this rule of thumb. Some routes may be covered by buses that operate out of multiple garages, or the allocation may be different on evenings or weekends than it is during weekday operating hours. This potential complexity of bus operations, if significant, must be taken into account when amalgamating bus ridership to the bus garage level.

Road Network Data

One of the primary components required when calculating bus exterior OTS is a comprehensive digital road map, otherwise known as a road network. This usually takes the form of a GIS line file whereby each arc or road segment on the map is a spatially accurate representation of an actual section of road. The road network is used as a base map on which to overlay bus GPS data and would serve as a point of reference for the location of each GPS data point, as well as the latitudes and longitudes of bus stops. An example of an acceptable digital road map would be ESRI's StreetMap Pro which is based on street data provided by TeleAtlas and has detailed nationwide street coverage down to the local road level. The StreetMap Pro data layer provides the following attributes which are required for calculating bus exterior OTS:

- Street name for each road segment (to assist in referencing GPS data points);
- One-way designation;
- Posted speed limit.

When calculating exterior bus OTS it is necessary to know the one-way designation of each street segment in which a GPS point falls to ensure that credit for impressions is assigned correctly. For example, a bus traveling on a one-way street should not get credit for impressions from the opposing stream of traffic.

The posted speed limit of each section of road along a transit route is also a critical piece of information for the transit model; the bus exterior algorithm described earlier in this report compares the spot speed of each GPS point with the posted speed limit to calculate advertising impressions, reflecting the movement of the vehicle in relationship to surrounding traffic. As an example, a bus traveling significantly slower than the posted speed limit would likely encounter fewer vehicles in the opposing stream of traffic than one traveling at the speed limit and, thus, the impressions are adjusted to reflect this.

Traffic Data

As the basis for calculating the exterior OTS of a bus, **all** sections of road on which a bus route is located must be assigned a vehicular traffic count. The traffic count must be representative of traffic volumes on an average day. The accepted standard to be used is the annual average daily traffic (AADT). The AADT represents the 24-hour traffic volume at a location, averaged over 365 days. AADTs smooth out daily and monthly fluctuations in traffic and allow traffic volumes to be compared across locations. Most state DOTs and some municipalities provide traffic data in AADT format. To provide AADT counts across an entire jurisdiction, DOTs often use a sample of traffic count locations that are equipped with continuous counting equipment and, using the data generated from these permanent count stations, create daily and seasonal adjustment factors that are applied to shorter duration counts to estimate AADTs at other locations.

Thus, the base traffic data is uniformly expressed as an AADT; it is equally important to then adjust the base AADT assigned to a specific GPS point to reflect the specific day and month in which the GPS point was recorded. Therefore, a companion to the AADT dataset is a set of daily and monthly variation factors that would be used to adjust the traffic volume estimates from an average day to the specific day being measured by the GPS readings.

Furthermore, hourly factors are required that express the percentage of the 24-hour AADT traffic volume to be apportioned to each hour of the day. Ideally, the hourly, daily, monthly variation factors should be relevant to local conditions. For example, an AADT traffic count assigned to a road section with a GPS reading taken at a one minute interval between 9 AM and 10 AM on a Tuesday in December would need to be reduced to reflect one minute of traffic of the hour starting at 9 AM on a Tuesday in December.

In summary, traffic data should be collected and universally expressed as an AADT. In addition, one or more datasets of variation factors are required to convert the average 24-hour count to a specific month, day of the week and hour of the day.

Pedestrian Data

The audience of exterior bus advertising comprises both occupants of other vehicles that pass or are passed by the bus and pedestrians on the sidewalk. The algorithm developed to estimate pedestrian exposures to exterior bus advertising is premised on the availability of two-sided, 24-hour, mid-block pedestrian volumes along all relevant sections of road on the bus route system. If available, actual pedestrian counts could be used.

Modeled or estimated pedestrian counts are also acceptable for use. Given the relative scarcity of comprehensive pedestrian counts and the expense of gathering such data, Peoplecount had previously developed a pedestrian activity model that estimates the two-sided, 24-hour, mid-block pedestrian volume along a section of road. This model has currently been implemented in nine of the top ten markets in the U.S. and is used to augment existing vehicular circulations at outdoor advertising locations measured by the Traffic Audit Bureau and could be used to estimate pedestrian exposures to exterior bus advertising.

Internal Transit System OTS

Rail System Data

To accurately estimate the advertising impressions garnered from advertising in **railcar interiors** by a transit authority's fleet of rail or subway cars, it is critical to have detailed and accurate knowledge of the characteristics of the fleet and rail or subway system. Specifically, the following pieces of data are needed to characterize rail or subway operations:

- **Fleet -** number of railcars, both active and spares, and their allocation to rail or subway lines or sections of the transit system;
- **Routes** - knowledge of the subway or rail lines including system mapping;
- **Ridership** – ideally via detailed passenger counts, but otherwise estimated through origin-destination surveys. Ridership for at least a full year should be used in order to calculate audience exposures for an **average week of the year.** Ridership should be expressed by rail line.

Rail-based transit ridership data are routinely collected by the transit authorities, usually through a combination of known measures from fare boxes and automatic passenger counts, combined with estimates based on origin-destination surveys. Furthermore, it is important to know the total number of rail cars, including active cars and spares, and their allocation to each rail line. Some systems have dedicated cars operating on certain rail or subway lines, while others draw from one or more common pools of rail cars.

Station Data

In-station advertising comprises advertising faces located on platforms, in corridors, on stairways and in common areas. For the purposes of estimating advertising exposures to in-station advertising, stations are characterized by two types of areas: platform (i.e., trackside) and concourse (i.e., all other common areas). The distinction is that platform advertising is exposed to passengers transferring from one train to another whereas concourse advertising targets only those transit riders who are entering or exiting the rail or subway system at that particular station.

Detailed ridership and O-D data can usually be acquired from the transit authorities. The gross number of people that pass through a subway station in a given day comprises:

- **Entries** – riders arriving in the station to initiate their transit trip;
- **Exits** – riders debarking from the subway train; and
- **Transfers** – riders transferring either between subway trains or from a bus or other transit mode to a subway line (in which they do not pass through turnstiles or pay an additional fare).

In many transit systems there are sources of **uncounted transit riders** that move through stations. For example:

- not all transit systems track the usage of transit passes, requiring only visual inspection of the card at certain points in the system or at busy times of day;
- many transit systems require swipe-in only and not swipe-out; and
- rail-to-rail transfers are usually not tracked. Likewise, rail-bus transfers are not always tracked if bus bays are located inside the turnstiles of the rail station.

Thus, to supplement hard ridership data collection, most transit systems conduct passenger Origin and Destination (O-D) surveys periodically. These surveys are invaluable in filling in, not only the missing ridership details of multi-leg transit trips, but also supplementary information such as exact origin and destination locations, trip modes before and after transit use, rider demographics, trip purpose, frequency of transit use, etc.

If fare collection or passenger counting methods do not accurately count the above components of station users, detailed origin-destination modeling is required. Many transit authorities have already analyzed their O-D data, in which case, station volumes should include the Exit and Transfer components. In the absence of O-D modeling or estimating by the transit authority, it is necessary to use other means to accurately estimate station-by-station total users. Over the course of a day, exits can often be approximated as equal to entries. Transfers, however, if not physically measured must be estimated by elaborate balancing and weighting of known ridership counts with survey responses.

The methodology for estimating the Opportunity to See station advertising is premised on deriving separate estimates of concourse-level and platform-level ridership volumes. As origin-destination surveys have been deemed an important tool for tracking rider movements, and thus estimating exposures to internal transit system advertising, the ideal transit rider O-D survey would include the following data items:

- addresses of the ultimate origin and destination of the one-way trip and mode of travel before and after the transit trip portion;
- trip purpose;
- full details of every leg of the transit trip, including a list of all stations used to begin, end or transfer and each line or bus route used in sequence;
- an estimate of the monthly frequency of this exact trip and of transit usage in general; and
- rider demographics including age, sex, income and ethnicity.

Having examined questionnaires, data summaries and raw ridership travel survey data of a number of major transit systems, the variations in methodology, questions asked, data entry, coding, and weighting techniques are remarkable. It is strongly recommended that the public transit industry (perhaps under the leadership of APTA or a TCRP-funded study) consider **standardizing the survey questions** and the coding of results. As a minimum, the data items listed above should be reported.

CHAPTER 4 CONCLUSIONS AND RECOMMENDATIONS

INDUSTRY CONSULTATION

From the initial industry consultation documented in Chapter 1, much of the feedback gleaned indicated that the transit advertising industry overwhelmingly desired an audience measurement system similar to the Traffic Audit Bureau's Out-of-Home Ratings for standard billboards and transit shelters. Beyond that, most media buyer/planners simply desired audience ratings data compatible with existing commercial media planning software. Media sellers were less specific about their data and software preferences, many using custom in-house software or even simple spreadsheets. Overall, few of these potential users of transit media audience data had specific needs regarding data format or software specifications. Therefore, to gather more in-depth industry insight, follow-up consultation was targeted to a number of specialists who had very detailed inside knowledge of out-of-home audience measurement systems in general and/or transit advertising knowledge specifically. Thus, with the participation of the Traffic Audit Bureau, a number of meetings, presentations and conference calls were conducted, through which a common industry direction has been reached and a solid implementation plan has been devised.

Specifically, the following in-person meetings, presentations and conference calls were held:

- **TAB Transit Committee** – Comprising TAB staff, advertising agency representatives, and major transit advertising sales contractors including CBS Outdoor, Lamar Advertising and Titan, this committee is primarily concerned with the practical details of implementing and funding a transit media audience measurement system. Peoplecount met with the TAB Transit Committee, made presentations and received feedback on its methodology and implementation plan on at least three occasions. Furthermore, the TAB continued to consult with the Transit Committee, particularly the sales contractors, throughout the final stages of this project, with the goal of recommending an implementation plan that has since been endorsed by its Board of Directors;
- **TAB Technical Committee** – Comprising TAB staff, agency research directors and leading experts in out-of-home audience research, many of whom have international experience, this committee is primarily concerned with the detailed review and approval of measurement methodologies that are ultimately endorsed by the TAB. Peoplecount met with and made presentations to the TAB Technical Committee on at least three occasions, receiving feedback and agreement on its proposed measurement methodologies, including eye tracking, bus exterior audience measurement methodologies and interior transit measurement methodologies;
- **Industry Experts** – Regarding eye tracking, Peoplecount met with Perception Research Services in New York, as well as members of the Technical Committee who had inside knowledge of the Postar eye tracking research in the U.K. Furthermore, TAB arranged discussions and meetings with the Australian firm Audience Data Solutions Pty Ltd. who develop demographic-reach-frequency audience distributions for out-of-home advertising (used to convert advertising impressions to

audience ratings by demographic profile), whose principal also developed the demographic-reach-frequency models for TAB's Out-of-Home Ratings system, to ensure compatibility of its assumptions, data and methodologies with any future industry ratings system that is developed for transit.

CHALLENGES AND OPPORTUNITIES

- **Further Eye Tracking Research Required:** Funding and oversight will be required for ongoing research, implementation and maintenance of the system. In particular, further **eye tracking research may be** required (beyond the scope of this current project) to develop "Visibility Adjustment Factors" for the various sizes, types and placements of transit media. Investigations are underway via the TAB's Transit Committees and Technical Committees to explore the alternatives of funding original eye tracking research in the U.S. versus licensing already-existing VAI data from Postar in the U.K.
- **Ongoing Stewardship:** Responsibility for implementation and ongoing maintenance of the system must be assigned and funded. Likely candidates include the Traffic Audit Bureau, APTA, a new, yet-to-be-formed industry body, or a combination of such stakeholder governance. Ongoing funding could be in the form of membership fees, user fees, data licensing fees, transit authority participation fees, or a combination. In addition to ongoing funding, the stewardship body must be seen as a **third-party, arms'-length auditor** of the data. Recommendations in this regard are proposed later in this Chapter.
- **Implementation:** Funding will be required to implement the algorithms and calculations developed and apply them to specific transit systems. Traditionally, transit media vendors would be expected to fund this process. However, in order to ensure full buy-in and universal acceptance from media buyers, it is necessary to encourage most or all transit systems to participate. As such, additional funding from other sources (e.g., APTA or other industry associations, media buyers, transit systems, government resources) would be welcome. **It is important to ensure full buy-in from most of the major transit systems (and their media vendors) in the country.** This will mean managing expectations, having a feasible funding model and roll-out schedule, and educating buyers.
- **Contract Length:** Transit media vendors have expressed concern with the sometimes **short duration of sales contracts.** When the contract is short or involves one-year renewal increments, there is no incentive for the vendors to fund major research as they cannot be certain to realize a return on investment within the contract period. Perhaps **transit systems can consider incorporating directives or incentives in future contracts requiring support for and use of the new audience measurement system.** Ultimately, it can become an important tool in setting up contractual measures for both parties (i.e., ridership from the transit system versus delivered audiences and advertising revenues from the vendor).

- **Implementation Software:** For measurement of the rider-targeted advertising, examples of calculation worksheets have been provided herein (Appendix H), which can easily be implemented via spreadsheets. The calculations are simple and, given the differences among transit systems with a rail-based component, it is not worth creating elaborate plug-and-play software. On the other hand, exterior bus advertising measurement definitely lends itself to a software application. The numerous calculations that have to be amalgamated are laborious to process manually. Using robust GIS software and mapping tools (such as ArcGIS), software can be created to automatically process bus travel data (such as GTFS data files, GPS readings or other common bus schedule and routing data outputs). The development of such software is beyond the scope of this project. The Traffic Audit Bureau is currently investigating the feasibility of the development of such a software package to assist in the estimation of OTS audiences for exterior bus advertising. Otherwise, the TAB has found that, by licensing its data to third-party vendors who produce media buying and planning software, commercial software or custom data sets can be developed for software platforms already used by planners/buyers.
- **Reach-Frequency-Demographics:** Such media planning software includes reach-frequency-demographic breakdowns of the audience impression data, which must be modeled for individual transit systems. The Traffic Audit Bureau is currently investigating means of modeling R-F-Demos across the country using nationally available datasets such as Census data, the National Household Transportation Survey (NHTS) and the American Community Survey (ACS).
- **Education:** Especially among general planners and non-transit specialists, there will be a need to continually educate buyers to understand and demand the new metrics in their purchasing contracts. This role would likely be taken on by the stewardship body appointed.

EYE TRACKING STUDY CONCLUSIONS AND RECOMMENDATIONS

The objective of the eye tracking pilot study was to gain sufficient knowledge, using a relatively modest budget, to recommend a methodology to conduct a future full-scale eye tracking study. A great deal of insight was gleaned from this pilot study regarding the advantages and disadvantages of the two different techniques tested (i.e., videotape versus eye camera technique).

Upon analyzing the advantages and disadvantages of each approach, along with the results, it is conceded that neither of the study methods can be used exclusively. Rather, the **video camera technique is recommended for filming in situations where the viewer is moving, such as in stations and at street level** for exterior buses. While the passenger is on board transit vehicles, however, the **eye camera technique is best for filming stationary passengers inside buses and railcars**. The rationale is as follows:

- Due to the unevenness and unpredictability of the opportunities to see transit advertising on bus exteriors, it is necessary to control the testing environment by using videotaped sequences. The technique does accurately capture the pedestrian experience when the pedestrian crosses paths with exterior bus advertising, both while standing still and moving. Ultimately, a full-scale study must also include the perspective of occupants of other vehicles;
- The video camera cannot be used inside buses and railcars due to the difficulty of steadying the camera when the transit vehicle is moving and because the video camera dictates too much where the respondent should be looking. The eye camera technique was much more effective at recreating the viewing experience of a stationary rider because of the freedom of the survey subject to replicate normal behaviors.

From a purely technical standpoint, results of each technique indicate that a mixture of each is appropriate. For measures of advertising inside buses and rail cars, the mobile camera technique works best, while for all other measures the video camera technique is preferred.

Moving forward, the Traffic Audit Bureau intends to follow through with the development of VAI (Visibility Adjustment Index) scores for transit advertising, either by coordinating and raising funding for original eye tracking research or by licensing agreements with international governing bodies that have already implemented comparable research.

The Opportunity-to-See (OTS) calculations presented herein for rider-targeted advertising estimate the entire realm of people that would come into contact with an “advertising node” within the transit system, which is considered as:

- The inside of any bus that is assigned to a particular bus garage;
- The inside of any railcar that is assigned to a particular rail or subway line (or “line group” if cars are shared);
- The concourse area of a particular station; or
- The platform area of a particular station.

Nevertheless, it is recognized that a particular passenger in the system does not always have the actual opportunity to see every advertising poster available in the “node”. Ultimately, the VAI scores applied will be a blend of two components:

- The **real proportion** of advertising posters that an average passenger encounters in each part of the transit system (or “Structural OTS”), considering where passengers tend to walk, congregate, sit or stand; the distance and angle of visibility, the configuration of the advertising relative to the advertising vehicle, etc. For example, if there are 30 advertising cards displayed along the length of a bus, perhaps only 10 of them on average would even be within the plausible viewing area of the typical transit rider;

- The **likelihood-to-see ratio** (or VAI – Visibility Adjustment Index), even when the advertisement is within viewing range, given the typical eye movements of the passenger in that particular circumstance. For example, perhaps the typical rider actually notices 60 percent of the advertisements to which (s)he is exposed.

In the above examples, the VAI could comprise two components: the 10/30 or 0.33 Structural OTS ratio and the 0.60 VAI. The first component would be a "hard coded" number that reflects the configuration of the particular advertising node, the dispersion of advertising posters and the typical movements or "coverage" of the node by the average passenger. The second component is an empirical ratio derived through eye tracking research. Ultimately, the VAI will be the product of these two components, whether the two components are explicitly cited or are blended into one index. In the above example, the blended VAI of 0.20 (i.e., 0.33 x 0.60) would be applied to the gross ridership or patronage of the advertising vehicle to calculate the number of advertising impressions gleaned. **Any future eye tracking and visibility research must consider both components of the VAI index.**

RECOMMENDED TRANSIT MODEL IMPLEMENTATION PLAN

Stewardship and Funding

Peoplecount reviewed the various candidates for ongoing governance, maintenance and funding of a Transit Advertising Audience Metrics system, including the Traffic Audit Bureau, APTA, a new, yet-to-be-formed industry body, or a combination of such stakeholder governance. Alternatives were discussed with the TAB and the TCRP oversight committee. In light of the media buyer/planner community's expressed desire to have a system that is integrated with and comparable to the existing TAB Out-of-Home Ratings metrics for traditional outdoor advertising, and able to be integrated with commercial planning software, all parties have agreed that it makes most sense to have ongoing implementation and maintenance of a Transit Advertising Audience Metrics system overseen by the Traffic Audit Bureau. Out-of-home media audience metrics is the core competency of the TAB.

The TAB has already discussed the implementation of such a system with its key members and Board of Directors, including the major transit media sales contractors. The TAB is currently putting in place a mechanism to fund the implementation of transit media metrics across the U.S. over approximately two to three years.

Much of the funding will come from the major transit advertising sales contractors and, to a lesser extent, advertiser and agency TAB members who wish to support its implementation. It is acknowledged that the TCRP has already invested significant funds for this current project at the request of the public transit industry. Nevertheless, the TAB would like to consult further with the public transit industry (perhaps via a body such as APTA) to determine **whether supplementary funding is available** from either APTA or the individual transit authorities.

Surface Vehicle Exterior OTS

Through the data collection efforts undertaken in Atlanta, Chicago and Portland during the pilot study phase of this project, the model to estimate the opportunity to see exterior bus advertising was developed, based on earlier work conducted by Peoplecount. The exterior bus OTS model allows for fleet-wide audience metrics where previously this was not possible. The audience components comprise pedestrians and other vehicle occupants, and there are separate streams of traffic and pedestrians exposed to each of the four sides of the transit vehicle.

Data Requirements

One of the main inputs to the OTS model for exterior bus advertising is a vehicular traffic count. These counts are typically expressed as an annual average daily traffic count (AADT). AADTs represent the average daily traffic count at a location over the entire year. It is from this base count that the total number of vehicles passing a bus at a given time on a particular road can begin to be derived. For this reason, a database of traffic count data at or near bus stops (preferably mapped) is paramount to the success of the model implementation.

Assuming that the Traffic Audit Bureau does oversee the implementation of transit advertising audience metrics in the future, this non-profit organization has already amassed a mapped database of almost 100,000 traffic counts across the continental U.S. Since many transit shelters carry advertising that is already measured by the TAB, many of the existing traffic counts are located along bus routes.

Nevertheless, it is acknowledged that more traffic and pedestrian data will be required to fully implement the model for exterior bus advertising metrics. While the geographic coverage of these traffic counts is already quite extensive, that coverage usually does not completely encompass the vast web of surface transit routes in a particular market. Thus, the first and most pressing need is to fill in the missing traffic and pedestrian data before vehicle exterior OTS can be calculated.

Traffic Intensity Model

Two differing approaches have been considered for filling in missing traffic data in a market. The first is to simply, through a manual approach, obtain and enter the missing traffic count data from official government sources (i.e., state, regional and local DOTs) along the routes of the transit authority that is being measured in the market. This approach has the advantage of limiting the number of traffic counts required as only roads with surface transit routes would be processed. The major disadvantages of this approach are that researching traffic counts manually for individual locations is very labor intensive and, in any case, traffic counts are not available for each segment of every surface transit route in the market. This approach is also very specific to a single transit system and the work required to fill in these counts is not transferable to other transit operators in other cities. For these reasons it was decided not to pursue this approach.

A second approach, one that has been used with great success for Postar in the U.K., involves the creation of a "traffic intensity model" to be used to predict traffic counts where none currently exist (or where manually entering government traffic volume data is time consuming). This approach is well accepted in other countries, and often involves the use of "artificial neural network" modeling that relies on known traffic count data plus other local variables to fill in traffic counts at other locations. By using this approach, the large number of actual traffic counts in the TAB traffic count database, coupled with other variables taken from Census data and other national sources can be used as "seeds" to predict traffic volumes on roads where a count is currently missing.

In this way, entire counties and in fact entire markets can be assigned a continuous series of counts along every stretch of road beyond the local road class level. Preliminary discussions have indicated that the model would likely be applied to roads down to the collector level and would exclude the smaller local road class. While it is recognized that, at the individual level, these predicted counts would not provide sufficient accuracy or granularity to be used for the measurement of an individual billboard, for example, but at an aggregate level, given that exterior bus advertising will be measured only to the level of bus garage, the error rates will fall within an acceptable range.

The main advantages of the "traffic intensity model" approach are:

- The end product will allow for OTS calculations to be carried out for **any** surface transit operator in that geographic area and in fact could also allow for other forms of mobile advertising such as taxi-top advertisers to avail of the data and perhaps share in the costs of its development;
- Once the model is developed, the application of the model to a certain geographic area is much more economical than sourcing out of individual traffic counts would be;
- The data model is "future proofed" in that changes in or additions to bus routes do not necessitate continual revisions to the underlying database. Rather, the data layer could include all significant roads in the market and would be maintained with annual county-level growth rates and wholesale updates based on an industry-agreed timetable.

Tracking of Surface Transit Vehicle Routes

Another key component in calculating vehicle exterior OTS is an accurate understanding of bus routes, operating schedules and average travel speeds (or bus timetables by bus stop, preferably one that reflects congestion and changing traffic conditions throughout the day). Three alternative sources of such data have been identified, namely:

- For those transit authorities that have **on-board GPS devices**, obtain a robust sample of historical GPS files, covering multiple days, vehicles and routes. The downside to this approach is that there can often be a wide disparity in the types and formats of GPS data collected by the various transit authorities (as discussed under the "Refine Data Needs" section in Chapter 3). For example, the time interval at which GPS data points are collected varies widely from one authority to another (and should ideally be four minutes or less between readings to maintain accuracy), as does the data fields actually recorded. This disparity in GPS file formats would make any type of automatic processing difficult, unless data can be converted into one or a small number of standard formats. Another drawback is that some transit authorities do not yet collect GPS data from their buses, including large systems such as the New York MTA, which is only just now pilot testing GPS tracking.

- More promising is the recent introduction of the **General Transit Feed Specification (GTFS) data,** a common format for public transportation schedules and associated geographic information that is being collected by Google for its Google Transit applications. At the time of writing, over 230 U.S. transit systems have contributed their transit schedule data to Google. The fundamental advantage of using the GTFS data is that it is available in a single, uniform format and includes every bus route and run, weekday and weekend schedules, along with latitude/longitude coordinates of the bus stop points, thus lending itself to an automated, mapped solution. The main disadvantage of using GTFS data over live GPS files is that the schedule presumably reflects ideal conditions and does not account for day-to-day schedule variations, short-turning and other practices to mitigate off-schedule conditions. Nevertheless, it appears that the schedules do attempt to reflect changing traffic conditions throughout the day, as evidenced from longer travel times during peak hours.
- In the event that neither GPS files nor GTFS data are available for a particular bus system, such data could be "mocked up" from available transit schedules. This is the least desirable alternative, and would likely require that the transit authority incur additional costs in setting up such files before the data could be processed and external bus OTS be calculated.

Transit authorities that have contributed GTFS data to the Google feed, or alternatively those that employ a GPS system (with a collection interval of four minutes or less and data that is readily exportable with all of the required fields intact) would be ideal candidates for automated processing through a bus exterior OTS software calculator.

If GTFS data are used, the OTS calculations could be processed to represent one entire average week of operation for all buses and routes in the system. To account for the sharing of buses among routes , the route-specific data calculations would then be amalgamated to the level of bus garage.

If, however, actual GPS files are used, some sample must be selected, both in terms of the number of vehicles tracked and the time interval that is considered as representative. Ideally, a full month's GPS data for each operating vehicle in the fleet could be processed through a software calculator. This would allow for the calculation of a daily average circulation per vehicle. Vehicles would then be amalgamated by bus garage to provide average weekly OTS calculations by garage. In either case, the total weekly OTS circulations by garage would be apportioned based on the number of active and spare buses allocated to each garage to arrive at a total weekly OTS circulation per bus.

Software

APTA's nationwide database of transit systems has been examined and, of the 500+ transit systems listed, only 52 have a rail component, whether heavy rail or light, subway, surface-level or elevated. Thus, there is a large number of medium to small transit systems that operate buses only. Should a pre-packaged software system be developed to house the required traffic and pedestrian data and perform the required bus OTS calculations, it is conceivable that many of the transit systems (with perhaps some assistance in structuring datasets if GPS or GTFS are not available) could independently run their data and produce OTS calculations for exterior bus advertising with minimal assistance.

The Traffic Audit Bureau is proposing to develop such software. It is envisioned that it would be a map-based calculator, requiring the following data as inputs:

- **Data built in to the system** including a mapped data layer of traffic and pedestrian counts. The TAB would use sourced government DOT traffic counts where already available from its billboard audience ratings data and modeled traffic counts from a yet-to-be developed Traffic Intensity Model. Pedestrian data would be largely modeled, other than a limited number of actual counts that have been performed for model development or testing. Furthermore, data regarding the base road network, including directionality, road classification, presence of transit and other local variables needed to calculate bus exterior OTS could be preloaded and stored.
- **Data specific to the bus transit system** including latitudes and longitudes of bus stops, assignment of bus routes to bus garages, fleet size by bus garage and the bus schedule in some predetermined format. The software would have to allow inputs of the bus garage and fleet data. The bus schedule data could be pre-formatted to a standard file format, perhaps mocking up the same file format as either the GTFS or GPS bus tracking data.

In summary, in spite of the detailed data needed to estimate the opportunity to see exterior transit vehicle advertising, the proposed methodology is quite practicable using either available GTFS or GPS data and/or bus schedules, along with mapped nationwide base data. To convert the OTS data to LTS and, ultimately, reach-frequency-demographic audience ratings, further research and data manipulation are required from a central source such as the TAB.

Rider-Targeted Media OTS

Implementation of the OTS models for internal transit advertising largely comprises acquiring the necessary data as outlined in Chapter 3 and setting up worksheets to carry out the simple calculations, similar to those set up in Appendix H as an example. The complexity arises in the differing availability and formats of the data for each transit system. For simple systems where data is readily available in the format required, it is possible for the transit authority or the sales contractor to set up worksheets similar to the example in Appendix H and undertake the necessary calculations themselves, especially for surface vehicle interiors where the calculations are relatively straightforward. For transit systems with a **rail component,** the calculations and variations in available data become more complex and would likely require the assistance of a consultant such as Peoplecount to help collect, interpret and analyze the ridership and system data consistently.

For **interior surface vehicle advertising,** the Opportunity-to-See calculations are relatively straightforward, requiring a summary of bus ridership by bus route, assignment of bus routes to particular bus garages (for systems that operate out of more than one bus garage), and an understanding of the fleet size and utilization by bus garage (including spares). Bus ridership should be quoted for an average week of the year, using the most recently available data, including a full year to account for seasonality. Each bus leg of the transit trip is counted independently, as each bus is considered as a separate opportunity to see. It is also necessary to have an understanding of the advertising packages that are sold by the sales contractor to enable OTS calculations to be quoted for the various bus interior media types and packages. Simple calculations as laid out in Appendix H can then be employed to estimate the average ridership by bus and, ultimately, the average weekly OTS per media package.

For **interior railcar advertising,** the calculations are similar to those of bus interiors. Instead of clustering vehicles by bus garage, railcars are clustered by “rail line group”, comprising all the rail lines that are served by a common pool of railcars. If all the railcars in the system are shared equally among all rail lines, then it is necessary to aggregate the ridership of all rail lines and divide by the entire railcar fleet (including active spares) to arrive at an average opportunity to see per railcar. If, however, railcars are dedicated to specific lines, then it is necessary to calculate or acquire the ridership of each line. Again, multiple legs of one transit trip are each counted, as each railcar presents a unique opportunity to see in-car advertising. As many transit systems do not count or otherwise record rail-to-rail transfers, this component of the ridership might require estimation via rider origin-destination counts or surveys.

For **in-station advertising,** station-by-station entry, exit and transfer counts are required. Some or all of these may be directly counted, estimated or directly measured via fare boxes or card swipes, or estimated from O-D travel surveys. It is necessary to obtain fully detailed ridership data, as well as the raw data of any O-D travel surveys. In the absence of any such data collected by the transit authority, gross estimates of transfer percentages may be used; failing that nationwide travel survey data such as the American Community Survey (ACS) or the National Household Travel Survey (NHTS) may have to serve as a surrogate, although such data is available at a much less granular level.

An understanding of the media types and placements **by transit station** is necessary. Specifically, it is important to distinguish between advertising media that is displayed at the track/platform level versus media that are located in common areas such as concourses or corridors. The audiences for each are estimated separately, and only for those stations in which the particular media type is displayed.

The above procedures are used to estimate OTS of transit media **inside the turnstiles** of transit stations. There may be other media vendors operating outside of the turnstiles or in common areas of multi-modal transit stations. Because of the variety of scenarios, including sources of non-rider traffic as transit stations merge with office towers and shopping concourses, such OTS calculations are not included in the rider-targeted media and would be treated individually depending on the case.

Converting OTS (Opportunity to See) to LTS (Likelihood to See)

This report largely addresses the complex calculations of OTS, that is, the gross traffic that can be found within the vicinity of a transit media advertisement. For commercial purposes and to allow direct comparability with traditional outdoor media such as billboards, the transit media buying and selling industry wishes to quote audience ratings based on actual audience impressions, also known as LTS. The adjustment that is made to OTS to arrive at LTS is called the Visibility Adjustment Index or "VAI".

In consultation with the TAB's Technical Committee, the VAI adjustment from gross OTS to LTS is accomplished in two steps, namely **"Structural OTS"** and true **"Visibility Adjustment Index".**

Structural OTS

In transit vehicles where the passenger is generally standing or sitting stationary and tending to face a fixed direction for most of the trip, a fractional adjustment to the gross OTS needs to be made to account for the proportion of transit media panels within the specific advertising vehicle (i.e., bus or railcar) that can reasonably be viewed by a typical passenger. This component of visibility is being termed the **"structural OTS"** as it often depends on the layout or structure of the transit vehicle. Consider the following examples:

- If the entrance on a bus is in the front, then 100 percent of passengers would at least pass through the first part of the bus and would thus be exposed to the advertisements in that section. Conversely, advertising at the back of the bus would generate a smaller group of riders that may be sitting or standing all the way in the back. The middle third of the bus might generate an OTS somewhere between the two extremes. The actual percentages have not been generated, as they depend on the configurations of individual buses and railcars and even the fare collection practices (e.g., back-door entries). In general, using this logic, the average advertising poster on the bus could be reasonably expected to be seen by some fraction of the total ridership of the bus;
- Similarly, if a railcar has two side doors, roughly dividing the car into thirds, then it is likely that a passenger would stay within one section for the entire ride, thus being legitimately exposed to only about one-third of the ads within that railcar. Again, the principle is agreed on but the percentages must be generated for each configuration of bus or railcar, taking into account the passenger loading and unloading practices.

Likewise, for in-station advertising, Structural OTS factors would have to be developed to account for some station users missing certain advertising panels due to multiple station entrances, corridors or platform accesses, and for long platforms in general. Again, these would depend on particular station configurations and media placement, so cannot be developed until the implementation stage. For station dominations, it is likely that the Structural OTS factor would be set at or close to 1.0.

While practices for the calculation of “Structural OTS” will be further defined at the implementation stage as audience measurement for specific transit systems is rolled out, it is important that these factors be developed consistently by the governing body having ultimate stewardship of the measurement system and applied universally. It is not appropriate to have individual sales contractors or transit authorities developing and quoting such factors independently.

Visibility Adjustment Index

Once the Structural OTS factors for buses, railcars and stations are developed, the VAI is applied, as derived from eye tracking studies. The VAI will reflect typical habits of the transit rider in that particular setting, including an average of standing and sitting points of view, as well as normal behavior such as reading, use of laptops and other devices, sleeping, looking out the window, people watching, etc. The VAI expresses the proportion of the Structural OTS audience that actually looks at the ad when afforded a fair opportunity to view it. The VAI usually reflects the noticeability of an advertising structure, given its size and placement.

Another issue is how to account for the possibility that there can be multiple pieces of the same advertising within the same bus, railcar or station. The following points are considered when determining how multiple viewings of the same ad are handled:

- Multiple ads in one bus, railcar or station do not generate more OTS than the total structural OTS of that advertising type. That is to say, an ad cannot be credited with more than 100 percent of the ridership in that part of the transit system; and
- Multiple ads DO generate a higher VAI score, as there is a greater likelihood of seeing at least one of the ads. It is assumed that multiple instances are distributed evenly throughout the venue. **VAI scores for multiple exposures** can be compounded using the following formula:

Where VAI = Visibility Adjustment Index of single board
n = number of identical ads in same advertising location (vehicle or station)

For example, if the VAI score of one particular poster type is 0.66, then the score for two posters within the same transit node would be 0.88, three would be 0.96 and so on, approaching a value of 1.0 (or 100 percent probability of seeing the ad). For practical and credibility purposes, the industry may decide to cap VAI scores at some high proportion like 0.95. For station dominations, therefore, the compounding effect would result in VAI scores of very close to 1.0.

Summary

In summary, OTS is converted to LTS and, ultimately, to audience ratings in the following manner:

1. Calculate **gross OTS** of the bus or railcar interior or exterior according to the algorithms presented herein;

2. Determine whether the gross OTS should be apportioned to a **"Structural OTS"** to account for the true proportion of the gross audience that has a genuine opportunity to see the average advertising poster within that media type;
3. **VAI scores** are applied for different combinations of media type and placement that have been derived from eye tracking research, whether original or licensed from other sources. This results in a Likelihood to See or **LTS audience**;
4. The LTS audience is then divided into **demographic groups** and expressed as the product of an unduplicated reach times the average frequency of media viewing over a given time period.

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ABBREVIATIONS AND GLOSSARY OF TERMS

AADT	Average Annual Daily Traffic – the two-directional, 24-hour traffic volume count on a particular road section, averaged over all 365 days of the year, accounting for daily and monthly fluctuations.
ACS	American Community Survey
APC	Automatic Passenger Counter
AVAS	Automatic Voice Annunciation System
Bus	Used generically in this report to refer to any surface transit vehicle. See "Surface Vehicle".
CBSA	Core-Based Statistical Area - a metropolitan area(s) within larger markets (e.g. DMAs) containing a substantial population nucleus, together with adjacent communities having a high degree of economic and social integration with that core; a standard geography for buying and selling media.
DMA	Designated Market Area - A television market area defined by Nielsen Media Research that is also used by advertisers for multi-media planning. DMAs are non-overlapping and cover the entire United States.
ESOMAR	The European Society for Opinion and Market Research, a world association for market, social and opinion researchers.
Eyes On	Media measurement that provides counts of demographic audiences actually noticing the advertising on Out-of-Home displays.
GIS	Geographic Information System
GPS	Global Positioning System
GTFS	General Transit Feed Specification - a common format for public transportation schedules and associated geographic information.
Line group	One or more rail or subway lines that share a common pool of railcars
LTS	Likelihood to See
Node	A discrete unit or segment of the transit system, defined for the purpose of calculating a common OTS audience circulation (i.e., a bus garage, rail line group, station concourse or station platform).
NHTS	National Household Travel Survey
O-D	Origin-destination
OTS	Opportunity to See
Rail	Used generically in this report to refer to any transit system operating on tracks on a separate, dedicated right of way, including heavy rail, light rail (not operating on street surfaces), commuter rail or subways.
Rail line group	See "line group"
R-F	Reach-Frequency

Structural OTS	The fraction of the gross "Opportunity to See" audience that has a genuine opportunity to see the advertisement, given the configuration of the transit advertising node and typical usage of the facility (e.g., multiple entrances, long vehicle or platform lengths, etc.).
Surface vehicle	Any transit vehicle that operates on road rights of way in mixed traffic.
TAB	Traffic Audit Bureau for Media Measurement (www.tabonline.com)
TCRP	Transit Cooperative Research Program
Transit trip	A single incident of one-way transit usage from an origin to a destination, which may include multiple legs of a particular transit vehicle type or multiple transit modes with transfers in between.
Trip leg	A portion of the transit trip on one particular transit vehicle.
VAI	Visibility Adjustment Index

APPENDIX A

Sample of U.S. Transit Authority Data Availability

Appendix A: Sample of US Transit Authority Data Availability

Transit Authority	Basic Ridership Info Available	O/D Data Available	Customer Survey Data Available	Infrastructure Data Available	Buses GPS Tracked	GIS Route Layer	GTFS Data Available	Access to Data (Yes/No)
Bay Area Rapid Transit (BART)	- Riders swipe in/out at each station; distance-based fares - Swiping provides total ridership by station - Origin-Destination matrix	- Station Profile Survey 2008 - Distributed on platforms/returned at destination - Collected home address, O-D stations, final destination - Sampled 4 daily time periods	- Customer Satisfaction Survey every 2 years - Telephone survey on frequency of use, station cleanliness, general satisfaction - General demographics collected as well	- Length of rail lines - Type and number of equipment - No buses	N/A	N/A	Yes	Yes
Chicago Transit Authority (CTA)	- Ridership by bus route and rail line - Rail station entries - Cross-platform transfers - Ridership by bus stop using auto counters and GPS	- O/D study 2007 - 34,000 sample - Distributed on board over 2 months	- Rider/Non Rider telephone survey - 2,800 households polled on travel behavior in last 7 days - Small scale intercept surveys measure impact of route changes	- Length of rail lines, surface routes - Type and number of equipment	- All buses equipped with AVL (automatic vehicle locators)	Yes	Yes	Yes
Detroit Department of Transportation	- Fare box data is main source - Electronic tracking of transfers but not exit station - Annually 535 random trips have ridership by bus stop counted manually	- O/D data collected by SEMCOG(Detroit MPO) - Last conducted approx. 2001, being redone in 2011 - Sample 10% of daily weekday ridership of each route	- Every 3 yrs a general on-board ridership survey conducted - Collects data on race, gender, income, home address - One purpose is to ensure visible minorities are well-serviced	- Length of bus routes - Type and amount of equipment	Yes	Yes	Yes	- May need written request for information

Appendix A: Sample of US Transit Authority Data Availability

Transit Authority	Basic Ridership Info Available	O/D Data Available	Customer Survey Data Available	Infrastructure Data Available	Buses GPS Tracked	GIS Route Layer	GTFS Data Available	Access to Data (Yes/No)
Fort Worth Transportation - "The T"	- No APCs on board - passengers per mile, passengers per hour by route - on/off study of individual routes - Comprehensive ridership by bus stop not available	- Geodemographic marketing segmentation survey - collected a significant # of addresses to the block level - sample size of 1000	- Demographic data/ customer satisfaction collected yearly - Market segmentation study by rider/non-rider conducted circa 2003 - 1000 intercept surveys conducted on board annually	- above ground trains (commuter rail) - TRE 50/50 partners with Dallas (Fort Worth -Dallas route) -Fixed route buses; rider request flex-route buses; van pools	Yes	Yes	Yes	Yes
LA DOT Transit (smaller of 2 Transit Authorities in LA)	- Drivers count total passengers by trip (not by stop) every day - Ridership by bus stop done manually for each route annually	- No	- Bi-Annual Travel Survey (last done Fall 2008) - 15,-16,000 sample - Collect basic demography; trip frequency, trip purpose, trip details	- Length of bus routes - Type and amount of equipment	- Just beginning to track some	No	No	Yes (whatever is available)
Los Angeles County Metropolitan Transportation Authority (LACMTA)	- Ridership by line (boardings and alightings by station), Ridership by bus route - APC equipment in some of fleet provides sample of Ridership by bus stop for each route by month.	- O/D survey circa 2001. 2011 survey in progress. - Track home, boarding pt, egress pt, destination - 2001 data obsolete due to addition of busway and LRT lines and no longer offering free transfers	- Annual on-board customer satisfaction survey (15,000-16,000 respondents) on service satisfaction, frequency of use -data available, ridership, along with basic demographic information	- Length of rail lines, surface routes - Type and amount of equipment	Yes - collected at fixed time intervals -Used for real-time tracking to report next bus arrival. Downloaded wirelessly.	Yes	Yes	Yes

Appendix A: Sample of US Transit Authority Data Availability

Transit Authority	Basic Ridership Info Available	O/D Data Available	Customer Survey Data Available	Infrastructure Data Available	Buses GPS Tracked	GIS Route Layer	GTFS Data Available	Access to Data (Yes/No)
Metro Transit - Minneapolis	-Ridership by trip (not by stop) from fare boxes - Smart Card system being implemented. Will record boardings (not exits) by stop - 15% of bus fleet equipped with APC (none on rail) - Ridership by bus stop counted manually on a sample of routes each year - Light rail is a POP system. Manually count a sample of boardings only - Commuter rail ridership from ticket sales by stn	- On board O/D study conducted by Metropolitan Council in 2005 - Asked origin, final destination, boarding/ alighting points, - Recorded route that rider was on as well as any other routes used on that trip - General demographics also collected	- On board customer survey, demographic and satisfaction, conducted every 2 years on a sample of routes - In addition to basic demographic and satisfaction data also ask origin and destination zip code or city - Surveys handed out by drivers or other staff and returned to staff or mailed back -3000 - 4000 respondents from buses and 1500 on light rail	- Length of rail lines, surface routes - Type and amount of equipment	Yes	Yes, includes park and ride lots	Yes	Yes
Metropolitan Atlanta Rapid Transit Authority (MARTA)	- Ridership by bus stop (100% of buses have APC) - Rail station entries and exits - 100% Smartcard -Origin-Destination counts available from rail ridership	- Annual system-wide study done mainly to estimate bus and train transfers - 15 years of data available - Atlanta MPO regional on-board study asks questions pertaining to O/D	- Annual on-board quality of service survey (7,000-10,000 respondents) Perception of quality, demographics and home address - Atlanta MPO does regional on-board study every 10 yrs	- Length of rail lines, surface routes - Type and amount of equipment	- All buses equipped with AVL (automatic vehicle locators)	Yes	Yes (not released to public)	Yes

Appendix A: Sample of US Transit Authority Data Availability

Transit Authority	Basic Ridership Info Available	O/D Data Available	Customer Survey Data Available	Infrastructure Data Available	Buses GPS Tracked	GIS Route Layer	GTFS Data Available	Access to Data (Yes/No)
Miami Dade Transit	- Ridership by route from fare box taps (EZCard) and cash collections - Metro Rail requires tap-in/tap-out, yielding ridership by station -Origin-Destination counts from Metro Rail ridership - Light rail system is free. Beam counters tally station ins/outs - Ridership by bus stop on all routes from APC	- Last system-wide O/D study in 2005 - On-board survey with sample size of 21,000 bus riders, slightly fewer rail riders (approx. 10% of riders) - 20 questions including start point, final destination, route taken - tracks rider from start to finish	- Tracking Survey done every 3 yrs - Telephone survey of 2000 respondents including 200 bus riders, 200 rail riders, 200 that ride both and approx. 1400 non-riders	- Length of rail lines, surface routes - Type and number of equipment	Yes	Yes	Yes	Yes
Milwaukee County Transit System	- Ridership by route provided by fare box - Fare boxes are cash only - Have 35 APC-equipped buses rotated through routes to provide 7 day counts by bus stop for each route every 3 months	- Southeastern Wisconsin Regional Planning Commission last did an O/D study here in 2002 - On-board survey collected origin, destination, transfer point, time of day, home address, and basic demographics - Attempted to capture more than 10% of transit riders	- Only beginning to formulate ridership surveys - Expected to be conducted annually	- Length of bus routes - Type and number of equipment	Yes	Yes	Yes	Yes

Appendix A: Sample of US Transit Authority Data Availability

Transit Authority	Basic Ridership Info Available	O/D Data Available	Customer Survey Data Available	Infrastructure Data Available	Buses GPS Tracked	GIS Route Layer	GTFS Data Available	Access to Data (Yes/No)
New York Metropolitan Transportation Authority (MTA)	- Ridership info from fare box swipes -Both bus and subway riders only swipe in, not out - Some manual counts done of subway station exits - Swipe cards can be tracked by A.M. swipe and P.M. swipe - Ridership by bus stop done manually as required	- Limited O/D data from fare card swipes - 1997 Household Travel Survey done by NYMTC - Random-dial telephone survey of transit and non-transit users - Participants tracked travel for 24 hrs - Transit riders asked for origin, route number, destination stop, final destination - Update scheduled for 2010-2011	- Annual Rider Survey conducted - Random phone survey of riders to determine customer impressions of system - Sample size 1,200 NYC adult residents using MTA (5 boroughs), 1200 outside NYC (600 ride weekly, 600 occasional users) - General demographics collected as part of survey	- Length of rail lines, surface routes - Type and number of equipment	- Currently piloting an AVL system but no system-wide GPS tracking yet	Yes	Yes	Yes
Port Authority of Allegheny County (Pittsburgh and area)	- Operator records fare type for each passenger; cash fare only - 60% of buses have APC equipment; data in use by 2011-2012 - Manual boardings/ alightings counts as required - system-wide ridership survey by bus stop in 2007	- As part of ridership survey done by Southwestern Pennsylvania Commission O/D data was collected. - Home, Origin, Bus on, Bus off, Destination were collected and geocoded	- Southwestern Pennsylvania Commission conducted system-wide on-board ridership survey (in 2007) - Sample size 15,469 - Survey responses linked to origin stop for respondent - General demographic data collected as part of these surveys	- Length of rail lines, surface routes - Type and number of equipment	- Buses equipped with GPS but not a real-time system. - Data are downloaded after return to garage	From SEPTA	Yes	Yes but raw survey data may require NDA

Appendix A: Sample of US Transit Authority Data Availability

Transit Authority	Basic Ridership Info Available	O/D Data Available	Customer Survey Data Available	Infrastructure Data Available	Buses GPS Tracked	GIS Route Layer	GTFS Data Available	Access to Data (Yes/No)
San Francisco Municipal Transportation Agency (MUNI)	FY2011 Weekday and Weekend Avg. Daily Ridership by bus route and rail line	-O/D Travel Survey data provided by SFCTA -Data of limited use due to quality issues	Conducted by SFCTA	- Type and amount of equipment - Bus garage fleet allocation	Some are, moving to track more	Yes	Yes	Yes
SANDAG - San Diego Regional Planning Authority	- Annual boardings through fare box collections - Rail line boardings est. through surveys - Ridership by bus stop done manually for each route annually - 15-20% of buses have APC, providing continuous ridership counts by bus stop	- Travel survey every 5 years including O/D questions - 40,000 sample - Surveys distributed on board and collected on exit - Collect up to 4 points including origin, destination, start and stop purposes	- Travel survey comprises 2 different surveys randomly distributed, each with 28 questions, 13 common, last 15 specific to either planning or modeling	- Length of rail lines, surface routes - Type and number of equipment	- Approx. 1/2 of fleet has AVL - Contracted part of fleet not tracked	Yes	No	Yes, may need NDA for survey data
Seattle Metro	- some fare data; Smart Card system - for some routes, ridership by bus stop is available - some APCs in use, rotated between buses	-Origin-Destination counts available for LRT riders - periodically conduct travel or intercept surveys	- Surveys are usually on-board and informal. Occasionally they do a mail-out - rider/non-rider survey conducted every other year - conduct focus groups and have a community relations group who do public outreach	- Length of bus routes, rail lines - Type and number of equipment	- Buses not yet tracked but scheduled to be	Yes	Yes	Yes

Appendix A: Sample of US Transit Authority Data Availability

Transit Authority	Basic Ridership Info Available	O/D Data Available	Customer Survey Data Available	Infrastructure Data Available	Buses GPS Tracked	GIS Route Layer	GTFS Data Available	Access to Data (Yes/No)
SEPTA – Southeastern Pennsylvania Transit Authority	- Fare box collections are a source of ridership data - no smartcards - Ridership by bus stop counted manually as needed (at least once per route every 5 years) - APC equipment tested in a pilot study. Full rollout expected. - Commuter rail station counts every 2 yrs, recording boardings and exits for each train for one day.	- Limited O/D data collected - O/D study done on one regional rail line circa 2009 - Used on-board questionnaire to determine origin station and final destination city (500 respondents) - Purpose was to determine where Bucks County residents were going to work	- Annual 4C survey (cleanliness, convenience, courtesy, communication) done to determine service quality - Random dial phone survey of 2400 respondents	- Length of rail lines, surface routes - Type and number of equipment	Yes	Yes	Yes	Yes
TriMet - Portland, OR	- Ridership through APCs - Fare boxes are cash only - Few manual counts conducted on buses - Commuter rail does not have APCs - Conductor counts every trip by stop manually	- O/D data collected every 10 yrs (system covered section by section) - 30-50% of surveyed section trips are sampled - New construction requires before and after O/D studies on affected routes to measure impact	- Annually survey 1000 respondents by phone - gather gender, age, income, ethnicity - other questions pertain to ridership/non-ridership, rating of performance, awareness of services	- Length of rail lines, surface routes - Type and number of equipment	Yes including rail	Yes	Yes	Yes

Appendix A: Sample of US Transit Authority Data Availability

Transit Authority	Basic Ridership Info Available	O/D Data Available	Customer Survey Data Available	Infrastructure Data Available	Buses GPS Tracked	GIS Route Layer	GTFS Data Available	Access to Data (Yes/No)
Washington Metropolitan Area Transit Authority (WMATA)	For buses and rail stations; not by rail line	O/D matrix for rail in 400-page hard copy format only	Limited	Yes	Unknown	Yes	Yes	Limited

APPENDIX B

Description of TAB Out-of-Home Ratings Audience Research

TAB Out-of-Home Ratings Metrics

Out-of-home media has a new audience measurement system that reports its true value

Available in 200+ markets with demographic ratings for nearly 400,000 bulletins, posters, junior posters, transit shelters, and other street furniture throughout the United States.

Why Out-Of-Home Ratings?

Out-of-home media has a new audience measurement system that reports its true value.

For over 75 years, out-of-home media buyers and sellers used DECs, measuring only circulation, or the number of times people 18+ passed an out-of-home display in a day. Out-of-Home Ratings go way beyond DEC-based measurement, becoming the advertising industry's first media measurement system that reports audiences who **actually see your ads.**

The Out-of-Home Ratings media measurement system provides unit by unit demographic detail, a discriminating reach and frequency model, and audience metrics that are similar to, but a step beyond, those supplied by other media.

The Research Program

Out-of-Home Ratings is an integrated research program designed to meet the unique challenge of measuring out-of-home audiences. The specifications for Out-of-Home Ratings were set by advertisers, advertising agencies and media companies that comprise the membership of TAB, a not-for-profit audience research/auditing organization. The research design was created following an international review of best practices in out-of-home measurement.

A technical committee of media research experts provided oversight to an RFP process which selected six leading research organizations to work in collaboration. Their expertise included: survey research, traffic engineering, eye-tracking research, modeling, and data integration. Only the integration of multiple techniques and their data streams yielded the accurate, granular details (unit by unit ratings across the United States) that are essential for reporting the true value of an out-of-home audience.

The Numbers…A Step Beyond Other Media

While Out-of-Home Ratings reports audiences using metrics similar to other advertising media, the difference is that Out-of-Home Ratings counts only the people actually seeing an ad. Other media count people who might have seen it.

Out-of-Home Ratings

Out-of-Home Ratings are the number of eye-contacts people have with an out-of-home display. Some facts about Out-of-Home Ratings:

- OOHRs are based only on audiences who actually see your ads.
- OOHRs are available for all major demographic audience segments including age, gender, race/ethnicity and income.
- OOHRs are reported as weekly impressions versus DECs which are daily measures.
- Unless identified as in-market Out-of-Home Ratings, OOHRs may include impressions delivered to people living outside of the market.

Rating Points

Rating Points are the total number of in-market impressions delivered by an out-of-home display expressed as a percentage of that market's population. One rating point represents impressions equal to 1% of that population. Rating Points include multiple impressions to a person and are a gross count of audience.

Some facts about Out-of-Home Ratings and Gross Rating Points:

- Total OOHRs must first be reduced to the in-market OOHRs of individuals who live in the defined market and are part of that market's population base.
- Market definitions (CBSA, DMA, Custom) must be clearly defined.
- Custom markets may be created using counties as a base.
- Only ratings for the same geography or market can be added to report total GRPs.

Reach and Frequency

Out-of-home's old reach and frequency (R-F) model was incapable of showing the true value of various advertising campaigns. For example, geographically dispersed and clustered schedules with equivalent GRPs would have had the same reach. With Out-of-Home Ratings, the new R-F model considers not only the size of the campaign, but also market size and road infrastructure, media or campaign coverage in the market, and most importantly, audience duplication.

For the first time, out-of-home has a powerful R-F model that is sensitive to the geographic delivery of out-of-home advertising.

The ABCs of Out-of-Home Ratings

A. Weekly Circulation Counts — People Passing

Weekly circulation counts are the foundation of the Out-of-Home Ratings measurement system. They provide a gross count of the people that pass each out-of-home display and have an opportunity to see the advertising. TAB collects traffic counts from departments of transportation at the local, county, and state levels. Peoplecount contributes the required traffic engineering expertise to translate the numbers into the average weekly traffic volume for the current year. Both vehicular and pedestrian circulations are considered. (Pedestrian circulation is available in New York, Los Angeles, Chicago, Philadelphia, Atlanta, San Francisco, and Dallas-Fort Worth.)

Separate counts are collected for each road segment from which an out-of-home display can be seen.

B. Visibility Adjustments —People Seeing

Three separate companies — Micromeasurements Solutions, Perception Research Services, and the Marketing Accountability Partnership — worked together to create high quality video simulations of vehicular and pedestrian exposures to various out-of-home displays in various environments. In total, nearly 15,000 tests of people noticing displays and the ads on them were conducted using state of the art eye-tracking technology. The results were analyzed and modeled to generate Out-of-Home Ratings adjustments for all TAB inventory. These adjustments made out-of-home the first medium to report audiences noticing the advertising on a display, or its Out-of-Home Ratings commercial audience.

The key factors that determine the likelihood that a display and its advertising will be noticed include:

- Format
- Angle to the Road
- Display size
- Street Type
- Roadside Position
- Distance from the Road

A visibility adjustment is applied to the weekly circulation of each display. Displays on the right receive a lower adjustment than displays of similar size on the left side of the road. Large displays also receive a lower adjustment than small displays. Visibility adjustments will range from 0.35 to 0.70 for the majority of out-of-home displays. Some displays, based on their characteristics, may have adjustments near 1.0, where others will have adjustments near0.10.

C. Trip Surveys — Demographics and Reach-Frequency

Out-of-Home Ratings uses travel information from the U.S. Census Bureau and other governmental sources that report trips to work and other trips from each census tract (neighborhoods) to others. This rich data source allows TAB's data integration team to generate millions of trips in all markets across the country.

Mediamark Research (MRI) conducted approximately 50,000 travel surveys in 15 markets. The purpose of these surveys was to collect detailed information about trips, their purposes and modes of transportation in order to supplement trip information derived from the census surveys.

This survey information provides the data required for reporting the audience demographics, in-market vs. total audiences, and trip duplication required for reach and frequency.

Out-of-Home Ratings provides powerful insights in markets of all sizes

Out-of-Home Ratings works in small neighborhoods and across large markets. In this example, Out-of-Home Ratings shows that displays on Interstates feeding into Chicago have different upper income profiles. Notice how the percent composition of upper income adult changes on displays as each Interstate picks up travelers from surrounding neighborhoods.

Don’t just look for the TAB Out-of-Home Ratings tag…DEMAND IT!

For the first time, out-of-home media has credible audience metrics that are comparable to other media. Out-of-Home Ratings provide a solid foundation for buyers and sellers.

Now when you see proposals with the TAB Out-of-Home Ratings Audience Estimates tag you can use them with confidence.

What sourcing TAB Out-of-Home Ratings means

- The media company presenting the information has supported the development of a sound and credible audience measurement system.
- The numbers are consistent with those being used by other members of the TAB.
- For the first time, you can integrate audience information across vendors to assess a campaign’s impact in a market.
- You are using numbers that can be integrated into multi-media planning and media mix models.
- You are using the only audience metrics based on people who actually see your ads.

For additional details visit:

www.eyesonratings.com, home of:

The Traffic Audit Bureau
for Media Measurement
271 Madison Avenue, Suite 1504
New York, NY 10016
212.972.8075
www.tabonline.com

APPENDIX H

Transit Advertising OTS Worksheets

Calculation of Transit Media OTS - Bus Interiors

MARKET DATA:

Market Name	Chicago, IL
Transit System Name	Chicago Transit Authority
Transit System Abbreviation	CTA

TRANSIT SYSTEM DATA:

Bus System Data:

No. of Bus Garages 7

Data by Bus Garage:

Bus Garage Name >>>	103rd	74th	77th	Chicago	Forest Glen	Kedzie	North Park	Totals
Total Weekly Bus Trip Legs (FY2011)	662,894	957,811	797,431	1,033,578	789,736	932,423	865,762	**6,039,636**
Peak Bus Requirement	189	229	198	230	209	229	242	**1,526**
Total No. of Active Buses (incl. spares)	220	267	231	264	244	264	290	**1,780**
Avg Weekly Bus Trip Legs/Bus	3,013	3,587	3,452	3,915	3,237	3,532	2,985	**3,393**

TRANSIT MEDIA DATA:

Bus Interior System Data:

No. Interior Bus Configs: 1

Bus Interior Media Inventory:

Bus Configuration Name >>>	All	Totals
No. buses in category	1,780	**1,780**
No. Interior cards 22" x 21"/bus	1	
No. Interior cards 11" x 46"/bus	14	

Bus Interior Media by Bus Garage:

Bus Garage Name >>>	103rd	74th	77th	Chicago	Forest Glen	Kedzie	North Park	Totals
No. Interior cards 22"x21"/garage	220	267	231	264	244	264	290	**1,780**
No. Interior cards 11"x46"/garage	3080	3738	3234	3696	3416	3696	4060	**24,920**

Weekly OTS per Package:
22" x 21" Interior Bus Card

	25	50	100
Package Coverage >>>	25	50	100
No. cards 22"x21"/bus in Package	1	1	1
No. buses in Package	250	500	1000
Total No. cards per Package	250	500	1,000
Avg Weekly OTS per card**	3,393	3,393	3,393
Total Weekly OTS of Package (all garages)*	848,263	1,696,527	3,393,054

Brand Bus

Package Coverage >>>	BB Half (Downtown)	BB Full (Downtown)	BB Half (Chicago)	BB Full (Chicago)
No. cards 22"x21"/bus in Package	1	1	1	1
No. cards 11"x 46"/bus in Package	7	14	7	14
No. Michelangelos/bus in Package	1	2	1	2
No. buses in Package	156	156	313	313
Total No. panels per Package	1,404	2,652	2,817	5,321
Garage group serving Package	103rd/Chicago/Kedzie/North Park		74th/77th/Forest Glen	
Total Active Buses (incl Spares)	1,038	1,038	742	742
Avg Weekly OTS per panel **	3,367	3,367	3,430	3,430
Total Weekly OTS of Package	525,209	525,209	1,073,556	1,073,556

*** Can also be targeted by bus garage (inventory permitting)**

**** Assumes all bus passengers have OTS**

Calculation of Transit Media OTS - Rail Interiors

MARKET DATA:

Market Name	Chicago, IL
Transit System Name	Chicago Transit Authority
Transit System Abbreviation	CTA

TRANSIT SYSTEM DATA:

Rail System Data:

No. of Rail Line Groups: 8 (Railcars are dedicated to a line)

Data by Rail Line Group:

Rail Line Group Name >>>	Blue	Brown	Green	Orange	Pink	Purple	Red	Yellow	**Totals**
Avg. Weekly Rail Trip Legs	944,166	602,134	378,348	308,334	172,015	222,492	1,556,599	29,870	**4,213,958**
Avg. Rail Legs per Trip	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Total Weekly Rail Trip Legs	944,166	602,134	378,348	308,334	172,015	222,492	1,556,599	29,870	**4,213,958**
Peak Railcar Requirement	256	144	96	80	36	72	280	6	**970**
Total No. of Active Railcars (incl. spares)	320	162	108	94	78	84	346	6	**1,198**
Avg Weekly Rail Trip Legs/Car	2,951	3,717	3,503	3,280	2,205	2,649	4,499	4,978	**3,517**

TRANSIT MEDIA DATA:

Rail Interior System Data:

No. Different Interior Railcar Configs: 2

Railcar Interior Media Inventory:

Railcar Configuration Name >>>	Blue	Brown	Green	Orange	Pink	Purple	Red	Yellow	**Totals**
No. railcars in category	320	162	108	94	78	84	346	6	**1,198**
No. 22"x21" Cards/car	1.6	2	2	2	2	2	2	2	**1.9**
No. 11"x46.5" Cards/car	14	14	14	14	14	14	14	14	**14**

Railcar Interior Media by Rail Line Group:

Rail Line Group Name >>>	Blue	Brown	Green	Orange	Pink	Purple	Red	Yellow	**Totals**
No. 22"x21" Cards/rail line group	498	324	216	188	156	168	692	12	**2,254**
No. 11"x46" Cards/rail line group	4,480	2,268	1,512	1,316	1,092	1,176	4,844	84	**16,772**

Weekly OTS per Package: 22" x 21" Interior Card

		All Lines	
Package Coverage >>>	25	50	100
No. 22"x21" cards/railcar in Package	1	1	1
No. railcars in Package	250	500	1000
Total No. cards per Package	250	500	1000
Avg Weekly OTS per card*	3,517	3,517	3,517
Total Weekly OTS of Package	**879,374**	**1,758,747**	**3,517,494**

Brand Train

Package Coverage >>>	Citywide 10% Fleet	
No. 22"x21" Cards/car in Package	2	*Some Blue line cars have 1 per car
No. 11"x46" Cards/car in Package	14	
No. Michelangelos/car in Package	2	
No. railcars in Package	120	
Total No. panels per Package	2,160	
Avg Weekly OTS per panel*	3,517	
Total Weekly OTS of Package	**422,099**	

*** Assumes all rail passengers have OTS**

Calculation of Transit Media OTS - Rail Stations

MARKET DATA:

Market Name	Chicago, IL
Transit System Name	Chicago Transit Authority
Transit system Abbreviation	CTA

TRANSIT SYSTEM DATA:

Station Data:

Number of Stations 141

		AVG WEEKLY RIDERSHIP *(*Oct10-Sep11 Avg.)*			AVERAGE WEEKLY OTS	
Station Name ↓	**Line**	**Entries (E)**	**Rail Transfers (T)**	**Exits (X)**	**Concourse (E+X)**	**Platform (E+T+X)**
18th	Pink	10,331		10,331	20,661	20,661
35-Bronzeville-IIT	Green/South	12,197		12,197	24,393	24,393
35th/Archer	Orange	15,939		15,939	31,877	31,877
43rd	Green/South	6,041		6,041	12,082	12,082
47th-Green	Green/South	7,814		7,814	15,628	15,628
47th-Red	Red	20,776		20,776	41,552	41,552
51st	Green/South	6,725		6,725	13,449	13,449
54th/Cermak	Pink	11,333		11,333	22,666	22,666
63rd	Red	21,851		21,851	43,702	43,702
69th	Red South	35,959		35,959	71,918	71,918
79th	Red South	48,355		48,355	96,710	96,710
87th	Red South	31,215		31,215	62,431	62,431
95th	Red South	76,542		76,542	153,083	153,083
Adams/Wabash	Loop El	42,430	6,445	42,430	84,860	91,305
Addison-Blue	Blue	14,862		14,862	29,723	29,723
Addison-Brown	Brown	13,417		13,417	26,834	26,834

		AVG WEEKLY RIDERSHIP *(*Oct10-Sep11 Avg.)*			AVERAGE WEEKLY OTS	
Station Name ↓	**Line**	**Entries (E)**	**Rail Transfers (T)**	**Exits (X)**	**Concourse (E+X)**	**Platform (E+T+X)**
Addison-Red	Red Subway	55,710		55,710	111,420	111,420
Argyle	Red North	17,318		17,318	34,637	34,637
Armitage	Brown	23,893		23,893	47,785	47,785
Ashland/63rd	Green/South	9,271		9,271	18,543	18,543
Ashland-Lake	Pink/Green	14,914	6,120	14,914	29,828	35,948
Ashland-Orange	Orange	9,031		9,031	18,062	18,062
Austin-Blue	Blue West	11,690		11,690	23,381	23,381
Austin-Green	Green	11,953		11,953	23,907	23,907
Belmont	Red North	78,929	109,716	78,929	157,859	267,575
Belmont-Blue	Blue Subway	29,121		29,121	58,243	58,243
Berwyn	Red North	20,809		20,809	41,617	41,617
Bryn Mawr	Red North	29,991		29,991	59,982	59,982
California-Cermak	Pink	7,839		7,839	15,677	15,677
California-Green	Green/West	6,646		6,646	13,291	13,291
California-O'Hare	Blue North	25,830		25,830	51,659	51,659
Central Park	Pink	6,593		6,593	13,187	13,187
Central-Green	Green	14,139		14,139	28,278	28,278
Central-Purple	Purple	5,223		5,223	10,445	10,445
Cermak-Chinatown	Red South	26,286		26,286	52,572	52,572
Chicago-Blue	Blue Subway	22,125		22,125	44,250	44,250
Chicago-Brown	Brown	34,869		34,869	69,737	69,737
Chicago-Red	Red Subway	96,824		96,824	193,648	193,648
Cicero-Cermak	Pink	7,486		7,486	14,971	14,971
Cicero-Forest Park	Blue	8,269		8,269	16,537	16,537
Cicero-Green	Green/West	8,723		8,723	17,447	17,447
Clark/Division	Red Subway	48,092		48,092	96,183	96,183
Clark/Lake	Loop El/Blue Subway	101,430	138,192	101,430	202,859	341,051

		AVG WEEKLY RIDERSHIP *(*Oct10-Sep11 Avg.)*			AVERAGE WEEKLY OTS	
Station Name ↓	**Line**	**Entries (E)**	**Rail Transfers (T)**	**Exits (X)**	**Concourse (E+X)**	**Platform (E+T+X)**
Clinton-Blue	Blue Subway	17,927		17,927	35,854	35,854
Clinton-Green	Green/West	24,398	10,015	24,398	48,797	58,812
Conservatory	Green/West	5,646		5,646	11,292	11,292
Cumberland	Blue North	26,943		26,943	53,886	53,886
Damen-Brown	Brown	13,098		13,098	26,196	26,196
Damen-Cermak	Pink	7,827		7,827	15,654	15,654
Damen-O'Hare	Blue North	35,278		35,278	70,557	70,557
Davis	Purple	23,844		23,844	47,688	47,688
Dempster	Purple	5,194		5,194	10,388	10,388
Diversey	Brown	30,817		30,817	61,633	61,633
Division	Blue Subway	32,879		32,879	65,757	65,757
East 63rd-Cottage Grove	Green/South	7,761		7,761	15,522	15,522
Forest Park	Blue West	22,290		22,290	44,580	44,580
Foster	Purple	5,031		5,031	10,061	10,061
Francisco	Brown	8,117		8,117	16,235	16,235
Fullerton	Red North	79,985	111,187	79,985	159,969	271,156
Garfield-Green	Green/South	8,024	267	8,024	16,048	16,315
Garfield-Red	Red South	25,071		25,071	50,142	50,142
Grand-Blue	Blue	12,464		12,464	24,928	24,928
Grand-Red	Red Subway	65,848		65,848	131,696	131,696
Granville	Red North	24,659		24,659	49,317	49,317
Halsted-Green	Green/South	5,161		5,161	10,323	10,323
Halsted-Orange	Orange	14,364		14,364	28,728	28,728
Harlem-Forest Park	Blue West	6,143		6,143	12,286	12,286
Harlem-Green	Green/West	22,031		22,031	44,062	44,062
Harlem-O'Hare	Blue North	16,041		16,041	32,081	32,081
Harold Washington Library	Loop El	24,702	3,752	24,702	49,403	53,155

		AVG WEEKLY RIDERSHIP *(*Oct10-Sep11 Avg.)*			AVERAGE WEEKLY OTS	
Station Name ↓	**Line**	**Entries (E)**	**Rail Transfers (T)**	**Exits (X)**	**Concourse (E+X)**	**Platform (E+T+X)**
Harrison	Red Subway	25,578		25,578	51,156	51,156
Howard	Red North	38,911	81,276	38,911	77,822	159,098
Illinois Medical District	Blue West	18,617		18,617	37,234	37,234
Indiana	Green/South	5,368		5,368	10,736	10,736
Irving Park-Blue	Blue North	24,127		24,127	48,253	48,253
Irving Park-Brown	Brown	16,412		16,412	32,823	32,823
Jackson-Blue	Blue Subway (plus 1/2 Tunnel)	43,949	60,491	43,949	87,897	148,388
Jackson-Red	Red Subway(plus 1/2 Tunnel)	66,643	60,804	66,643	133,286	194,090
Jarvis	Red North	9,292		9,292	18,584	18,584
Jefferson Park Transit Center	Blue North	37,054		37,054	74,108	74,108
Kedzie-Brown	Brown	11,536		11,536	23,072	23,072
Kedzie-Cermak	Pink	5,718		5,718	11,435	11,435
Kedzie-Green	Green/West	8,554		8,554	17,108	17,108
Kedzie-Homan	Blue West	12,741		12,741	25,482	25,482
Kedzie-Orange	Orange	17,866		17,866	35,732	35,732
Kimball	Brown	24,509		24,509	49,019	49,019
King Drive	Green/South	3,638		3,638	7,275	7,275
Kostner	Pink	2,541		2,541	5,082	5,082
Lake	Red Subway	105,183	15,980	105,183	210,367	226,347
Laramie	Green/West	8,450		8,450	16,901	16,901
LaSalle	Blue Subway	15,879		15,879	31,757	31,757
LaSalle/Van Buren	Loop El	15,843	2,406	15,843	31,685	34,091
Lawrence	Red North	21,295		21,295	42,591	42,591
Linden	Purple	6,125		6,125	12,250	12,250
Logan Square	Blue Subway	36,539		36,539	73,078	73,078
Loyola	Red North	33,576		33,576	67,152	67,152
Madison/Wabash	Loop El	35,375	5,374	35,375	70,751	76,125

		AVG WEEKLY RIDERSHIP *(*Oct10-Sep11 Avg.)*			AVERAGE WEEKLY OTS	
Station Name ↓	**Line**	**Entries (E)**	**Rail Transfers (T)**	**Exits (X)**	**Concourse (E+X)**	**Platform (E+T+X)**
Main	Purple	7,190		7,190	14,380	14,380
Merchandise Mart	Loop El	34,169		34,169	68,338	68,338
Midway	Orange	49,789		49,789	99,578	99,578
Monroe-Blue	Blue Subway	34,022		34,022	68,045	68,045
Monroe-Red	Red Subway	53,467		53,467	106,934	106,934
Montrose-Blue	Blue North	12,275		12,275	24,550	24,550
Montrose-Brown	Brown	14,787		14,787	29,573	29,573
Morse	Red North	27,799		27,799	55,598	55,598
North/Clybourn	Red Subway	33,869		33,869	67,738	67,738
Noyes	Purple	4,445		4,445	8,889	8,889
Oak Park-Blue	Blue West	9,935		9,935	19,870	19,870
Oak Park-Green	Green/West	9,128		9,128	18,256	18,256
O'Hare	Blue North	63,055		63,055	126,110	126,110
Paulina	Brown	14,419		14,419	28,837	28,837
Polk	Pink	17,243		17,243	34,486	34,486
Pulaski-Cermak	Pink	7,001		7,001	14,002	14,002
Pulaski-Forest Park	Blue West	11,307		11,307	22,613	22,613
Pulaski-Green	Green	12,359		12,359	24,717	24,717
Pulaski-Orange	Orange	27,654		27,654	55,307	55,307
Quincy/Wells	Loop El	40,843	6,206	40,843	81,687	87,893
Racine	Blue	13,167		13,167	26,333	26,333
Randolph/Wabash	Loop El	41,619	6,323	41,619	83,238	89,561
Ridgeland	Green/West	7,523		7,523	15,046	15,046
Rockwell	Brown	9,781		9,781	19,563	19,563
Roosevelt	Orange/Red Subway	68,363	90,174	68,363	136,727	226,901
Rosemont	Blue North	28,268		28,268	56,537	56,537
Sedgwick	Brown	22,759		22,759	45,517	45,517

		AVG WEEKLY RIDERSHIP *(*Oct10-Sep11 Avg.)*			AVERAGE WEEKLY OTS	
Station Name ↓	**Line**	**Entries (E)**	**Rail Transfers (T)**	**Exits (X)**	**Concourse (E+X)**	**Platform (E+T+X)**
Sheridan	Red North	32,366		32,366	64,732	64,732
Skokie	Yellow	14,977		14,977	29,953	29,953
South Boulevard	Purple	4,667		4,667	9,334	9,334
Southport	Brown	17,778		17,778	35,557	35,557
Sox-35th	Red South	32,504		32,504	65,008	65,008
State/Lake	Loop El	55,557	8,439	55,557	111,114	119,553
Thorndale	Red North	17,703		17,703	35,406	35,406
UIC-Halsted	Blue West	31,096		31,096	62,191	62,191
Washington/Wells	Loop El	36,035	5,475	36,035	72,070	77,545
Washington-Blue	Blue Subway	48,271		48,271	96,543	96,543
Wellington	Brown	15,654		15,654	31,309	31,309
Western-Brown	Brown	23,692		23,692	47,383	47,383
Western-Cermak	Pink	6,412		6,412	12,824	12,824
Western-Forest Park	Blue West	9,716		9,716	19,432	19,432
Western-O'Hare	Blue North	26,631		26,631	53,263	53,263
Western-Orange	Orange	19,196		19,196	38,392	38,392
Wilson	Red North	38,365		38,365	76,731	76,731
TOTALS		**3,438,504**	**728,641**	**3,438,504**	**6,877,008**	**7,605,650**
			21%	**Transfers**		

STATION MEDIA INVENTORY:

Station Name ↓	Line	1-Sheet # on Concourse	1-Sheet # on Platform	1-Sheet WTD_OTS	2-Sheet # on Concourse	2-Sheet # on Platform	2-Sheet # in Tunnel	2-Sheet WTD_OTS	Station King # on Concourse	Station King # on Platform	Station King WTD_OTS	Station Queen # on Concourse	Station Queen OTS
18th	Pink					8		20,661		4	20,661		
35-Bronzeville	Green/South					24		24,393					
35th/Archer	Orange		8	31,877		17		31,877				1	31,877
43rd	Green/South												
47th-Green	Green/South					24		15,628					
47th-Red	Red												
51st	Green/South					23		13,449					
54th/Cermak	Pink					16		22,666		1	22,666		
63rd	Red												
69th	Red South												
79th	Red South					20		96,710					
87th	Red South					10		62,431					
95th	Red South				9	6		153,083					
Adams/Wabash	Loop El		7	91,305	6	24		90,016					
Addison-Blue	Blue												
Addison-Brown	Brown					27		26,834					
Addison-Red	Red Subway		6	111,420		26		111,420		8	111,420		
Argyle	Red North									2	34,637		
Armitage	Brown					21		47,785					
Ashland/63rd	Green/South					18		18,543					
Ashland-Lake	Pink/Green												
Ashland-Orange	Orange		7	18,062		17		18,062				2	18,062
Austin-Blue	Blue West		3	23,381		6		23,381		2	23,381		
Austin-Green	Green												
Belmont	Red North				32	26		207,042					
Belmont-Blue	Blue Subway	1	6	58,243	2	21		58,243					

		1-Sheet			2-Sheet				Station King			Station Queen	
Station Name ↓	**Line**	**# on Concourse**	**# on Platform**	**WTD_OTS**	**# on Concourse**	**# on Platform**	**# in Tunnel**	**WTD_OTS**	**# on Concourse**	**# on Platform**	**WTD_OTS**	**# on Concourse**	**OTS**
Berwyn	Red North		2	41,617		4		41,617					
Bryn Mawr	Red North		4	59,982		8		59,982		2	59,982		
California-Cermak	Pink					11		15,677					
California-Green	Green/West					33		13,291		1	13,291		
California-O'Hare	Blue North		2	51,659		4		51,659		2	51,659		
Central Park	Pink					11		13,187		2	13,187		
Central-Green	Green												
Central-Purple	Purple		6	10,445	6	41		10,445		4	10,445		
Cermak-Chinatown	Red South												
Chicago-Blue	Blue Subway												
Chicago-Brown	Brown					32		69,737					
Chicago-Red	Red Subway					46		193,648					
Cicero-Cermak	Pink					18		14,971					
Cicero-Forest Park	Blue												
Cicero-Green	Green/West					12		17,447					
Clark/Division	Red Subway		9	96,183		18		96,183		8	96,183		
Clark/Lake	Loop El/Blue Subway		10	341,051		52		341,051					
Clinton-Blue	Blue Subway		12	35,854		24		35,854		8	35,854		
Clinton-Green	Green/West					24		58,812		2	58,812		
Conservatory	Green/West												
Cumberland	Blue North					14		53,886					
Damen-Brown	Brown				4	8		26,196					
Damen-Cermak	Pink					6		15,654					
Damen-O'Hare	Blue North		2	70,557	4	12		70,557		3	70,557		
Davis	Purple					24		47,688					

		1-Sheet			2-Sheet				Station King			Station Queen	
Station Name ↓	Line	# on Concourse	# on Platform	WTD_OTS	# on Concourse	# on Platform	# in Tunnel	WTD_OTS	# on Concourse	# on Platform	WTD_OTS	# on Concourse	OTS
Dempster	Purple		6	10,388		12		10,388		3	10,388		
Diversey	Brown				10	18		61,633	2		61,633		
Division	Blue Subway					2		65,757					
East 63rd-Cottage Grove	Green/South					18		15,522					
Forest Park	Blue West		4	44,580	5	14		44,580					
Foster	Purple		4	10,061	1	20		10,061		2	10,061		
Francisco	Brown												
Fullerton	Red North				32	30		213,769					
Garfield-Green	Green/South					36		16,315					
Garfield-Red	Red South												
Grand-Blue	Blue												
Grand-Red	Red Subway					44		131,696					
Granville	Red North		6	49,317		12		49,317					
Halsted-Green	Green/South												
Halsted-Orange	Orange		8	28,728		16		28,728				2	28,728
Harlem-Forest Park	Blue West		4	12,286		8		12,286		2	12,286		
Harlem-Green	Green/West					15		44,062					
Harlem-O'Hare	Blue North					8		32,081		7	32,081		
Harold Washington Library	Loop El					24		53,155					
Harrison	Red Subway		10	51,156		20		51,156		8	51,156		
Howard	Red North				5			77,822					
Illinois Medical District	Blue West					10		37,234					
Indiana	Green/South												
Irving Park-Blue	Blue North												
Irving Park-Brown	Brown					14		32,823					

Station Name ↓	Line	1-Sheet # on Concourse	1-Sheet # on Platform	1-Sheet WTD_OTS	2-Sheet # on Concourse	2-Sheet # on Platform	2-Sheet # in Tunnel	2-Sheet WTD_OTS	Station King # on Concourse	Station King # on Platform	Station King WTD_OTS	Station Queen # on Concourse	Station Queen OTS
Jackson-Blue	Blue Subway (plus 1/2 Tunnel)					42	28	113,229					
Jackson-Red	Red Subway(plus 1/2 Tunnel)		10	194,090		20	28	116,340					
Jarvis	Red North		4	18,584		12		18,584					
Jefferson Park Transit Center	Blue North	2		74,108	12			74,108					
Kedzie-Brown	Brown												
Kedzie-Cermak	Pink					9		11,435		2	11,435		
Kedzie-Green	Green/West					22		17,108					
Kedzie-Homan	Blue West												
Kedzie-Orange	Orange		8	35,732		16		35,732				2	35,732
Kimball	Brown		6	49,019		14		49,019		4	49,019		
King Drive	Green/South												
Kostner	Pink					10		5,082					
Lake	Red Subway		8	226,347		16		226,347					
Laramie	Green/West												
LaSalle	Blue Subway		12	31,757		24		31,757		8	31,757		
LaSalle/Van Buren	Loop El		9	34,091		18		34,091		5	34,091		
Lawrence	Red North												
Linden	Purple		4	12,250		23		12,250					
Logan Square	Blue Subway	1	6	73,078	2	37		73,078					
Loyola	Red North		6	67,152		25		67,152	1		67,152		
Madison/ Wabash	Loop El		11	76,125	2	29		75,778		11	76,125		
Main	Purple		4	14,380		8		14,380		1	14,380		
Merchandise Mart	Loop El		5	68,338		10		68,338		8	68,338		

		1-Sheet			2-Sheet				Station King			Station Queen	
Station Name ↓	Line	# on Concourse	# on Platform	WTD_OTS	# on Concourse	# on Platform	# in Tunnel	WTD_OTS	# on Concourse	# on Platform	WTD_OTS	# on Concourse	OTS
Midway	Orange												
Monroe-Blue	Blue Subway		12	68,045		24		68,045		8	68,045		
Monroe-Red	Red Subway		16	106,934		32		106,934					
Montrose-Blue	Blue North												
Montrose-Brown	Brown					21		29,573					
Morse	Red North		4	55,598		8		55,598		4	55,598		
North/Clybourn	Red Subway					70		67,738		8	67,738		
Noyes	Purple		4	8,889		22		8,889		4	8,889		
Oak Park-Blue	Blue West		4	19,870		8		19,870		2	19,870		
Oak Park-Green	Green/West					6		18,256					
O'Hare	Blue North												
Paulina	Brown					10		28,837					
Polk	Pink		6	34,486		32		34,486		6	34,486		
Pulaski-Cermak	Pink												
Pulaski-Forest Park	Blue West												
Pulaski-Green	Green												
Pulaski-Orange	Orange		8	55,307		16		55,307				2	55,307
Quincy/Wells	Loop El												
Racine	Blue												
Randolph/ Wabash	Loop El		10	89,561	1	22		89,286		12	89,561		
Ridgeland	Green/West												
Rockwell	Brown												
Roosevelt	Orange/Red Subway		22	226,901		42		226,901		4	226,901	2	136,727
Rosemont	Blue North				2	8		56,537					
Sedgwick	Brown					18		45,517					
Sheridan	Red North		5	64,732		12		64,732		8	64,732		

Station Name ↓	Line	1-Sheet # on Concourse	1-Sheet # on Platform	1-Sheet WTD_OTS	2-Sheet # on Concourse	2-Sheet # on Platform	2-Sheet # in Tunnel	2-Sheet WTD_OTS	Station King # on Concourse	Station King # on Platform	Station King WTD_OTS	Station Queen # on Concourse	Station Queen OTS
Skokie	Yellow		4	29,953		8		29,953					
South Boulevard	Purple		5	9,334		18		9,334		2	9,334		
Southport	Brown				2	26		35,557		2	35,557		
Sox-35th	Red South				1	39		65,008	1	6	65,008		
State/Lake	Loop El		9	119,553		29		119,553		10	119,553		
Thorndale	Red North		4	35,406		8		35,406					
UIC-Halsted	Blue West												
Washington/ Wells	Loop El	2	2	74,808	7	16		75,879		4	77,545		
Washington-Blue	Blue Subway		12	96,543		24		96,543		7	96,543		
Wellington	Brown					7		31,309					
Western-Brown	Brown		6	47,383	4	24		47,383		2	47,383		
Western-Cermak	Pink												
Western-Forest Park	Blue West												
Western-O'Hare	Blue North												
Western-Orange	Orange		8	38,392		16		38,392				2	38,392
Wilson	Red North				6	12		76,731					

	Summary - 1-Sheet:	Summary - 2-Sheet:	Summary - Stn King:	Summary - Stn Queen:
Total No. Panels	**366**	**2,181**	**203**	**13**
No. Stations Covered	**53**	**103**	**44**	**7**
Avg. # Panels/Stn	**6.9**	**21.2**	**4.6**	**1.9**
Avg Weekly OTS/Stn	**64,243**	**57,859**	**50,895**	**49,261**
Total Weekly OTS	**3,404,898**	**5,959,518**	**2,239,381**	**344,824**

TRANSIT MEDIA DATA:

Weekly OTS per Package:

One-Sheet Poster

Package Coverage >>>	**25**	**50**	**100**
No. Panels per Package	50	100	200
Avg. # Stations in Package	50	53	53
Avg # Panels/Stn in Package	1.0	1.9	3.8
Avg Weekly OTS per panel*	64,243	64,243	64,243
Total Weekly OTS of Package	3,212,168	3,404,898	3,404,898

Two-Sheet Poster

Package Coverage >>>	**25**	**50**	**100**
No. Panels per Package	90	180	360
Avg. # Stations in Package	90	103	103
Avg # Panels/Stn in Package	1.0	1.7	3.5
Avg Weekly OTS per panel*	57,859	57,859	57,859
Total Weekly OTS of Package	5,207,346	5,959,518	5,959,518

Station King

Package Coverage >>>	**25**	**50**
No. Panels per Package	40	80
Avg. # Stations in Package	40	44
Avg # Panels/Stn in Package	1.0	1.8
Avg Weekly OTS per panel*	50,895	50,895
Total Weekly OTS of Package	2,035,801	2,239,381

***Assumes all relevant station users have OTS**

Calculation of Transit Media OTS - Bus Exteriors

MARKET DATA:

Market Name Chicago, IL

Transit System Name Chicago Transit Authority

Transit System Abbrev. CTA

25M, 50M - refer to a mix of left and right panels

TRANSIT SYSTEM DATA:

Bus System Data:

No. of Bus Garages 7

Data by Bus Garage:

Bus Garage Name >>>	103rd	74th	77th	Chicago	Forest Glen	Kedzie	North Park	**Total**
Total No. of Active Buses (incl. spares)	220	267	231	264	244	264	290	**1,780**
Total Wkly Veh. OTS (Opposing Dir.)	13,011,299	16,464,428	9,867,556	14,492,045	12,458,768	12,326,334	14,719,919	**93,340,349**
Total Wkly Veh. OTS (Same Dir. Left)	4,374,199	5,148,876	3,371,732	4,704,934	3,834,655	4,197,537	4,883,477	**30,515,411**
Total Wkly Veh. OTS (Same Dir. Right)	189,549	223,118	146,108	203,880	166,168	181,893	211,617	**1,322,334**
Total Wkly Veh. OTS (Cross_St Left)	145,807	171,629	112,391	156,831	127,822	139,918	162,783	**1,017,180**
Total Wkly Veh. OTS (Cross_St Right)	145,807	171,629	112,391	156,831	127,822	139,918	162,783	**1,017,180**
Total Wkly Pedestrian OTS (1 Side)	2,009,644	1,159,036	2,150,245	2,377,354	1,135,370	3,063,777	4,068,199	**15,963,625**
Total Wkly Pedestrian OTS (All Sides)	4,019,288	2,318,073	4,300,490	4,754,708	2,270,741	6,127,554	8,136,397	**31,927,251**
Total Wkly Vehicular OTS by bus side:								
Left	17,531,304	21,784,934	13,351,679	19,353,811	16,421,245	16,663,789	19,766,178	**124,872,941**
Right	335,355	394,747	258,499	360,712	293,990	321,811	374,400	**2,339,515**
Front	13,011,299	16,464,428	9,867,556	14,492,045	12,458,768	12,326,334	14,719,919	**93,340,349**
Back	4,563,748	5,371,994	3,517,840	4,908,815	4,000,824	4,379,430	5,095,095	**31,837,746**
All Sides	17,866,660	22,179,681	13,610,178	19,714,522	16,715,236	16,985,600	20,140,578	**127,212,456**
Average Wkly OTS per bus:								
Left	79,688	81,592	57,799	73,310	67,300	63,120	68,159	**70,153**
Right	1,524	1,478	1,119	1,366	1,205	1,219	1,291	**1,314**
Front	59,142	61,665	42,717	54,894	51,061	46,691	50,758	**52,438**
Back	20,744	20,120	15,229	18,594	16,397	16,589	17,569	**17,886**
Ped 1 Side	9,135	4,341	9,308	9,005	4,653	11,605	14,028	**8,968**
All Sides	81,212	83,070	58,919	74,676	68,505	64,339	69,450	**71,468**
Ped All Sides	18,269	8,682	18,617	18,010	9,306	23,210	28,057	**17,937**

TRANSIT MEDIA DATA:

Bus Exterior System Data:

No. Different Bus Types: 4

Bus Exterior Media Inventory:

Bus Type >>>	New Flyer 40'	New Flyer 60'	Nova 40'	Optima 30'
No. buses in category	1,048	208	479	45
No. King Posters/bus (L)	1	2	1	0
No. King Posters/bus (R)	1	1	0	0
No. Taillight Displays/bus	1	1	1	0
No. Fullback Bus Displays/bus	1	1	1	0
No. CTA Headlights/bus	1	1	1	0
No. Wrapped Bus Displays/bus	1	1	1	0

Bus Exterior Media by Bus Garage:

Bus Garage Name >>>	103rd	74th	77th	Chicago	Forest Glen	Kedzie	North Park	Totals
No. King Posters /garage (L)	250	267	222	264	225	323	392	1943
No. Buses w/King Posters/garage (L)	203	267	222	264	225	264	290	1735
Avg. No. King Posters/bus (L)	1.2	1.0	1.0	1.0	1.0	1.2	1.4	1.1
No. King Posters /garage (R)	203	163	73	218	68	264	267	1256
No. Buses w/King Posters/garage (R)	203	163	73	218	68	264	267	1256
Avg. No. King Posters/bus (R)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total No. Buses w/King Posters/ garage	203	267	222	264	225	264	290	1735
Avg. No. King Posters/bus	2.2	1.6	1.3	1.8	1.3	2.2	2.3	1.8
No. Taillight Displays/garage	203	267	222	264	225	264	290	1735
No. buses w/Taillight Displays/ garage	203	267	222	264	225	264	290	1735

Bus Garage Name >>>	103rd	74th	77th	Chicago	Forest Glen	Kedzie	North Park	Totals
Avg. No. Taillight Displays/bus	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
No. Fullback Displays/garage	203	267	222	264	225	264	290	1735
No. Buses w/Fullback Displays/ garage	203	267	222	264	225	264	290	1735
Avg. No. Fullback Displays/bus	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
No. CTA Headlights/garage	203	267	222	264	225	264	290	1735
No. Buses w/CTA Headlights/ garage	203	267	222	264	225	264	290	1735
Avg. No. CTA Headlights/bus	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
No. Wrapped Displays/garage	203	267	222	264	225	264	290	1735
No. Buses w/Wrapped Displays/ garage	203	267	222	264	225	264	290	1735
Avg. No. Wrapped Bus Displays/ bus	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Average Weekly OTS:

Bus Garage Name >>>	103rd	74th	77th	Chicago	Forest Glen	Kedzie	North Park	**Totals**
King Posters (L) (vehicle)	79,688	81,592	57,799	73,310	67,300	63,120	68,159	70,153
King Posters (L) (pedestrian)	9,135	4,341	9,308	9,005	4,653	11,605	14,028	8,968
King Posters (R) (vehicle)	1,524	1,478	1,119	1,366	1,205	1,219	1,291	1,314
King Posters (R) (pedestrian)	9,135	4,341	9,308	9,005	4,653	11,605	14,028	8,968
King Posters (M) (vehicle)	44,661	51,223	43,773	40,771	51,961	35,281	41,067	43,126
King Posters (M) (pedestrian)	9,135	4,341	9,308	9,005	4,653	11,605	14,028	8,968
Taillight Displays (vehicle)	20,744	20,120	15,229	18,594	16,397	16,589	17,569	17,886
Taillight Displays (pedestrian)	9,135	4,341	9,308	9,005	4,653	11,605	14,028	8,968
Fullback Bus Displays (vehicle)	20,744	20,120	15,229	18,594	16,397	16,589	17,569	17,886
Fullback Bus Displays (pedestrian)	9,135	4,341	9,308	9,005	4,653	11,605	14,028	8,968
CTA Headlights (vehicle)	59,142	61,665	42,717	54,894	51,061	46,691	50,758	52,438
CTA Headlights (pedestrian)	9,135	4,341	9,308	9,005	4,653	11,605	14,028	8,968
Wrapped Displays (vehicle)	81,212	83,070	58,919	74,676	68,505	64,339	69,450	71,468
Wrapped Displays (pedestrian)	18,269	8,682	18,617	18,010	9,306	23,210	28,057	17,937

Total Weekly OTS:

Bus Garage Name >>>	103rd	74th	77th	Chicago	Forest Glen	Kedzie	North Park	**Totals**
King Posters (L) (vehicle)	16,176,613	21,784,934	12,831,484	19,353,811	15,142,542	16,663,789	19,766,178	121,716,041
King Posters (L) (pedestrian)	1,854,353	1,159,036	2,066,469	2,377,354	1,046,960	3,063,777	4,068,199	15,560,050
King Posters (R) (vehicle)	309,441	240,988	81,690	297,860	81,932	321,811	344,706	1,650,804
King Posters (R) (pedestrian)	1,854,353	707,576	679,515	1,963,118	316,415	3,063,777	3,745,549	11,264,221
King Posters (M) (vehicle)	9,066,158	13,676,561	9,717,711	10,763,571	11,691,149	9,314,075	11,909,418	74,822,886
King Posters (M) (pedestrian)	1,854,353	1,159,036	2,066,469	2,377,354	1,046,960	3,063,777	4,068,199	15,560,050
Taillight Displays (vehicle)	4,211,094	5,371,994	3,380,782	4,908,815	3,689,284	4,379,430	5,095,095	31,032,859
Taillight Displays (pedestrian)	1,854,353	1,159,036	2,066,469	2,377,354	1,046,960	3,063,777	4,068,199	15,560,050
Fullback Displays (vehicle)	4,211,094	5,371,994	3,380,782	4,908,815	3,689,284	4,379,430	5,095,095	31,032,859
Fullback Displays (pedestrian)	1,854,353	1,159,036	2,066,469	2,377,354	1,046,960	3,063,777	4,068,199	15,560,050
CTA Headlights (vehicle)	12,005,880	16,464,428	9,483,106	14,492,045	11,488,618	12,326,334	14,719,919	90,980,621
CTA Headlights (pedestrian)	1,854,353	1,159,036	2,066,469	2,377,354	1,046,960	3,063,777	4,068,199	15,560,050
Wrapped Displays (vehicle)	16,486,054	22,179,681	13,079,912	19,714,522	15,413,639	16,985,600	20,140,578	123,996,410
Wrapped Displays (pedestrian)	3,708,706	2,318,073	4,132,939	4,754,708	2,093,921	6,127,554	8,136,397	31,120,101

Weekly OTS per Package:

King Posters

Package Coverage >>>	25M	50M
No. King Posters/bus in Package	1	1
No. buses in Package	250	500
Total No. posters per Package	250	500
Garages	All	All
Avg Weekly OTS per poster (vehicle)**	43,126	43,126
Avg Weekly OTS per poster (pedestrian)**	8,968	8,968
Total Weekly OTS of Package (vehicle)*	10,781,396	21,562,791
Total Weekly OTS of Package (pedestrian)*	2,242,082	4,484,164

Taillight Displays

Package Coverage >>>	25	50
No. Taillight Displays/bus in Package	1	1
No. buses in Package	250	500
Total No. posters per Package	250	500
Garages	All	All
Avg Weekly OTS per poster (vehicle)**	17,886	17,886
Avg Weekly OTS per poster (pedestrian)**	8,968	8,968
Total Weekly OTS of Package (vehicle)*	4,471,593	8,943,187
Total Weekly OTS of Package (pedestrian)*	2,242,082	4,484,164

Fullback Displays

Package Coverage >>>	25	50
No. Fullback Displays/bus in Package	1	1
No. buses in Package	38	75
Total No. posters per Package	38	75
Garages	All	All
Avg Weekly OTS per poster (vehicle)**	17,886	17,886
Avg Weekly OTS per poster (pedestrian)**	8,968	8,968
Total Weekly OTS of Package (vehicle)*	679,682	1,341,478
Total Weekly OTS of Package (pedestrian)*	340,796	672,625

Wrapped Displays

Package Coverage >>>	25	50
No. Wrapped buses in Package	13	25
Garages	All	All
Avg Weekly OTS per poster (vehicle)**	71,468	71,468
Avg Weekly OTS per poster (pedestrian)**	17,937	17,937
Total Weekly OTS of Package (vehicle)*	929,080	1,786,692
Total Weekly OTS of Package (pedestrian)*	233,177	448,416

***   Can be targeted by bus garage (inventory permitting)**
**** Assumes all vehicle occupants and pedestrians have OTS**