National Capital Region Transportation Planning Board

TPB Version 2.3 Travel Forecasting Model for the 3,722-Zone Area System: Calibration Report

Draft Report

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Transportation planning at the regional level in the Washington area is coordinated by the National Capital Region Transportation Planning Board (TPB), the federally designated Metropolitan Planning Organization (MPO) for the region. The TPB is staffed by the Department of Transportation Planning (DTP) at the Metropolitan Washington Council of Governments (COG). COG is an independent, nonprofit association comprised of elected officials from 21 local governments, members of the Maryland and Virginia state legislatures, and members of the U.S. Congress.

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Abstract: This report describes the application of a travel forecasting process, known as the Version 2.3 model, for the Washington, D.C. region. Version 2.3 is distinguished from prior TPB travel models in that it has been developed over a new 3,722 transportation analysis zone system, and it has been calibrated and validated with several sources of recently collected travel data, including the COG/TPB 2007/08 Household Travel Survey. TPB Travel Forecasting Subcommittee provided oversight for the Version 2.3 model development effort.

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Preface

This is an update to the calibration report dated February 28, 2011. As the Version 2.3 travel model on the 3,722-TAZ area system remains in development, this document is subject to revision until November 2011 when the model is expected to be adopted by the TPB.

Chapter 1 Introduction

Transportation planning at the regional level in the Washington area is coordinated by the National Capital Region Transportation Planning Board (TPB), the federally designated Metropolitan Planning Organization (MPO) for the region. The TPB is staffed by the Department of Transportation Planning (DTP) at the Metropolitan Washington Council of Governments (COG). COG is an independent, nonprofit association comprised of elected officials from 21 local governments, members of the Maryland and Virginia state legislatures, and members of the U.S. Congress. The TPB coordinates transportation planning among federal, state, and local transportation agencies in the region. TPB staff maintains a travel forecasting capability that is used to support regional, corridor, and local transportation planning needs. The Models Development work activity in the TPB's Unified Planning Work Program (element 4.C in the FY2011 UPWP) is established to maintain and refine the TPB's travel forecasting methods and practice on a continuing basis.

This report documents the development of a newly developed travel forecasting process known as the Version 2.3 travel model. Version 2.3 is similar to the TPB's existing model, Version 2.2, in that it is a trip-based model incorporating the standard "four-step" process applied by most MPOs. However, the Version 2.3 model is different from Version 2.2 in two key respects. First, Version 2.3 operates on a more detailed zone system consisting of 3,722 Transportation Analysis Zones (TAZs). This represents an almost doubling of internal TAZs that are currently used by the Version 2.2 model. The increase in TAZs will allow for greater sensitivity to land development patterns, particularly for areas of intense land development. Second, the Version 2.3 model has also been calibrated with an array of newly collected travel survey data. The primary data source supporting the Version 2.3 calibration is the COG/TPB 2007/08 Household Travel Survey. The previous regional travel survey supporting the existing Version 2.2 model was conducted in 1994. Version 2.3 also includes several additional technical refinements which are described in greater detail below.

The oversight body of the TPB's Models Development program is the Travel Forecasting Subcommittee (TFS), a subcommittee of the Transportation Planning Board's Technical Committee. The TFS is comprised of representatives from state and local transportation agencies, local transportation consultants, and interested citizens. As many TFS members are active users of the regional model, the subcommittee has been engaged in all facets of the Version 2.3 development process on a bi-monthly basis during the past two years.

The remainder of this chapter briefly describes background on the data that was prepared for the Version 2.3 calibration process. It also describes technical features of the model that are not considered in the TPB's

existing Version 2.2 model. Chapter 2 describes some of the basic inputs to the travel model. The remainder of this report addresses the specific calibration work undertaken for each step of the model chain (Chapters 3 to 8). Validation summaries are presented in Chapter 9. The report also contains an appendix section which includes detailed calibration summaries.

1.1 Development history of the Version 2.3 travel model

The TPB's currently adopted travel model, Version 2.2, was released on March 1, 2008.[1] The Version 2.2 travel model was developed on the 2,191-TAZ area system and most of its sub-models were estimated/calibrated with data from the COG/TPB 1994 Household Travel Survey. At the time Version 2.2 was released, a parallel effort was also underway to combine a nested logit mode choice model and revised truck models into the Version 2.2 framework. This development effort proved to be viable and resulted in a release of what was then called the "draft Version 2.3 travel model" in June of 2008. The draft Version 2.3 model, like Version 2.2, was developed on the 2,191-TAZ area system.

The draft Version 2.3 model was not brought into production given that two related events were in motion during 2008. First, a new round of travel data collection was underway, including a major regional household travel survey (2007/08 HTS) and a bus on-board survey. Second, a new TAZ system was in development. The new zone system was envisioned to be developed over the same geographic area as the 2,191-TAZ system, but with smaller average zone sizes. TPB staff ultimately decided that the Version 2.3 travel model should not become the approved regional travel model until it incorporated the new zone system and the new data from the 2007/2008 Household Travel Survey.

The last two years have been spent compiling and cleaning new survey data, preparing calibration files based on the new 3,722 TAZ system, and estimating/calibrating the models that make up the regional travel model. This report documents the culmination of the Version 2.3 model calibration effort.

1.2 Calibration Data

1.2.1 2007/2008 COG/TPB Household Travel Survey

The COG/TPB 2007/08 Household Travel Survey (HTS) served as the primary data source for estimation and calibration of the Version 2.3 model. The survey included a sample of 11,400 households drawn from all 22 jurisdictions comprising the Version 2.3 study area. The 2007/08 HTS survey yielded approximately 88,000 un-weighted trip records occurring on weekdays.[2] The previous regional household travel survey, conducted in the spring and fall of 1994, included a 4,800-household sample drawn from a subset of jurisdictions in the modeled region (13 of the 22).

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[1] Ronald Milone et al., *TPB Travel Forecasting Model, Version 2.2: Specification, Validation, and User's Guide* (Washington, D.C.: Metropolitan Washington Council of Governments, National Capital Region Transportation Planning Board, March 1, 2008).

[2] National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, *2007/2008 TPB Household Travel Survey: Technical Documentation*, Draft report (Washington, D.C.: National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, August 27, 2010).

The 2007/08 HTS was not conducted during a specific season of the year, but rather, was collected on a continuing basis over a 15-month period, from February 2007 through May of 2008. As some of the sampled travel data were collected on federal holidays, staff decided to remove all holiday-related data from the final calibration file to ensure that the data reflected truly normal weekday conditions.[3] The removing of holiday-related data reduced the household sample by about 300 households.

TPB staff spent several months during the fall of 2010 checking the geo-coding, logic, and internal consistency of the household travel data, and summarizing the data by purposes, modes, political geography, and by time of day.

1.2.2 Land activity

The provision of zonal land activity posed a significant challenge as no such data was readily available for the new TAZ system during the early stages of the calibration effort (spring of 2010). At that point in time, the adopted land activity projections (Round 7.2a Cooperative Forecasts) were developed for the 2,191 TAZ-system only. Consequently, TPB staff assembled American Community Survey (ACS) and proprietary employment inventory data to develop what was referred to as the 2007 "Pseudo Round 8.0" land use for the 3,722-TAZ system. The 2007 land activity totals are shown on Table 1.

Table 1 2007 "Pseudo Round 8.0" Land Activity Totals

Households	2,339,832
HH Population	5,860,693
Group Quarters	119,669
Total Population	5,980,362
Total Employment	3,801,935
Industrial Employment	547,612
Retail Employment	665,172
Office Employment	179,6018
Other Employment	793,133
Land Area (sq. mi)	6,795.684

[3] Ronald Milone et al., *FY-2010 Development Program for TPB Travel Forecasting Models: DRAFT* (Washington, D.C.: National Capital Region Transportation Planning Board, June 30, 2010), sec. 2.4.4.

1.2.3 Other data

Staff compiled several sources of recent data beyond the 2007/08 HTS to support the Version 2.3 calibration and validation. These included 2007 Highway Performance Monitoring System (HPMS) traffic counts, the 2007 Air Passenger Survey, 2007 ACS data, and numerous transit on-board surveys for 2007 and 2008. The transit on-board surveys are discussed in more detail in Chapter 6.

1.3 Features of the Version 2.3 travel model

The following sections provide greater detail on the new TAZ system and on technical refinements to Version 2.3.

1.3.1 Modeled area and the 3,722-TAZ system

The Version 2.3 modeled area is the same as that of the existing Version 2.2 model (see Figure 1). The modeled area is comprised of 22 jurisdictions and extends over the District of Columbia and portions of three states: Maryland, Virginia, and West Virginia. The study area extends well beyond the TPB member area (as can be seen in Figure 1), [4] as well as, beyond the non-attainment area that is used in air quality planning work. The modeled area was expanded in the 1990s, to its present size, to ensure that it included the entire air quality non-attainment area.[5]

The modeled area is divided into a new 3,722-TAZ system, comprised of 3,675 internal zones and 47 external stations. The new TAZ system contains about 85% more internal zones than the existing 2,191-TAZ system.[6] The new TAZ system was developed to improve the connection between transportation planning and local development plans. The delineation of the new zone system was conducted primarily by land use planners and was heavily influenced by the regional activity centers/activity clusters concept adopted by the TPB and COG Board.[7] The modeling benefits of the more detailed zone system are substantial. It allows for a more detailed depiction of zonal access to the highway and transit systems and it also enables improved opportunities for modeling non-motorized travel.

One unfortunate aspect of the 3,722 TAZ system is that it does not neatly nest into the existing 2,191-TAZ system, and so, translating zonal attributes between systems is not easily done. However, spatial relationships between the two TAZ systems, complicated as they are, are well defined and can be made available. The 3,722 TAZ numbering has been developed on a jurisdictional basis. The TAZ numbering is shown on Table 2.

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[4] In many cases, there is a one-jurisdiction buffer between the modeled area cordon and the TPB member jurisdiction cordon. The urbanized portion of Charles County, Maryland is part of the TPB membership, but not the entire county.

[5] Ronald Milone, *FY-94 Development Program for MWCOG Travel Forecasting Models, Volume A: Current Applications*, Draft report (Washington, D.C.: Metropolitan Washington Council of Governments, National Capital Region Transportation Planning Board, June 30, 1994), 9-10.

[6] 3675/1972 = 1.86.

[7] Metropolitan Washington Council of Governments, *Metropolitan Washington Regional Activity Centers and Clusters* (Washington, D.C.: Metropolitan Washington Council of Governments (COG), April 2007).

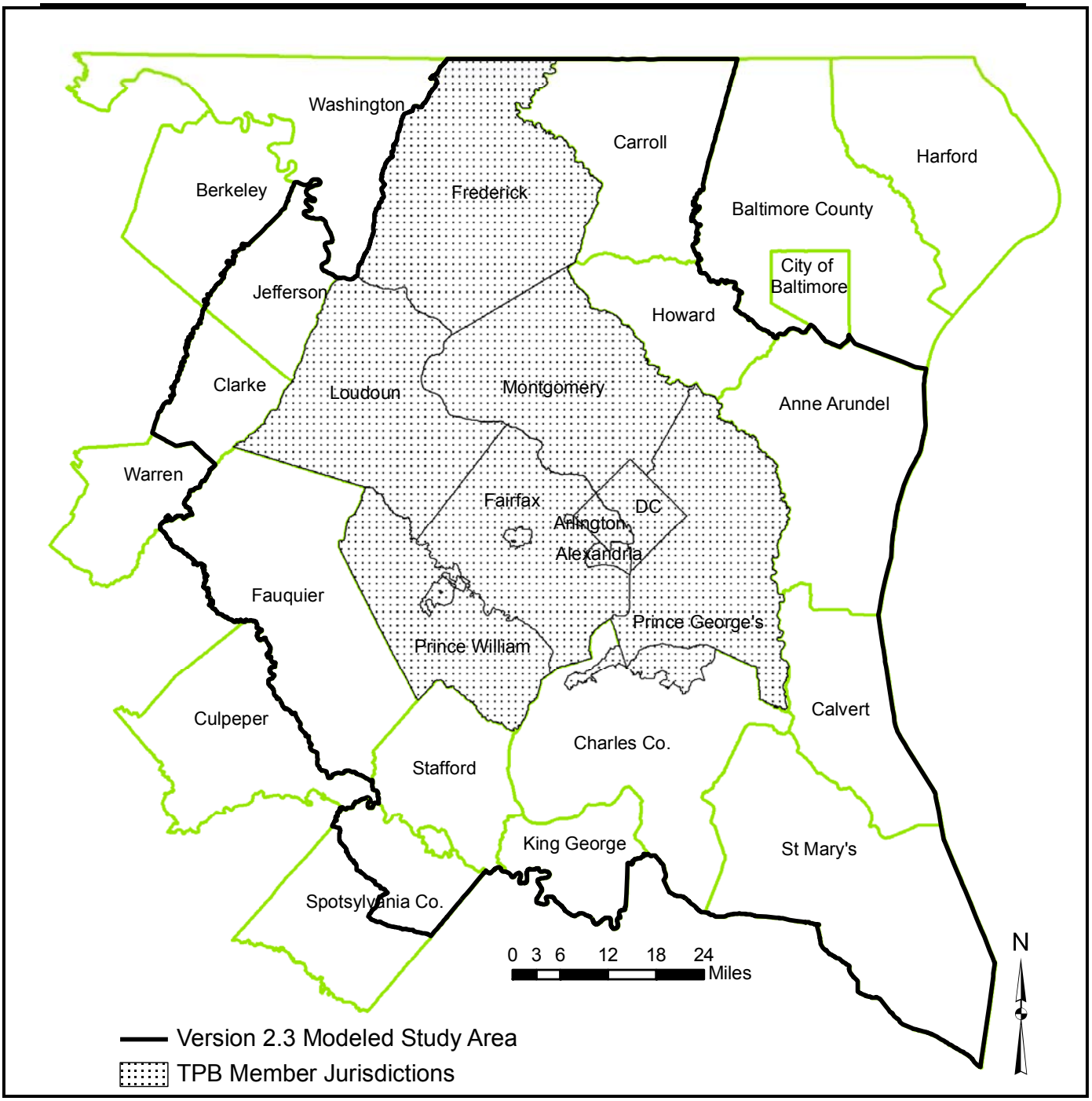

Figure 1 Modeled area of the Version 2.3 travel model and the TPB member jurisdiction area

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Table 2 3,722-TAZ Numbering Allocation by Jurisdiction

Jurisdiction	Active TAZ Count	Beginning TAZ	Ending TAZ	Inactive TAZs
District of Columbia	391	1	393	61, 382
Montgomery Co., Md.	376	394	769	
Prince George's Co., Md.	633	770	1404	770, 777
Arlington Co., Va.	141	1405	1545	
City of Alexandria, Va.	65	1546	1610	
Fairfax Co.. Va.	549	1611	2159	
Loudoun Co., Va.	282	2160	2441	
Prince William Co., Va.	376	2442	2819	2555, 2629
Frederick Co., Md.	130	2820	2949	
Howard Co., Md.	68	2950	3017	
Anne Arundel Co., Md.	98	3018	3116	3103
Charles Co., Md.	113	3117	3229	
Carroll Co., Md.	56	3230	3287	3266, 3267
Calvert Co., Md	47	3288	3334	
St. Mary's Co., Md.	75	3335	3409	
King George Co., Va.	25	3410	3434	
City of Fredericksburg, Va.	14	3435	3448	
Stafford Co., Va.	90	3449	3541	3478, 3482, 3495
Spotsylvania Co., Va.	61	3542	3603	3544
Fauquier Co., Va.	50	3604	3653	
Clarke Co., Va.	9	3654	3662	
Jefferson Co., WVa.	13	3663	3675	
External Stations:	47	3676	3722	
Reserved TAZ numbers	1,278	3723	5000	
Total Active Internal TAZs:	3662			
Total Active Internal and External TAZs:	3709			

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1.3.2 Nested-logit mode choice model

Version 2.3 model includes a nested-logit (NL) mode choice model, which replaces the sequential multinomial logit (SMNL) mode choice model used in Version 2.2. The NL model provides for a more exhaustive choice set (15 choices) compared to that offered by the existing SMNL model (5 choices).

1.3.3 Updated models for medium trucks and heavy trucks

The Version 2.2 model contains revised truck models that were initially developed, with consultant assistance, for the Version 2.3 model on the 2,191-TAZ system.[8] Separate model specifications exist for "medium" (2-axle, 6 tire), and "heavy" (all combination vehicle) trucks. TPB staff has adapted the 2,191-TAZ-based models to operate on the 3,722-TAZ system.

[8] William G. Allen, *Development of a Model for Truck Trips* (Windsor, South Carolina: Prepared for the Metropolitan Washington Council of Governments/National Capital Region Transportation Planning Board, January 14, 2008).

1.3.4 Subdivided non-home-based purpose

Whereas the Version 2.2 model uses a single Non-Home-Based trip purpose, the Version 2.3 model disaggregates NHB travel among two sub-purposes: Non-Home-Base Work (NHW) and Non-Home Base Other (NHO). This change was also in line with consultant recommendations.[9] TPB staff felt that the observed differences between these travel markets in terms of trip rates, trip lengths, modal preferences, etc. were substantial enough to justify establishing an additional purpose. TPB staff considered making other splits of trip purposes (e.g., separating out home-based school trips from home-based other trips), but ultimately decided to defer making any further splits of trip purposes at the present time.

1.3.5 Refined non-motorized travel

The Version 2.3 model includes the development of non-motorized trips for all (work and non-work) purposes. The Version 2.2 model develops non-motorized travel for the HBW purpose only. Staff felt that the more detailed TAZ system would facilitate efforts to better reflect this particular travel market. However, the non-motorized travel will be developed at the trip generation stage only.

1.4 Overview of the Version 2.3 travel model

A graphic showing the essential parts of the Version 2.3 modeling process is shown on Figure 2. Despite the general name for travel models ("four step"), the TPB travel model could more accurately be called a "six step" model. These six steps are described below.

[9] Cambridge Systematics, Inc., *Fiscal Year 2010 Task Reports*, Final Report (National Capital Region Transportation Planning Board, November 16, 2010), 2-3, 2-12.

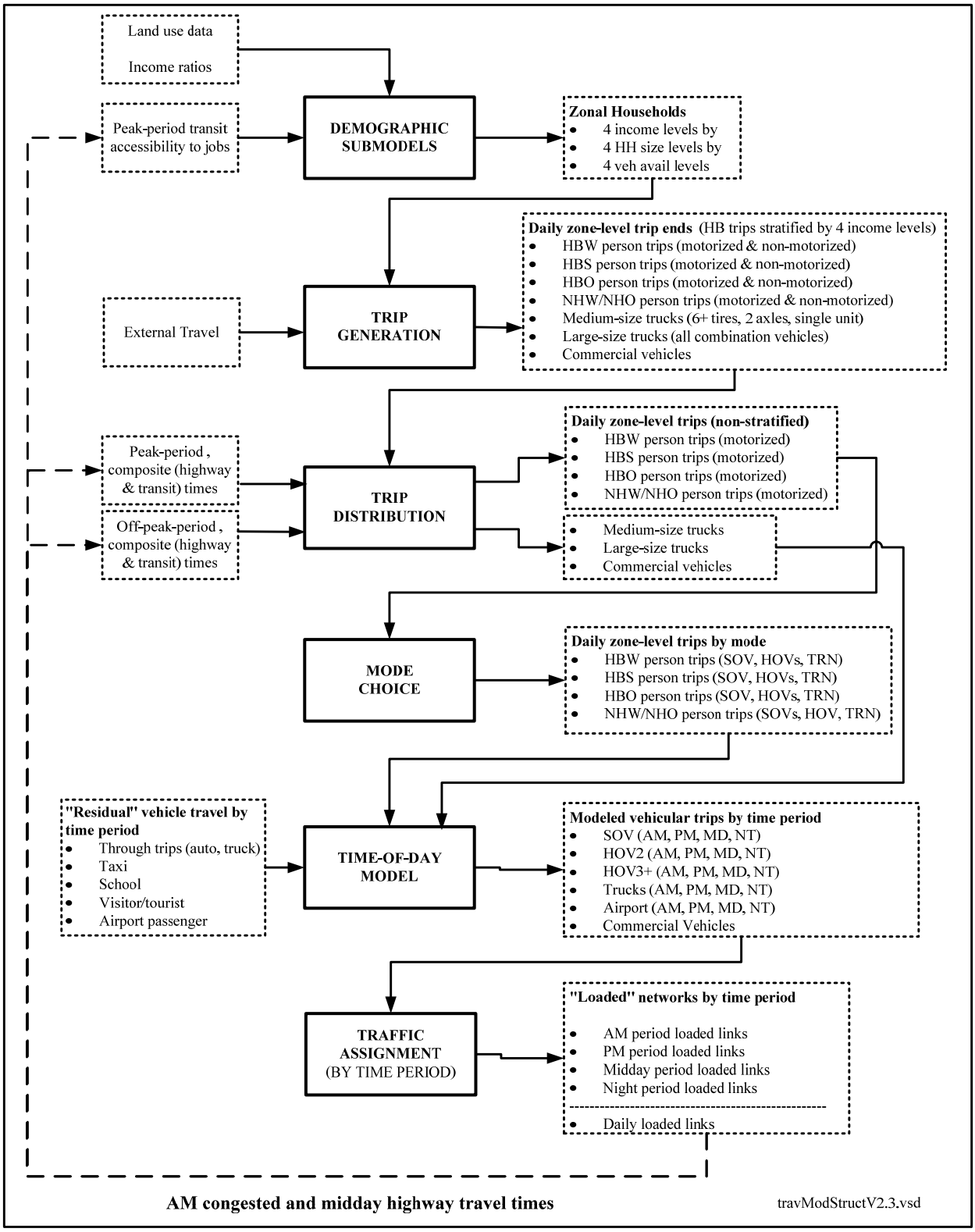

Figure 2 Structure of the Version 2.3 Travel Model

The demographic models are used to disaggregate the total number of zonal households across 64 cross-classes: 4 household income groups[10] by 4 household size groups (1, 2, 3, 4+ persons) by 4 vehicle availability groups (0, 1, 2, and 3+ vehicles available). The allocation of households to each cross-class is made at the traffic analysis zone (TAZ) level. The figure indicates that peak-hour transit accessibility measures are used as part of the demographic (vehicle availability) submodel step.

The trip generation models are next applied to compute daily person trip productions and attractions by purpose. Five modeled purposes are modeled: Home-Based Work (HBW), Home-Based Shop (HBS), Home-Based Other (HBO), Non-Home-Based Work (NHW), and Non-Home-Based Other (NHO). A commercial vehicle purpose (consisting of both autos and light duty trucks), and two truck types, Medium and Heavy, are also modeled. Medium trucks are those with two axles and 6 tires. Heavy trucks represent all combination vehicles.

Trip generation involves the application of daily trip rates to the number of households, in each of the 64 classes, and to the number of jobs. The trip rates reflect both motorized (i.e., transit and automobile) and non-motorized (i.e., bicycle and walk) person travel. The non-motorized trip-ends produced in the trip generation step are not carried forward into trip distribution. Trip attractions are computed by purpose as a function of zonal land use attributes. External (i.e., external-to-internal, X/I, and internal-to-external, I/X) productions and attractions are entered as an exogenous input, by purpose, into the trip generation process. External travel relates to auto person, commercial vehicle and truck travel only (transit externals are currently not considered in the model). The home-based productions and attractions are developed by the four income levels.

The trip distribution model uses the standard gravity model formulation and makes use of a composite time function that represents a blending of transit and highway travel times. The distribution step involves separate gravity model runs for 30 travel markets, given that home-based purposes are income stratified, and external travel is modeled separately by purpose and facility type (interstate travel vs. non-interstate). However, the trip distribution process ultimately results in seven daily trip tables corresponding to the basic motorized person, commercial, and truck purposes.

The mode choice process consists of five models corresponding to the HBW, HBS, HBO, NHW, and NHO purposes. The models are used to apportion total motorized person trips among SOVs, 2-occupant HOVs, 3+occupant HOVs, and 12 combinations of transit mode and access to transit.

The time-of-day model apportions daily resident travel among four time periods: AM peak period (6:00 AM to 9:00 AM), midday (9:00 AM to 3:00 PM), PM peak period (3:00 PM to 7:00 PM), and the nighttime/early morning hours (7:00 PM to 6:00 AM). The time-of-day model consists of survey-based factors that are applied on the basis of purpose, mode, and directionality (i.e., the home-to-non-home and non-home-to-home directions). This step also includes provisions for apportioning daily residual

[10] The income levels used approximate household income quartiles, based on the 2007 ACS.

travel[11] and truck travel among the three time periods. The time-of-day process ultimately produces three "total vehicle" trip tables, one for each of the four time periods.

The traffic assignment process addresses six user classes: SOVs, HOV-2, HOV 3+, commercial vehicles, trucks, and airport passenger vehicles. Highway link volumes are developed for each of the user classes by time period. Although one might expect the four time-of-day periods to result in four time-of-day traffic assignments, there are actually six traffic assignments conducted, since the AM and PM peak periods are split into two assignments (HOV3+ and non-HOV3+, the so-called "two-step assignment"). This is described in more detail in Chapter 8 and Figure 20. Daily transit assignments can also be produced in the Version 2.3 model, though this capability has yet to be fully calibrated and validated.

Figure 2 also indicates that highway speeds resulting from the traffic assignment process are recycled back into the trip distribution and mode choice steps. A method of successive averages (MSA) is applied to daily link volumes to ensure that regional speeds and VMT close in on an equilibrium condition. Figure 3 shows the 2007 VMT that is produced by the Version 2.3 model by speed feedback (SFB) iteration, and the dampened behavior that results using the MSA procedure. As indicated, the Version 2.3 model execution consists of five SFB iterations: an initial (or "pump prime") iteration using default input highway speeds and default mode choice model percentages, and four "standard" SFB iterations using traffic assignment-based input highway speeds and a mode choice model execution.

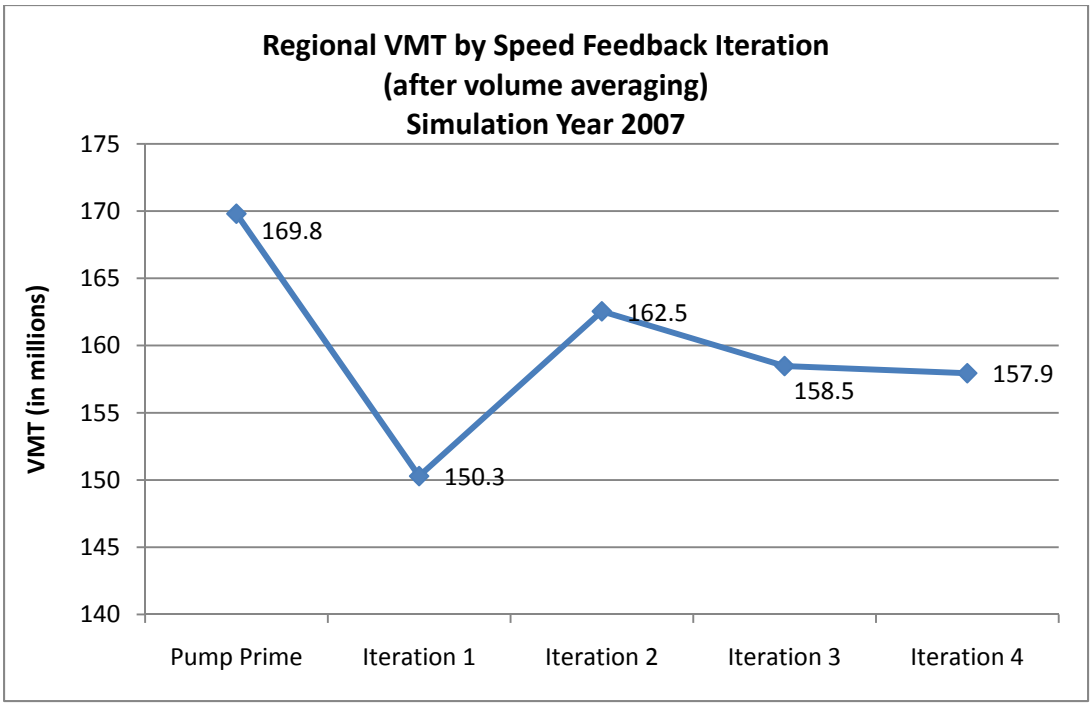

Figure 3 VMT by Iteration

[11] Residual travel is also referred to as "miscellaneous" travel which represents special travel markets that are typically not (or not well) represented in home-interview surveys; it is comprised of taxi, school, visitor/tourist, and air passenger auto driver travel.

Volume averaging is done for SFB iterations 2, 3, and 4.

1.5 Special modeling applications

Some of the special modeling applications are described in Chapter 8 (e.g, Section 8.4 "Double run of the travel model to address Northern Virginia HOV/HOT lane policy," on page 103).

Chapter 2 Inputs to the Travel Model

This chapter describes the land use and exogenous travel files that have been prepared for the Version 2.3 model application. Zonal land use forecasts are periodically updated from COG's Cooperative Forecasting Program. The most recent land use release is known as Round 8.0 and it was released in July 2010. Exogenous trip files used in the Version 2.3 model represent special travel markets that need to be accounted for in the regional forecast. Such markets include external trip-ends, through trips, airport passengers trips, and "miscellaneous" (or taxi, school, and visitor/ tourist) trips. This chapter does not address network-related inputs to the travel model, which are typically discussed in network documentation.

2.1 Round 8.0 Land Use

The Version 2.3 model requires the preparation of a zonal land use file in a standard format, for each simulation year. The most recently adopted land use projections are the Round 8.0 Cooperative Forecasts (adopted in November 2010). The Cooperative Forecasts are zonal (both 2,191- and 3,722-TAZ systems) projections of households, household population, group quarters population, and employment by category (i.e., retail, office, industrial, and other). The Round 8.0 forecasts include land use projections from 2005 to 2040 in five-year increments. The Version 2.3 model requires a few additional data items that are included in the standard land use file.

- Zonal area (sqare miles)
- Jurisdiction code (0-23)
- Zonal median income index (ratio of 2007 zonal median income to the regional median income, in tenths (e.g. a value of "10" indicates the ratio is 1.0 meaning the zonal income equals the regional median income)
- Airline distance to the nearest external station (miles)
- X-coordinate of TAZ centroid (Datum NAD83; Projection: Maryland state plane; Units: feet)
- Y-coordinate of TAZ centroid (Datum NAD83; Projection: Maryland state plane; Units: feet)

The zonal median income index was developed using 2007 ACS information and is normally assumed to remain constant over time. Procedures to prepare standardized land use files supporting the TPB travel model have, in recent years, included a provision to factor employment on a jurisdictional basis to account for definitional differences between local planning agencies. The Round 8.0 regional land use totals over time are listed on Table 3. The totals shown in between the five-year increments have been linearly interpolated. (Intermediate years are typically required for air quality planning work, and so files are generally prepared for all years between the base and horizon year in a given land use round).

Table 3 Round 8.0 Land Use Forecasts for Version 2.3 Modeling (w/ CTPP Employment Adjustments)

Year	HH	HHPOP	GQPop	TotPop	TotEMP	OffEMP	RetEMP	IndEMP	OthEMP
2000	2,143,451	5,632,014	116,105	5,748,119	3,441,381	1,630,149	628,912	459,906	722,414
2001	2,183,671	5,730,582	120,415	5,851,012	3,493,123	1,651,538	640,799	471,392	729,431
2002	2,223,890	5,829,130	124,740	5,953,891	3,544,852	1,672,917	652,676	482,869	736,474
2003	2,264,122	5,927,655	129,102	6,056,736	3,596,604	1,694,239	664,507	494,309	743,465
2004	2,304,341	6,026,203	133,427	6,159,615	3,648,333	1,715,618	676,384	505,786	750,508
2005	2,344,561	6,124,771	137,737	6,262,508	3,700,075	1,737,007	688,271	517,272	757,525
2006	2,373,295	6,196,646	138,757	6,335,407	3,745,215	1,756,046	700,656	523,177	765,338
2007	2,402,012	6,268,475	139,783	6,408,278	3,790,330	1,775,055	713,043	529,082	773,150
2007	2,339,832	5,860,693	119,669	5,980,362	3,801,935	1,796,018	665,172	547,612	793,133
2008	2,430,726	6,340,350	140,837	6,481,167	3,835,434	1,794,100	725,370	534,987	780,977
2009	2,459,443	6,412,179	141,863	6,554,038	3,880,549	1,813,109	737,757	540,892	788,789
2010	2,488,177	6,484,054	142,883	6,626,937	3,925,689	1,832,148	750,142	546,797	796,602
2011	2,524,150	6,562,726	143,920	6,706,665	3,982,448	1,860,822	762,224	552,967	806,367
2012	2,560,126	6,641,442	144,994	6,786,434	4,039,250	1,889,515	774,342	559,164	816,163
2013	2,596,143	6,720,132	146,038	6,866,172	4,096,084	1,918,247	786,467	565,363	826,073
2014	2,632,119	6,798,848	147,112	6,945,941	4,152,886	1,946,940	798,585	571,560	835,869
2015	2,668,092	6,877,520	148,149	7,025,669	4,209,645	1,975,614	810,667	577,730	845,634
2016	2,702,192	6,954,419	148,452	7,102,874	4,276,603	2,014,539	822,186	585,908	853,940
2017	2,736,270	7,031,287	148,762	7,180,051	4,343,579	2,053,440	833,723	594,056	862,270
2018	2,770,344	7,108,250	149,081	7,257,329	4,410,604	2,092,399	845,309	602,272	870,714
2019	2,804,422	7,185,118	149,391	7,334,506	4,477,580	2,131,300	856,846	610,420	879,044
2020	2,838,522	7,262,017	149,694	7,411,711	4,544,538	2,170,225	868,365	618,598	887,350
2021	2,870,184	7,333,196	150,516	7,483,723	4,599,869	2,202,750	877,523	624,893	894,682
2022	2,901,857	7,404,337	151,347	7,555,697	4,655,240	2,235,254	886,683	631,204	902,006
2023	2,933,527	7,475,526	152,190	7,627,703	4,710,506	2,267,809	895,868	637,520	909,402
2024	2,965,200	7,546,667	153,021	7,699,677	4,765,877	2,300,313	905,028	643,831	916,726
2025	2,996,862	7,617,846	153,843	7,771,689	4,821,208	2,332,838	914,186	650,126	924,058
2026	3,024,306	7,680,053	154,389	7,834,459	4,868,342	2,357,519	922,961	657,237	930,578
2027	3,051,804	7,742,282	154,953	7,897,243	4,915,485	2,382,209	931,694	664,379	937,125
2028	3,079,378	7,804,473	155,544	7,960,009	4,962,592	2,406,933	940,512	671,523	943,702
2029	3,106,876	7,866,702	156,108	8,022,793	5,009,735	2,431,623	949,245	678,665	950,249
2030	3,134,320	7,928,909	156,654	8,085,563	5,056,869	2,456,304	958,020	685,776	956,769
2031	3,158,341	7,984,123	157,111	8,141,244	5,099,494	2,478,581	966,151	692,053	962,650
2032	3,182,385	8,039,333	157,584	8,196,924	5,142,175	2,500,839	974,322	698,358	968,567
2033	3,206,445	8,094,523	158,064	8,252,580	5,184,826	2,523,179	982,549	704,656	974,531
2034	3,230,489	8,149,733	158,537	8,308,260	5,227,507	2,545,437	990,720	710,961	980,448
2035	3,254,510	8,204,947	158,994	8,363,941	5,270,132	2,567,714	998,851	717,238	986,329
2036	3,275,533	8,254,463	159,481	8,413,952	5,307,502	2,587,634	1,006,677	720,919	992,210
2037	3,296,569	8,303,964	159,979	8,463,962	5,344,893	2,607,540	1,014,501	724,623	998,114
2038	3,317,681	8,353,473	160,507	8,513,961	5,382,243	2,627,515	1,022,420	728,372	1,004,051
2039	3,338,717	8,402,974	161,005	8,563,971	5,419,634	2,647,421	1,030,244	732,076	1,009,955
2040	3,359,740	8,452,490	161,492	8,613,982	5,457,004	2,667,341	1,038,070	735,757	1,015,836

Notes: (1) - Rnd 8.0 Employment has been adjusted with CTPP-based factors.

(2) -The sum of emp. subcategories may not exactly equal the total emp. figures for interpolated years due to rounding

2007 2007 "Pseudo" Round 8.0 Land Activity

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2.2 External and Through Forecasts

External stations represent the entry and exit points of the highway network along the periphery of the modeled study area. External and through travel files are geographically referenced to 47 external stations, numbered from 3676 to 3722. The Version 2.3 model requires three files relating to external (I-X and X-I) and through (X-X) travel, for a given simulation year. These include:

- A through auto driver trip table file;
- A through commercial vehicle and truck (medium/heavy) trip table file;
- A file containing external productions and attractions by mode (auto, commercial vehicle, medium trucks, and heavy trucks).

The Version 2.3 external and through trip forecasts were recently updated to accommodate the revised truck models. Previously, the external and through trip forecasts were developed from base-year (year-2000) counts at each external station. The updated forecasts, however, were built from year-2005 counts, the year for which the revised truck models were calibrated. Care was taken to respect the same traffic growth levels for 2030 that were established previously. A summary of the revised external and through trips are shown in Table 4. The projected total level of external travel between 2005 and 2040 is shown to grow from 1,320,900 to 2,082,700, which reflects an average annual growth rate of about 1.3%. External productions and attractions are shown by travel mode and purpose, in Table 5 and Table 6, respectively.

Table 4 External and Through Auto/Truck Trips by Year

Year	AAWDT	Auto Drv Control	Truck Control	Auto XX Trip-Ends	ComVehXX Trip-Ends	Auto XI Adr Trips	Auto IX Adr Trips	TruckXX Trip-Ends	Truck XI Trips	Truck IX Trips
2000	1,215,783	1,003,776	114,016	70,027	5,318	486,084	442,347	59,702	27,157	27,157
2001	1,236,031	1,020,677	116,024	71,258	5,413	494,348	449,658	60,766	27,629	27,629
2002	1,256,657	1,037,896	118,072	72,513	5,510	502,769	457,104	61,851	28,110	28,110
2003	1,277,670	1,055,440	120,161	73,793	5,609	511,350	464,688	62,958	28,601	28,601
2004	1,299,076	1,073,316	122,292	75,099	5,710	520,094	472,413	64,089	29,102	29,102
2005	1,320,886	1,091,530	124,466	76,430	5,813	529,005	480,281	65,242	29,612	29,612
2006	1,343,106	1,110,090	126,684	77,789	5,918	538,087	488,296	66,420	30,132	30,132
2007	1,365,745	1,129,002	128,947	79,174	6,025	547,343	496,460	67,622	30,663	30,663
2008	1,388,813	1,148,275	131,256	80,587	6,135	556,776	504,777	68,848	31,204	31,204
2009	1,412,317	1,167,915	133,612	82,028	6,246	566,391	513,250	70,101	31,756	31,756
2010	1,436,269	1,187,931	136,016	83,499	6,360	576,191	521,882	71,379	32,319	32,319
2011	1,460,676	1,208,331	138,469	84,999	6,476	586,180	530,676	72,684	32,893	32,893
2012	1,485,548	1,229,122	140,973	86,529	6,595	596,362	539,636	74,017	33,478	33,478
2013	1,510,895	1,250,312	143,527	88,090	6,716	606,741	548,765	75,377	34,075	34,075
2014	1,536,728	1,271,912	146,135	89,683	6,839	617,322	558,067	76,766	34,684	34,684
2015	1,563,056	1,293,928	148,796	91,309	6,966	628,109	567,545	78,184	35,306	35,306
2016	1,589,891	1,316,370	151,511	92,967	7,094	639,105	577,203	79,632	35,940	35,940
2017	1,617,242	1,339,246	154,283	94,660	7,226	650,316	587,045	81,111	36,586	36,586
2018	1,645,121	1,362,567	157,113	96,386	7,360	661,747	597,075	82,621	37,246	37,246
2019	1,673,539	1,386,342	160,001	98,149	7,497	673,401	607,296	84,164	37,919	37,919
2020	1,702,507	1,410,580	162,950	99,947	7,637	685,283	617,713	85,739	38,605	38,605
2021	1,719,603	1,424,873	164,676	101,002	7,718	692,284	623,868	86,659	39,009	39,009
2022	1,736,886	1,439,323	166,423	102,069	7,801	699,363	630,089	87,590	39,416	39,416
2023	1,754,359	1,453,933	168,189	103,149	7,885	706,521	636,378	88,532	39,829	39,829
2024	1,772,023	1,468,704	169,977	104,240	7,970	713,758	642,736	89,485	40,246	40,246
2025	1,789,883	1,483,639	171,785	105,345	8,055	721,076	649,163	90,449	40,668	40,668
2026	1,807,938	1,498,739	173,615	106,462	8,142	728,475	655,659	91,425	41,095	41,095
2027	1,826,193	1,514,006	175,466	107,592	8,230	735,957	662,227	92,413	41,527	41,527
2028	1,844,649	1,529,443	177,339	108,735	8,319	743,523	668,866	93,412	41,963	41,963
2029	1,863,309	1,545,051	179,233	109,892	8,408	751,173	675,578	94,424	42,405	42,405
2030	1,882,174	1,560,833	181,151	111,062	8,499	758,908	682,363	95,447	42,852	42,852
2031	1,901,249	1,576,790	183,090	112,246	8,591	766,730	689,223	96,483	43,304	43,304
2032	1,920,534	1,592,924	185,053	113,443	8,684	774,640	696,157	97,531	43,761	43,761
2033	1,940,033	1,609,239	187,038	114,654	8,779	782,638	703,168	98,592	44,223	44,223
2034	1,959,749	1,625,735	189,047	115,880	8,874	790,726	710,255	99,666	44,691	44,691
2035	1,979,683	1,642,415	191,080	117,120	8,970	798,904	717,421	100,752	45,164	45,164
2036	1,999,838	1,659,281	193,136	118,374	9,068	807,175	724,665	101,852	45,642	45,642
2037	2,020,217	1,676,336	195,217	119,643	9,167	815,538	731,989	102,965	46,126	46,126
2038	2,040,823	1,693,582	197,323	120,927	9,266	823,996	739,393	104,091	46,616	46,616
2039	2,061,659	1,711,021	199,454	122,225	9,368	832,549	746,879	105,231	47,111	47,111
2040	2,082,727	1,728,655	201,610	123,540	9,470	841,198	754,448	106,385	47,612	47,612

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Table 5 External Auto/Truck Productions by Year

	HBWXI	HBSXI	HBOXI	NHBXI	ComvXI	HBWXI	HBSXI	HBOXI	NHBXI	ComvXI	MedTkXI	HeavyTkXI	AutoXI	TruckXI
Year	AutoDrvs	Auto Drvs	AutoDrvs	AutoDrvs	AutoDrv	AutoPsns	Auto Psns	AutoPsns	AutoPsns	AutoPsns			Drv Totl	Total
2000	236,559	42,352	117,778	56,408	32,987	272,043	69,457	189,623	72,203	42,223	3,637	23,520	486,084	27,157
2001	240,636	43,005	119,847	57,297	33,562	276,732	70,529	192,953	73,340	42,960	3,700	23,929	494,348	27,629
2002	244,792	43,670	121,956	58,202	34,149	281,510	71,619	196,348	74,499	43,711	3,765	24,346	502,769	28,110
2003	249,027	44,346	124,106	59,123	34,748	286,381	72,727	199,810	75,678	44,477	3,831	24,771	511,350	28,601
2004	253,344	45,034	126,298	60,061	35,358	291,346	73,855	203,340	76,878	45,258	3,898	25,204	520,094	29,102
2005	257,744	45,733	128,533	61,016	35,979	296,406	75,002	206,939	78,100	46,054	3,966	25,646	529,005	29,612
2006	262,229	46,444	130,813	61,987	36,613	301,564	76,168	210,609	79,344	46,865	4,036	26,096	538,087	30,132
2007	266,801	47,168	133,137	62,977	37,260	306,822	77,355	214,351	80,610	47,692	4,108	26,555	547,343	30,663
2008	271,462	47,903	135,508	63,984	37,919	312,181	78,562	218,167	81,900	48,536	4,180	27,024	556,776	31,204
2009	276,213	48,652	137,925	65,010	38,591	317,645	79,789	222,059	83,213	49,396	4,254	27,501	566,391	31,756
2010	281,057	49,413	140,390	66,055	39,276	323,216	81,038	226,028	84,550	50,273	4,330	27,989	576,191	32,319
2011	285,995	50,188	142,904	67,118	39,974	328,894	82,308	230,076	85,911	51,167	4,407	28,486	586,180	32,893
2012	291,030	50,976	145,468	68,201	40,687	334,684	83,600	234,204	87,298	52,079	4,486	28,992	596,362	33,478
2013	296,163	51,777	148,084	69,304	41,413	340,587	84,915	238,415	88,709	53,009	4,566	29,509	606,741	34,075
2014	301,396	52,593	150,751	70,427	42,154	346,606	86,252	242,710	90,147	53,957	4,648	30,037	617,322	34,684
2015	306,732	53,423	153,472	71,571	42,910	352,742	87,613	247,091	91,611	54,925	4,731	30,574	628,109	35,306
2016	312,174	54,267	156,248	72,737	43,680	359,000	88,997	251,559	93,103	55,911	4,816	31,123	639,105	35,940
2017	317,722	55,126	159,079	73,923	44,466	365,380	90,406	256,118	94,622	56,917	4,903	31,683	650,316	36,586
2018	323,380	55,999	161,968	75,132	45,268	371,887	91,839	260,768	96,169	57,943	4,992	32,254	661,747	37,246
2019	329,149	56,889	164,914	76,363	46,086	378,521	93,297	265,512	97,745	58,990	5,082	32,837	673,401	37,919
2020	335,033	57,793	167,920	77,618	46,920	385,288	94,781	270,351	99,350	60,057	5,174	33,431	685,283	38,605
2021	338,495	58,333	169,685	78,361	47,410	389,270	95,666	273,193	100,302	60,684	5,228	33,780	692,284	39,009
2022	341,997	58,878	171,471	79,113	47,905	393,296	96,560	276,068	101,264	61,319	5,283	34,133	699,363	39,416
2023	345,538	59,428	173,276	79,872	48,407	397,368	97,463	278,975	102,236	61,961	5,339	34,490	706,521	39,829
2024	349,118	59,984	175,102	80,639	48,914	401,486	98,375	281,915	103,218	62,610	5,395	34,851	713,758	40,246
2025	352,739	60,546	176,950	81,415	49,427	405,650	99,296	284,889	104,211	63,266	5,451	35,217	721,076	40,668
2026	356,400	61,114	178,818	82,199	49,945	409,860	100,226	287,897	105,214	63,930	5,509	35,586	728,475	41,095
2027	360,103	61,687	180,707	82,991	50,470	414,118	101,166	290,939	106,228	64,601	5,567	35,960	735,957	41,527
2028	363,847	62,266	182,619	83,792	51,000	418,424	102,115	294,016	107,253	65,280	5,625	36,338	743,523	41,963
2029	367,633	62,850	184,552	84,601	51,536	422,778	103,075	297,128	108,289	65,967	5,685	36,720	751,173	42,405
2030	371,463	63,441	186,507	85,419	52,079	427,182	104,043	300,276	109,336	66,661	5,745	37,107	758,908	42,852
2031	375,335	64,038	188,485	86,245	52,628	431,635	105,022	303,461	110,394	67,363	5,805	37,498	766,730	43,304
2032	379,251	64,640	190,485	87,080	53,183	436,138	106,010	306,681	111,463	68,074	5,867	37,894	774,640	43,761
2033	383,211	65,249	192,509	87,925	53,744	440,693	107,009	309,939	112,544	68,792	5,929	38,294	782,638	44,223
2034	387,216	65,864	194,555	88,778	54,312	445,299	108,018	313,234	113,636	69,519	5,992	38,699	790,726	44,691
2035	391,266	66,486	196,626	89,641	54,886	449,956	109,037	316,567	114,740	70,254	6,055	39,109	798,904	45,164
2036	395,363	67,113	198,720	90,512	55,466	454,667	110,066	319,939	115,856	70,997	6,119	39,523	807,175	45,642
2037	399,505	67,747	200,838	91,394	56,054	459,431	111,106	323,349	116,984	71,749	6,184	39,942	815,538	46,126
2038	403,695	68,388	202,981	92,284	56,648	464,249	112,156	326,799	118,124	72,509	6,250	40,366	823,996	46,616
2039	407,932	69,035	205,148	93,184	57,249	469,122	113,217	330,289	119,276	73,279	6,317	40,795	832,549	47,111
2040	412,217	69,689	207,341	94,094	57,857	474,050	114,289	333,819	120,441	74,056	6,384	41,229	841,198	47,612

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Table 6 External Auto/Truck Attractions by Year

	HBWIX	HBSIX	HBOIX	NHBIX	ComvIX	HBWIX	HBSIX	HBOIX	NHBIX	ComvIX	MedTkIX	HeavyTkIX	AutoIX	TruckIX
Year	AutoDrvs	Auto Drvs	AutoDrvs	AutoDrvs	AutoDrv	AutoPsns	Auto Psns	AutoPsns	AutoPsns	AutoPsns			Drv Totl	Total
2000	146,581	41,644	164,738	56,400	32,983	168,568	68,297	265,229	72,193	42,219	3,637	23,520	442,347	27,157
2001	148,926	42,318	167,565	57,289	33,559	171,265	69,402	269,780	73,330	42,956	3,700	23,929	449,658	27,629
2002	151,314	43,004	170,447	58,194	34,146	174,011	70,526	274,419	74,488	43,707	3,765	24,346	457,104	28,110
2003	153,744	43,702	173,384	59,115	34,744	176,806	71,670	279,148	75,667	44,472	3,831	24,771	464,688	28,601
2004	156,218	44,411	176,378	60,053	35,354	179,650	72,834	283,968	76,867	45,253	3,898	25,204	472,413	29,102
2005	158,736	45,133	179,430	61,007	35,976	182,546	74,019	288,882	78,089	46,049	3,966	25,646	480,281	29,612
2006	161,299	45,868	182,541	61,979	36,609	185,494	75,224	293,890	79,333	46,860	4,036	26,096	488,296	30,132
2007	163,909	46,616	185,712	62,968	37,256	188,495	76,450	298,997	80,600	47,687	4,108	26,555	496,460	30,663
2008	166,565	47,376	188,946	63,976	37,915	191,550	77,697	304,203	81,889	48,531	4,180	27,024	504,777	31,204
2009	169,270	48,150	192,242	65,001	38,586	194,661	78,966	309,510	83,202	49,391	4,254	27,501	513,250	31,756
2010	172,024	48,938	195,603	66,046	39,271	197,827	80,258	314,921	84,539	50,267	4,330	27,989	521,882	32,319
2011	174,828	49,739	199,030	67,109	39,970	201,052	81,572	320,439	85,900	51,161	4,407	28,486	530,676	32,893
2012	177,682	50,554	202,525	68,192	40,682	204,335	82,909	326,064	87,286	52,073	4,486	28,992	539,636	33,478
2013	180,589	51,384	206,088	69,295	41,409	207,678	84,270	331,801	88,698	53,003	4,566	29,509	548,765	34,075
2014	183,549	52,228	209,721	70,418	42,149	211,082	85,655	337,651	90,135	53,951	4,648	30,037	558,067	34,684
2015	186,564	53,088	213,426	71,562	42,905	214,548	87,064	343,616	91,600	54,918	4,731	30,574	567,545	35,306
2016	189,633	53,962	217,205	72,727	43,675	218,078	88,498	349,699	93,091	55,904	4,816	31,123	577,203	35,940
2017	192,760	54,852	221,058	73,914	44,461	221,673	89,958	355,904	94,610	56,910	4,903	31,683	587,045	36,586
2018	195,943	55,758	224,988	75,123	45,263	225,335	91,443	362,231	96,157	57,936	4,992	32,254	597,075	37,246
2019	199,186	56,680	228,997	76,354	46,080	229,064	92,955	368,685	97,733	58,982	5,082	32,837	607,296	37,919
2020	202,488	57,618	233,085	77,608	46,914	232,861	94,493	375,267	99,338	60,050	5,174	33,431	617,713	38,605
2021	204,447	58,176	235,490	78,351	47,404	235,114	95,408	379,138	100,290	60,677	5,228	33,780	623,868	39,009
2022	206,426	58,740	237,921	79,103	47,900	237,390	96,333	383,053	101,251	61,311	5,283	34,133	630,089	39,416
2023	208,426	59,309	240,380	79,862	48,401	239,690	97,267	387,012	102,223	61,953	5,339	34,490	636,378	39,829
2024	210,448	59,885	242,867	80,629	48,908	242,015	98,211	391,015	103,206	62,602	5,395	34,851	642,736	40,246
2025	212,490	60,466	245,381	81,405	49,420	244,364	99,164	395,064	104,198	63,258	5,451	35,217	649,163	40,668
2026	214,554	61,053	247,924	82,189	49,939	246,738	100,127	399,158	105,202	63,922	5,509	35,586	655,659	41,095
2027	216,641	61,646	250,496	82,981	50,463	249,137	101,100	403,299	106,216	64,593	5,567	35,960	662,227	41,527
2028	218,749	62,246	253,097	83,781	50,993	251,561	102,083	407,486	107,240	65,272	5,625	36,338	668,866	41,963
2029	220,879	62,851	255,727	84,591	51,530	254,011	103,076	411,721	108,276	65,958	5,685	36,720	675,578	42,405
2030	223,032	63,463	258,388	85,408	52,072	256,487	104,079	416,004	109,323	66,652	5,745	37,107	682,363	42,852
2031	225,208	64,081	261,078	86,235	52,621	258,989	105,093	420,336	110,380	67,355	5,805	37,498	689,223	43,304
2032	227,407	64,705	263,799	87,070	53,176	261,518	106,117	424,716	111,450	68,065	5,867	37,894	696,157	43,761
2033	229,630	65,336	266,551	87,914	53,737	264,074	107,151	429,147	112,530	68,783	5,929	38,294	703,168	44,223
2034	231,876	65,973	269,334	88,768	54,304	266,657	108,196	433,628	113,622	69,510	5,992	38,699	710,255	44,691
2035	234,146	66,617	272,149	89,630	54,879	269,268	109,252	438,160	114,726	70,245	6,055	39,109	717,421	45,164
2036	236,440	67,268	274,996	90,502	55,459	271,906	110,319	442,744	115,842	70,988	6,119	39,523	724,665	45,642
2037	238,759	67,925	277,875	91,383	56,046	274,573	111,397	447,380	116,970	71,739	6,184	39,942	731,989	46,126
2038	241,103	68,589	280,788	92,273	56,640	277,268	112,486	452,068	118,110	72,500	6,250	40,366	739,393	46,616
2039	243,471	69,260	283,733	93,174	57,241	279,992	113,586	456,811	119,262	73,269	6,317	40,795	746,879	47,111
2040	245,865	69,937	286,713	94,083	57,849	282,745	114,697	461,607	120,427	74,047	6,384	41,229	754,448	47,612

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I:\ateam\docum\FY11\Ver2.3\modelDoc\ Rnd8Based_Ext_AutTrk_CV.xlsx, (IXTrips)

2.3 Miscellaneous and Airport-Passenger Trip Forecasts

The remaining exogenous travel markets consist of taxis, school, and visitor/tourist auto driver trips (collectively referred to as “miscellaneous trips”) and airport-passenger auto driver trips. The miscellaneous trip totals, shown by year on Table 7, are based on surveyed travel patterns that have been growth factored through time. The airport-passenger forecasts are shown on Table 8. The airport trips have been recently updated using the 2007 COG Air Passenger Survey. The trip tables represent auto travel to each of the three major airports serving the Washington/Baltimore area.

Table 7 Miscellaneous Auto Driver Forecasts

Year	School	Taxi	Visitor/ Tourist
2000	250,448	111,246	222,227
2001	255,158	112,989	226,423
2002	259,861	114,586	230,605
2003	264,556	116,329	234,769
2004	269,271	117,928	238,970
2005	273,930	119,671	243,045
2006	277,301	121,103	246,065
2007	280,645	122,504	249,010
2008	283,994	123,938	251,972
2009	287,368	125,477	254,993
2010	290,712	126,881	257,941
2011	294,940	128,748	261,728
2012	299,119	130,536	265,388
2013	303,334	132,394	269,139
2014	307,557	134,263	272,918
2015	311,736	136,057	276,574
2016	315,734	138,233	280,147
2017	319,733	140,385	283,723
2018	323,707	142,564	287,229
2019	327,698	144,721	290,788
2020	331,653	146,891	294,257
2021	335,374	148,724	297,598
2022	339,052	150,476	300,828
2023	342,766	152,304	304,155
2024	346,445	154,101	307,391
2025	350,158	155,830	310,714
2026	353,359	157,324	313,529
2027	356,574	158,933	316,376
2028	359,810	160,395	319,284
2029	363,022	161,984	322,126
2030	366,220	163,486	324,934
2031	369,030	164,826	327,428
2032	371,830	166,186	329,898
2033	374,676	167,632	332,479
2034	377,476	169,010	334,951
2035	380,292	170,339	337,456
2036	382,740	171,540	339,623
2037	385,196	172,762	341,808
2038	387,653	173,952	343,989
2039	390,110	175,134	346,174
2040	392,556	176,445	348,328

Ref: I:\ateam\mod_inputs\misc\2010_07_23_Rnd80Based \Interpolate_Misc_trips.xlsx
I:\ateam\docum\FY11\Ver2.3\modelDoc\ Interpolate_Misc_trips_V23.xlsx

Table 8 Air Passenger Auto Driver Trips by Year and Airport

	Airport			
Year	National	Dulles	BWI	Total
2000	18,746	16,585	14,486	49,723
2001	18,343	16,595	14,810	49,656
2002	17,941	16,604	15,134	49,588
2003	17,538	16,614	15,459	49,521
2004	17,136	16,623	15,783	49,453
2005	16,733	16,633	16,107	49,386
2006	16,714	17,000	16,918	50,544
2007	16,694	17,368	17,729	51,703
2008	16,673	17,737	18,540	52,863
2009	16,653	18,105	19,351	54,022
2010	16,634	18,471	20,162	55,180
2011	16,870	19,407	20,626	56,814
2012	17,106	20,343	21,091	58,449
2013	17,347	21,279	21,556	60,089
2014	17,583	22,214	22,020	61,724
2015	17,820	23,150	22,485	63,358
2016	18,058	24,133	22,969	65,061
2017	18,298	25,116	23,452	66,765
2018	18,541	26,101	23,938	68,476
2019	18,781	27,084	24,421	70,180
2020	19,019	28,068	24,906	71,883
2021	19,233	29,032	25,393	73,547
2022	19,448	29,997	25,883	75,214
2023	19,667	30,962	26,372	76,885
2024	19,882	31,927	26,861	78,552
2025	20,096	32,891	27,349	80,216
2026	20,284	33,850	27,856	81,868
2027	20,474	34,810	28,362	83,522
2028	20,667	35,771	28,869	85,180
2029	20,857	36,731	29,376	86,835
2030	21,046	37,690	29,883	88,487
2031	21,171	38,518	30,360	89,917
2032	21,298	39,347	30,839	91,350
2033	21,425	40,175	31,316	92,781
2034	21,551	41,004	31,795	94,213
2035	21,677	41,832	32,272	95,643
2036	21,765	42,416	32,724	96,766
2037	21,852	43,001	33,175	97,890
2038	21,938	43,586	33,627	99,012
2039	22,025	44,171	34,078	100,135
2040	22,113	44,755	34,530	101,258

Ref: I:\ateam\mod_inputs\airport\2009_07_25_Rnd80Based\ Airport_Summary.xls
I:\ateam\docum\FY11\Ver2.3\modelDoc\ Airport_Summary_V23.xls

Chapter 3 Demographic models

This chapter describes the specification of the demographic modeling process used within the Version 2.3 travel model. The demographic models, or sub-models, refer to the household size, household income, and vehicle availability models that are run prior to trip generation. The models are applied at the zone level and are used to apportion the total number households among 64 size, income, and vehicle availability categories or cross classifications:

- Household size (1, 2, 3, or 4+ persons per household);
- Household income (Income "quartile" 1, 2, 3, or 4); and
- Vehicle ownership/availability (0, 1, 2, or 3+ vehicles per household).

Prior to this latest update, the last two updates of the demographic models, or sub-models, were completed in 2004, using the 1990 Census Transportation Planning Package (CTPP) data, and in 2006, using the 2000 CTPP data. The demographic models used in the Version 2.3 travel model are similar to those used in the Version 2.2 travel model, with the following exceptions. First, the validation of the three demographic sub-models was updated to year 2007 conditions, using the American Community Survey (ACS).[12] Second, the vehicle availability model has been recalibrated based on the 2007/2008 Household Travel Survey.

The 2000 Census was the last decennial census to include the long form, a roughly one-in-six sample of the population that included many questions about commuting travel. The long form was the basis for the CTPP data in 1990 and 2000. The American Community Survey (ACS) is a project of the U.S. Census Bureau that replaces the long form in the decennial census. Ideally, when updating the demographic models, one would like to have small area, e.g., zone-level, data. Unfortunately, the ACS data does not generally support development of models at the TAZ level of geography, due to privacy concerns regarding the release of data. Consequently, the ACS updates were done using county-level data.[13]

According to the 2007 ACS data, the regional median household income is $84,280 and the regional mean household income is $106,780 (in year 2007 dollars). The household income quartiles, based on the 2007 ACS data, are shown in Table 9.

[12] Hamid Humeida to Files, "Analysis of data from the American Community Survey (ACS): Households by household income, household size, and vehicle availability," Memorandum, March 19, 2010.
[13] It is thought that some CTPP data may be produced in the future from multiple years of the ACS, but that data is not likely to be available for another few years.

Table 9 Household income quartiles computed from the ACS

Quartile	Income range (2007 dollars)
First	Less than $50,000
Second	$50,000 to $99,999
Third	$100,000 to $149,999
Fourth	$150,000 or more

The median household income reported from the 2007/2008 HTS ($90,086) is slightly higher than that of the ACS ($84,280). However, both medians fall in the same income interval, $50,000-$99,999. One possible explanation for the difference is that the larger ACS sample covered a larger percentage of lower income households than the 2007/2008 HTS.

A sub-model was developed for each of the three socio-economic dimensions. The household size sub-model uses Census-based relationships to estimate the percent of households in each integer class of household size, given the zone's average household size. The household income sub-model uses similar Census-based relationships to estimate the percent of households in each income class, given the zone's median household income. Lastly, the vehicle ownership model uses a disaggregate logit formulation to estimate the percentage of households in each of the four vehicle-availability classes. The logit model makes use of the household size and income information developed in prior steps as well as some additional parameters. The model specifications are detailed below.

3.1 Household size sub-model

The household size sub-model is an "aggregate share" model. The model is essentially a family of four curves used to allocate the total number of households among integer size levels, based on the average household size of a given zone. Each curve uses the same independent variable.

Curve	Dependent variable	Independent variable
1	Percent of HHs with 1 person	Average zonal household size
2	Percent of HHs with 2 persons	Average zonal household size
3	Percent of HHs with 3 persons	Average zonal household size
4	Percent of HHs with 4+ persons	Average zonal household size

The final model is shown in graphical form in Figure 4 and in tabular form in Table 10.

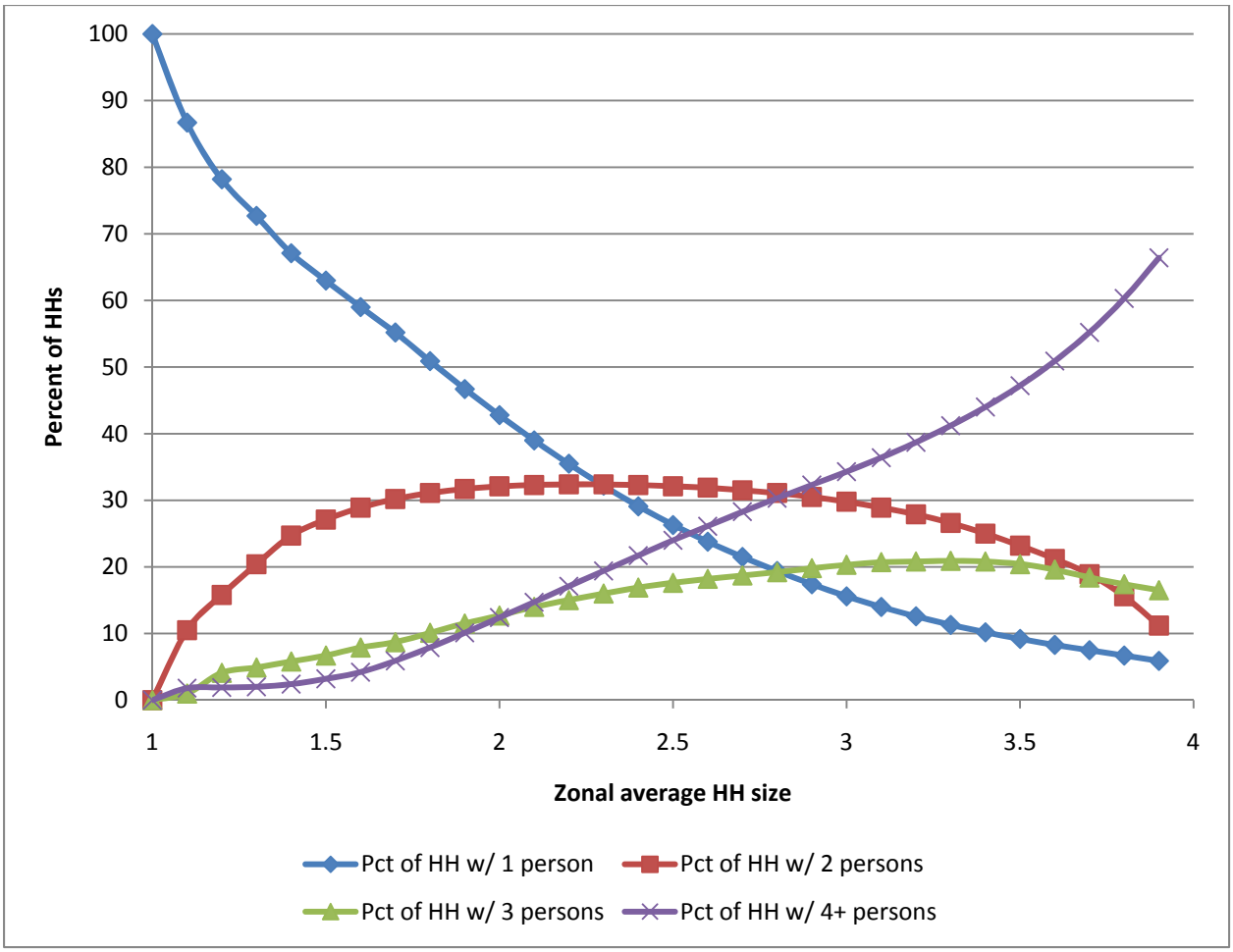

Figure 4 Household size sub-model: Graphical form

Table 10 Household size sub-model: Tabular form

Avg. Zonal HH Size	Pct of HH with 1 person	Pct of HH with 2 persons	Pct of HH with 3 persons	Pct of HH with 4+ persons
1.0	100.0	0.0	0.0	0.0
1.1	86.7	10.5	1.0	1.8
1.2	78.2	15.8	4.1	1.9
1.3	72.7	20.4	4.9	2.0
1.4	67.1	24.7	5.8	2.4
1.5	63.0	27.1	6.7	3.2
1.6	59.0	28.9	7.9	4.2
1.7	55.2	30.2	8.7	5.9
1.8	50.9	31.1	10.1	7.9
1.9	46.7	31.7	11.5	10.1
2.0	42.8	32.1	12.7	12.4
2.1	39.0	32.3	14.0	14.7
2.2	35.5	32.4	15.0	17.1
2.3	32.2	32.4	16.0	19.4
2.4	29.1	32.3	16.9	21.7
2.5	26.3	32.1	17.6	24.0
2.6	23.8	31.9	18.2	26.1
2.7	21.5	31.5	18.7	28.3
2.8	19.4	31.1	19.2	30.3
2.9	17.4	30.5	19.8	32.3
3.0	15.6	29.8	20.3	34.3
3.1	14.0	28.9	20.7	36.4
3.2	12.6	27.9	20.8	38.7
3.3	11.3	26.6	20.9	41.2
3.4	10.2	25.0	20.8	44.0
3.5	9.2	23.2	20.4	47.2
3.6	8.3	21.2	19.6	50.9
3.7	7.5	18.9	18.4	55.2
3.8	6.7	15.6	17.4	60.3
3.9	5.9	11.2	16.5	66.4

3.2 Household income sub-model

The household income sub-model is also an "aggregate share" model and is, therefore, similar in form to the household size sub-model. The household income sub-model is used to estimate the share of households in each of the four income quartiles in each zone, given the median household income for the zone.

Unlike the 2000 CTPP, the most recent census data, the 2007 American Community Survey (ACS), is not available at the census tract level. This fact presented a limitation to any possible updates of the income sub-model using the ACS aggregated data. The county geography is the lowest level that the 2000 CTPP and the 2007 ACS data could be compared. As such, it was decided to use the existing models based on the 2000 CTPP data and to develop an area-based zone equivalency to migrate the 2191 TAZ model to the new 3722 TAZ system.[14] Based on the 2000 CTPP data, the income ratio variable was developed as shown in Equation 1.

Equation 1 Income ratio equation

$$\text{Income ratio} = (\text{zonal median HH income}) / (\text{regional median HH income})$$

The final model is shown in graphical form in Figure 5 and in tabular form in Table 11.

[14] Hamid Humeida to Files, "Development of an equivalency file to convert the household income sub-model from the 2191 TAZ system to the new 3722 TAZ system," Memorandum, June 2, 2010.

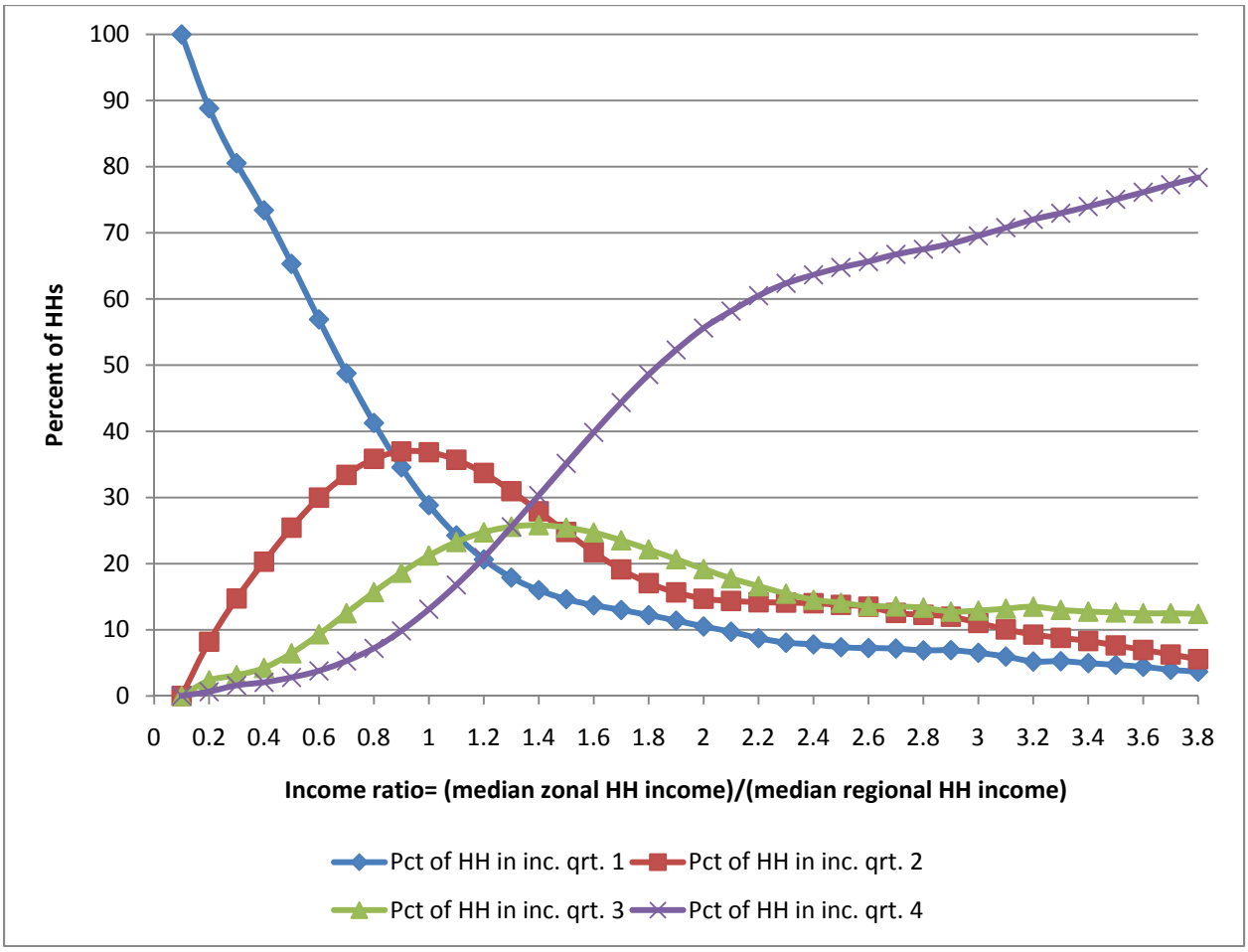

Figure 5 Household income sub-model: Graphical form

Table 11 Household income sub-model: Tabular form

Income Ratio	Pct of HH in inc. qrt. 1	Pct of HH in inc. qrt. 2	Pct of HH in inc. qrt. 3	Pct of HH in inc. qrt. 4
0.1	100.0	0.0	0.0	0.0
0.2	88.8	8.2	2.3	0.6
0.3	80.5	14.7	3.1	1.6
0.4	73.4	20.3	4.2	2.1
0.5	65.3	25.4	6.4	2.8
0.6	56.9	30.0	9.3	3.8
0.7	48.8	33.4	12.5	5.3
0.8	41.3	35.9	15.7	7.2
0.9	34.6	37.0	18.6	9.8
1.0	28.8	36.8	21.2	13.1
1.1	24.3	35.7	23.3	16.8
1.2	20.6	33.7	24.8	20.9
1.3	17.9	31.0	25.6	25.6
1.4	16.0	27.9	25.8	30.3
1.5	14.6	24.8	25.5	35.2
1.6	13.7	21.7	24.7	39.8
1.7	13.0	19.1	23.5	44.4
1.8	12.2	17.0	22.2	48.6
1.9	11.4	15.7	20.7	52.3
2.0	10.5	14.7	19.2	55.6
2.1	9.7	14.4	17.8	58.2
2.2	8.7	14.2	16.6	60.5
2.3	8.1	14.1	15.5	62.4
2.4	7.8	14.0	14.5	63.7
2.5	7.4	13.8	14.1	64.8
2.6	7.3	13.5	13.6	65.7
2.7	7.2	12.6	13.5	66.8
2.8	6.9	12.3	13.3	67.5
2.9	6.9	12.0	12.7	68.4
3.0	6.5	11.0	12.9	69.6
3.1	6.0	10.1	13.2	70.8
3.2	5.2	9.3	13.5	72.0
3.3	5.3	8.8	13.0	73.0
3.4	5.0	8.3	12.8	74.0
3.5	4.7	7.6	12.6	75.1
3.6	4.4	7.0	12.5	76.1
3.7	4.0	6.3	12.5	77.3
3.8	3.7	5.6	12.4	78.4

3.3 Vehicle availability sub-model

The vehicle availability sub-model is the last demographic sub-model. It is a disaggregate choice model that apportions households among vehicle availability levels. The variables considered are household size, household income (furnished by the previous sub-models), area type, and transit accessibility defined as the number of jobs accessible in 45 minutes using the "best" AM transit service. The best transit service is defined as the minimum AM walk-/drive-access transit time among the Metrorail-related transit (i.e., Metrorail only or bus/Metrorail). The vehicle availability model specification is detailed in Table 12.

Table 12 Vehicle availability model

Number of Vehicles					
0	1	2	3+	Variable	New Coefficient
	X			Constant	0.5382
		X		Constant	-3.0820
			X	Constant	-6.8508
	X			Household Size	0.1693
		X		Household Size	1.3439
			X	Household Size	1.6910
	X			Income level 2	1.4535
		X		Income level 2	1.8432
			X	Income level 2	2.4619
	X			Income level 3	2.2589
		X		Income level 3	3.4209
			X	Income level 3	4.6234
	X			Income level 4	2.6558
		X		Income level 4	3.9163
			X	Income level 4	5.5402
	X			Employment w/in 45 min transit	-1.20E-06
		X		Employment w/in 45 min transit	-2.04E-06
			X	Employment w/in 45 min transit	-2.37E-06
	X			Area type	0.2092
		X		Area type	0.4772
			X	Area type	0.7792
	X			DC dummy	-0.9448
		X		DC dummy	-1.3977
			X	DC dummy	-1.5294

3.4 Demographic Model Validation Results

In order to evaluate how well the models fit the data, a comparison was made between the estimated results and data from the 2007 ACS. Table 13, Table 14, and Table 15 show the regional estimates, observed ACS data, the ratio of estimated to observed, and the difference between the estimated and observed results. It is evident that the difference between the estimated and observed data is less than 1% for all three demographic models, which indicates an acceptable fit. The difference in the total number of households of 15,885 is due to Clarke County being omitted from the ACS dataset because the county is small and no data was available at this level of geography. In addition to regional summaries, jurisdictional summaries for household size, household income, and vehicle availability are presented in a memorandum[15].

Table 13 2007 Regional Estimated and Observed Households by Size

Estimated					
	1 Psn	2 Psns	3 Psns	4+ Psns	Total
HHs	664,559	723,464	392,846	558,997	2,339,865
Pct.	28.40%	30.92%	16.79%	23.89%	100.00%
Observed					
	1 Psn	2 Psns	3 Psns	4+ Psns	Total
HHs	649,305	713,509	385,435	575,731	2,323,980
Pct.	27.94%	30.70%	16.59%	24.77%	100.00%
Estimated/Observed Ratio					
	1 Psn	2 Psns	3 Psns	4+ Psns	Total
HHs	1.0235	1.0140	1.0192	0.9709	1.0068
Pct.	1.0165	1.0071	1.0123	0.9643	1.0000
Estimated- Observed					
	1 Psn	2 Psns	3 Psns	4+ Psns	Total
HHs	15,254	9,955	7,411	-16,734	15,885
Pct.	0.46%	0.22%	0.20%	-0.88%	0.00%

[15] Hamid Humeida to Files, "Analysis of data from the American Community Survey (ACS): Households by household income, household size, and vehicle availability," Memorandum, March 19, 2010.

Table 14 2007 Regional Estimated and Observed Households by Income Level

Estimated					
	< 50.00k	50.00k-99.99k	100.k-149.99k	> 150.00k	Total
HHs	635,803	726,626	483,261	494,175	2,339,865
Pct.	27.17%	31.05%	20.65%	21.12%	100.00%
Observed					
	< 50.00k	50.00k-99.99k	100.k-149.99k	> 150.00k	Total
HHs	640,594	731,729	470,110	481,547	2,323,980
Pct.	27.56%	31.49%	20.23%	20.72%	100.00%
Estimated/Observed Ratio					
	< 50.00k	50.00k-99.99k	100.k-149.99k	> 150.00k	Total
HHs	0.9925	0.9930	1.0280	1.0262	1.0068
Pct.	0.9858	0.9863	1.0210	1.0193	1.0000
Estimated- Observed					
	< 50.00k	50.00k-99.99k	100.k-149.99k	> 150.00k	Total
HHs	-4,791	-5,103	13,151	12,628	15,885
Pct.	-0.39%	-0.43%	0.42%	0.40%	0.00%

Table 15 2007 Regional Estimated and Observed Households by Vehicles Available

Estimated					
	0 Vehs.	1 Veh.	2 Vehs.	3+ Vehs.	Total
HHs	197,911	734,183	877,105	530,667	2,339,865
Pct.	8.46%	31.38%	37.49%	22.68%	100.00%
Observed					
	0 Vehs.	1 Veh.	2 Vehs.	3+ Vehs.	Total
HHs	200,561	733,753	865,514	524,152	2,323,980
Pct.	8.63%	31.57%	37.24%	22.55%	100.00%
Estimated/Observed Ratio					
	0 Vehs.	1 Veh.	2 Vehs.	3+ Vehs.	Total
HHs	0.9868	1.0006	1.0134	1.0124	1.0068
Pct.	0.9801	0.9938	1.0065	1.0056	1.0000
Estimated- Observed					
	0 Vehs.	1 Veh.	2 Vehs.	3+ Vehs.	Total
HHs	-2,650	430	11,591	6,515	15,885
Pct.	-0.17%	-0.20%	0.24%	0.13%	0.00%

Chapter 4 Trip Generation

The Version 2.3 trip generation process computes zonal trip productions and trip attractions, for each modeled purpose, on the basis of zonal land activity. This chapter details the trip generation model pertaining to resident, commercial vehicle, and truck purposes. "Resident trips" are those made by people who reside in the modeled area. Information on resident trips is obtained from the COG/TPB 2007/2008 Household Travel Survey.

4.1 Model Structure

The trip generation model is used to compute the number of daily person trips (i.e., on an average weekday) and daily truck/commercial vehicle trips produced by and attracted to each transportation analysis zone (TAZ). Resident trips are stratified into five trip purposes:

- Home-Based Work (HBW)
- Home-Based Shop (HBS)
- Home-Based Other (HBO)
- Non-Home-Based Work (NHW)
- Non-Home-Based Other (NHO)

HBO trips include home-based school and home-based university trips, since these trips are not modeled separately. Following consultant guidance, what used to be one trip purpose – non-home-based (NHB) – has now been divided into two trip purposes: NHW and NHO.[16] In the Version 2.1 travel model and previous TPB travel models, commercial vehicle travel, described below, was assumed to be part of the non-home-based trip purpose, although this is no longer the case. In general, a commercial vehicle is a motor vehicle used to transport goods (freight), services, or, potentially, revenue-paying passengers. However, the usage of this term within the TPB travel model is more limited. Since the TPB travel model has always had a truck model (for medium trucks and heavy trucks), the term "commercial vehicle" is used to refer to light-duty vehicles (auto, light trucks, SUV, etc.) used to transport goods and services.[17] Consequently, there are three commercial/truck vehicle types:

- Medium truck (single unit, two axles, 6 or more tires)
- Heavy truck (all combination vehicles)[18]
- Commercial vehicles (autos and light duty trucks used to transport commercial goods and services)

Examples of commercial vehicles include "delivery and courier vehicles (including postal vehicles), light trucks used in construction, tradesmen, craftsmen, equipment service personnel, telephone company trucks, shuttle vans, taxicabs, ambulances, police cars, government vehicles, and 4-tire vans used for

[16] Cambridge Systematics, Inc., *Fiscal Year 2010 Task Reports*, 2-3, 2-12.
[17] William G. Allen Jr., *Development of a Model for Commercial Vehicle Trips* (Washington, D.C.: Metropolitan Washington Council of Governments, National Capital Region Transportation Planning Board, May 4, 2007).
[18] Note that "heavy" and "medium" do not refer strictly to the weight of the vehicle.

paratransit and school transportation."[19] As stated earlier, in the Version 2.1 travel model and previous TPB travel models, commercial vehicle travel was assumed to be part of the non-home-based trip purpose. Similar to the Version 2.2 model, the Version 2.3 model now accounts for commercial trips as a separate and distinct trip purpose. The trip generation process also estimates productions and attractions associated with non-motorized (walk and bicycle) trips. The non-motorized trips are removed from the "final" trip-ends prior to the trip distribution step.

The resident trip generation process can be envisioned as a series of six sequential steps. These are:

1) Trip production model;
2) Internal-to-external trip extraction model;
3) Non-motorized trip production model;
4) Trip attraction model;
5) Non-motorized trip attraction model; and
6) Home-based attraction income disaggregation model.

4.2 Trip Production Model

The trip production model is a cross-classification model involving the application of trip rates to households in specific socioeconomic categories. The trip rates are specific to each purpose. The cross-classes established for the Version 2.3 model are structured by the four household income, four household size, and four vehicle availability levels used in the demographic models. The total number of cross-classes equals 64 (i.e., 4 x 4 x 4). The trip rates are displayed, by purpose in Table 16, Table 17, Table 18, Table 19, and Table 20. Trip rates are weighted rates, based on the 2007/2008 Household Travel Survey.[20]

[19] Allen, *Development of a Model for Commercial Vehicle Trips*, 4.
[20] Hamid Humeida to Files, M Moran, and Ronald Milone, "Estimation of Trip Production Model based on the 2007 Household Travel Survey," Memorandum, January 13, 2011.

Table 16 Final HBW Trip Production Rates[21]

		Vehicles				
Income Level	**HH Size**	**0**	**1**	**2**	**3+**	**Subtotal**
00k - 50k	1-PSN	0.41	0.65	0.54	0.66	0.58
	2-PSN	0.67	0.86	1.27	1.34	1.05
	3-PSN	0.91	1.34	1.89	1.92	1.55
	4+PSN	1.34	1.34	1.70	2.50	1.69
	Subtotal	0.55	0.80	1.35	1.75	0.94
50k-100k	1-PSN	1.00	1.06	1.04	1.04	1.05
	2-PSN	1.20	1.29	1.41	1.51	1.39
	3-PSN	1.25	1.70	1.95	2.05	1.93
	4+PSN	1.34	1.82	1.99	2.69	2.24
	Subtotal	1.06	1.20	1.63	2.14	1.55
100k-150k	1-PSN	1.08	0.99	1.09	1.29	1.03
	2-PSN	1.72	1.78	1.78	1.87	1.79
	3-PSN	1.72	1.82	2.05	2.51	2.23
	4+PSN	1.75	1.97	1.98	2.71	2.26
	Subtotal	1.33	1.36	1.86	2.42	1.92
> 150k	1-PSN	1.16	1.04	1.20	0.87	1.07
	2-PSN	1.72	1.82	1.87	1.90	1.88
	3-PSN	1.72	2.16	2.28	2.93	2.62
	4+PSN	1.75	2.24	2.60	2.97	2.75
	Subtotal	1.33	1.57	2.15	2.58	2.25
	TOTAL	0.72	1.10	1.78	2.33	**1.63**

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[21] Source: Hamid Humeida to Files, Mark Moran, and Ronald Milone, "Estimation of Trip Production Model based on the 2007 Household Travel Survey," Memorandum, January 13, 2011.

Table 17 Final HBS Trip Production Rates[22]

		Vehicles				
Income Level	**HH Size**	**0**	**1**	**2**	**3+**	**Subtotal**
00k - 50k	1-PSN	0.59	0.65	0.77	0.77	0.64
	2-PSN	0.88	1.16	1.18	1.29	1.15
	3-PSN	0.90	1.31	1.52	1.57	1.36
	4+PSN	1.00	1.31	1.52	1.53	1.40
	Subtotal	0.69	0.85	1.25	1.35	0.94
50k-100k	1-PSN	0.59	0.67	0.64	0.77	0.66
	2-PSN	0.88	1.26	1.31	1.31	1.28
	3-PSN	0.92	0.94	1.64	1.74	1.52
	4+PSN	1.25	1.59	2.12	2.15	2.07
	Subtotal	0.69	0.85	1.52	1.76	1.28
100k-150k	1-PSN	0.67	0.71	0.73	0.77	0.71
	2-PSN	0.88	1.30	1.31	1.31	1.30
	3-PSN	0.88	1.65	1.69	1.63	1.66
	4+PSN	1.75	1.81	2.22	2.36	2.25
	Subtotal	0.83	1.04	1.68	1.86	1.60
> 150k	1-PSN	0.86	0.89	0.89	0.89	0.89
	2-PSN	1.31	1.31	1.31	1.31	1.31
	3-PSN	0.88	1.66	1.66	1.66	1.66
	4+PSN	1.24	2.12	2.40	2.45	2.41
	Subtotal	0.99	1.27	1.71	1.83	1.70
	TOTAL	0.70	0.90	1.58	1.79	**1.36**

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[22] Source: Hamid Humeida to Files, Mark Moran, and Ronald Milone, "Estimation of Trip Production Model based on the 2007 Household Travel Survey," Memorandum, January 13, 2011.

Table 18 Final HBO Trip Production Rates[23]

		Vehicles				
Income Level	**HH Size**	**0**	**1**	**2**	**3+**	**Subtotal**
00k - 50k	1-PSN	0.80	0.89	0.89	1.17	0.87
	2-PSN	0.78	1.57	1.98	2.22	1.70
	3-PSN	1.55	1.57	3.00	3.00	2.25
	4+PSN	1.66	3.76	3.76	5.91	3.93
	Subtotal	0.91	1.30	2.38	3.48	1.62
50k-100k	1-PSN	0.80	0.89	0.89	1.18	0.89
	2-PSN	1.26	2.08	2.08	2.10	2.06
	3-PSN	1.55	3.00	3.47	3.79	3.47
	4+PSN	1.66	6.15	6.44	6.81	6.52
	Subtotal	0.96	1.59	3.45	4.52	2.86
100k-150k	1-PSN	1.09	0.90	0.93	0.90	0.92
	2-PSN	1.55	2.08	2.08	2.10	2.08
	3-PSN	2.50	3.40	3.66	3.79	3.70
	4+PSN	2.50	6.48	7.36	7.36	7.31
	Subtotal	1.35	1.87	4.24	4.93	3.96
> 150k	1-PSN	1.09	0.90	0.98	1.15	0.95
	2-PSN	1.55	2.08	2.08	2.08	2.08
	3-PSN	2.50	4.15	5.00	5.00	4.94
	4+PSN	2.50	6.48	7.36	7.87	7.55
	Subtotal	1.23	2.35	4.25	5.09	4.34
	TOTAL	0.95	1.58	3.76	4.75	**3.13**

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[23] Source: Hamid Humeida to Files, Mark Moran, and Ronald Milone, "Estimation of Trip Production Model based on the 2007 Household Travel Survey," Memorandum, January 13, 2011.

Table 19 Final NHW Trip Production Rates[24]

		Vehicles				
Income Level	**HH Size**	**0**	**1**	**2**	**3+**	**Subtotal**
00k - 50k	1-PSN	0.30	0.37	0.37	0.37	0.35
	2-PSN	0.30	0.32	0.44	0.44	0.38
	3-PSN	0.35	0.56	0.56	0.85	0.57
	4+PSN	0.35	0.56	0.56	1.18	0.65
	Subtotal	0.31	0.39	0.48	0.76	0.42
50k-100k	1-PSN	0.30	0.75	0.75	0.75	0.72
	2-PSN	0.30	0.77	0.81	0.81	0.79
	3-PSN	0.83	0.77	0.77	0.93	0.83
	4+PSN	0.83	0.94	0.94	1.04	0.97
	Subtotal	0.33	0.77	0.83	0.94	0.81
100k-150k	1-PSN	0.30	0.75	0.75	0.75	0.73
	2-PSN	0.75	1.03	1.03	1.18	1.06
	3-PSN	0.95	1.03	1.15	1.18	1.15
	4+PSN	0.98	1.03	1.15	1.33	1.21
	Subtotal	0.49	1.03	1.08	1.24	1.08
> 150k	1-PSN	0.75	1.00	1.00	1.05	0.99
	2-PSN	0.80	1.08	1.08	1.08	1.08
	3-PSN	1.26	1.26	1.30	1.42	1.36
	4+PSN	1.26	1.35	1.35	1.42	1.38
	Subtotal	0.77	1.10	1.20	1.31	1.23
	TOTAL	0.33	0.70	0.95	1.13	**0.87**

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[24] Source: Hamid Humeida to Files, Mark Moran, and Ronald Milone, "Estimation of Trip Production Model based on the 2007 Household Travel Survey," Memorandum, January 13, 2011.

Table 20 Final NHO Trip Production Rates[25]

		Vehicles				
Income Level	**HH Size**	**0**	**1**	**2**	**3+**	**Subtotal**
00k - 50k	1-PSN	0.58	0.68	0.96	1.12	0.68
	2-PSN	0.63	1.22	1.22	1.44	1.17
	3-PSN	0.71	1.25	1.25	1.25	1.18
	4+PSN	1.10	1.10	1.72	1.69	1.45
	Subtotal	0.63	0.86	1.30	1.44	0.95
50k-100k	1-PSN	0.61	0.68	0.96	1.21	0.72
	2-PSN	0.63	1.22	1.25	1.45	1.26
	3-PSN	0.74	1.46	1.47	1.62	1.52
	4+PSN	1.10	1.54	2.33	2.56	2.33
	Subtotal	0.64	0.89	1.56	1.95	1.35
100k-150k	1-PSN	0.61	0.72	0.94	0.88	0.76
	2-PSN	0.87	1.22	1.25	1.53	1.30
	3-PSN	1.00	1.46	1.47	1.62	1.53
	4+PSN	1.38	1.54	2.33	2.56	2.38
	Subtotal	0.75	0.99	1.67	2.00	1.63
> 150k	1-PSN	0.67	0.72	0.99	1.36	0.84
	2-PSN	0.95	1.22	1.49	1.62	1.50
	3-PSN	1.00	1.46	1.56	1.66	1.61
	4+PSN	1.49	2.39	2.41	2.56	2.48
	Subtotal	0.76	1.17	1.79	1.98	1.79
	TOTAL	0.64	0.91	1.61	1.94	**1.41**

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Table 21 shows a summary of the trip production rates across the five trip purposes, indicating an average of about 8.40 trip productions per household on an average weekday. According to NCHRP 365, one would expect about 8.5 daily person trips per household for an urban area with over one million people.[26]

[25] Source: Hamid Humeida to Files, Mark Moran, and Ronald Milone, "Estimation of Trip Production Model based on the 2007 Household Travel Survey," Memorandum, January 13, 2011.

[26] William A. Martin and Nancy A. McGuckin, *NCHRP Report 365, Travel Estimation Techniques for Urban Planning*, National Cooperative Highway Research Program (NCHRP) (Washington, D.C.: Transportation Research Board, National Research Council, 1998), 25.

Table 21 Daily trip productions per household (average weekday), summary across the trip purposes

	Daily Trip Productions per HH (ave wkday)
HBW	1.63
HBS	1.36
HBO	3.13
NHW	0.87
NHO	1.41
Total	8.40

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4.3 The Internal-to-External Trip Estimation Model

Travel can be categorized into four markets, based on whether the starting and ending points of the trip are within or beyond the modeled area, as can be seen in Table 22.

Table 22 Categorization of trips into four markets, based on whether the starting and ending points of the trip are within or beyond the modeled area

Travel market	Acronym	Short-hand name
Internal-to-internal	I-I	Internal
Internal-to-external	I-X	External
External-to-internal	X-I	External
External-to-external	X-X	Through

Since I-X trips and X-I trips are typically referred to as "external travel," one can also think in terms of three markets: internal, external, and through. External and through travel (I-X, X-I and X-X) are entered exogenously into the trip generation process. However, since the trip production rates include both internal (I-I) and internal-to-external (I-X) trips generated by households that reside in the modeled area, it is necessary to remove the I-X portion of total trip productions to avoid double counting.

The first I-X trip extraction sub-model was estimated by William Allen in the early 1990s based on the 1987 Home Interview Survey and the 1478 zone system. The model was then updated by TPB staff in 1997 using the 1994 HTS and the 2,191 zone system.[27] [28] [29] Consequently, this is the third update of the I-X trip extraction model. This latest update is based on the 2007 HTS and the 3,722-zone system, which has 3,675 internal zones. All of these models are based on the premise that the share of I-X trips is inversely related to the distance between the centroid of the production zone and the nearest external station.

In Version 2.2 of the travel model, a single curve was developed to extract internal-to-external trips following trip generation. However, during Version 2.3 model calibration, it was noted that Home-Based-Work internal-to-external trip rates are dramatically different for counties in the vicinity of Baltimore.[30] Thus, for the purposes of HBW I-X trip estimation, the region was split into counties near Baltimore (i.e., Anne Arundel, Howard, and Carroll counties) and the rest of the region. The equations

[27] Parsons, Brinckerhoff, Quade & Douglas, Inc., KPMG Peat Marwick LLP, and William G. Allen Jr. to Metropolitan Washington Council of Governments, "Technical Assistance for 1995 Model Validation: Technical Memorandum #2: Review of 1994 Survey Files," Memorandum, January 19, 1997, 16.
[28] Parsons, Brinckerhoff, Quade & Douglas, Inc., KPMG Peat Marwick LLP, and William G. Allen Jr. to Metropolitan Washington Council of Governments, "Technical Assistance for 1995 Model Validation: Technical Memorandum #4: Trip Generation and Time-of-Day Models," Memorandum, June 30, 1997, 7.
[29] Ronald Milone, Hamid Humeida, and Meseret Seifu, *FY-97 Models Development Program for COG/TPB Travel Models*, Draft (Washington, D.C.: Metropolitan Washington Council of Governments, National Capital Region Transportation Planning Board, June 30, 1997), 3-31.
[30] Hamid Humeida to M Moran, "I-X Trip Extraction Sub-Model," Memorandum, January 13, 2011.

developed for I-X trip extraction are described below and shown graphically in Figure 6. This function captures the fact that, as the distance to the nearest external station increases, the share of total trip productions that is attracted to external locations (I-X) drops.

Equation 2 Percent of total trips productions that are I-X

IX_Baltimore_HBW= 0.3348 Exp (-0.0938*DNE)

IX_Baltimore_Non-HBW= 0.1766 Exp (-0.1957*DNE)

IX_Non-Baltimore_HBW= 0.2133 Exp (-0.1950*DNE)

where

DNE = the "straight-line" distance to the nearest external station (in miles)

Exp = the exponential function

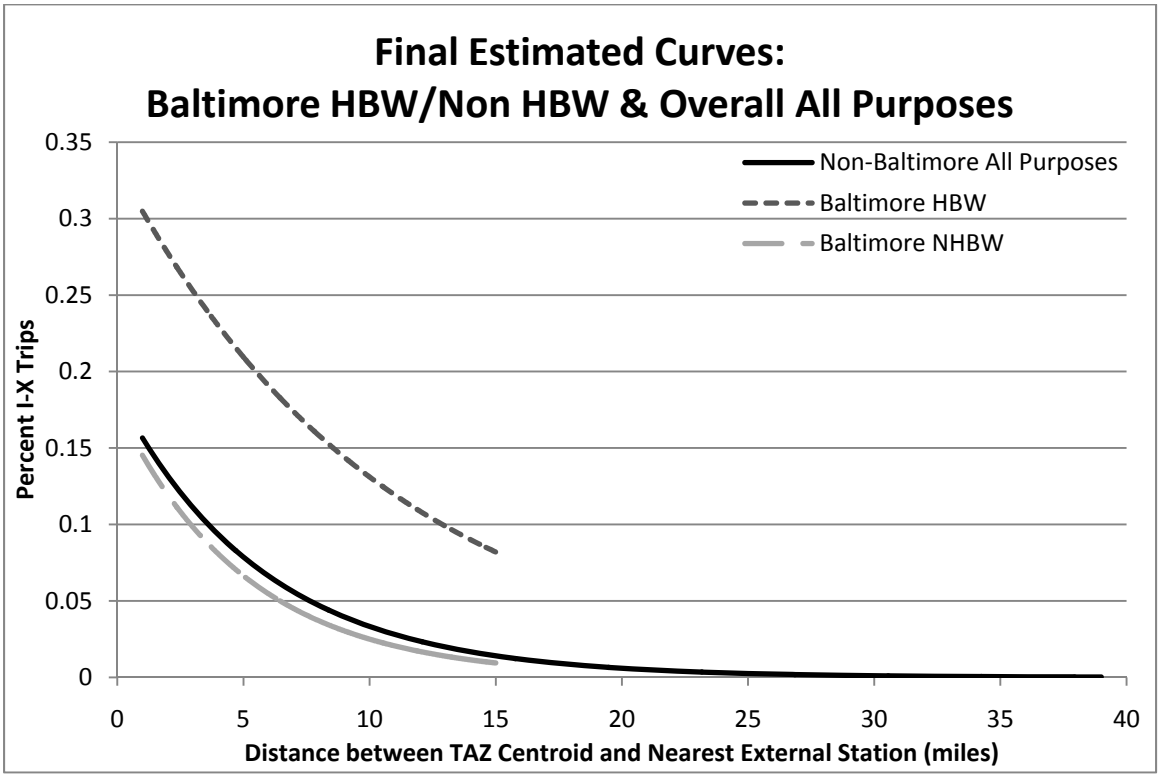

Figure 6 Internal-to-External Trip Extraction Model

4.4 Area type

Area type is an important parameter that is used as a basis for determining link free-flow speed and link capacity, and is also used in a number of models, including the vehicle ownership, trip generation models, and the non-motorized HBW trip end model. In Version 2.2 model, area type is defined based on a one-mile "floating" employment and population density. The one-mile floating density for a

specified TAZ is calculated by adding the density in the TAZ to the density in other TAZs whose centroid lies within a one-mile radius of the specified TAZ's centroid (this aggregation technique is sometimes referred to as "geographic centroid aggregation"). In the Version 2.2 travel model, there were seven area types, which were a function of the population density and the employment density.[31] In the Version 2.3 travel model on the 3,722-TAZ area system, there are now six area types, as can be seen in Table 23.[32] Changes to the previous definitions included combining area types 6 and 7, changing the employment and population category thresholds, as well as reclassifying some area types. Also, the new scheme has generally a smoother transition from one area type to the next.

Table 23 Area Type Definitions (1-7) as a function of population and employment density

One-Mile "Floating" Population Density (Pop/Sq mi)	One- mile "Floating" Employment Density (Emp/Sq mi)						
	0-100	101-350	351-1,500	1,501-3,550	3,551-13,750	13,751-15,000	15,001+
0-750	6	6	5	3	3	3	2
751-1,500	6	5	5	3	3	3	2
1,501-3,500	6	5	5	3	3	2	2
3,501-6,000	6	4	4	3	2	2	1
6,001-10,000	4	4	4	2	2	2	1
10,001-15,000	4	4	4	2	2	2	1
15,001+	2	2	2	2	2	1	1

Two maps showing the revised area types can be seen in Figure 7and Figure 8.

[31] Ronald Milone et al., *TPB Travel Forecasting Model, Version 2.2: Specification, Validation, and User's Guide*, 4-8.
[32] Mary Martchouk to MS Moran, "Area Type Definitions for Version 2.3 Travel Demand Model," Memorandum, June 16, 2010.

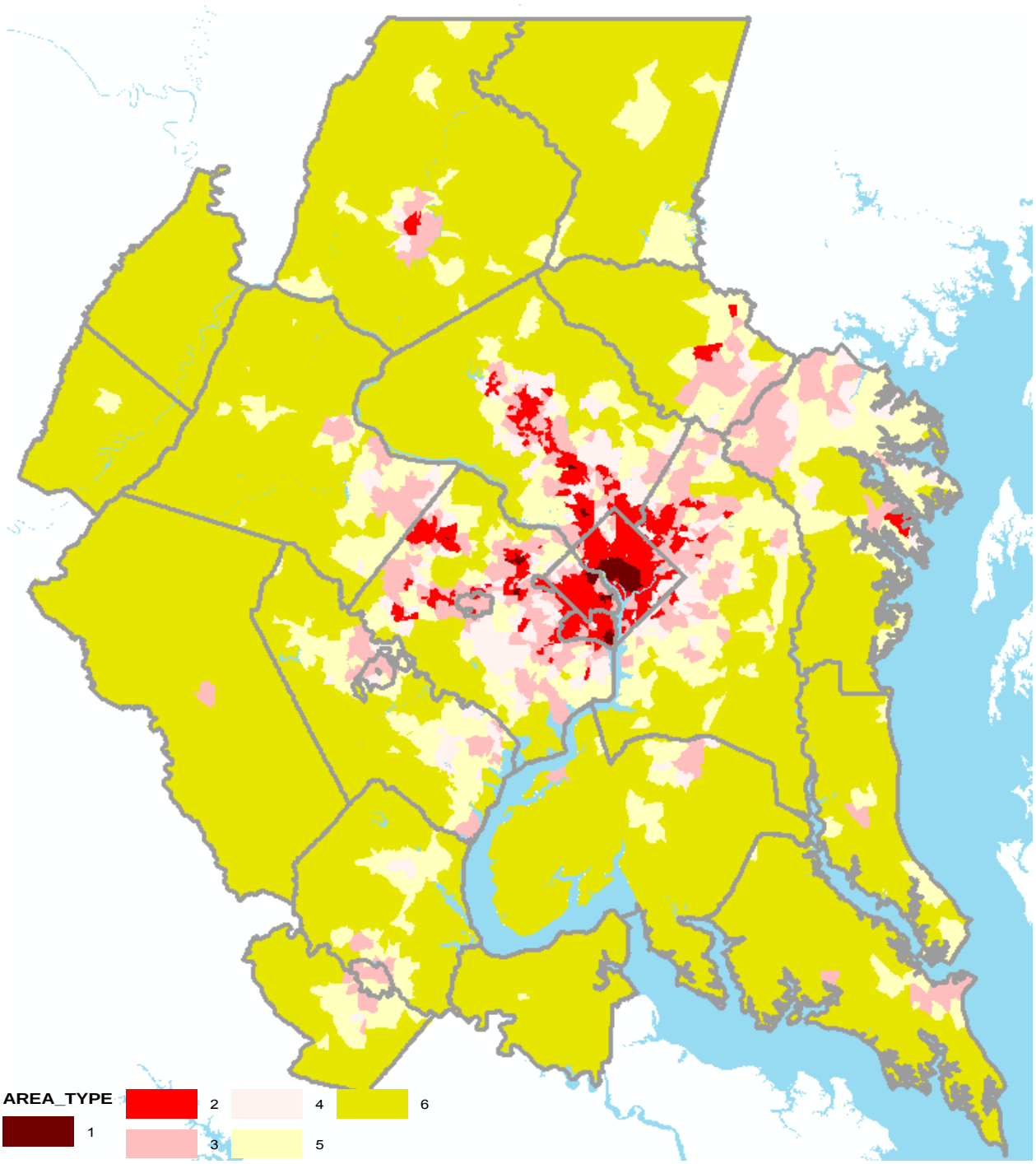

Figure 7 Revised area types used in the Version 2.3 travel model: Modeled area

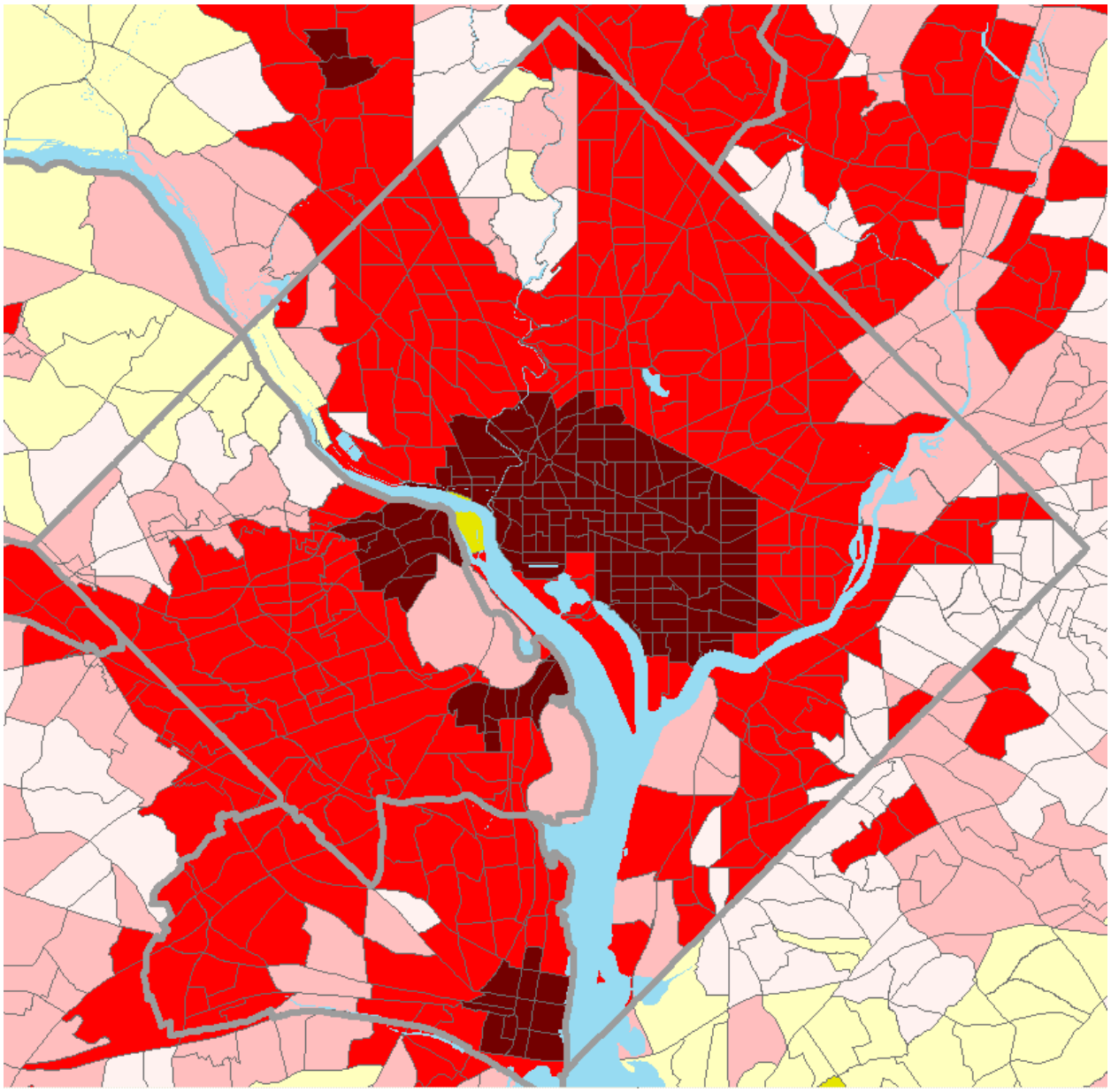

Figure 8 Revised area types used in the Version 2.3 travel model: the 10-mile square

The following names are associated with the six area types:

Table 24 Description of each area type and examples of each area type

Area Type	Name	Examples
1	High mixed employment and population density	1. Downtown DC, between Georgetown, Florida Ave., and 11th St. NE & SE 2. Old Town Alexandria 3. The Rosslyn/Court House area of Arlington Co. 4. Pentagon City area of Arlington Co. 5. Downtown Bethesda, Maryland 6. Center of Tysons Corner, Virginia
2	Medium/high mixed density	1. A majority of DC outside the downtown core 2. A majority of Arlington Co., south of Lee Highway 3. A majority of Alexandria 4. Areas of Tysons Corner just beyond the center 5. Annapolis, Maryland 6. Downtown Frederick, Maryland 7. Parts of Reston and Herndon, Virginia, along the Dulles Access/Toll Road
3	Medium employment density	1. Parts of upper NW DC near Rock Creek Park 2. Parts of Arlington along Lee Highway 3. National Airport 4. The Pentagon 5. Arlington Cemetery 6. BWI Airport 7. Potomac Mills mall in Woodbridge, Virginia
4	Medium population density	1. Parts of upper NW DC near Rock Creek Park 2. Parts of north Arlington 3. SE DC near the Capitol Heights Metrorail station 4. Chevy Chase, Maryland, near the DC border
5	Low density	1. Area along McArthur Boulevard in DC 2. Upper north Arlington Co. 3. Fort Hunt section of Fairfax Co. 4. Dulles Airport 5. Andrews Air Force Base
6	Rural	1. Great Falls, Virginia 2. Much of Loudoun Co., Virginia 3. Most of Fauquier Co., Virginia 4. Much of Charles, St. Mary's, and Calvert Counties, Maryland 5. Most of Frederick and Carroll Co., Maryland

Note that the Pentagon and Arlington Cemetery are area type 3 ("medium employment density"). This is due to the use of the one-mile floating density. Users of the travel model may wish to re-categorize Arlington Cemetery as "rural" (area type 6) and the Pentagon as area type 2 ("medium/high mixed density"). These can be reset using the area-type override capability that currently exists in the travel model.

While calibrating the trip generation model, a series of area-type adjustments were added to the model, as seen in Table 25.[33]

[33] Ronald Milone to Files, "Performance of trip generation models," Memorandum, November 18, 2010.

Table 25 Area-type adjustments developed in trip generation calibration

Motorized Production Adjustments

AreaType->	1	2	3	4	5	6
HBW	1.1358	1.1180	1.0554	0.9175	0.9577	0.9307
HBS	0.8092	0.9504	1.0793	0.9059	1.0751	0.8620
HBO	1.1067	1.1181	1.0303	0.9647	1.0109	0.8324
NHB	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
NHO	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Motorized Attraction Adjustments

AreaType->	1	2	3	4	5	6
HBW	1.0765	0.8478	0.9612	1.1045	0.9871	1.0383
HBS	0.7952	1.0967	1.1577	0.8770	0.9437	0.5187
HBO	1.1542	1.1304	0.9307	1.0635	1.0480	0.8032
NHB	1.1457	0.8686	0.9843	1.5731	1.1860	1.0919
NHO	0.7953	1.0652	1.0724	0.9180	1.0899	0.7224

Nonmotorized Production Adjustments

AreaType->	1	2	3	4	5	6
HBW	1.4424	1.1007	1.0554	0.9175	0.9577	0.9307
HBS	1.2222	1.2677	1.0793	0.9059	1.0751	0.8619
HBO	0.9363	1.3047	1.0303	0.9647	1.0109	0.8325
NHB	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
NHO	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Nonmotorized Attraction Adjustments

AreaType->	1	2	3	4	5	6
HBW	1.2809	1.0087	1.1436	1.3141	1.1746	1.2354
HBS	1.0758	1.2904	1.3709	1.0385	1.1175	0.6141
HBO	0.6886	1.2374	1.0476	1.1970	1.1796	0.9041
NHB	1.0477	1.0620	0.8302	1.3269	1.0004	0.9211
NHO	1.2008	1.0651	0.8146	0.6974	0.8280	0.5488

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In model application, these are supplemented with a series of jurisdiction-level production and attraction modification factors (p-mods and a-mods).

4.5 Non-Motorized Production Trip Model

The trip rates developed in trip generation reflect both motorized and non-motorized travel. The inclusion of non-motorized trips was intended to allow the modeler the ability to relate land use policy (e.g. land use mix, density, etc.) to the level of walking and bicycling, and its explicit effect on the reduction of motorized travel. However, the decision was also made early on that non-motorized trips should not be carried forth into trip distribution and mode choice steps given that the non-motorized

trips are extremely dissimilar in spatial scale compared to that of motorized travel (non-motorized trips predominantly occur within zones, or between adjacent zones). In Version 2.2 travel model, non-motorized trips were estimated using a fixed percentage developed based on area type and were only modeled for home-based work trips.[34]

In Version 2.3 of the model, non-motorized trip are estimated for all purposes. In addition, walking environment factors, sometimes referred to as pedestrian environment factors or PEFs, are considered in modeling these trips. Walking environment can be captured using parameters that can be estimated based on a GIS street layer and include block density, ratio of 4-way intersections to cul-de-sacs, and major/minor street density. All these parameters were considered in the non-motorized model, however, only block density proved to be a significant predictor of non-motorized trip percentage.

The percentage of non-motorized trips was modeled using linear regression for high density areas (area types 1 and 2). For other area types, too few non-motorized trips were observed to produce any meaningful model results and thus fixed percentages of non-motorized trips were assumed for each area type as shown in Table 26.[35] For area types 1 and 2, HBW and HBS/HBO models were estimated as shown in Table 27 and Table 28. Note that the no non-motorized trip models are developed at the production end for non-home-based trips.

Table 26 Production End Non-Motorized Trip Percentages for Area Types 3-6

Area Type	HBW	HBS	HBO	NHW	NHO	Total
3	2.45%	2.79%	8.19%	4.69%	4.20%	5.00%
4	1.15%	2.32%	7.36%	2.04%	3.99%	4.52%
5	0.42%	1.06%	5.10%	2.41%	3.10%	3.00%
6	0.81%	0.17%	3.58%	3.07%	1.77%	2.08%

[34] Ronald Milone et al., *TPB Travel Forecasting Model, Version 2.2: Specification, Validation, and User's Guide*, 4-8.
[35] Mary Martchouk to M Moran, "Validation of Non-Motorized Trip Model," Memorandum, October 27, 2010; Mary Martchouk to M Moran, "Development of the Non-motorized Trip End Model," Memorandum, October 7, 2010.

Table 27 HBW Non-Motorized Production-End Trip Model

Variable	Definition	Coefficient	Std. Error	T- stat.	P-value	Avg. Value
Constant		-0.00388	0.009633	-0.402	0.6875	
POPDEN10	One-mile floating population density (persons/sq. mile)	2.20E-06	1.12E-06	1.963	0.0496	8943
EMPDEN10	One-mile floating employment density (employees/sq. mile)	3.54E-06	1.85E-07	19.148	0	16520
BLKDEN05	Street block density (blocks/sq. mile)	0.000474	0.000124	3.82	0.0001	71.99
Adjusted R^2		0.44				
Number of Observations		758				

Table 28 Home-Based Shop (HBS) and Home-Based Other (HBO) Non-Motorized Production Trip Model

Variable	Definition	Coefficient	Std. Error	T- stat.	P-value	Avg. Value
Constant		-0.00870	0.01148	-0.758	0.4485	
POPDEN10	One-mile floating population density (persons/sq. mile)	1.110E-05	1.37E-05	8.141	0	8812
EMPDEN10	One-mile floating employment density (employees/sq. mile)	2.582E-06	2.30E-06	11.243	0	16150
BLKDEN05	Street block density (blocks/sq. mile)	0.00083426	0.00013	5.527	0	70.53
Adjusted R^2			0.40			
Number of Observations			786			

4.6 Trip Attraction Model

The trip attraction models are linear regression equations that use land use data, including employment and population, to predict the number of attractions in a TAZ. The equations were developed using district-level data from the 2007/2008 Household Travel Survey. Trip attractions are estimated by trip

purpose and two area type groupings (area types 1-2 and area types 3+).[36] The resulting trip attractions models are shown below.

HBW_Attr_1-2 = 1.118* TOTEMP

HBW_Attr_3+= 0.8546* TOTEMP

HBS_Attr_1-2= 1.995*RETEMP+ 0.301*TOTPOP

HBS_Attr_3+= 3.102*RETEMP+ 0.221*TOTPOP

HBO_Attr_1-2= 0.425*NONRETEMP+ 1.012*TOTPOP

HBO_Attr_3+= 1.084*NONRETEMP+ 0.588*RETEMP+ 0.777*TOTPOP

NHW_Attr_1-2= 0.944*RETEMP+ 0.557*OFFEMP+ 0.656*OTHEREMP

NHW_Attr_3+= 0.807*RETEMP+ 0.522*OFFEMP+ 0.507*OTHEREMP

NHO_Attr_1-2= 0.097*NONRETEMP+ 1.498*RETEMP+ 0.300*TOTPOP

NHO_Attr_3+= 0.178*NONRETEMP+ 2.784*RETEMP+ 0.184*TOTPOP

4.7 Non-motorized Attraction Trip Model

The non-motorized trip model on the attraction trip end is estimated similarly to the non-motorized trip model on the production trip end. For area types 3-6, a fixed percentage of non-motorized trips is assumed for each area type as shown in Table 29. For area types 1 and 2, the non-motorized trips are predicted as a function of the land use and walkability factors. The models are split by trip purpose into HBW, HBS/HBO/NHO, and NHW. However, since there are too few HBW non-motorized trip attractions, a fixed percentage of 4.87% is assumed. The HBS/HBO/NHO and NHW models are shown in Table 30 and Table 31.

[36] Mary Martchouk to M Moran, "Development of Trip Attraction Models," Memorandum, September 14, 2010.

Table 29 Attraction End Non-Motorized Trip Percentages for Area Types 3-6

Area Type	HBW	HBS	HBO	NHW	NHO	Total
3	1.71%	1.48%	6.19%	4.59%	4.26%	3.87%
4	2.33%	4.14%	9.28%	1.95%	3.87%	6.42%
5	0.77%	1.45%	5.67%	2.16%	3.19%	3.67%
6	1.41%	0.74%	5.28%	3.46%	1.23%	3.42%

Table 30 HBS/HBO/NHO Non-Motorized Attraction Trip Model

Variable	Definition	Coefficient	Std. Error	T- stat.	P-value	Avg. Value
Constant		-0.0157	0.00953	-1.647	0.0995	
POPDEN10	One-mile floating population density (persons/sq. mile)	1.08E-05	1.18E-04	9.203	0	8612
BLKDEN05	Street block density (blocks/sq. mile)	0.001294	0.000125	10.35	0	68.87
Adjusted R^2		0.37				
Number of Observations		822				

Table 31 NHW Non-Motorized Attraction Trip Model

Variable	Definition	Coefficient	Std. Error	T- stat.	P-value	Avg. Value
Constant		-0.00383	0.012245	-0.312	0.7547	
POPDEN10	One-mile floating population density (persons/sq. mile)	5.41E-06	1.48E-04	3.665	0.0002	8769
EMPDEN10	One-mile floating employment density (employees/sq. mile)	5.34E-06	2.30E-05	23.196	0	18003
BLKDEN05	Street block density (blocks/sq. mile)	0.001217	0.000165	7.382	0	70.43
Adjusted R^2		0.57				
Number of Observations		756				

4.8 Home-based Trip Attraction Income Disaggregation Model

The Version 2.3 trip distribution and mode choice models are applied by income level for the home-based trip purposes. Trip production stratification by income is straightforward since trip productions

are developed by income, along with size and vehicle availability levels. However, the trip attraction model calculates total trip attractions for each TAZ, and so, a technique is necessary for apportioning the total attractions among the four income levels, for each home-based purpose.

The approach for apportioning trip attractions by income level is one that assumes that the zonal income distribution is not substantially different from the regional income distribution. The approach does, however, allow for the income variation by area type which is an important consideration. Ideally, it would be desirable to know the type of employment in each TAZ as a basis for the distributing HBW attractions by income, or the type of retail employment as a basis for distributing HBS attractions by income. Unfortunately, this type of information is not currently available as an input to the travel model and cannot be considered.

The income distribution of HBW, HBS, and HBO trip attractions by area type is shown on Table 32, Table 33, and Table 34, respectively. These tables were summarized from the 2007/08 HTS. Table 32 indicates that 12.95% of regional attractions are comprised of income level 1 attractions. Table 32 also indicates that the regional proportion varies somewhat by area type. For example, the proportion of income level 1 attractions in area type 1 (high density urban) is about 9.6% of all attractions in area type 1, and this differential is reflected in the ratios shown at the bottom of Table 32 (the ratio of 9.4% to 12.95% is 0.74). This information will be used to perform the apportioning of total motorized attractions by income level. In application, the technique is will be performed for each purpose as follows:

1. Total motorized attractions will be computed for a TAZ.
2. The TAZ level trip attractions will be calculated by income level, by purpose, using the following equation:

Equation 3 Trip Attraction by Income Level

Attractions(L) = Total Attractions * Regional Pct(L) * Ratio (L,AT)

where:

Attractions(L)	= income level L trip attractions
Total Attractions	= Total trip attractions
Regional Pct(L)	= Regional percent of trip attractions of income L
Ratio (L,T)	= Ratio of area type T pct. of income L attractions to the regional pct.

3. The income-based attractions computed in step 2 will be normalized to the step 1 total.

The regional income percentage and the area type-based ratios for each HB purpose are read into the trip generation program as a parameter table (or a "lookup table"). After all TAZs have been processed, the zonal trip attractions in each income group are scaled to match the computed trip production totals. This method assures that the income distribution of attractions within area types will agree with that of the 2007/08 HTS. It is assumed that this distribution will remain stable over time.

Table 32 HBW Motorized Trip Attractions by Area Type and Income

Area Type	Income1	Income2	Income3	Income4	Total
1	80,191	241,965	287,102	222,871	832,129
2	101,088	288,627	309,459	204,419	903,593
3	147,866	350,939	345,579	195,381	1,039,764
4	30,640	67,420	44,367	28,069	170,496
5	61,816	139,199	133,200	49,754	383,969
6	34,570	73,482	63,813	19,652	191,517
Total	**456,170**	**1,161,633**	**1,183,521**	**720,146**	**3,521,469**

Income Distribution of HBW Trip Attractions by Area Type

Area Type	Income1	Income2	Income3	Income4	Total
1	9.64%	29.08%	34.50%	26.78%	100.00%
2	11.19%	31.94%	34.25%	22.62%	100.00%
3	14.22%	33.75%	33.24%	18.79%	100.00%
4	17.97%	39.54%	26.02%	16.46%	100.00%
5	16.10%	36.25%	34.69%	12.96%	100.00%
6	18.05%	38.37%	33.32%	10.26%	100.00%
Total	**12.95%**	**32.99%**	**33.61%**	**20.45%**	**100.00%**

Ratio of Area Type Income Distribution to the Regional Distribution

Area Type	Income1	Income2	Income3	Income4
1	0.7439	0.8815	1.0266	1.3097
2	0.8636	0.9683	1.0190	1.1062
3	1.0978	1.0232	0.9889	0.9189
4	1.3873	1.1988	0.7743	0.8050
5	1.2428	1.0990	1.0322	0.6336
6	1.3935	1.1631	0.9914	0.5018

Source: 2007/2008 HTS

Table 33 HBS Motorized Trip Attractions by Area Type and Income

Area Type	Income1	Income2	Income3	Income4	Total
1	20,757	42,349	37,159	27,709	127,974
2	95,882	191,413	204,988	128,509	620,791
3	165,345	381,588	368,510	159,232	1,074,675
4	56,739	117,664	112,012	58,191	344,607
5	72,449	211,873	201,293	60,035	545,650
6	30,362	54,583	60,979	22,475	168,398
Total	**441,533**	**999,471**	**984,940**	**456,151**	**2,882,095**

Income Distribution of HBS Trip Attractions by Area Type

Area Type	Income1	Income2	Income3	Income4	Total
1	16.22%	33.09%	29.04%	21.65%	100.00%
2	15.45%	30.83%	33.02%	20.70%	100.00%
3	15.39%	35.51%	34.29%	14.82%	100.00%
4	16.46%	34.14%	32.50%	16.89%	100.00%
5	13.28%	38.83%	36.89%	11.00%	100.00%
6	18.03%	32.41%	36.21%	13.35%	100.00%
Total	**15.32%**	**34.68%**	**34.17%**	**15.83%**	**100.00%**

Ratio of Area Type Income Distribution to the Regional Distribution

Area Type	Income1	Income2	Income3	Income4
1	1.0587	0.9542	0.8499	1.3677
2	1.0085	0.8890	0.9663	1.3076
3	1.0046	1.0239	1.0035	0.9362
4	1.0744	0.9844	0.9511	1.0670
5	0.8668	1.1197	1.0796	0.6949
6	1.1769	0.9345	1.0597	0.8433

Source: 2007/2008 HTS

Table 34 HBO Motorized Trip Attractions by Area Type and Income

Area Type	Income1	Income2	Income3	Income4	Total
1	62,588	104,036	102,072	91,767	360,463
2	232,338	416,417	418,281	285,700	1,352,736
3	207,625	572,863	552,918	310,960	1,644,367
4	136,070	326,709	315,535	187,180	965,495
5	151,018	504,410	521,081	241,014	1,417,524
6	60,220	235,598	277,858	106,643	680,319
Total	**849,860**	**2,160,033**	**2,187,745**	**1,223,265**	**6,420,904**
Income Distribution of HBO Trip Attractions by Area Type					
Area Type	Income1	Income2	Income3	Income4	Total
1	17.36%	28.86%	28.32%	25.46%	100.00%
2	17.18%	30.78%	30.92%	21.12%	100.00%
3	12.63%	34.84%	33.62%	18.91%	100.00%
4	14.09%	33.84%	32.68%	19.39%	100.00%
5	10.65%	35.58%	36.76%	17.00%	100.00%
6	8.85%	34.63%	40.84%	15.68%	100.00%
Total	**13.24%**	**33.64%**	**34.07%**	**19.05%**	**100.00%**
Ratio of Area Type Income Distribution to the Regional Distribution					
Area Type	Income1	Income2	Income3	Income4	
1	1.3112	0.8579	0.8312	1.3365	
2	1.2976	0.9150	0.9075	1.1087	
3	0.9539	1.0357	0.9868	0.9927	
4	1.0642	1.0059	0.9592	1.0178	
5	0.8044	1.0577	1.0790	0.8924	
6	0.6684	1.0294	1.1987	0.8231	

Source: 2007/08 HTS

4.9 Truck Model

The origin/destination truck trip generation rates are based on area type and land activity variables as shown in Table 35. The truck trip generation model also includes provisions to remove external trucks generated because external truck travel is accounted for exogenously. The truck trip generation process also includes network checks provisions to ascertain whether or not truck access from each TAZ to the highway network is valid. There are some zonal centroids in the regional network that have a single connection to a parkway where trucks are prohibited. In these types of cases, truck trip generation is suppressed. Finally, the truck model also considers a limited number of special generator TAZs, or locations where truck traffic generation is known to be more intensive. Global trip generation adjustments are applied to the special generator TAZs. The medium truck generation is factored by 2.70 while heavy trucks are factored by 5.3.

Table 35 Truck trip generation rates as a function of truck type, area type, and land use category[37]

Vehicle Type	Area Type	Land Use Category				
		Office	Retail	Industrial	Other	HH
Medium Truck (Single Unit 6+ Tires)	1 (CBD)	0.004	0.088	0.088	0.014	0.070
	2 - 4	0.005	0.125	0.125	0.020	0.100
	5	0.006	0.150	0.150	0.024	0.120
	6	0.006	0.150	0.150	0.024	0.120
Heavy Truck (All Combination Vehicles)	1 (CBD)	0.001	0.027	0.055	0.002	0.011
	2 - 4	0.002	0.039	0.078	0.003	0.015
	5	0.002	0.043	0.086	0.003	0.017
	6	0.002	0.043	0.086	0.003	0.017

Ref: I:\ateam\docum\FY09\Version2.3_modelDoc_2008-07\tgcheck.xls

4.10 Commercial Vehicle Model

The trip generation of zonal commercial vehicle trips is developed with the equation shown below:[38]

Equation 4 Trip generation of commercial vehicle trips

COM productions =
(0.056*indemp + 0.168*offemp + 0.494*retemp + 0.082*othemp + 0.130* HH)*ATFAC

(attractions = productions, by zone)

where:

indemp = industrial employment
offemp = office employment
retemp = retail employment
othemp = other employment
HH = households
ATFAC = area type adjustment factor:

Area type	Factor
1	1.05
2	0.90
6	1.20

Note: no factor is applied to area types 3-5.

[37] Allen, *Development of a Model for Truck Trips*.
[38] Allen, *Development of a Model for Commercial Vehicle Trips*, 46.

4.11 References

{Bibliography}

Chapter 5 Trip Distribution

The Version 2.3 trip distribution model involves a standard gravity model approach and the use of a composite (highway and transit) travel time impedance measure. The model also employs income stratification as well as special external (i.e., external-to-internal, X/I, and internal-to-external, I/X) auto and truck distribution models. The Version 2.3 trip distribution process is identical to that of Version 2.2, except that, first, the truck F-Factors have been revised,[39] and, second, the output formats of trip table have been changed from an integer format to a real number format (two-decimals).

5.1 Model Structure

The Version 2.3 trip distribution model is used to develop zonal trip tables corresponding to the eight basic trip purposes:

- HBW, HBS, HBO, NHW, and NHO motorized person trips,
- Commercial vehicle trips, and
- Medium and heavy truck trips.

The Version 2.3 trip distribution process consists of several different distribution models that are developed for special travel markets within the eight basic purposes. As can be seen in Table 36, there are 17 markets for internal (I-I) trips and 13 markets for external (I-X, X-I) trips, which leads to 30 trip distribution markets.

Table 36 Trip distribution markets

Purpose/Mode	Internal (I-I) trips	External (I-X, X-I) trips
HBW person	4 income strata	2 facility types: interstate and arterial
HBS person	4 income strata	2 facility types: interstate and arterial
HBO person	4 income strata	2 facility types: interstate and arterial
NHW person	1 (non-stratified)	2 facility types: interstate and arterial
NHO person	1 (non-stratified)	2 facility types: interstate and arterial
Commercial vehicles	1 (non-stratified)	1 (non-stratified)
Medium truck	1 (non-stratified)	1 (non-stratified)
Heavy truck	1 (non-stratified)	1 (non-stratified)
Total internal/ext. markets	**17**	**13**
Total markets modeled		**30**

For the current calibration effort, 14 of the 30 trip distribution markets have been re-calibrated using the observed motorized trips from the 2007/2008 Household Travel Survey data and year 2007 highway

[39] Allen, *Development of a Model for Truck Trips*.

and transit networks (See Table 37).[40] These 14 markets account for the vast majority of motorized travel in the region. The external distribution models were not re-estimated as no external survey data has been recently collected for these markets. Similarly, the internal trip distribution markets for commercial vehicles and trucks were not re-estimated. Consequently, the "legacy" friction factor (F-factor) curves used in the Version 2.2 model will be maintained for the other 16 markets. The commercial vehicle and truck models calibrated in 2008 on the 2,191-TAZ area system were preserved and adapted to operate on the 3,722-TAZ area system.[41]

Table 37 Trip distribution markets that were re-calibrated

Purpose/Mode	Internal Person Models
HBW person	4 Income Strata
HBS person	4 Income Strata
HBO person	4 Income Strata
NHW person	1 (non-stratified)
NHO person	1 (non-stratified)
Total Markets	14

5.2 Internal Motorized Person Models

The Version 2.3 trip distribution model includes income stratification for the home-based trip purposes. The model also makes use of a composite time formulation involving both highway and transit travel times. The composite time formulation is desirable since many corridors in the Washington region are well served by transit and the consideration of highway time only (as has been used in some previous model versions) has the potential to understate accessibility. The definition of the composite time is:

[40] Ron Milone to Files, "Version 2.3 Trip Distribution Calibration," Memorandum, January 2, 2011.
[41] Ronald Milone to Hamid Humeida and M Moran, "Conversion Truck Modeling Inputs for the 3722 System," Memorandum, March 26, 2010; Hamid Humeida to Files, "Development of an equivalency file to convert truck modeling inputs from the 2191 TAZ system to the new 3722 TAZ system," Memorandum, April 16, 2010.

Equation 5 Composite time

$$CT_i = \frac{1}{\frac{1}{HT + TollT_i} + \frac{P_i}{TT}}$$

where

CT_i = Composite time for income level i
HT = Congested highway time (minutes), including terminal time
$TollT_i$ = Time equivalent (minutes)of tolls associated with the minimum-time path for income i
P_i = Regional transit share of income i for the trip purpose
TT = Metrorail-related transit time (min.), including in-vehicle and out-of-veh. time components

The highway and transit times used in the formulation vary by purpose. AM peak highway/transit times are used for the HBW purpose and midday highway/transit times are used for the remaining HBS, HBO, NHW and NHO purposes. The highway time (HT) includes both over-the-network times as well as terminal times, e.g., parking and retrieving a vehicle, which vary from 1 to 5 minutes depending on the area type of the origin/destination. Since the trip distribution model not only distributes trips between zones, but also determines the number of trips that stay within each zone, the average travel time for intra-zonal trips must be estimated. The intra-zonal highway times have been set to 85% of the minimum inter-zonal time. The previous assumption (50% of the minimum intra-zonal time) was found to yield an overestimation in intra-zonal travel and so the percentage was increased to better approximate the observed intra-zonal proportions. The regional share of transit trips made by each income group (P_i) is shown in Table 38 as percents. The table indicates that work transit shares vary by income, from 0.1483 to 0.1851. The transit percentages for the remaining purposes vary by income group from 0.0104 to 0.1239. Since these values are relatively small, the effect of highway times will be generally more pronounced on the overall composite time function compared to the effect of transit times for most interchanges.

Table 38 Internal Motorized Trips and Transit Percentages by Purpose and Mode

Purpose	Mode	Income Level <50k	50k - 100k	100k - 150k	>150k	Total
HBW	Transit	84,443	181,611	199,065	106,767	571,886
	Auto Person & Transit	456,170	1,161,633	1,183,520	720,145	3,521,468
	Transit Percentage	*18.51%*	*15.63%*	*16.82%*	*14.83%*	*16.24%*
HBS	Transit	35,553	18,377	11,572	4,748	70,250
	Auto Person & Transit	441,532	999,471	984,941	456,151	2,882,095
	Transit Percentage	*8.05%*	*1.84%*	*1.17%*	*1.04%*	*2.44%*
HBO	Transit	105,308	49,816	41,030	19,324	215,478
	Auto Person & Transit	849,860	2,160,034	2,187,745	1,223,266	6,420,905
	Transit Percentage	*12.39%*	*2.31%*	*1.88%*	*1.58%*	*3.36%*
NHW	Transit	20,858	38,214	51,402	29,110	139,584
	Auto Person & Transit	183,863	549,589	557,211	320,450	1,611,113
	Transit Percentage	*11.34%*	*6.95%*	*9.22%*	*9.08%*	*8.66%*
NHO	Transit	35,845	10,999	12,305	6,216	65,365
	Auto Person & Transit	478,859	1,050,166	950,672	437,335	2,917,032
	Transit Percentage	*7.49%*	*1.05%*	*1.29%*	*1.42%*	*2.24%*
All	Transit	282,007	299,017	315,374	166,165	1,062,563
	Auto Person & Transit	2,410,284	5,920,893	5,864,089	3,157,347	17,352,613
	Transit Percentage	*11.70%*	*5.05%*	*5.38%*	*5.26%*	*6.12%*

Source: 2007/08 HTS, Ref: 2007_HTS_Trips_by_Mode&Income.xlsx

Some points can be made regarding the composite time function. First, for interchanges that are not served by transit, the composite time function reflects highway time. Second, the presence of transit service will generally contribute a small benefit to the travel time, since the regional transit shares are relatively small. Nonetheless, the composite time function will still reflect some travel time benefit with the presence of competitive transit service. This benefit would not be captured with an impedance measure based on highway time alone.

The highway time in the composite time function consists of both over-the-network time combined with terminal times (both production and attraction-end times). The highway time also includes toll values accumulated along the path that have been transformed into equivalent minutes.

The time-cost equivalents are provided by income level and purpose, and are shown on Table 39. These equivalents were developed using 2007 ACS income data and are described in greater detail in Chapter 2 ("Set-Up Programs and Highway Network Building") of the Version 2.3 model user's guide.

The basis of the $TollT_i$ term calculation is specified in Table 39. The table indicates the average time valuation (minutes per 2007 dollar) assigned to a toll value by income level and trip type (in 2007

dollars). The table indicates, for example, that a $1.00 toll equates to 8.7 minutes of travel time for a traveler in income level 1. More generally, the table indicates that travelers commuting to work are less sensitive to tolls than non-work-bound travelers because the time valuation of commuters is relatively high. The table also reflects the intuitive generalization that lower income travelers are more sensitive to tolls than the higher income travelers. Table 40 indicates assumed average time valuations by time period and mode. The values shown on Table 40 are not used in the distribution step, but will be used in the traffic assignment process, where income is not considered but highway mode is considered.

Table 39 Time Valuation (Minutes/2007$) by Purpose and Income Level

HH Income Quartile Range (1)	Mid-Point of HH Income Range	Hourly Rate per Worker (2)	2007 Time Valuation (Minutes per Dollar) Work Trips (75% V.O.T.)	Non-work (50% V.O.T.)
$ 0 - $ 50,000	$25,000	$9.23	8.7	13.0
$ 50,000 - $ 100,000	$75,000	$27.70	2.9	4.3
$100,000 - $150,000	$125,000	$46.17	1.7	2.6
$150,000 +	$175,000	$64.64	1.2	1.9

Notes:

(1) Income groups based on 2007 ACS-based quartiles

(2) Hourly rate based on 1,920 annual hours/worker * 1.41 workers/HH = 2,707 hrs/HH

(3) Median 2007 Annual Income for modeled area is $84,280

Table 40 Time valuation (minutes per year 2007 dollar) by vehicle type and time period, used in traffic assignment

	Equivalent minutes per dollar			
Mode	AM Peak	Midday	PM Peak	Night
SOV	2.5	3.0	3.0	3.0
HOV 2-occupant auto	1.5	4.0	2.0	4.0
HOV 3+occupant auto	1.0	4.0	1.0	4.0
Light duty commercial vehicle	2.0	2.0	2.0	2.0
Truck	2.0	2.0	2.0	2.0
Auto serving airport passenger	2.0	2.0	2.0	2.0

Time_Valuation_V2.3.xls

5.3 External Auto Person , commercial vehicle, and truck models

The external trip distribution models segment markets by purpose and facility. Facilities are distinguished as interstates (or interstate-like facilities) and arterial facilities. The rationale behind this distinction is that arterial facilities tend to serve more localized traffic associated with shorter trip lengths while interstate travel is associated with longer trip lengths. In contrast, the external commercial vehicle and truck models (medium and heavy) are not segmented by facility types.

The highway time is used as the impedance measure in the distribution of external trips. AM peak time is used for the HBW purpose and midday times are used for all remaining purposes. The external calibration does not make use of time penalties added into the impedance files. However, the impedances are altered in that extremely large time values were inserted into internal and through (I-I, X-X) interchanges to preclude those types of interchanges from occurring in the trip distribution process.

5.4 Friction Factor Summary

The process of calibrating F-factors for each purpose and income strata was established after the observed trip files and network files were prepared. Developing F-factors is a trial-and-error process. Test F-factors are used in a gravity model (GM) execution and then subsequently adjusted based on a comparison of observed and estimated trip lengths made for each one-minute increment of travel time. The calculation used to adjust the F-factor is as follows:

Equation 6 Friction factor calibration

$F_{adjusted} = F_{used} *$ Observed Pct./Estimated Pct.

where

$F_{adjusted}$ = Adjusted F-factor to be used in a future GM execution
F_{used} = Tested F-factor used in a previous GM execution
Observed Pct. = Percentage of observed trips observed
Estimated Pct. = Percentage of estimated trips resulting from the use of the test F-factors

The resulting adjusted F-curve typically appears as a “saw-tooth” looking function because the observed trip percent is subject to varying degrees of sampling error from one impedance unit to the next. An

irregular function is not desirable for modeling. Consequently, a nonlinear curve fitting is used for "smoothing" the adjusted F-factor curve.

The Gamma function was selected for smoothing the adjusted F-factor function. The form of the function is:

$$F_i = A \times I^B \times e^{-GI}$$

where

F_i = "Smoothed", adjusted F-factor at impedance unit I
I = travel impedance (usually time in minutes)
A, B, G = Gamma function coefficients to be statistically estimated
e = Euler's number; base of natural logarithms

The resulting Gamma coefficients are listed on Table 41. Friction factors are also shown graphically in Figure 9, Figure 10, Figure 11, and Figure 12.

Table 41 Estimated Gamma Distribution Values by Purpose and Income Strata

Purpose	Strata	Beta	Gamma
HBW	Income 1	-0.95818	-0.04622
	Income 2	-1.41425	-0.02571
	Income 3	-1.49461	-0.01920
	Income 4	-1.88024	-0.00835
HBS	Income 1	-2.46334	-0.07853
	Income 2	-1.33371	-0.12170
	Income 3	-1.99113	-0.09033
	Income 4	-2.91461	-0.06704
HBO	Income 1	-1.83692	-0.09635
	Income 2	-1.92946	-0.07128
	Income 3	-1.72297	-0.08637
	Income 4	-2.44221	-0.05837
NHW		-2.34915	-0.01478
NHO		-1.77486	-0.07430

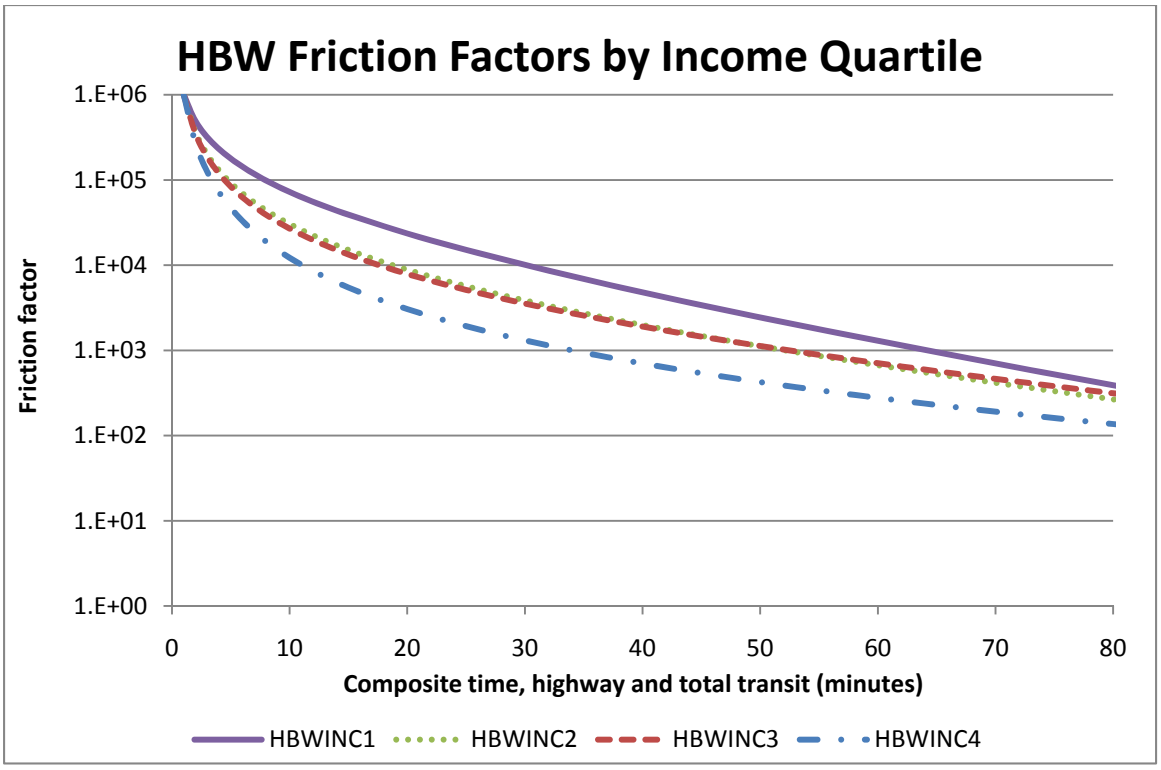

Figure 9 HBW Friction Factors

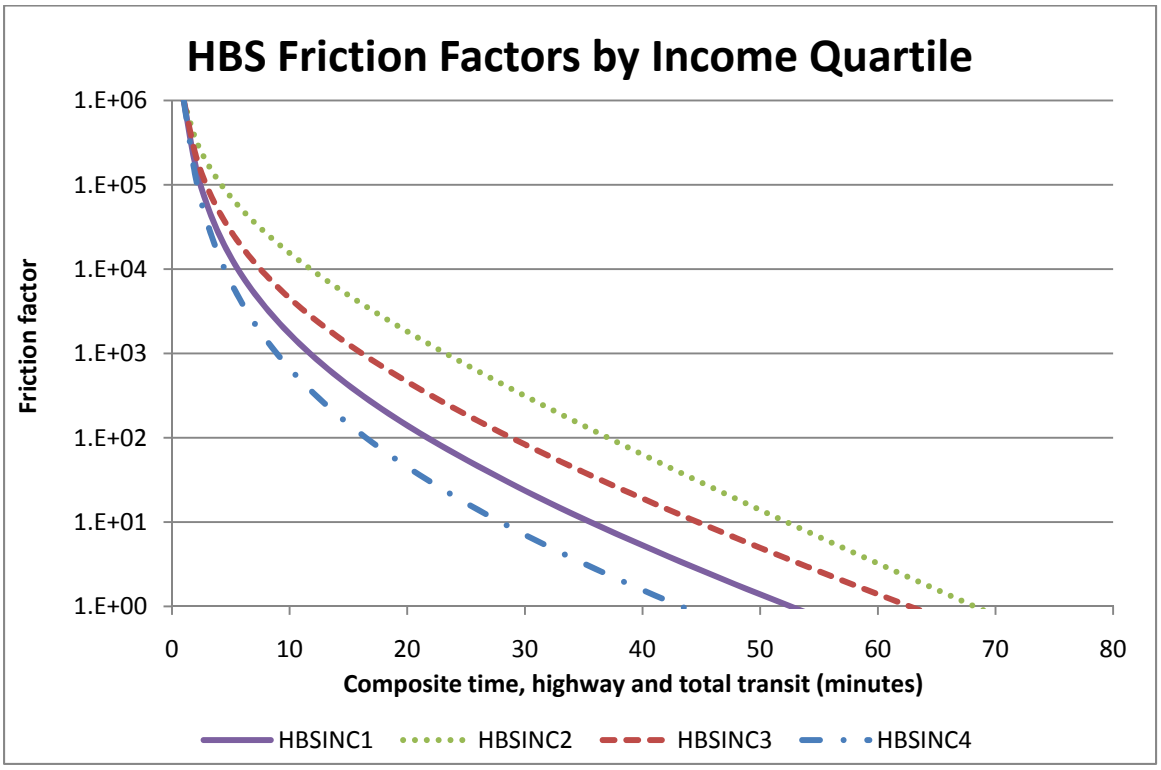

Figure 10 HBS Friction Factors

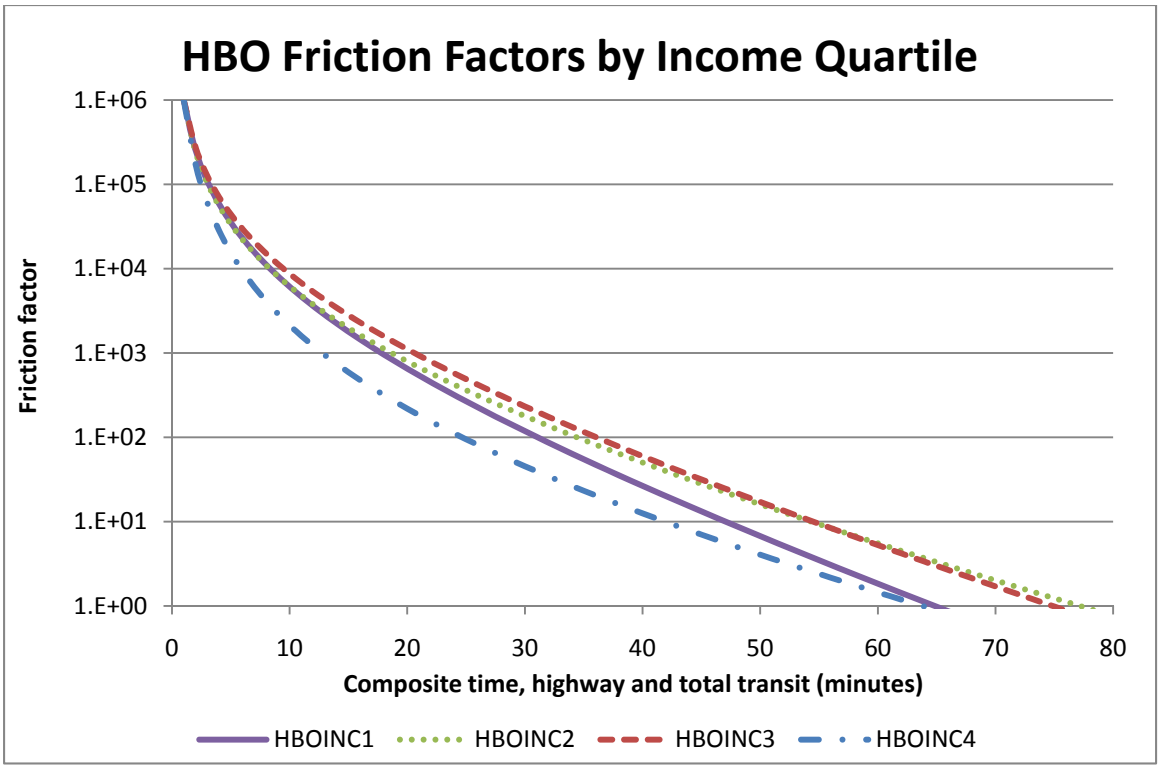

Figure 11 HBO Friction Factors

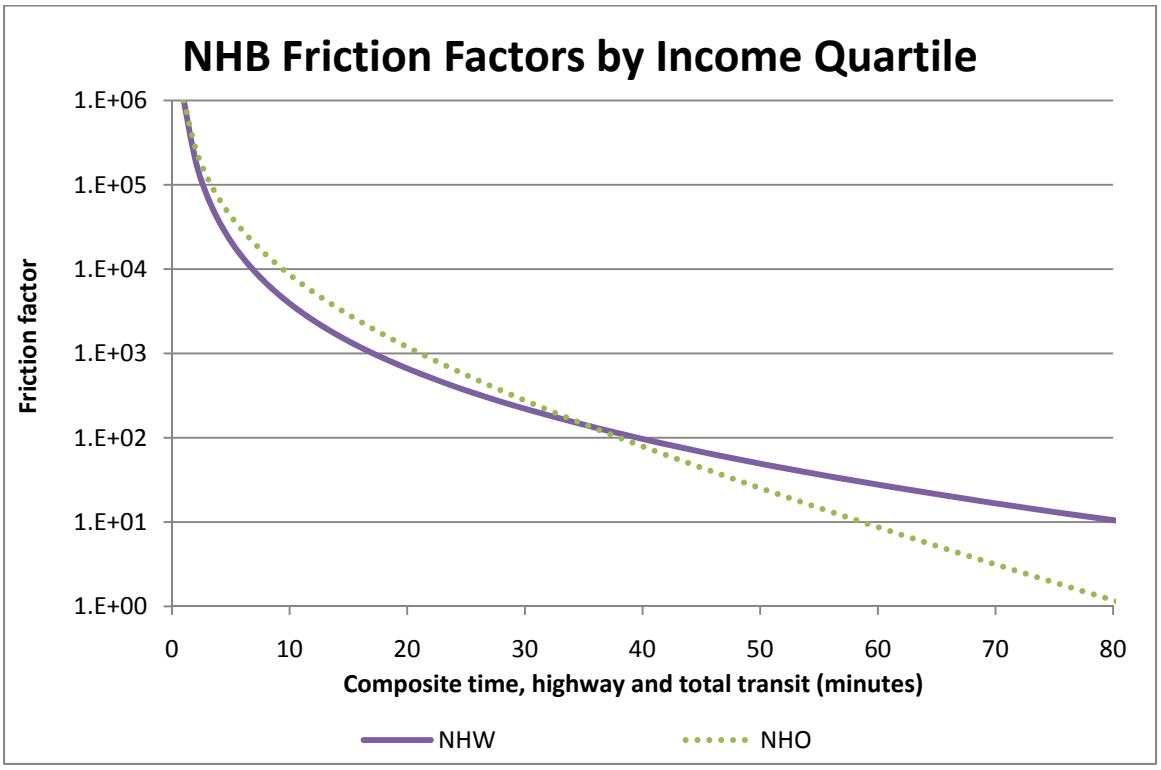

Figure 12 NHB Friction Factors

Table 42 presents a summary of estimated and observed trip lengths and intra-zonal percentages resulting from the calibrated F-factors, which are reasonable.

Table 42 Regional Estimated and Observed Trip lengths and Intra-zonal Percentages

	Income	HTS	Trip Length in Composite mins.			Intrazonal Percentage		
Purpose	Level	Trips	Est.	Obs.	Est.-Obs.	Est.	Obs.	Est.-Obs.
HBW	1	456,200	33.69	35.58	-1.89	3.12	3.22	-0.10
	2	1,161,600	46.54	47.21	-0.67	3.00	2.92	0.08
	3	1,183,500	52.47	51.33	1.14	2.02	1.97	0.05
	4	720,100	53.57	52.21	1.36	1.41	1.62	-0.21
HBS	1	441,500	16.56	16.81	-0.25	9.13	9.33	-0.20
	2	999,500	16.82	17.17	-0.35	8.98	9.84	-0.86
	3	984,900	17.30	17.70	-0.40	7.88	7.68	0.20
	4	456,200	16.83	17.13	-0.30	6.37	5.19	1.18
HBO	1	849,900	16.73	18.31	-1.58	9.36	7.90	1.46
	2	2,160,000	17.61	17.86	-0.25	11.60	11.06	0.54
	3	2,187,700	17.15	17.77	-0.62	9.92	12.15	-2.23
	4	1,223,300	17.00	17.92	-0.92	9.56	9.12	0.44
NHW	(n/a)	1,611,100	24.63	23.58	1.05	10.63	7.44	3.19
NHO	(n/a)	2,917,000	17.13	17.50	-0.37	17.33	14.61	2.72

The calibration procedure is described in more detail in a recent memorandum,[42] which includes trip-length frequency distributions comparing estimated and observed trips.

5.5 References

{Bibliography}

[42] Ron Milone to Files, "Version 2.3 Trip Distribution Calibration."

Chapter 6 Mode choice

6.1 Overview

A mode choice model is used to apportion motorized person trips by travel mode. The mode choice model in the TPB Version 2.3 travel model on the 3,722-TAZ area system is a 15-choice, nested-logit mode choice (NLMC) model. The model includes three auto modes (drive alone, shared ride 2-person, and shared ride 3+person) and four transit modes (commuter rail, all bus, all Metrorail, and combined bus/Metrorail) by three modes of access to transit (park and ride, kiss and ride, and walk), as shown in Figure 13.

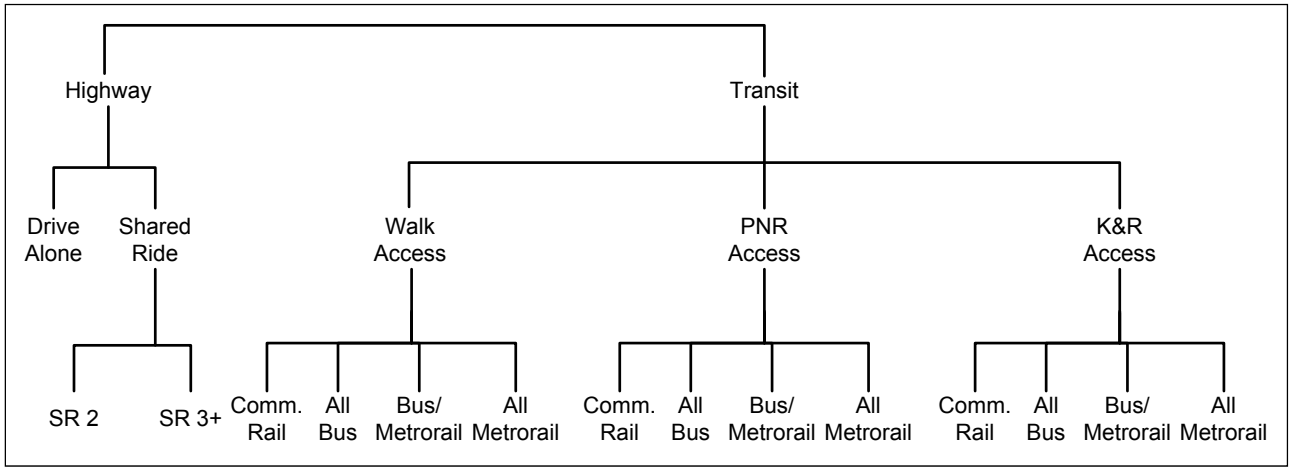

Figure 13 Nesting structure of the nested-logit mode choice model in the Version 2.3 travel model

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The definition of high-occupancy vehicle (HOV) trips has changed, compared to the definition that was used in Version 2.2 and before. Previously, HOV trips coming out of the mode choice model referred to *only those that use HOV facilities for a substantial portion of their trip*. Similarly, in previous models, the definition of low-occupancy vehicle (LOV) included both drive-alone and carpools (provided the carpools did not use a preferential HOV facility). By contrast, in the Version 2.3 NLMC model, the term LOV refers to only the drive-alone trips. Similarly, HOV refers to all shared-ride 2 (2-person carpools) and shared-ride 3 (3+ person carpools), irrespective of whether they use an HOV facility or not.

In terms of access to transit, park-and-ride (PNR) access means driving to transit and parking a motor vehicle at the PNR lot, for the purpose of boarding a transit vehicle at the transit stop. Similarly, kiss-and-ride (KNR) access, also known as "ride to transit," means accessing transit by driving in cases where one either 1) is dropped-off/picked-up or 2) rides with a PNR driver. Motorized person trips are those that occur in motorized vehicles, such as cars, trains, buses, and subways. Motorized trips exclude walk and bike trips. However, as noted above, walking is represented in the model as one of the three access modes to transit. The NLMC model is applied at the zone-to-zone interchange level after trip distribution and before highway and transit assignment (i.e., within what is known as the "speed feedback loop" of the four-step model). The model is applied using a Fortran program named AEMS

(AECOM mode split modeling package).[43] AEMS is completely parametric, i.e., all characteristics for any given mode choice model are specified in a control file. Characteristics represented in the control file include nesting structure, market segmentation, utility/disutility functions, and the values of coefficients and constants. AEMS can handle models with any nesting structure and up to 15 choices.[44] AEMS and its control files are described in more detail in the Version 2.3 travel model user's guide.

There are five NLMC models – one for each trip purpose: home-based work (HBW), home-based shop (HBS), home-based other (HBO), non-home-based work (NHW), and non-home-based other (NHO). Each of the five models shares the same nesting structure (shown in Figure 13), but each has its own set of coefficients and constants, discussed later in this chapter. In model application, the inputs to the TPB Version 2.3 nested logit mode choice model are

- Motorized person trips, segmented by four income levels and 20 geographic market segments, in production/attraction format (these are output from the trip distribution step);
- Highway "skims" (i.e., zone-to-zone travel times and costs), which come from the highway path building and skimming process;
- Transit "skims," which come from the transit path building and skimming process; and
- Zonal attributes, such as parking cost, terminal time (i.e., the time to park and "unpark" a car), and the percent of each zone that is within walking distance to transit (where two walking distances are defined: short and long).

The HBW mode choice model was calibrated with and is applied with transit and highway skims corresponding to the AM peak period. The non work (i.e., HBS, HBO, NHW, and NHO) mode choice models were calibrated with and are applied with transit and highway skims corresponding to the midday period.

Two of the most significant changes between the NLMC model and its predecessor (the sequential multinomial logit, or SMNL, mode choice model found in the Version 2.2 travel model) are that the NLMC model handles 15 choices (up from five, previously) and the NLMC model provides sufficiently detailed output, such that a transit assignment can be performed.

Although not explicitly listed as one of the four transit travel modes, the NLMC model can also model light rail transit (LRT), bus rapid transit (BRT), and street car.[45] A description of how LRT, BRT, and streetcar are represented in the model can be found in the mode choice chapter of the Version 2.3 travel model user's guide (Chapter 11). Other significant changes, compared to past TPB mode choice models, include the new definition of HOV trips (mentioned earlier), revised methods for coding access to transit (both walk and drive), revised procedures for calculating the percent of each zone within walking distance to transit, and more detailed transit path-building procedures -- transit paths by transit

[43] AECOM Consult, Inc., *AECOM Consult Mode Choice Computation Programs, AEMS, Users Guide*, Draft report (Fairfax, Virginia: AECOM Consult, Inc., April 5, 2005).
[44] A newer version of AEMS is now available that can handle up to 18 choices.
[45] Manish Jain to Ronald Milone and M Moran, "MWCOG network coding guide for Nested Logit Model," Memorandum, February 2008, 10.

sub-mode and access mode, yielding 11 paths for each of the two time-of-day periods (AM peak period and midday period).

6.2 Background

The nested-logit mode choice model in the TPB Version 2.3 travel model nested-logit mode choice model is a descendant of an earlier nested-logit model developed by AECOM Consult, Inc. for the Washington Metropolitan Area Transit Authority (WMATA). The TPB nested-logit mode choice model and its predecessor, the AECOM/WMATA nested logit mode choice model, share many traits, but also have some key differences. Table 43 summarizes the key differences between these two models. More information can be found on pages 6-2 to 6-8 of the earlier Version 2.3 model documentation.[46]

[46] Ronald Milone et al., *TPB Travel Forecasting Model, Version 2.3: Specification, Validation, and User's Guide*, Draft report (Washington, D.C.: Metropolitan Washington Council of Governments, National Capital Region Transportation Planning Board, June 30, 2008), 6-2 to 6-8.

Table 43 Comparison of characteristics found in both the AECOM/WMATA NLMC model and the TPB NLMC model

Item	AECOM/WMATA NLMC	TPB NLMC
Travel modes	15 (3 auto, 12 transit)	Same
Nesting structure	3 levels, including auto by occupancy and transit by access mode	Same
Model application code	AEMS Fortran program	Same
How the mode choice model is applied	As a post process to the regional travel model	Within the speed feedback loop of the regional travel model (i.e., after trip distribution and before traffic assignment)
Trip purposes	3 (HBW, HBS/O, and NHB)	5 (HBW, HBS, HBO, NHW, and NHO)
Types of travel skims	2 (AM peak period and off peak period)	2 (AM peak period and **midday** period)
Number of mode choice models	6 (HBW AM, HBW OP, HBS/O AM, HBS/O OP, NHB AM, and NHB OP)	5 (HBW AM, HBS MD, HBO MD, NHW MD, and NHO MD)
Geographic market segmentation	7 superdistricts; 20 production/attraction interchanges	Same
Economic market segmentation	Households stratified by income (four levels)	Same
Revised transit access coding	• Additional information to describe transit stations; • A new way to code sidewalks and walk-access-to-transit links; • A new way to code drive-access-to-transit links; • Additional coding detail around Metrorail stations with "park and ride" access; and • Revised procedures for calculating the percent of each zone that is within walking distance to transit	Same, except the item in the fourth bullet has not been adopted: • Additional coding detail around Metrorail stations with "park and ride" access;
Calibration year	2002	2007/2008
Data used for calibration	2002 WMATA Metrorail survey; 2000 Regional bus survey; Boarding counts for express bus and commuter rail	2008 Metrorail Survey; 2008 Regional Bus Survey, supplemented by the Fairfax Connector Bus Survey; 2007-2008 On-Board Survey of Maryland Transit Administration (MTA) Riders; 2005 Virginia Railway Express (VRE) Passenger Survey
Calibration approach	Calibrated by AECOM for 6 models applied as a post process	Re-calibrated by TPB staff for 5 models. Applied as an integral part of the speed feedback loop
Calibration programs	Used the Fortran program CALIBMS to automate the process of calculating nesting constants	Same

6.3 Detailed description of the TPB nested-logit mode choice model

The NLMC model in TPB's Version 2.3 travel model can be thought of as consisting of four parts, each of which is described below:

1. A set of available modes/choices (15) and a nesting structure;
2. Rules for market segmentation
3. A set of utility equations, which include time and cost coefficients and also income constants;
4. A set of nesting *coefficients* (a.k.a. logsum parameters or Φ) and nesting *constants* (NC).

6.3.1 Choice set and nesting structure

The choice set and nesting structure of the NLMC model in the Version 2.3 travel model was already described in section 6.1 on page 67.

6.3.2 Market segmentation

The TPB NLMC model is market segmented by household income level, geography, and by access to transit. This three-way market segmentation scheme was developed by AECOM Consult, Inc. for the AECOM/WMATA NLMC model and was retained by TPB staff. The income segmentation is the same that is used for the first two steps of the travel model (i.e., trip generation and trip distribution), namely households are segmented by the four household income levels. As for geographic market segmentation, AECOM Consult, Inc. divided the modeled area into seven superdistricts: [47]

1. DC core
2. VA core
3. DC urban
4. MD urban
5. VA urban
6. MD suburban
7. VA suburban

These seven superdistricts are also shown in Figure 14. Although seven market areas could lead to 49 (= 7 x 7) geographic interchanges, AECOM Consult, Inc. grouped them into the 20 paired production/attraction areas shown in Table 45. Another way to view the 20 geographic market segments is shown in Table 46.

Table 44 Production and attraction market segments used in the TPB Version 2.3 NLMC model

Production Areas	Attraction Areas
1. DC Core / Urban	1. DC Core
2. MD Urban	2. VA Core
3. VA Core / Urban	3. Urban
4. MD Suburban	4. Suburban
5. VA Suburban	

Ref: O:\model_dev\nest_log\marketSeg.xls

[47] Bill Woodford, "Development of Revised Transit Components of Washington Regional Demand Forecasting Model" (presented at the Transit Modeling Meeting, held at the Metropolitan Washington Council of Governments, Washington, D.C., December 1, 2004), 30.

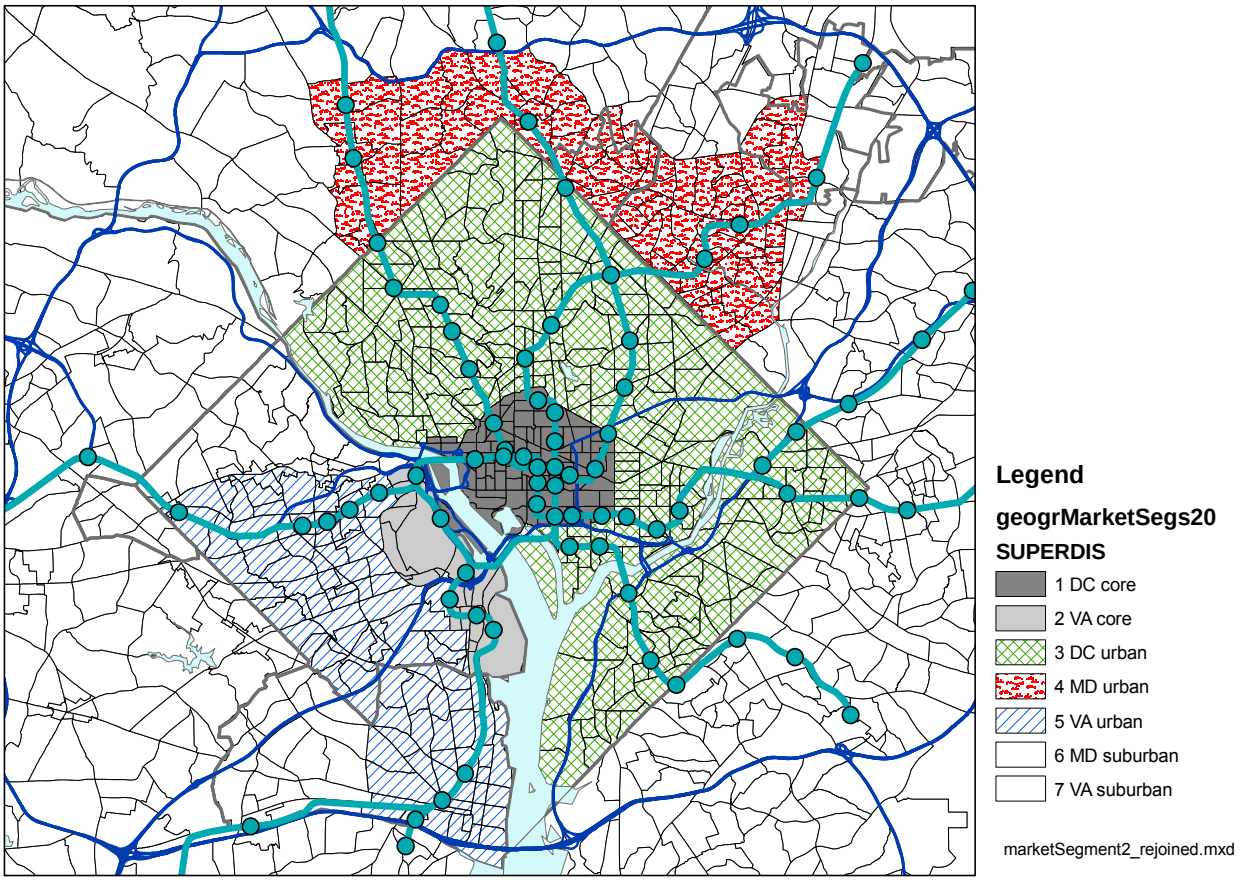

Figure 14 Seven superdistricts used in the Version 2.3 nested-logit mode choice model

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O:\model_dev\nest_log\marketSegment2_rejoined_forBlackAndWhite.emf

Table 45 20 geographic market segments used in the TPB nested-logit mode choice model

Market Seg No.	Prod Superdis	Attr Superdis	Production Area	Attraction Area
1	1,3	1	DC	DC core
2	1,3	2	DC	VA core
3	1,3	3,4,5	DC	Urban DC, MD, VA
4	1,3	6,7	DC	Suburban MD, VA
5	4	1	MD urban	DC core
6	4	2	MD urban	VA core
7	4	3,4,5	MD urban	Urban DC, MD, VA
8	4	6,7	MD urban	Suburban MD, VA
9	2,5	1	VA core/urban	DC core
10	2,5	2	VA core/urban	VA core
11	2,5	3,4,5	VA core/urban	Urban DC, MD, VA
12	2,5	6,7	VA core/urban	Suburban MD, VA
13	6	1	MD suburban	DC core
14	6	2	MD suburban	VA core
15	6	3,4,5	MD suburban	Urban DC, MD, VA
16	6	6,7	MD suburban	Suburban MD, VA
17	7	1	VA suburban	DC core
18	7	2	VA suburban	VA core
19	7	3,4,5	VA suburban	Urban DC, MD, VA
20	7	6,7	VA suburban	Suburban MD, VA

Ref: O:\model_dev\nest_log\marketSeg.xls

Table 46 Equivalency between seven super-districts and the 20 geographic market segments

		1 DC core	2 VA core	3 DC urban	4 MD urban	5 VA urban	6 MD suburban	7 VA suburban
1	**DC core**	1	2	3	3	3	4	4
3	**DC urban**	1	2	3	3	3	4	4
4	**MD urban**	5	6	7	7	7	8	8
2	**VA core**	9	10	11	11	11	12	12
5	**VA urban**	9	10	11	11	11	12	12
6	**MD suburban**	13	14	15	15	15	16	16
7	**VA suburban**	17	18	19	19	19	20	20

Ref: O:\model_dev\nest_log\superDistr_marketSeg.xlsx

Table 47 shows the equivalency between the seven NLMC superdistricts and the new 3,722-TAZ area system.

Table 47 Equivalency between nested-logit mode choice superdistricts and TPB TAZ 3,722

No.	Name	TAZs (TPB TAZ 3,722)
1	DC core	1-4,6-47,49-63,65,181-287,374-381
2	VA core	1471-1476,1486-1489,1493,1495-1504,1507,1508,1510,1511
3	DC urban	5,48,51,64,66-180,210-281,288-373,382-393
4	MD urban	603,606,612-628,630-640,662-664,669,670,913,916,917,939-957,959,961-982,985,
4	MD urban	986
5	VA urban	1405-1422,1427-1435,1448,1452,1454-1464,1477-1485,1490-1492,1494,1505,1506,
5	VA urban	1509,1512-1545,1569-1609
6	MD suburban	394-602,604,605,607-611,629,641-661,665-668,671-912,914,915,918-938,958,960,
6	MD suburban	983,984,987-1404,2820-3102,3104-3409
7	VA suburban	1423-1426,1436-1447,1449-1451,1453,1465-1470,1546-1568,1610-2554,2556-2628,
7	VA suburban	2630-2819,3410-3477,3479-3481,3483-3494,3496-3675

Ref: O:\model_dev\nest_log\equiv_tpbTaz3722_nlmc_superdistr.txt and O:\model_dev\nest_log\Market_segment_NewTAZs_sorted.xlsx

Finally, the mode choice model is segmented by access to transit:

- Park and ride (PNR),
- Kiss and ride (KNR, or "ride to transit"), and
- Walk

Walk-access is further segmented by the length of walk to transit:

- Short walk (<= 0.5 miles)
- Long walk (> 0.5 miles and <= 1.0 mile).

This contrasts with the Version 2.2 mode choice model, which used slightly different definitions of short walk (0 to 0.3333 mile) and long walk (0.3333 mile to 1.0 mile).

6.3.3 Utility equations, including time and cost coefficients and income constants

The TPB nested-logit mode choice model has five utility equations -- one per trip purpose. The time and cost coefficients used in the utility equations are shown in Table 48.

Table 48 Time and cost coefficients in the Version 2.3 nested-logit mode choice model

		Trip Purpose (5)				
Variable		**HBW**	**HBS**	**HBO**	**NHBW**	**NHBO**
In-vehicle time	ivt	-0.02128	-0.02168	-0.02322	-0.02860	-0.02860
Auto access time	aat	-0.03192	-0.03252	-0.03483	-0.04290	-0.04290
Walk access time	ovtwa	-0.04256	-0.04336	-0.04644	-0.05720	-0.05720
Other out-of-vehicle time*	ovtot	-0.05320	-0.05420	-0.05805	-0.07150	-0.07150
Cost - Income group 1	costinc1	-0.00185	-0.00202	-0.00202	-0.00994	-0.00994
Cost - Income group 2	costinc2	-0.00093	-0.00101	-0.00101	-0.00994	-0.00994
Cost - Income group 3	costinc3	-0.00062	-0.00067	-0.00067	-0.00994	-0.00994
Cost - Income group 4	costinc4	-0.00046	-0.00051	-0.00051	-0.00994	-0.00994
* Includes boarding penalty						

Ref: O:\model_dev\nest_log\NLmcTimeCostCoef5.xlsx

A note about calibration and estimation of coefficient values

Some of the coefficients in Table 48 are statistically estimated, others are set using professional judgment and rules of thumb. Before discussing which are statistically estimated and which are set using professional judgment, it is useful to understand how calibration approaches have changed in the past few years.

In previous mode choice models developed by TPB staff (e.g., the sequential, multinomial-logit mode choice model in the Version 2.1 and Version 2.2 travel models), coefficients in the utility equations of the mode choice model were statistically estimated.[48] Following the estimation of coefficients, TPB staff would check the reasonableness of coefficients by using various rules of thumb. For example, one rule of thumb is that the ratio of the out-of-vehicle travel time coefficient to the in-vehicle travel time coefficient (C_{ovtt}/C_{ivtt}) should be between 2.0 and 3.0. This rule of thumb has always been used by TPB staff in mode choice model estimation and has also been proposed by the Federal Transit Administration.[49] In cases where the estimated coefficients did not agree with the rule of thumb, one was left to ponder the cause of the discrepancy. For example: Was there a problem with the estimation data? Was a utility equation misspecified? Was the estimation software not used correctly? Did the discrepancy in the ratio value represent a true difference in travel behavior of Washington, D.C. area travelers compared to other travelers in the U.S? Or, since the values of the coefficients are, in part, a function of the other coefficients in the utility equation, would a different set of utility variables have resulted in coefficient values that met the rule of thumb? Due to issues such as these, and the increased interest in getting proposed transit projects to pass muster with the FTA, many consulting firms and agencies have started taking a new approach in calibrating mode choice models: namely, using a combination of statistically estimated coefficients and coefficients that are set by fiat, typically based on rules of thumb. This latter approach is what was used by AECOM when they calibrated their nested-logit mode choice model in 2004-2005, and it is also the approach used by TPB staff in calibrating the NLMC model.

Discussion of coefficient values in the TPB nested-logit mode choice model

The in-vehicle time (IVT) coefficients are all about -0.02 and were statistically estimated using Alogit software. These come from earlier estimation work done by TPB staff, for the 2.1C and 2.1D travel models. These values are in the range of values expected by FTA, which expects IVT coefficients in the range of -0.03 to -0.02.[50] The next three time coefficients have been set as multiples of the IVT coefficient. For example, the auto access time coefficient is set equal to 1.5 times the IVT coefficient, indicating that time spent in a car for accessing transit is perceived as 1.5 times as burdensome as time spent in the transit vehicle itself. Similarly, the walk-access time coefficient is set equal to 2.0 time the

[48] Using a maximum likelihood estimation (MLE) technique in a software package such as Alogit.

[49] Jim Ryan, "Travel Forecasting for New Starts: The FTA Perspective", April 7, 2004, 55; Federal Transit Administration, "12 - Early Quality-of-Service Analysis of the Alternatives" (presented at the Travel Forecasting for New Starts Proposals Workshop, Minneapolis, Minnesota, June 16, 2006), 38, http://www.fta.dot.gov/planning/newstarts/planning_environment_5402.html.

[50] Ryan, "Travel Forecasting for New Starts: The FTA Perspective," 53; Federal Transit Administration, "12 - Early Quality-of-Service Analysis of the Alternatives," 37.

IVT coefficient, indicating that time spent walking to access transit is perceived as 2.0 times as burdensome as time spent in the transit vehicle. Lastly, the other-out-of-vehicle time coefficient is set to a value of 2.5 times the IVT coefficient. These last two out-of-vehicle time coefficients conform to FTA expectations that the ratio of C_{ovt}/C_{ivt} should be between 2.0 and 3.0, unless an agency can provide compelling evidence to the contrary. Next come four cost coefficients, one per household income group (income group 1, 2, 3, and 4). The first cost coefficient, like the IVT coefficient, was statistically estimated from a previous version of the regional travel model. The remaining three cost coefficients, in the case of the three home-based purposes, are set as factors of the cost coefficient for income group 1. Specifically, the cost coefficient for income group 2 is equal to ½ the cost coefficient for income group 1. Similarly, the cost coefficient for income group 3 is equal to 1/3 the cost coefficient for income group 1, and the cost coefficient for income group 4 is equal to 1/4 the cost coefficient for income group 1.

The TPB NLMC model also uses a set of income constants, which were developed for the AECOM/WMATA NLMC model and retained for use in the TPB model (See Table 49). AECOM introduced the income constants to help reduce the high number of modeled boardings in Northwest DC.[51]

Table 49 Income constants used in the TPB Ver. 2.3 NLMC model

	Income stratification		
Mode	**Low**	**Middle**	**High**
All auto modes	0.0	0.0	0.0
Walk to commuter rail	2.0	0.0	-2.0
Walk to all bus	2.0	0.0	-2.0
Walk to bus/Metrorail	2.0	0.0	-2.0
Walk to all Metrorail	2.0	0.0	-2.0
PNR and KNR to transit	0.0	0.0	0.0

Ref: O:\model_dev\nest_log\NLmcTimeCostCoef5.xlsx

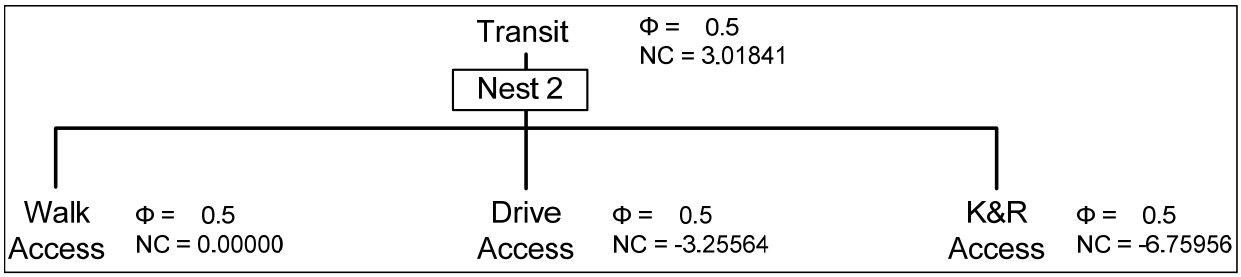
The income constants apply to all trip purposes. "Low income" means income group 1. "Middle income" means income groups 2 and 3. "High income" means income group 4. These income constants have the effect of increasing the probability (due to the +2.0) that low income travelers will choose walk to transit and decreasing the probability (due to the -2.0) that high income travelers will choose walk to transit.

6.3.4 Nesting coefficients and nesting constant

Each nest in a nested-logit mode choice model has at least two alternatives. For example, in the TPB NLMC model, the transit nest has three alternatives: PNR, KNR, and walk access. Each nest has N nesting coefficients (a.k.a. logsum parameters, or Φ) and N-1 constants (NCs), where N is the number of alternatives in the nest. So, for example, in the example nest shown in Figure 15, the transit nest has three alternatives, three nesting coefficients, and two (non-zero) nesting constants.

[51] Bruce Williams, "Revised Calibration Results with Additional Revisions to Transit Components of Washington Regional Demand Forecasting Model" (presented at the Transit Modeling Meeting, held at the Metropolitan Washington Council of Governments, Washington, D.C., March 2, 2005), 5.

Figure 15 Example of a nest in a nested logit mode choice model (with hypothetical values for Φ and NC)



Ref: O:\model_dev\nest_log\NestedChoice_Struct3.vsd

In the TPB NL MC model, nesting coefficients (Φ) have been set using professional judgment and nesting constants (NC) are estimated in the calibration process. This follows the lead set by AECOM in their calibration of the AECOM/WMATA NL MC model.

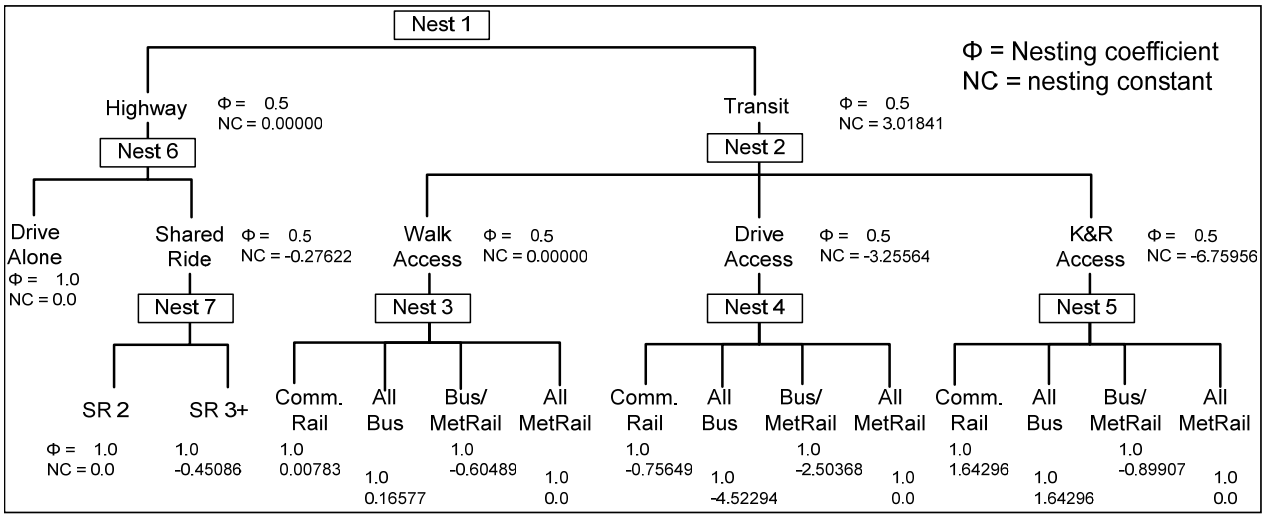
Nesting coefficients

The nesting coefficients (Φ) in a nested-logit mode choice model are a function of the underlying correlation between the unobserved components for pairs of alternatives in a nest, and they characterize the degree of substitutability between those alternatives. The values of the nesting constants should lie between 0 and 1, as indicated in Table 50. All the nesting coefficients in the TPB NL MC model have been set, by fiat, to 0.5. The TPB NL MC model has three layers of nests, but the bottom layer does not have nesting coefficients, so it has two layers of nests with nesting coefficients. The top-level equivalent of the nesting coefficients can be calculated by multiplying the nesting coefficient values of the two layers, i.e., 0.5 * 0.5 = 0.25, which is in the range of what would be considered reasonable (See Figure 16).

Table 50 Interpretation of nesting coefficient values in nested-logit mode choice models

Nesting coefficient value	Implication
$0 < \Phi < 1$	The range of acceptable values for Φ. Decreasing values of Φ indicate increased substitution among alternatives in a nest.
$\Phi = 0$	Implies perfect correlation between pairs of alternatives in the nest
$\Phi = 1$	Zero correlation among mode pairs in the nest. This means the nested-logit (NL) model becomes a multinomial logit (MNL) model.
$\Phi > 1$	Reject the nested-logit model

Figure 16 Examples of possible values for nesting coefficients and nesting constants



Ref: O:\model_dev\nest_log\NestedChoice_Struct3.vsd

Nesting constants

As stated earlier, AECOM developed 20 production/attraction market segments, based on seven superdistricts. We have chosen to retain this same geographic market segmentation in our model. There is one nesting constant for each market segment (20), each travel mode (15), and each trip purpose (5). Calibrating the nested-logit mode choice model essentially consists of estimating these nesting constants. Details of the calibration process can be found in section 6.4 on page 78.

6.3.5 Other details

In past documentation, there was documentation regarding other details of the NL MC model, such as revised transit access coding conventions, transit path-building procedures, and the treatment of parking costs and terminal times.[52] It is intended to include this information in either the user's guide and/or the network documentation.

6.4 Calibration process

To calibrate the TPB NLMC model, one assumes that the time and cost coefficients are known. The calibration consists of finding a set of nesting constants that allow the NLMC model to most closely replicate the observed market shares (known as "targets"). As mentioned in section 6.2 on page 69, an automated routine, implemented as a Fortran program named CALIBMS, is used to perform the calibration. Once one has run CALIBMS, one should ideally check the values of the output nesting constants to make sure that none of the constants are overly large. If one or more of the constants are overly large, their values can be manually overridden. For this particular calibration effort, due to time constraints, none of the calculated values were overridden. The NLMC calibration process was performed twice: first, using an observed, year-2007 trip table from the 2007/2008 COG/TPB

[52] Ronald Milone et al., *TPB Travel Forecasting Model, Version 2.3: Specification, Validation, and User's Guide*, 6-10.

Household Travel Survey (HTS);[53] and second, using a simulated, year-2007 trip table.[54] Details of these two calibration efforts can be found in the cited memos. Just prior to the April 29, 2011 draft of this report, the mode choice model was calibrated using CALIBMS a third time. This calibration, which was also to a simulated, year-2007 trip table, was done because of updates that were made to the year-2007 transit network, including correcting a problem with the generation of drive-access transit links.[55] This third calibration has not yet been documented in a memo, but the results of this calibration are relected in this revised report.

6.4.1 Observed data and calibration targets

A "calibration target" is a control total representing the number of person trips (for an average weekday) for each trip purpose (5), travel mode (15), and geographic market segment (20). The following on-board transit surveys were used to develop trip targets:

- 2008 Metrorail Survey[56]
- 2008 Regional Bus Survey (supplemented by the Fairfax Connector Bus Survey)[57]
- 2007-2008 On-Board Survey of Maryland Transit Administration (MTA) Riders, which would include survey information from riders of the Maryland Area Regional Commuter (MARC) train service[58]
- 2005 Virginia Railway Express (VRE) Passenger Survey[59]

Since the calibration year is 2007, it is preferable to have a survey from that year. In some cases this was not possible (e.g., no survey was conducted in 2007) or not desirable (e.g., a survey in another year was of better quality), or both. In the case of Metrorail, there was, in fact, a 2007 Metrorail Passenger

[53] MS Moran to Ronald Milone, "Using CALIBMS and an observed trip table to calibrate the nested-logit mode choice model that is part of the TPB Version 2.3 travel model on the 3,722-TAZ area system," Memorandum, January 19, 2011.
[54] MS Moran to Ronald Milone, "Using CALIBMS and a simulated trip table to calibrate the nested-logit mode choice model that is part of the TPB Version 2.3 travel model on the 3,722-TAZ area system," Memorandum, February 19, 2011.
[55] It was found that the travel model was not building paths between TAZs and PNR lots. The auto access script (AutoAcc4.s) creates auto access links with default values for this type of condition, which resulted in incorrect times and distances on the links.
[56] WB&A Market Research, "2008 Metrorail Passenger Survey", 2008.
[57] Robert E. Griffiths, "2008 Regional Bus Survey: Preliminary Results" (presented at the Travel Forecasting Subcommittee of the Technical Committee of the National Capital Region Transportation Planning Board, held at the Metropolitan Washington Council of Governments, Washington, D.C., May 22, 2009); NuStats, *2008 Regional Bus Survey: Draft Report* (Austin, Texas: Metropolitan Washington Council of Governments (COG), June 2009); Clara Reschovsky, *Analysis of 2008 Bus Survey Data, WMATA On-Board Survey*, Internal Report (Washington, D.C.: Metropolitan Washington Council of Governments, National Capital Region Transportation Planning Board, June 30, 2010).
[58] NuStats, *Baltimore 2007-2008 On-Board Study: Final Report* (Austin, Texas: Maryland Transit Administration, December 2008).
[59] Virginia Railway Express, *2005 Passenger Survey* (Virginia Railway Express, n.d.), http://www.vre.org/feedback/cs_survey/survey_results_index.htm.

Survey,[60] but it was believed that the 2008 survey had more complete information. For example, the 2008 survey, in contrast with the 2007 survey, included production-end mode of access to the first transit vehicle for every observation.[61] The 2008 Metrorail survey[62] was collected by WB&A, geocoded by Rummel, Klepper & Kahl, LLP (RK&K), and cleaned by Parsons Brinckerhoff (PB). The final survey included 35,966 records, which were expanded to 786,813 daily Metrorail trips (the average number of trips in September 2008).[63] Survey results were not factored to 2007 conditions, given the proximity of the two years.

Information about bus-only trips was obtained from the 2008 Regional Bus Survey (supplemented by the Fairfax Connector Bus Survey). Again, data was not explicitly factored to year-2007 conditions. Details can be found in a recent memo.[64] Commuter rail information was obtained from the 2007-2008 MTA survey (which included MARC riders) and the 2005 VRE survey (which included VRE riders). The MTA survey was collected by NuStats and provided to MWCOG by PB. The total number of MARC survey records after it was cleaned and geocoded by PB was 1,915, which were then expanded to 26,451 trips. Although VRE conducts a survey on an annual basis, the 2007 survey was "Deemed Statistically Invalid," according to the VRE website (http://www.vre.org/feedback/cs_survey/survey_results_index.htm). We have used the 2005 survey and factored the results to year-2007 conditions.[65] The transit person trip control totals ("targets") can be seen in Table 51.

Table 51 Transit person trip control totals ("targets") for 2007, average weekday

	HBW (Peak)	HBS (Midday)	HBO (Midday)	NHBW (Midday)	NHBO (Midday)	TOTAL
WK-CR	1,851	21	210	0	400	2,483
PNR-CR	16,645	0	259	0	208	17,112
KNR-CR	1,473	0	197	0	217	1,887
ALL CR	19,970	21	666	0	825	21,482
WK-BUS	171,836	18,432	87,043	23,685	16,226	317,222
PNR-BUS	15,966	81	3,029	354	1,522	20,953
KNR-BUS	4,554	199	2,004	1,425	880	9,063
ALL BUS	192,356	18,712	92,077	25,465	18,628	347,238
WK-BUS/MR	132,144	2,486	23,694	12,417	3,960	174,701
PNR-BUS/MR	27,525	112	2,700	1,482	560	32,379
KNR-BUS/MR	9,248	136	1,731	1,211	1,003	13,329

[60] WB&A Market Research, *2007 Metrorail Passenger Survey Final Report* (Washington Metropolitan Area Transit Authority, October 16, 2007).
[61] Mary Martchouk to MS Moran, "Developing Transit Calibration Targets for 2007," Memorandum, June 2, 2010, 5.
[62] WB&A Market Research, "2008 Metrorail Passenger Survey."
[63] Mary Mary Martchouk to MS Moran, "Developing Transit Calibration Targets for 2007."
[64] Mary Martchouk to M Moran, "Developing Bus-only Calibration Targets for 2007," Memorandum, August 17, 2010.
[65] Mary Mary Martchouk to MS Moran, "Developing Transit Calibration Targets for 2007," 8-9.

ALL BUS/MR	168,916	2,733	28,125	15,110	5,524	220,408
WK-MR	194,164	4,854	46,905	56,578	16,428	318,928
PNR-MR	137,984	469	15,658	7,270	1,562	162,943
KNR-MR	42,791	145	4,437	4,378	1,832	53,582
ALL MR	374,939	5,468	66,999	68,226	19,822	535,454
GRAND TOTAL	**756,181**	**26,934**	**187,867**	**108,801**	**44,798**	**1,124,582**

Ref: O:\model_dev\nest_log\Mode_choice_targets.xlsx

Whereas the transit person trip targets were developed from on-board transit surveys, the auto person targets were developed by undertaking a series of logical steps which made sense to TPB staff, but also required several weeks of effort. The steps were as follows:

1) A 2007 observed (2007/08 HTS) auto driver trip table was combined with a set of "residual" trip tables (trucks, visitor auto trips, etc.) and this was assigned to the highway network. The observed auto trips were adjusted so that regional VMT targets were matched reasonably.
2) The resulting auto person trip table resulting from the step 1 trip table was converted to auto person trips by occupant group and compressed to the 20 geographic market segments.
3) The NL MC model was calibrated to the auto person targets (from step 2) and the transit target figures.
4) The calibrated Version 2.3 four-step model was fully executed using the NL MC model developed in step 3. Trip generation and distribution adjustments were made to achieve a close match with the 2007/08 HTS and to match regional VMT targets.
5) Auto person trips by occupant group (resulting from step 4) were compressed to the 20 geographic markets segments and combined with the transit targets.
6) The NL MC model was re-calibrated to the auto person targets (from step 5) and the transit target figures.
7) The calibrated Version 2.3 four-step model was executed using the NL MC model developed in step 6.

The simulation resulting from step 7 resulted in the "final" Version 2.3 model simulation, which satisfied three desired conditions sought by TPB staff:

1) Simulated person trips reasonably matched observed 2007/08 HTS patterns by purpose;
2) Simulated transit trips matched the observed targets by purpose and market segment that were developed from available transit on-board surveys; and
3) Simulated VMT reasonably matched HPMS-based target figures for the region, and by jurisdiction using: 1) equilibrated highway speeds, 2) a reasonably well converged highway assignment process, and 3) a well calibrated mode choice model.

Aggregated control totals representing the auto person trip targets can be found in Table 52.

Table 52 Average weekday auto person trip control totals ("targets") for 2007 used for the calibration to a simulated trip table

	HBW (Peak)	HBS (Midday)	HBO (Midday)	NHBW (Midday)	NHBO (Midday)	TOTAL
DRIVE ALONE	2,488,139	1,310,755	2,142,698	1,172,254	1,261,823	8,375,669
SR2	274,299	936,969	2,353,079	261,343	977,302	4,802,992
SR3+	9,228	593,357	1,770,683	6,393	615,484	2,995,145
TOTAL AUTO	**2,771,666**	**2,841,081**	**6,266,460**	**1,439,990**	**2,854,609**	**16,173,806**

Ref: O:\model_dev\nest_log\Mode_choice_targets2.xlsx

One key point to remember is that the NL MC model in the Version 2.3 travel model was calibrated using different data sources from those used to calibrate the multinomial-logit (MNL) mode choice model in the Version 2.2 travel model. Thus the travel patterns in the calibration data are different. The Version 2.2 mode choice model was calibrated using the 1994 COG/TPB Household Travel Survey and validated using the 2000 Census Transportation Planning Package (CTPP). By contrast, the Version 2.3 mode choice model was calibrated to year-2007 conditions, with the primary data set being the 2008 Metrorail Survey. As for the Version 2.3 mode choice model, there was some debate over whether to use the 2007/2008 HTS or the most recent on-board transit surveys. It was decided to use the on-board transit surveys since they contained more observations. For example, the 2007/2008 HTS contained about 5,500 transit trip records[66] (and this survey was twice the size of the 1994 HTS – 11,000 households vs. 4,800 households). By contrast, the transit on-board surveys provided about 51,000 transit trip records, of which about 35,000 were from the Metrorail Survey (see Table 53).

Table 53 Transit surveys used to calculate transit trip targets

Transit Survey	Submode Targets	Number of Records
2008 Metrorail Survey	Metrorail, Metrorail/Bus	34,852
2007 Bus Survey	Bus-only	10,959
2007 MARC Survey (MTA Baltimore Transit Survey)	Commuter Rail	1,594
2005 VRE Survey	Commuter Rail	3,646
Total	**All**	**51,051**

6.4.2 Calibration results

The calibration result shown in this section of the report comes from the calibration to a simulated trip table, which was derived from the earlier calibration to an observed trip table. The automated calibration process, which involves running AEMS and CALIBMS 105 times (21 times for each trip purpose), takes about 22 hours on a standard workstation or the travel model server (TMS3). The output of the calibration process is the set of nesting constants, which are shown on Table 54, Table 55,

[66] Mary Martchouk to M Moran, "Comparison of Transit Trips from 2007/2008 HTS to Transit Surveys," Memorandum, August 17, 2010.

Table 56, Table 57 and Table 58 on pages 84 through 85. A positive nesting constant has the effect of increasing trips in the given category and a negative nesting constant has the effect of decreasing trips in the given category. The values shown on these five tables are "top-level equivalent" nesting constants. However, the output from the CALIBMS procedure is represented in terms of lower-level equivalent constants, so one has to convert the lower-level values to top-level values. This conversion is currently done in an Excel spreadsheet (such as newSegSumm5purps2007.xlsx) and will also be explained in the next section of this chapter.

Table 54 Top-level equivalent nesting constants for HBW

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		DC CORE / URBAN-DC CORE	DC CORE / URBAN-VA CORE	DC CORE / URBAN-URBAN	DC CORE / URBAN-OTHER	MD URBAN-DC CORE	MD URBAN-VA CORE	MD URBAN-URBAN	MD URBAN-OTHER	VA CORE / URBAN-DC CORE	VA CORE / URBAN-VA CORE	VA CORE / URBAN-URBAN	VA CORE / URBAN-OTHER	MD OTHER-DC CORE	MD OTHER-VA CORE	MD OTHER-URBAN	MD OTHER-OTHER	VA OTHER-DC CORE	VA OTHER-VA CORE	VA OTHER-URBAN	VA OTHER-OTHER
1	LOV	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	HOV2	-1.2480	-1.2374	-1.2310	-1.3288	-1.2418	-1.3340	-1.1717	-1.1980	-1.2609	-1.1978	-1.1964	-1.2320	-1.3233	-1.2912	-1.2537	-1.1819	-1.8259	-1.6906	-1.5670	-1.2273
3	HOV3+	-2.1687	-2.0721	-2.3550	-2.1664	-2.1319	-2.1859	-2.0452	-2.3336	-2.4380	-2.0853	-2.1482	-2.2932	-2.2286	-2.2047	-2.2586	-2.0411	-3.8602	-3.9512	-3.8896	-2.5384
4	WLK CR	3.3455	3.5898	5.1590	0.5075	2.2449	1.4029	1.2030	-0.4190	5.1416	0.9026	2.8224	0.1675	0.5180	-1.1347	-0.4346	-1.3466	-1.1922	-0.8419	-1.1693	-2.5057
5	WLK BUS	3.1849	0.5735	4.3034	0.7077	0.6450	-0.8591	0.8557	-0.0119	1.6383	0.2508	0.8984	-1.0121	0.3380	-0.0472	0.4568	-0.3970	-0.2538	0.4162	-0.1903	-0.8520
6	WLK BU/MR	3.1847	2.8299	4.4263	0.6259	0.8948	0.2704	0.7404	-0.2569	2.6206	-0.2094	1.0330	-0.7518	0.2023	-0.3117	0.1152	-0.7563	0.0582	0.1831	-0.0379	-1.2934
7	WLK METRO	3.5467	4.2523	6.5668	6.4208	3.2047	2.0680	2.1086	1.7243	6.9119	1.6915	5.2387	4.2240	2.4084	1.0207	2.0174	-0.0196	3.3393	2.2108	2.6989	1.5793
8	PNR CR	1.5852	1.0064	1.9365	1.0443	-0.2709	-0.2445	-1.4252	-1.7562	0.7899	-1.7852	-1.1012	-2.7807	-0.3328	-1.0613	-1.3581	-2.2999	-1.6393	-0.7040	-1.2525	-3.0440
9	KNR CR	0.6531	-0.5795	0.9069	0.6406	-1.0234	-0.7831	-1.7086	-2.1729	-0.2017	-2.6368	-1.8783	-2.2496	-1.9173	-3.0280	-2.6277	-3.0995	-2.9613	-2.1229	-2.5587	-4.1428
10	PNR BUS	1.0564	1.0064	0.0995	-1.0905	-1.5727	-0.2445	-2.2614	-1.5999	0.8523	-1.4719	-1.4332	-2.3207	-1.6451	0.0798	-0.8095	-2.0611	-0.9928	-0.1428	-0.9196	-3.7662
11	KNR BUS	0.1902	-0.5795	-0.1038	-0.1443	-0.8638	-0.7831	-1.7388	-1.4896	-0.2017	-2.6368	-1.8783	-1.7623	-2.4989	-1.0069	-1.5321	-2.3715	-2.0743	-1.4473	-1.9414	-3.2196
12	PNR BU/MR	1.9018	1.1965	0.5483	-0.4415	0.0765	-0.0964	-1.5211	-2.0239	0.8298	-1.7852	-0.9617	-2.7807	-0.0626	0.0689	-0.7476	-1.9866	-0.6453	-0.4702	-0.8692	-3.3233
13	KNR BU/MR	1.3214	1.3245	1.1432	-0.6295	0.6511	-0.7831	-1.0318	-2.0898	1.9134	-2.6368	-1.8635	-2.8816	-1.1429	-1.0071	-1.5162	-2.4396	-1.7025	-1.5144	-1.8241	-3.3111
14	PNR METRO	1.6869	1.2026	2.5239	1.1580	-0.1003	-0.0267	-1.1087	-1.2416	0.7024	-1.2800	-1.0244	-0.4782	0.0226	0.3888	-0.3755	-1.8415	-0.6505	-0.3297	-0.6986	-2.3639
15	KNR METRO	-0.1123	-0.6242	0.9356	0.3335	-1.0937	-0.6471	-1.7322	-2.5198	-0.2597	-2.5600	-1.6840	-1.7265	-0.7963	-0.7117	-0.9333	-2.0198	-1.0806	-0.7501	-0.9477	-1.6399

Ref: O:\model_dev\nest_log\calibms_2011-04sim\newSegSumm5purps2007_04_22.xlsx, sheet= NSTC2

Table 55 Top-level equivalent nesting constants for HBS

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		DC CORE / URBAN-DC CORE	DC CORE / URBAN-VA CORE	DC CORE / URBAN-URBAN	DC CORE / URBAN-OTHER	MD URBAN-DC CORE	MD URBAN-VA CORE	MD URBAN-URBAN	MD URBAN-OTHER	VA CORE / URBAN-DC CORE	VA CORE / URBAN-VA CORE	VA CORE / URBAN-URBAN	VA CORE / URBAN-OTHER	MD OTHER-DC CORE	MD OTHER-VA CORE	MD OTHER-URBAN	MD OTHER-OTHER	VA OTHER-DC CORE	VA OTHER-VA CORE	VA OTHER-URBAN	VA OTHER-OTHER
1	LOV	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	HOV2	-0.1066	-0.1112	-0.0842	-0.1098	-0.1292	0.0954	-0.0765	-0.0884	-0.0989	-0.0974	-0.0824	-0.0906	-0.1551	-0.1802	-0.1092	-0.0830	-0.1347	-0.1191	-0.1024	-0.0807
3	HOV3+	-0.2448	-0.2537	-0.2151	-0.2547	-0.2742	0.1212	-0.2041	-0.2197	-0.2415	-0.2326	-0.2129	-0.2257	-0.3272	-0.3564	-0.2559	-0.2126	-0.3041	-0.2636	-0.2495	-0.2100
4	WLK CR	-1.4892	-3.4561	-1.1668	-1.6468	-1.0089	-0.7720	-1.5591	-3.4618	-1.2880	-2.9870	-1.6809	-3.2068	-2.8714	-3.3641	-1.2370	-1.7648	-0.6291	-28.5941	-1.8715	-2.1680
5	WLK BUS	-1.3521	-3.4561	-1.2669	-1.5961	-1.5405	-0.7720	-1.5027	-2.8664	-1.2880	-1.6502	-2.0209	-2.5112	-1.7158	-3.3641	-1.1845	-1.7007	0.1199	-20.6239	-2.0790	-2.0480
6	WLK BU/MR	-1.3055	-3.4561	-1.1095	-2.4345	-0.7675	-0.7720	-1.3188	-3.4618	-1.2880	-2.9870	-2.1731	-3.2068	-1.6919	-1.7046	-1.7984	-2.8714	-0.6291	-28.5941	-1.9453	-6.8931
7	WLK METRO	-1.7819	-2.5088	-1.0188	-2.0403	-1.0480	0.8561	-2.0952	-3.6049	-0.0032	-2.9870	-0.9330	-3.2068	-2.8714	-3.3641	-1.0115	-3.1652	1.9225	-28.5941	-0.7129	-2.7514
8	PNR CR	-3.3874	-3.6595	-3.8804	-3.1513	-3.8261	-2.0067	-4.3323	-4.3572	-2.6231	-5.1048	-5.8665	-4.4740	-2.5929	-5.3166	-4.6576	-10.9779	-2.7421	-36.6449	-7.9511	-36.1654
9	KNR CR	-4.6861	-3.6595	-3.7559	-3.1513	-3.8261	-2.0067	-4.3323	-4.5568	-4.4045	-5.1048	-3.8488	-4.4740	-2.7265	-5.3166	-5.0743	-6.8011	-3.6778	-36.6449	-5.6528	-8.1895
10	PNR BUS	-3.3874	-3.6595	-3.8804	-3.1513	-3.8261	-2.0067	-4.3323	-4.3572	-2.6231	-5.1048	-5.8665	-4.4740	-0.6883	-5.3166	-4.6576	-6.8818	-2.7421	-36.6449	-7.9511	-13.6469
11	KNR BUS	-4.6861	-3.6595	-3.4624	-3.1513	-3.8261	-2.0067	-4.3323	-2.2920	-4.4045	-5.1048	-3.8488	-4.4740	-2.7265	-5.3166	-5.0743	-4.9070	-3.6778	-36.6449	-5.6528	-8.1895
12	PNR BU/MR	-3.3874	-3.6595	-2.5016	-3.1513	-3.8261	-2.0067	-4.3323	-4.3572	-2.6231	-5.1048	-5.8665	-4.4740	-1.6249	-5.3166	-4.6576	-10.9779	-0.2738	-36.6449	-7.9511	-36.1654
13	KNR BU/MR	-4.6861	-3.6595	-3.0382	-3.1513	-3.8261	-2.0067	-4.3323	-4.5568	0.2733	-5.1048	-3.8488	-4.4740	-1.6242	-5.3166	-3.6674	-6.8011	-3.6778	-36.6449	-5.6528	-8.1895
14	PNR METRO	-2.7095	-3.6595	-2.9225	-3.1513	-3.8261	-2.0067	-4.3323	-4.3572	-2.6231	-5.1048	-3.9129	-4.4740	-2.8675	-5.3166	-3.8559	-10.9779	-3.4341	-36.6449	-6.8653	-36.1654
15	KNR METRO	-4.5150	-3.6595	-4.4317	-3.1513	-3.8261	-2.0067	-4.3323	-4.5568	-4.4045	-5.1048	-3.8488	-4.4740	-2.9201	-5.3166	-5.0466	-6.8011	-3.6778	-36.6449	-5.6528	-8.1895

Ref: O:\model_dev\nest_log\calibms_2011-04sim\newSegSumm5purps2007_04_22.xlsx, sheet= NSTC2

Table 56 Top-level equivalent nesting constants for HBO

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		DC CORE / URBAN-DC CORE	DC CORE / URBAN-VA CORE	DC CORE / URBAN-URBAN	DC CORE / URBAN-OTHER	MD URBAN-DC CORE	MD URBAN-VA CORE	MD URBAN-URBAN	MD URBAN-OTHER	VA CORE / URBAN-DC CORE	VA CORE / URBAN-VA CORE	VA CORE / URBAN-URBAN	VA CORE / URBAN-OTHER	MD OTHER-DC CORE	MD OTHER-VA CORE	MD OTHER-URBAN	MD OTHER-OTHER	VA OTHER-DC CORE	VA OTHER-VA CORE	VA OTHER-URBAN	VA OTHER-OTHER
1	**LOV**	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	**HOV2**	0.0882	0.1183	0.1222	0.1140	0.0860	0.1173	0.1360	0.1414	0.0786	0.0969	0.1317	0.1265	0.0311	0.0615	0.0844	0.1458	0.0520	0.0651	0.0880	0.1516
3	**HOV3+**	-0.0252	0.0157	0.0230	0.0115	-0.0287	0.0146	0.0430	0.0500	-0.0380	-0.0125	0.0371	0.0293	-0.1103	-0.0617	-0.0320	0.0558	-0.0775	-0.0583	-0.0270	0.0642
4	**WLK CR**	0.5314	0.3636	-0.1406	0.2128	1.1149	0.4291	-0.1317	-1.1812	3.3181	-1.1603	-0.6154	-1.0082	3.4410	-0.1360	-0.1427	-1.2648	2.3918	-0.2253	0.0817	-1.1391
5	**WLK BUS**	0.5174	-1.4267	-0.0794	-0.7345	0.2566	0.9562	-0.3667	-1.1766	1.2985	-3.4073	-1.2670	-1.7064	0.5209	-0.1360	-0.0185	-0.6314	2.0021	-1.1071	-0.6617	-0.9755
6	**WLK BU/MR**	0.6389	-0.0309	-0.2535	-0.7708	0.6692	0.6152	-0.4666	-1.4564	1.6774	-3.0144	-0.1771	-1.4219	-0.0244	-0.5781	-0.3936	-0.9100	1.7306	-1.2620	0.4351	-2.6078
7	**WLK METRO**	0.5195	0.5299	-0.2001	0.0578	1.5112	0.2022	0.4434	-0.8057	3.9267	-0.6694	0.2888	0.7649	0.7170	0.4618	-0.5103	-1.3216	3.4185	0.9054	1.5690	-0.6034
8	**PNR CR**	-0.7892	-0.6321	-2.0637	-2.4950	-1.3861	-2.3411	-2.8839	-2.5846	-0.2080	-4.1748	-4.3420	-4.9294	0.1700	0.0572	-1.4461	-4.3005	-0.3597	-2.3951	-2.0154	-27.4255
9	**KNR CR**	-2.2039	-1.7497	-2.9600	0.9622	-2.3265	-2.3411	-4.3305	-4.4065	-1.1071	-4.1748	-4.4911	-3.9562	-1.4296	-0.2539	-1.6732	-4.2599	-1.0611	-3.2364	-2.3591	-27.8823
10	**PNR BUS**	-1.4282	-0.6321	-2.8780	-1.4547	-1.3861	-2.3411	-2.5673	-0.4172	-0.2080	-4.1748	-4.3420	-4.9294	0.7208	0.0572	-1.8117	-3.3467	0.5292	-2.3951	-2.3831	-25.5411
11	**KNR BUS**	-1.3975	-1.7497	-2.6333	-2.1458	-2.3265	-2.3411	-3.3380	-2.5683	-1.1071	-4.1748	-3.3182	-3.9562	-1.6858	-0.2539	-1.5927	-3.1966	-1.0611	-3.2364	-2.1109	-25.5376
12	**PNR BU/MR**	-1.1133	-0.6321	-1.7265	-2.4950	1.0725	-2.3411	-3.2137	-2.5846	0.1464	-4.1748	-2.1721	-4.9294	1.6181	2.5378	-1.5653	-11.2343	0.9612	-1.2579	-2.0814	-30.3573
13	**KNR BU/MR**	-0.2678	-1.7497	-2.7642	-2.2450	0.3619	-2.3411	-4.3305	-3.6190	2.8103	-4.1748	-4.4911	-3.9562	-0.5074	0.1310	-1.8421	-3.8809	-0.3118	-1.4806	-1.9594	-27.5952
14	**PNR METRO**	-0.7281	-0.6321	-1.9289	-1.2201	-1.3253	-2.3411	-3.0540	-2.5846	-0.2134	-4.1748	-2.9969	-2.2751	-0.6915	-0.1045	-1.9818	-4.0825	-0.5227	-2.0425	-1.7397	-15.2486
15	**KNR METRO**	-2.5353	-1.7091	-3.1126	-1.7430	-2.3619	-2.3411	-4.2993	-4.4065	-1.6509	-4.1748	-3.9642	-2.3452	-1.8735	-0.1500	-2.5639	-4.0816	-1.1396	-3.2987	-2.3586	-11.9266

Ref: O:\model_dev\nest_log\calibms_2011-04sim\newSegSumm5purps2007_04_22.xlsx, sheet= NSTC2

Table 57 Top-level equivalent nesting constants for NHW

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		DC CORE / URBAN-DC CORE	DC CORE / URBAN-VA CORE	DC CORE / URBAN-URBAN	DC CORE / URBAN-OTHER	MD URBAN-DC CORE	MD URBAN-VA CORE	MD URBAN-URBAN	MD URBAN-OTHER	VA CORE / URBAN-DC CORE	VA CORE / URBAN-VA CORE	VA CORE / URBAN-URBAN	VA CORE / URBAN-OTHER	MD OTHER-DC CORE	MD OTHER-VA CORE	MD OTHER-URBAN	MD OTHER-OTHER	VA OTHER-DC CORE	VA OTHER-VA CORE	VA OTHER-URBAN	VA OTHER-OTHER
1	**LOV**	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	**HOV2**	-2.8076	-2.3268	-2.0493	-2.0398	-3.0891	0.0727	-1.9931	-2.0559	-2.9530	-2.4387	-2.1974	-2.0396	-3.7360	-4.3981	-2.7309	-1.5492	-3.8333	-3.4207	-3.3260	-1.7021
3	**HOV3+**	-4.5561	-4.0697	-3.6935	-4.0380	-4.8114	0.1272	-3.5614	-3.9357	-4.9056	-4.2074	-3.8513	-3.8318	-6.1346	-6.7376	-4.9460	-3.2980	-6.2208	-5.5268	-6.0681	-3.5334
4	**WLK CR**	-1.8702	-1.0603	-0.5026	1.6745	-2.1187	1.5458	-1.6929	-0.3142	-2.3544	-1.4536	-1.7666	-0.8626	-1.8000	-1.6455	-1.5302	-0.4536	-1.2446	-3.3165	-1.8407	-1.5317
5	**WLK BUS**	-2.1733	-1.0603	-0.6216	-0.5804	-1.9607	1.5458	-1.6185	0.0764	-2.3544	-1.9481	-1.9937	-2.0436	-2.0723	-1.6455	-1.2964	-0.2257	-2.3235	-3.9187	-2.8205	-1.6698
6	**WLK BU/MR**	-0.6308	1.1992	0.0608	0.2920	-1.0762	3.5271	-0.2148	-0.3483	-0.8389	-1.1025	-0.7238	-1.2900	-1.5086	-0.8160	-0.9437	-1.1090	-1.4772	-3.0785	-1.7695	-0.6494
7	**WLK METRO**	-1.8910	-1.0315	-0.4433	3.0409	-2.2884	1.3468	-2.0111	-1.3001	-2.2301	-1.3924	-1.8046	0.6125	-1.8178	-2.1823	-2.3647	-1.7525	-0.4119	-3.0068	-0.3053	0.6313
8	**PNR CR**	-2.7668	-1.7241	-1.7719	1.6713	-3.4352	-1.1980	-4.1784	-3.3533	-2.6560	-2.9153	-3.8699	-0.8256	-3.0141	-2.8942	-3.0768	-4.5954	-2.4675	-4.4365	-4.4332	-6.7147
9	**KNR CR**	-3.5618	-1.8702	-2.4353	-0.3249	-4.5542	-1.1980	-3.8956	-3.6563	-4.0568	-5.7899	-5.9390	-2.6795	-4.0011	-3.3870	-3.1745	-2.3758	-3.5758	-4.7736	-4.6353	-5.9639
10	**PNR BUS**	-2.9982	-1.7241	-3.2910	0.3011	-3.4352	-1.1980	-4.1784	-3.3533	-2.6560	-2.9153	-3.8699	-1.7819	-3.0141	-2.8942	-2.8731	-4.6254	-3.8156	-4.4365	-4.4332	-5.4816
11	**KNR BUS**	-3.0999	-1.8702	-1.7428	-0.2396	-4.5542	-1.1980	-2.7736	-3.6563	-4.0568	-3.2232	-3.6515	-1.4461	-3.1680	-3.3870	-2.1115	-1.4719	-3.5758	-4.7736	-4.6353	-4.9465
12	**PNR BU/MR**	-2.3953	-1.7241	-2.2700	0.0385	-1.4265	-1.1980	-2.0239	-3.3533	-0.7967	-0.1637	-1.4717	-1.3388	0.5178	-2.8942	-0.6192	-5.2625	-0.7769	-1.8126	-2.0487	-8.5105
13	**KNR BU/MR**	-1.0282	-1.8702	-0.9607	-1.3292	-4.5542	-1.1980	-1.3690	-3.6563	-2.4116	-5.7899	-5.9390	-2.9670	-2.2274	-1.6265	-1.7226	-2.0644	-2.4089	-2.6812	-3.1503	-4.9319
14	**PNR METRO**	-2.7917	-1.3327	-1.5559	2.2804	-3.5483	-1.1980	-4.6134	-2.7991	-3.0818	-2.4452	-3.7513	-0.0287	-3.2871	-2.8451	-3.4313	-4.3169	-2.6078	-3.7876	-4.0687	-6.7148
15	**KNR METRO**	-3.9610	-1.8546	-2.9263	-0.0791	-4.5185	-1.1980	-5.5988	-3.1372	-4.1041	-6.0358	-6.0906	-3.9243	-4.1018	-3.5432	-4.0943	-5.0191	-3.2015	-4.3837	-4.3172	-5.9639

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Table 58 Top-level equivalent nesting constants for NHO

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		DC CORE / URBAN-DC CORE	DC CORE / URBAN-VA CORE	DC CORE / URBAN-URBAN	DC CORE / URBAN-OTHER	MD URBAN-DC CORE	MD URBAN-VA CORE	MD URBAN-URBAN	MD URBAN-OTHER	VA CORE / URBAN-DC CORE	VA CORE / URBAN-VA CORE	VA CORE / URBAN-URBAN	VA CORE / URBAN-OTHER	MD OTHER-DC CORE	MD OTHER-VA CORE	MD OTHER-URBAN	MD OTHER-OTHER	VA OTHER-DC CORE	VA OTHER-VA CORE	VA OTHER-URBAN	VA OTHER-OTHER
1	**LOV**	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	**HOV2**	-2.0604	0.3756	-1.0363	-1.0030	-2.3798	0.2176	-1.0329	-0.6477	0.0176	-1.4395	-1.2048	-0.8186	-2.9425	0.1014	-1.2900	-0.4335	-3.3299	-2.2091	-1.4103	-0.4252
3	**HOV3+**	-3.0052	0.7608	-1.6774	-1.6867	-3.4528	0.2289	-1.6267	-1.1461	0.1265	-2.3215	-1.9117	-1.3542	-4.3103	0.4020	-2.0686	-0.8254	-5.3255	-3.3366	-2.2659	-0.8088
4	**WLK CR**	-2.6541	19.2969	-1.1088	3.8773	-3.5436	0.9030	-1.9624	0.6396	7.7431	-2.4618	-1.6400	-0.6371	5.0616	1.8604	1.4366	-0.0456	-1.9593	-3.8649	-2.3217	-2.3273
5	**WLK BUS**	-2.6996	5.8792	-1.1669	-0.3095	-3.3537	0.9030	-1.7979	-0.4314	2.5421	-3.7431	-2.3509	-2.9005	-3.3391	1.8604	-1.5989	-0.8300	-1.9593	-3.4590	-2.9518	-1.9956
6	**WLK BU/MR**	-1.4181	19.6255	-0.8141	0.3150	-3.6002	0.9030	-1.3740	-0.4795	4.0013	-2.4618	-1.5189	-3.1728	-3.3199	1.8604	-1.3404	-2.2244	-1.4532	-2.5646	-1.0148	-9.4459
7	**WLK METRO**	-2.8230	19.7269	-1.0757	1.0172	-3.5594	1.4109	-2.4935	-2.4966	8.4688	-2.0909	-1.0903	-1.2230	-4.2343	2.8364	-2.8919	-3.3003	-0.5670	-3.8649	-2.1702	-0.5292
8	**PNR CR**	-3.0422	16.1521	-2.5065	5.3609	-4.9273	-1.7186	-4.2962	-3.1526	3.3719	-3.6240	-3.0499	-3.0070	-1.9187	5.2464	-2.2491	-3.6440	-2.7228	-6.1599	-4.9323	-31.4031
9	**KNR CR**	-3.9533	17.3499	-2.7575	6.6078	-5.6469	-1.7186	-4.4743	-3.8854	1.4915	-3.9838	-3.6773	-5.3190	-3.6137	5.7569	-2.9749	-5.1515	-3.1524	-6.6068	-4.9836	-24.4360
10	**PNR BUS**	-3.0434	16.1521	-2.7467	-1.9261	-4.9273	-1.7186	-2.2096	-3.1526	3.3719	-3.6240	-3.0499	-3.0070	-4.2180	4.7628	-3.8443	-1.9504	-2.7228	-6.1599	-4.9323	-24.4256
11	**KNR BUS**	-2.8178	17.3499	-2.3025	-0.5062	-5.6469	-1.7186	-3.1858	-1.1634	1.4915	-3.9838	-3.6773	-2.7824	-5.0027	2.5162	-3.0047	-2.9372	-3.1524	-6.6068	-4.9836	-22.1139
12	**PNR BU/MR**	-2.0785	16.1521	-1.3615	-1.9261	-2.6968	-1.7186	-4.2962	-3.1526	3.9647	-3.6240	-3.0499	-3.0070	-2.2746	12.1702	-1.1770	-3.6440	-1.3833	-6.1599	-4.5383	-31.4031
13	**KNR BU/MR**	-2.6918	17.3499	-1.5723	-0.7601	-5.6469	-1.7186	-4.4743	-3.8854	7.2145	0.6901	-1.6347	-5.3190	-2.8965	2.5162	-1.1355	-5.1515	-1.2678	-6.6068	-4.9836	-24.4360
14	**PNR METRO**	-3.1378	16.8792	-3.7765	-1.8273	-5.1905	-1.7186	-4.2962	-3.1526	3.5941	-3.6240	-3.0499	-3.0070	-4.8419	1.5384	-4.4006	-3.6440	-2.6874	-5.7006	-3.7120	-31.4031
15	**KNR METRO**	-4.3282	17.5751	-3.2020	-1.6075	-5.5732	-1.7186	-4.8729	-3.8854	0.5376	-4.4781	-5.2204	-5.3190	-5.7119	1.1799	-4.4855	-5.1515	-3.6943	-6.6068	-3.9147	-16.6661

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Top-level nesting constants are computed as follows:

Equation 7 Equation for calculating the top-level equivalent value of a nesting coefficient

$$\text{Higher-level constant} = \{(\text{lower-level nest constant}) \times (\text{higher-level nest coefficient}) + (\text{higher-level nest constant})\} \text{ and so on, up to the top nest level}$$

To help illustrate this, we will perform a sample calculation. Figure 17 shows a nested-logit mode choice model with the same structure as the TPB NLMC model. Nest 4 is the PNR or drive-access to transit nest. The figure shows hypothetical values for nesting coefficients and nesting constants, with all values being in lower-level equivalents (the same as what might come out of an automated mode choice calibration process such as CALIBMS). According to Figure 17, the lower-level nesting constant for the PNR bus/Metrorail choice is -2.50368. To convert this value to its upper-level equivalent, we multiply it by the nesting *coefficient* of the next higher level (the PNR nest, whose nesting coefficient value is 0.5). Then we add the nesting constant value of the PNR nest (-3.25564). Next, we multiply the result by the nesting coefficient of the next level up (the transit nest, whose nesting coefficient value is also 0.5). And finally, we add the nesting coefficient for the transit nest (3.01841), giving a result of 0.7647. This calculation can be seen below and on Figure 17.

Sample calculation:

PNR BU/MR (top level) = { (-2.50368)*(0.5) + (-3.25564) } * (0.5) + (3.01841) = 0.7647

In addition, to calculate the implied minutes of impedance, we divide the top-level nesting constant value by the IVT coefficient, as shown in Equation 8.

Equation 8 Equation for calculating the implied minutes of impedance of a top-level nesting constant

Implied minutes of impedance = (top level const) / IVT coefficient

Thus, continuing with the example,

Implied minutes of impedance = 0.7647/-0.02128 = 35.9 minutes.

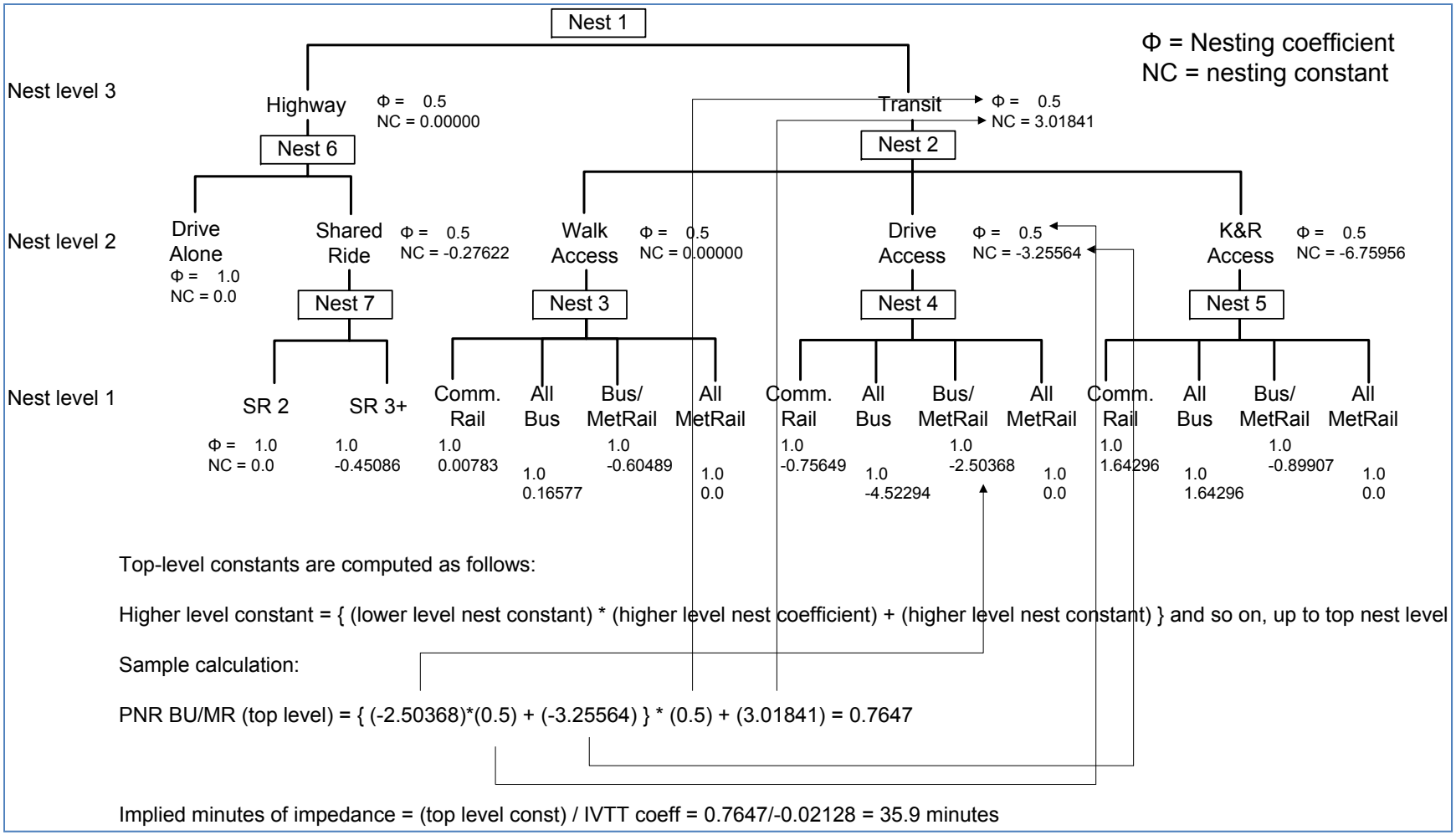

Figure 17 Example of calculating a top-level nesting constant from the lower-level nesting constants that come out of CALIBMS

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6.5 Model application

The model was calibrated to year-2007 conditions, since the year 2007 is considered the base year for this model. The model was also applied for the year 2007. The NLMC model has the capability to perform transit assignments. In 2008, when TPB staff released the draft documentation for the Version 2.3 travel model on the 2,191-TAZ area system, TPB staff had performed transit assignments and had presented transit assignment results for the years 2002 and 2005.[67] For this current effort on the 3,722-TAZ area system, however, TPB staff has not had the time to test the transit assignment, so no such results are reported in this chapter. Instead, we present some of the year-2007 estimated mode choice data from the year-2007 calibration to a simulated trip table.[68] Three summary tabulations can be found in Table 59, Table 60, and Table 61. Person trips by travel mode and trip purpose, summed for all 20 geographic market segments, can be found in Table 59. The total number of estimated daily person trips is 17,328,698. The total number of estimated transit person trips is 1,099,715, which is close to the control total shown in Table 51 (1,124,582) and Table 59 (1,124,587).

The primary difference between this current calibration effort (using a simulated year 2007 trip table) and the previous effort (using an observed year 2007 trip table), [69] is the fact that the 1.75 factor that had been applied to all non-work trips has been removed, since it is no longer needed to ensure that the travel model matches observed VMT. So, for example, the target or "observed" HBS total person trips has gone from 4.952 million to 2.853 million – a 42% drop, or the equivalent of a 1.74 scaling factor. Since no factor had been applied to it, HBW was largely unaffected: target total person trips went from 3.707 million to 3.501 million, a 6% drop, or the equivalent of a 1.05 scaling factor. In terms of total person trips across all five trip purposes, the "observed" value went from 27.515 million to 17.187 million, which corresponds to a 38% drop or the equivalent of a 1.60 scaling factor. The resultant effect on transit percents is similarly large. The "observed" HBS transit percent went from 0.5% to 0.9%, almost a doubling. The "observed" HBW transit percentage was only somewhat affected, going from 20.4% to 21.6%. As for the "observed" total (across five purposes) transit percent, this went from 4.1% to 6.5%.

[67] Ronald Milone et al., *TPB Travel Forecasting Model, Version 2.3: Specification, Validation, and User's Guide*, 6-39.

[68] MS Moran to Ronald Milone, "Using CALIBMS and a simulated trip table to calibrate the nested-logit mode choice model that is part of the TPB Version 2.3 travel model on the 3,722-TAZ area system."

[69] MS Moran to Ronald Milone, "Using CALIBMS and an observed trip table to calibrate the nested-logit mode choice model that is part of the TPB Version 2.3 travel model on the 3,722-TAZ area system."

Table 59 Person trips by travel mode and trip purpose, summed for all 20 geographic market segments

		HBW		HBS		HBO		NHW		NHO		ALL	
	Mode	Target	Model	Target	Model	Target	Model	Target	Model	Target	Model	Target	Model
All 20 Segments	DR ALONE	2,488,139	2,516,701	1,310,755	1,313,900	2,142,698	2,145,275	1,172,254	1,175,443	1,261,823	1,264,678	8,375,669	8,415,996
	SR2	274,299	276,480	936,969	939,238	2,353,079	2,355,943	261,343	261,902	977,302	979,290	4,802,992	4,812,853
	SR3+	9,228	9,070	593,357	594,762	1,770,683	1,772,873	6,393	6,512	615,484	616,917	2,995,145	3,000,133
	WK-CR	1,849	1,892	21	81	210	382	0	432	400	344	2,480	3,129
	WK-BUS	171,834	175,621	18,433	16,849	87,044	85,983	23,685	23,973	16,224	15,908	317,220	318,335
	WK-BU/MR	132,142	138,134	2,487	2,493	23,696	23,666	12,417	12,214	3,960	4,187	174,702	180,694
	WK-MR	194,165	159,891	4,853	4,656	46,904	45,959	56,579	55,878	16,428	15,729	318,929	282,113
	PNR-CR	16,647	16,458	0	2	260	497	0	66	208	213	17,115	17,237
	KNR-CR	1,472	1,457	0	330	197	225	0	65	216	276	1,885	2,352
	PNR-BUS	15,967	15,958	82	84	3,030	3,128	355	400	1,523	1,547	20,957	21,117
	KNR-BUS	4,553	4,613	199	372	2,004	2,347	1,426	1,408	880	999	9,062	9,740
	PNR-BU/MR	27,525	27,512	112	250	2,700	3,037	1,482	1,411	559	689	32,378	32,898
	KNR-BU/MR	9,248	9,432	136	812	1,733	1,848	1,210	1,127	1,003	1,010	13,330	14,229
	PNR-MR	137,984	138,044	469	450	15,657	15,659	7,271	7,172	1,563	1,783	162,944	163,106
	KNR-MR	42,794	43,936	146	358	4,436	4,312	4,378	4,279	1,831	1,881	53,585	54,765
	Total Person	3,527,846	3,535,199	2,868,019	2,874,636	6,454,331	6,461,132	1,548,793	1,552,280	2,899,404	2,905,451	17,298,393	17,328,698
	Total Transit	756,180	732,948	26,938	26,737	187,871	187,041	108,803	108,424	44,795	44,566	1,124,587	1,099,715
	Transit Pct	21.4%	20.7%	0.9%	0.9%	2.9%	2.9%	7.0%	7.0%	1.5%	1.5%	6.5%	6.3%

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Table 60 shows total person trips by market segment and Table 61 shows transit person trips by market segment.

Table 60 Total person trips by market segment

Market	HBW		HBS		HBO		NHW		NHO		ALL	
Segment	Target	Model	Target	Model	Target	Model	Target	Model	Target	Model	Target	Model
1	134,786	134,427	19,348	19,352	87,303	87,263	72,382	72,460	39,716	39,739	353,535	353,241
2	12,133	11,990	2,227	2,235	9,206	9,169	8,690	8,695	1,950	1,955	34,206	34,044
3	79,319	79,415	85,457	85,738	289,420	289,716	86,681	87,053	109,231	109,589	650,108	651,510
4	49,745	50,918	43,616	44,349	83,705	84,443	57,723	58,272	46,846	48,384	281,635	286,365
5	27,519	27,155	1,958	1,949	11,182	11,133	4,746	4,750	3,575	3,573	48,980	48,559
6	2,742	2,692	145	147	875	876	652	653	173	176	4,587	4,543
7	34,331	34,424	31,372	31,397	86,556	86,589	31,830	31,875	36,666	36,716	220,755	221,001
8	27,760	28,338	29,406	29,575	63,881	64,099	27,209	27,279	39,287	39,473	187,543	188,764
9	52,190	52,461	2,292	2,318	16,163	16,156	12,000	12,029	2,962	2,973	85,607	85,936
10	16,031	16,095	8,284	8,273	21,747	21,737	16,567	16,567	7,556	7,553	70,185	70,225
11	41,084	40,698	53,099	53,175	118,878	118,881	44,467	44,520	45,094	45,181	302,622	302,455
12	37,068	37,421	34,013	34,225	69,317	69,619	34,541	34,675	39,452	39,821	214,391	215,760
13	254,417	254,051	9,364	9,571	62,069	62,327	18,769	18,970	12,171	12,477	356,790	357,396
14	32,461	32,129	1,239	1,271	8,429	8,486	2,774	2,793	801	815	45,704	45,494
15	255,653	256,798	66,070	66,577	259,012	259,667	51,863	52,187	72,183	72,871	704,781	708,100
16	1,151,911	1,155,234	1,377,161	1,378,466	2,934,719	2,936,808	574,027	574,808	1,411,015	1,411,833	7,448,833	7,457,149
17	176,264	177,492	6,141	6,364	39,390	39,639	9,578	9,716	2,374	2,597	233,747	235,808
18	48,179	48,732	6,395	6,427	22,321	22,377	7,159	7,195	4,222	4,258	88,276	88,989
19	160,827	162,780	45,796	46,763	128,770	129,499	29,273	29,395	32,867	33,433	397,533	401,870
20	933,426	931,950	1,044,636	1,046,466	2,141,388	2,142,647	457,862	458,389	991,263	992,035	5,568,575	5,571,488
Total Person	3,527,846	3,535,199	2,868,019	2,874,636	6,454,331	6,461,132	1,548,793	1,552,280	2,899,404	2,905,451	17,298,393	17,328,698
Total Transit	756,180	732,948	26,938	26,737	187,871	187,041	108,803	108,424	44,795	44,566	1,124,587	1,099,715
Transit Pct	21.4%	20.7%	0.9%	0.9%	2.9%	2.9%	7.0%	7.0%	1.5%	1.5%	6.5%	6.3%

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Table 61 Transit person trips by market segment

Market Segment	HBW		HBS		HBO		NHW		NHO		ALL	
	Target	Model	Target	Model	Target	Model	Target	Model	Target	Model	Target	Model
1	121,156	120,830	2,516	2,494	32,693	32,643	29,816	29,838	9,430	9,407	195,611	195,211
2	10,475	10,274	145	140	3,142	3,110	4,281	4,292	1,880	1,857	19,923	19,673
3	71,016	70,406	6,941	6,925	41,914	41,917	24,992	25,074	11,535	11,542	156,398	155,863
4	20,938	18,528	1,238	1,250	5,028	5,021	6,633	6,453	2,681	2,728	36,518	33,980
5	20,376	19,892	202	182	3,493	3,441	2,089	2,083	467	453	26,627	26,051
6	1,753	1,706	32	33	183	173	192	193	35	32	2,195	2,138
7	15,410	15,275	900	889	6,656	6,605	2,084	2,056	1,014	1,002	26,064	25,827
8	6,056	5,999	390	372	2,659	2,638	1,901	1,885	1,056	1,047	12,062	11,941
9	46,277	45,356	197	183	7,689	7,572	5,427	5,429	2,540	2,461	62,130	61,001
10	7,160	7,073	247	246	938	922	2,977	2,953	586	570	11,908	11,763
11	20,454	18,725	1,397	1,371	5,681	5,634	4,626	4,604	2,260	2,235	34,418	32,569
12	5,473	4,846	466	471	1,991	1,935	1,703	1,662	374	352	10,007	9,264
13	122,128	118,147	377	358	11,153	11,123	4,701	4,719	966	951	139,325	135,298
14	14,072	13,682	27	22	1,436	1,420	493	479	295	287	16,323	15,890
15	68,062	66,130	1,779	1,765	16,478	16,471	3,984	3,988	2,077	2,043	92,380	90,397
16	42,095	41,998	5,444	5,434	21,809	21,786	4,505	4,468	3,970	3,963	77,823	77,648
17	76,030	71,137	218	202	7,192	7,102	3,220	3,205	753	808	87,413	82,454
18	21,412	20,626	21	32	1,061	1,025	676	654	123	114	23,293	22,451
19	41,081	38,659	597	584	6,262	6,148	1,838	1,792	871	855	50,649	48,038
20	24,756	23,661	3,804	3,784	10,413	10,356	2,665	2,596	1,882	1,861	43,520	42,257
Total Transit	756,180	732,948	26,938	26,737	187,871	187,041	108,803	108,424	44,795	44,566	1,124,587	1,099,715

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6.6 References

{Bibliography}

Chapter 7 Time-of-Day Model

The time-of-day model for the Version 2.3 travel model apportions daily vehicle trips among four modeled time-of-day periods, prior to the traffic assignment step. This chapter presents the details of the model and the development of the peaking factors. The actual peak-hour factors for the four time-of-day periods can be found on Table 70 on page 114.

7.1 Model Structure

The time-of-day model, which follows the mode choice model, addresses the temporal dimension of travel. The model distributes daily trips by purpose and mode to specific periods of the day, in preparation for the traffic assignment step. The four modeled time periods considered in the Version 2.3 model are defined as the AM peak period (6 – 9 AM), the midday period (9 AM – 3 PM), the PM peak period (3 PM – 7 PM) and the nighttime/early morning period (7 PM – 6 AM). Note that the AM peak period is defined as being three hour long (as it was in Version 2.2), but the PM peak period is now defined as being four hours long (compared to three hours in Version 2.2).[70]

The distribution of daily trips to specific time periods are made with time-in-motion factors developed from the 2007/2008 HTS. The factors, shown as Table 63, have been developed on the basis of purpose, mode, and directionality of the trip (with respect to the home-end and non-home ends of the trip). After applying the travel model, including the time-of-day-specific traffic assignment, it was found that the model was overestimating travel in the AM and PM peaks, and underestimating travel in the midday and night periods. Consequently, the time-of-day factors were adjusted so that the traffic assignment more closely matched the observed VMT. The resulting, adjusted time-of-day factors are shown in Table 64.

The truck and various non-modeled auto driver travel markets are also converted from daily trip tables to the four time periods using a system of temporal factors. The factors are summarized in Table 62.

[70] MS Moran to Ronald Milone, "Choosing the breakpoints for and duration of time-of-day periods used in the Version 2.3 travel model," Memorandum, October 21, 2010.

Table 62 Version 2.3 Temporal Factors (Percentages) For Truck and Non-Modeled Travel Markets

Time Period	Travel Market							
	Comm. Vehicle	Medium Truck	Heavy Truck	X-X Auto Dr	Taxi Auto Dr	Tourist Auto Dr	School Auto Dr	Airport Auto Dr
AM	18.70	25.00	20.00	18.70	18.70	18.70	18.70	23.10
MD	32.63	45.00	50.00	32.63	32.63	32.63	32.63	36.57
PM	32.89	20.00	10.00	32.89	32.89	32.89	32.89	25.38
NT	15.78	10.00	20.00	15.78	15.78	15.78	15.78	14.95

Note: Medium & Heavy truck factors were updated as part of the truck modeling update

The temporal factors shown for medium and heavy trucks were recently updated as part of the revised truck modeling effort.[71] The remaining temporal factors were based on professional judgment. The directional splits for the above auto trips are 50/50 (all time periods). The directional X/I and IX split for external commercial and truck trips 70/30, 30/70, and 50/50, for the AM, PM, and off-peak periods, respectively.

In application, these factors are assumed to remain *constant* over time. Although it is reasonable to expect, that congestion will encourage traffic spreading from the AM and PM periods to the off-peak, the peak spreading phenomenon is complex and not well understood in the profession. Instead of addressing this issue in the regional model, TPB accounts for peak spreading issues in its travel model post-processor (also known as the mobile emissions post processor), where hourly volume and speed estimates are formulated.[72]

[71] Allen, *Development of a Model for Truck Trips*.

[72] Hamid Humeida, "Emissions post processor used for the Air Quality Conformity Determination of the 2008 CLRP and the FY2009-2014 TIP," Memorandum, April 27, 2009; Ronald Milone and Hamid Humeida to Files, "Mobile Emissions Post-Processor Description and Results," Memorandum, May 26, 2009.

Table 63 Temporal travel distributions by purpose, mode, and direction

Purpose	Mode	Direction	AM	MD	PM	NT
HBW	Auto Driver	Home-NonHome	66.53	19.99	4.17	9.31
		NonHome-Home	1.41	8.16	70.77	19.66
	Drive Alone	Home-NonHome	67.06	19.69	3.89	9.36
		NonHome-Home	1.59	8.20	69.67	20.54
	Carpool Person	Home-NonHome	58.06	25.85	7.90	8.19
		NonHome-Home	0.25	8.69	75.95	15.11
	Transit	Home-NonHome	74.63	16.70	0.81	7.86
		NonHome-Home	0.19	2.78	79.88	17.15
HBS	Auto Driver	Home-NonHome	15.43	41.71	28.17	14.69
		NonHome-Home	1.49	32.12	38.24	28.15
	Drive Alone	Home-NonHome	20.84	43.46	22.08	13.62
		NonHome-Home	2.10	33.17	39.24	25.49
	Carpool Person	Home-NonHome	6.38	37.49	40.09	16.04
		NonHome-Home	0.30	29.26	35.89	34.55
	Transit	Home-NonHome	35.42	43.24	14.49	6.85
		NonHome-Home	0.36	25.76	38.85	35.03
HBO	Auto Driver	Home-NonHome	24.26	38.71	25.24	11.79
		NonHome-Home	6.96	27.53	35.58	29.93
	Drive Alone	Home-NonHome	22.43	42.19	23.05	12.33
		NonHome-Home	9.34	29.41	31.68	29.57
	Carpool Person	Home-NonHome	33.57	30.60	26.06	9.77
		NonHome-Home	2.37	22.94	45.92	28.77
	Transit	Home-NonHome	41.28	41.23	13.20	4.29
		NonHome-Home	0.52	23.33	43.54	32.61
NHW	Auto Driver	Home-NonHome	12.33	43.14	38.80	5.73
		NonHome-Home	12.33	43.14	38.80	5.73
	Drive Alone	Home-NonHome	12.93	42.82	38.36	5.89
		NonHome-Home	12.93	42.82	38.36	5.89
	Carpool Person	Home-NonHome	12.46	41.92	39.87	5.75
		NonHome-Home	12.46	41.92	39.87	5.75
	Transit	Home-NonHome	17.35	24.71	51.08	6.86
		NonHome-Home	17.35	24.71	51.08	6.86
NHO	Auto Driver	Home-NonHome	4.07	55.33	29.87	10.73
		NonHome-Home	4.07	55.33	29.87	10.73
	Drive Alone	Home-NonHome	4.92	57.58	28.17	9.33
		NonHome-Home	4.92	57.58	28.17	9.33
	Carpool Person	Home-NonHome	3.69	47.29	35.48	13.54
		NonHome-Home	3.69	47.29	35.48	13.54
	Transit	Home-NonHome	5.92	39.82	45.49	8.77
		NonHome-Home	5.92	39.82	45.49	8.77

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Table 64 Temporal travel distributions by purpose, mode, and direction

Purpose	Mode	Direction	AM	MD	PM	NT
HBW	Auto Driver	Home-NonHome	57.88	22.89	3.76	15.47
		NonHome-Home	1.14	8.73	59.62	30.51
	Drive Alone	Home-NonHome	58.38	22.56	3.50	15.56
		NonHome-Home	1.28	8.72	58.32	31.68
	Carpool Person	Home-NonHome	50.09	29.35	7.07	13.49
		NonHome-Home	0.21	9.59	66.01	24.19
	Transit	Home-NonHome	66.36	19.55	0.74	13.35
		NonHome-Home	0.16	3.06	69.35	27.43
HBS	Auto Driver	Home-NonHome	12.09	43.04	22.89	21.98
		NonHome-Home	1.10	30.82	28.90	39.18
	Drive Alone	Home-NonHome	16.42	45.06	18.03	20.49
		NonHome-Home	1.57	32.31	30.10	36.02
	Carpool Person	Home-NonHome	4.99	38.58	32.49	23.94
		NonHome-Home	0.21	27.13	26.20	46.46
	Transit	Home-NonHome	29.42	47.26	12.46	10.86
		NonHome-Home	0.25	23.98	28.47	47.30
HBO	Auto Driver	Home-NonHome	19.58	41.12	21.11	18.19
		NonHome-Home	5.07	26.41	26.87	41.65
	Drive Alone	Home-NonHome	17.89	44.28	19.05	18.78
		NonHome-Home	6.81	28.18	23.91	41.10
	Carpool Person	Home-NonHome	28.09	33.70	22.60	15.61
		NonHome-Home	1.76	22.35	35.23	40.66
	Transit	Home-NonHome	35.16	46.21	11.65	6.98
		NonHome-Home	0.37	22.15	32.56	44.92
NHW	Auto Driver	Home-NonHome	10.26	47.22	33.44	9.08
		NonHome-Home	10.26	47.22	33.44	9.08
	Drive Alone	Home-NonHome	10.75	46.85	33.05	9.35
		NonHome-Home	10.75	46.85	33.05	9.35
	Carpool Person	Home-NonHome	10.39	46.01	34.45	9.15
		NonHome-Home	10.39	46.01	34.45	9.15
	Transit	Home-NonHome	14.97	28.06	45.68	11.29
		NonHome-Home	14.97	28.06	45.68	11.29
NHO	Auto Driver	Home-NonHome	3.17	56.75	24.12	15.96
		NonHome-Home	3.17	56.75	24.12	15.96
	Drive Alone	Home-NonHome	3.85	59.34	22.86	13.95
		NonHome-Home	3.85	59.34	22.86	13.95
	Carpool Person	Home-NonHome	2.89	48.41	28.60	20.10
		NonHome-Home	2.89	48.41	28.60	20.10
	Transit	Home-NonHome	4.85	42.88	38.57	13.70
		NonHome-Home	4.85	42.88	38.57	13.70

Ref: I:\ateam\docum\FY11\Ver2.3\modelDoc\01_calib\todcomp_2008HTS_V23.xlsx

Chapter 8 Traffic Assignment/Feedback

The traffic assignment step is used to load a trip table onto the highway network in order to produce network link flows and speeds. The traffic assignment process of the Version 2.3 model is detailed in this chapter.

8.1 Updated features

Table 65 compares how traffic assignment features have changed from Version 2.2 to Version 2.3. Following the table is 1) a brief discussion of some of these items, and 2) more detailed descriptions of some features.

Table 65 A comparison of traffic assignment features in the Version 2.2 and 2.3 travel models

Feature	Version 2.2	Version 2.3
Methodology	Static, user equilibrium traffic assignment	Same
Algorithm	Frank-Wolfe	Frank-Wolfe*
Volume delay function	Conical	Same
Queuing delay function	Yes, sigmoid curve	None
User classes	5	6 (added commercial vehicles)
Time of day periods	AM, PM, off peak	AM, PM, midday, and night time
Number of time-of-day/user-class traffic assignments	5 (See Figure 19)	6 (See Figure 20)
Convergence criterion	60 user equilibrium iterations per time-of-day period	A relative gap of 10^{-3} (0.001) or 200 user equilibrium iterations, whichever is attained first
Speed feedback iterations	7 (pump prime, i1, i2, i3, i4, i5, i6)	5 (pump prime, i1, i2, i3, i4)
Two-step traffic assignment (see section 8.3 on page 99)	Yes	Yes
Double run of the travel model to address Northern Virginia HOV/HOT lane policy (see section 8.4 on page 103)	Yes	Yes
Number of zone-to-zone interchanges	$2,191^2$ = 4,800,481	$3,722^2$ = 13,853,284 (increased by a factor of 2.86 or 186%)
Free-flow capacity and speed lookup tables		Updated

* Bi-conjugate Frank-Wolfe algorithm was selected initially, however, after further testing, it was found to yield different results with and without distributed processing. If the issue is resolved, Version 2.3 will be updated to utilize the bi-conjugate Franke-Wolfe.

The Version 2.3 travel model traffic assignment process uses a static, user-equilibrium traffic assignment, implemented with a Frank-Wolfe algorithm. The bi-conjugate Franke-Wolfe algorithm, which yields faster convergence and run times, was used in the initial model tests. However, after implementation of distributed processing (Cube Cluster), it was found to yield different results with and without distributed processing. If the issue can be resolved by the software vendor, TPB staff plans to revert back to using the bi-conjugate Frank-Wolfe algorithm in the Version 2.3 travel model. The Version 2.3 traffic assignment uses a conical volume delay function, but foregoes the queuing delay function that had been added to the Version 2.2 travel model (see discussion later in the chapter). Whereas the

Version 2.2 traffic assignment process used five user classes, the Version 2.3 model uses six user classes (commercial vehicles is now its own user class). For the Version 2.2 traffic assignment, the convergence/stopping criterion was simply to stop after 60 user equilibrium (UE) iterations. In Version 2.3, there is a dual convergence/stopping criterion: attain a relative gap of 10^{-3} (0.001) or 200 user equilibrium iterations, whichever comes first. This means that the Version 2.3 traffic assignment reaches a more converged solution than was the case with Version 2.2 and it also means that the six user classes should be similarly converged if the assignment stops after reaching the relative gap stopping criterion. By contrast, in Version 2.2, since each user class went to 60 UE iterations, some of the five were more converged than others, as is shown later in this chapter.

The Version 2.3 traffic assignment continues to use both the two-step traffic assignment and the double run of the travel model to address Northern Virginia HOV/HOT lane policy, both of which are discussed in greater detail later in this chapter. The maximum TAZ number has increased from 2,191 to 3,722, a 70% increase. However, traffic assignment run times scale with the matrix size, so there has been an increase of 186% or a factor of 2.86. In the past, half of the model run time was spent on traffic assignment. Although we have not computed what this percentage is for the new model, we do know that a typical run time for the entire Version 2.2 travel model (traffic assignment and other steps) on our travel model server was about 18 hours and the new model takes about 80 hours (a factor of 4.4). If the model is distributed over 4 cores (using Cube Cluster as discussed in the User's Guide), model run time decreases to 47 hours. The increased run times are primarily due to the increased size of the matrices, the increased convergence in traffic assignment, the addition of a sixth user class in traffic assignment, and the fact that we now use four time-of-day periods (up from the previous three). For reference when model run times are discussed, the specifications or "specs" of the travel model server used by the models development staff (TMS3) are shown in Table 66.

Table 66 Specs of travel model server tms3

Item	Spec
Processor name and speed	Intel Xeon W5580 CPU @ 3.20GHz
Number of processors in system	2
Active cores per processor	4
Total number of cores	8
L2 Cache	4 x 256 KB
System Bus Frequency	133 MHz
Memory	4.0 GB
Hard drive	Network attached storage (NAS, O drive), 1.99 TB
Operating system	Windows Server Standard, SP2, 32-bit

Ref: O:\model_dev\computer_specs_2011-01.xlsx

8.2 Model structure

The traffic assignment step is executed five times during a given model run. The first assignment is called the "pump prime" traffic assignment. The last four traffic assignments, which occur as part of the speed feedback loop, are called iteration 1, 2, 3, and 4. For each of the five traffic assignments, there are actually four individual traffic assignments, one for each time-of-day period:

- AM peak period (3 hours: 6:00 AM to 9:00 AM)
- Midday period (6 hours: 9:00 AM to 3:00 PM)
- PM peak period (4 hours: 3:00 PM to 7:00 PM)
- Night/early morning period (11 hours: 7:00 PM to 6:00 AM)

The trips loaded in each time period are comprised of all purposes, as allocated by the time-of-day model. The trip tables that are loaded to the network are segmented into six user classes:

1. Single-occupant vehicles (SOVs)
2. Two-occupant HOVs
3. Three or more-occupant HOVs
4. Commercial vehicles
5. Medium/heavy truck
6. Airport auto driver

In Version 2.2, there were only five user classes, since the commercial vehicles category was grouped with medium/heavy truck. The primary reason for distinguishing truck markets is to allow for the option of using passenger car equivalents (PCEs) in the traffic assignment process. The use of PCE's has not yet been implemented, but they will be considered in future developmental work.

8.3 Two-step traffic assignment

To better understand the two-step assignment, it is necessary to discuss its development as part of the Version 2.2 travel model. The Version 2.2 traffic assignment process prior to the fall of 2008 consisted of three separate assignment executions: AM peak period, PM peak period, and the off-peak period (See Figure 18). The stopping criterion used was a fixed number UE iterations per time period (i.e., 60). To respect the various highway path options and prohibitions in the Washington region, five separate markets or "user classes" (trip tables) were loaded during each assignment execution:

1. Single-occupant vehicles, including commercial vehicles (SOV),
2. 2-occupant vehicles (HOV2),
3. 3+occupant vehicles (HOV3+),
4. Trucks (medium and heavy), and
5. Airport passenger vehicles.

	# UE Iterations	Period	Trip Markets Assigned
Assignment 1	60	AM	1 SOV 2 HOV 2-Occ. 3 HOV 3+-Occ. 4 Trucks 5 Airport Pax
Assignment 2	60	PM	1 SOV 2 HOV 2-Occ. 3 HOV 3+-Occ. 4 Trucks 5 Airport Pax
Assignment 3	60	Off-Peak	1 SOV 2 HOV 2-Occ. 3 HOV 3+-Occ. 4 Trucks 5 Airport Pax

Figure 18 Traffic assignment in the Version 2.2 Travel Model prior to fall 2008: three assignments, each with five market segments (user classes), resulting in 180 user equilibrium iterations

Source: Ronald Milone and Mark Moran, "TPB Models Development Status Report" (Presentation at the Travel Forecasting Subcommittee presented at the Travel Forecasting Subcommittee, Washington, D.C., November 21, 2008).

This type of assignment is known as a multi-class assignment. Although separate link volumes are developed for each of the five markets, the final loaded links file ultimately contains total volumes, speeds, and volume-to-capacity (V/C) ratios for each time period. The Version 2.2 travel model includes a speed feedback loop. The AM and off-peak SOV restrained times resulting from the traffic assignment step are fed back into trip generation (via transit accessibility), trip distribution, and mode choice. In standard application of the travel model, the four-step process is executed a total of seven times, hence seven traffic assignments.[73] The first of these traffic assignments is known as the "pump prime" assignment, since it primes the pump, or gets the process started. The pump prime assignment uses free-flow link speeds (based on a lookup table) and exogenous mode choice percentages (i.e., the mode choice model is not run). In the six subsequent applications of the four-step model, congested link speeds are used and the mode choice model is executed. A link-level "method of successive averaging" (MSA) process is applied after each successive highway assignment process to ensure that highway volumes (and hence speeds) will stabilize. The MSA averaging is performed on the basis of total (non-segmented) link volumes, and is performed individually for each time period.

In the fall of 2008, as part of air quality conformity work, the traffic assignment process was modified to improve the assignment of HOV/HOT traffic on the Capital Beltway in Virginia and the I-395 Shirley

[73] The total number of all-or-nothing traffic assignments is 1,260 (= 7 speed feedback loops x 3 time-of-day periods x 60 UE iterations). Traffic assignment accounts for over half of the model run time.

Highway.[74] The previous process, describe above included three traffic assignments by time period with five user classes, resulting in 180 UE iterations per speed feedback iteration, or 1,260 UE iterations per model run. The revised process, shown in Figure 19, splits the AM traffic assignment into two parts: non-HOV 3+ (i.e., SOV, HOV2, trucks, and airport passengers) and HOV 3+. Similarly, the PM traffic assignment is also split into the same two parts: non-HOV 3+ and HOV3+. This new traffic assignment process is sometimes referred to as the "two-step assignment," since it splits the AM and PM assignment each into two parts.[75] The result is five (not three) traffic assignments, with either four, one, or five user classes, depending on which assignment is being conducted. The fifth traffic assignment, representing the off-peak period, includes all five trip markets – it is only the AM and PM peak assignments where the non-HOV 3+ and HOV 3+ are split out. This results in 300 UE iterations per speed feedback iteration, or 2,100 UE iterations per model run (a 67% increase).

In the first step of the two-step assignment (assignments #1 and #3), non-HOV 3+ traffic (i.e., SOV, HOV 2, truck, and airport passenger trips) is assigned to all facilities (HOV and general purpose). In the second step, HOV 3+ traffic is assigned to HOT lanes and other facilities on the partially loaded network. The pre-assignment of non-HOV 3+ traffic results in congested link speeds for the general purpose lanes. This means that HOV 3+ traffic has a greater incentive to use HOV facilities, which results in improved HOV 3+ loadings on priority-use and general-use facilities.

[74] Ronald Milone and M Moran, "TPB Models Development Status Report" (presented at the Travel Forecasting Subcommittee of the Technical Committee of the National Capital Region Transportation Planning Board, held at the Metropolitan Washington Council of Governments, Washington, D.C., November 21, 2008).
[75] Jinchul Park to Files, "Two Step Traffic Assignment for HOT Lane Modeling in 2008 CLRP," Memorandum, December 2, 2008.

	# UE Iterations	Period	Trip Markets Assigned
Assignment 1	60	AM	1 SOV 2 HOV 2-Occ. 3 Trucks 4 Airport Pax
Assignment 2	60	AM	1 HOV 3+-Occ.
Assignment 3	60	PM	1 SOV 2 HOV 2-Occ. 3 Trucks 4 Airport Pax
Assignment 4	60	PM	1 HOV 3+-Occ.
Assignment 5	60	Off-Peak	1 SOV 2 HOV 2-Occ. 3 HOV 3+-Occ. 4 Trucks 5 Airport Pax

Figure 19 Traffic assignment in the Version 2.2 Travel Model after fall 2008: five assignments, with one, four, or five user classes, resulting in 300 user equilibrium iterations

Source: Ronald Milone and Mark Moran, "TPB Models Development Status Report" (Presentation at the Travel Forecasting Subcommittee presented at the Travel Forecasting Subcommittee, Washington, D.C., November 21, 2008).

The Version 2.3 travel model continues to use the same two-step assignment shown in Figure 19, except that there are six assignments, not five, as discussed in section 8.2 . The new traffic assignment process is described in Figure 20.

	# UE Iterations	Period	User classes
Assignment 1	Rel. gap= 10^{-3} OR 200 UE	AM	1. SOV 2. HOV 2 3. Trucks 4. Commercial Vehicles 5. Airport PAX
Assignment 2	Rel. gap= 10^{-3} OR 200 UE	AM	1. HOV 3+
Assignment 3	Rel. gap= 10^{-3} OR 200 UE	PM	1. SOV 2. HOV 2 3. Trucks 4. Commercial Vehicles 5. Airport PAX
Assignment 4	Rel. gap= 10^{-3} OR 200 UE	PM	1. HOV 3+
Assignment 5	Rel. gap= 10^{-3} OR 200 UE	Midday	1. SOV 2. HOV 2 3. HOV 3+ 4. Trucks 5. Commercial Vehicles 6. Airport PAX
Assignment 6	Rel. gap= 10^{-3} OR 200 UE	Night Time	1. SOV 2. HOV 2 3. HOV 3+ 4. Trucks 5. Commercial Vehicles 6. Airport PAX

Figure 20 Traffic assignment in the Version 2.3 Travel Model: six traffic assignments, with one, five, or six user classes

8.4 Double run of the travel model to address Northern Virginia HOV/HOT lane policy

The Version 2.2 travel model requires two model runs be performed for each scenario being modeled to address the stated policy of Virginia Department of Transportation (VDOT) that HOT facilities will not degrade the operations of HOV users. The "base run" captures the travel time for unimpeded flow of HOV traffic on HOT lanes, consistent with the stated operational policy. The "conformity run" or "final run" of the travel model substitutes the HOV skims obtained for the HOV skims that would otherwise be

obtained by simply skimming the networks with HOT lanes in operation. Only the HOV skims are taken from the "base run." Skims for all other modes are taken from the "conformity run." Under this framework, the "base run" serves solely as a means for measuring times for HOV traffic on HOT facilities. This procedure, which is also called the "HOV 3+ skim substitution option," is described on page 1-10 of the Version 2.2 documentation.[76]

Cambridge Systematics, Inc. (CS) has proposed eliminating the double run of the travel model to address Northern Virginia HOV/HOT lane policy by combining the two steps into one step. The consultant cites the following benefits: less time needed for model runs and greater consistency in mode choice modeling. [77] TPB staff is currently considering the pros and cons of eliminating the double run procedures, but has not chosen to eliminate it yet. Consequently, the double run of the travel model to address Northern Virginia HOV/HOT lane policy is still a part of the Version 2.3 travel model.

8.5 Convergence in traffic assignment

The convergence of the traffic assignment step for the Version 2.2 travel model is shown in Figure 21. This comes from a recent air quality conformity analysis.[78] The y-axis shows the relative gap, using a logarithmic scale, and the x-axis shows the number of UE iterations.

[76] Ronald Milone et al., *TPB Travel Forecasting Model, Version 2.2: Specification, Validation, and User's Guide*, 1-10.
[77] Cambridge Systematics, Inc., *Fiscal Year 2010 Task Reports*, 3-20.
[78] Ronald Milone and Meseret Seifu to Files, "Transmittal of Version 2.2 Travel Model files as per the October 21, 2009 Amendment to the 2009 CLRP/FY 2010-2015 TIP Air Quality Conformity Determination," Memorandum, October 29, 2009.

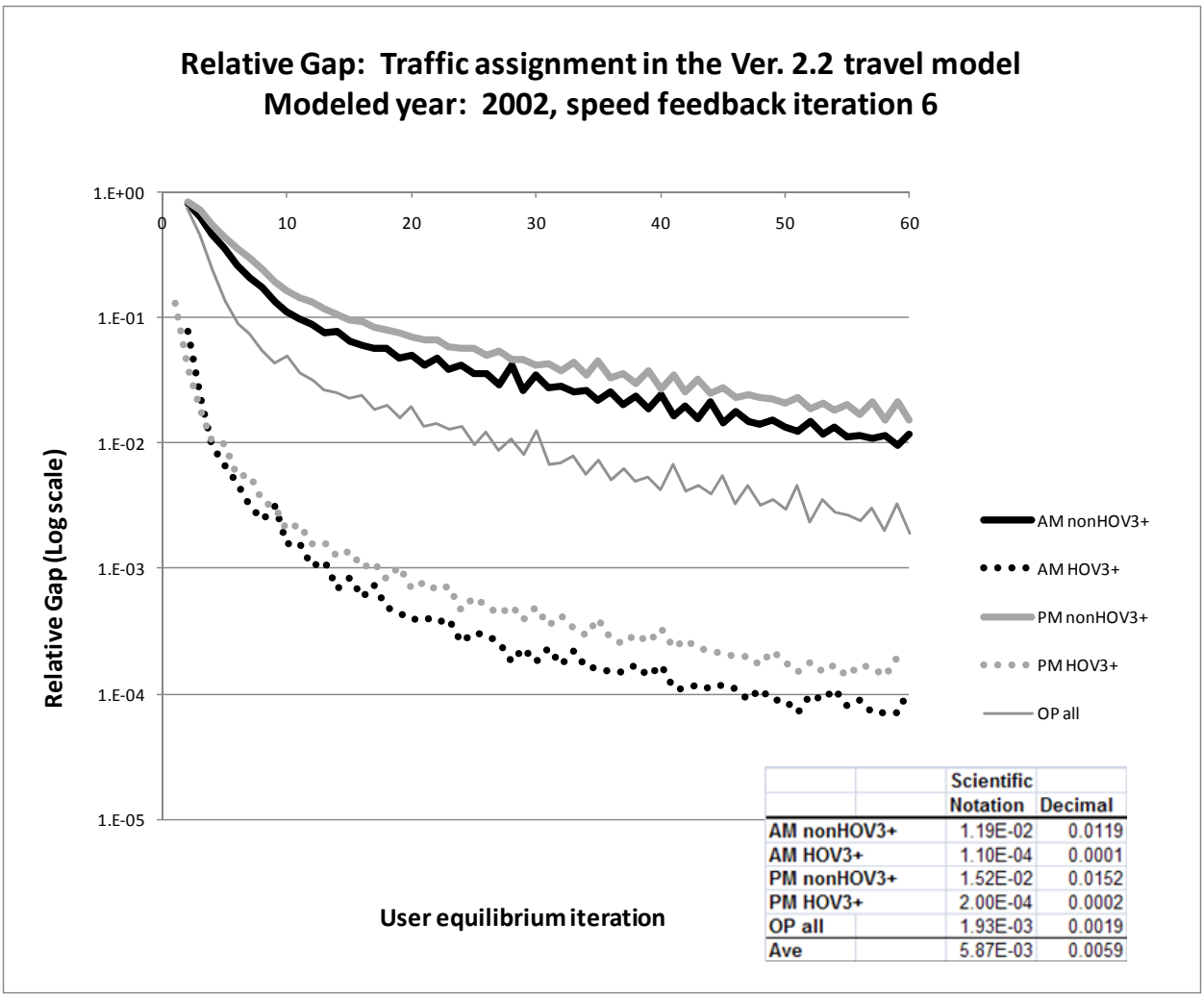

Figure 21 Relative gap by user equilibrium traffic assignment iteration: Version 2.2 Travel Model (final speed feedback iteration, i6)

Source: Transmittal of Version 2.2 Travel Model files as per the October 21, 2009 Amendment to the 2009 CLRP/FY 2010-2015 TIP Air Quality Conformity Determination (O:\model_dev\Version2.2_Jan08_Conformity2010Amended_Xmittal\2002_Conf). Ref: I:\ateam\from_consults\modelScanTaskOrder\2008_cs\2010\trafficAssignRelGapByIterVer2.2_2010_LogScale.pdf.

The current Version 2.2 travel model is reaching the following traffic assignment relative gaps

- about 10^{-2} (ca. 0.01 to 0.02) for the AM and PM non-HOV 3+ assignments
- about 10^{-3} (ca. 0.002) for the off-peak assignment
- about 10^{-4} (ca. 0.0001 to 0.0002) for the AM and PM HOV 3+ assignments

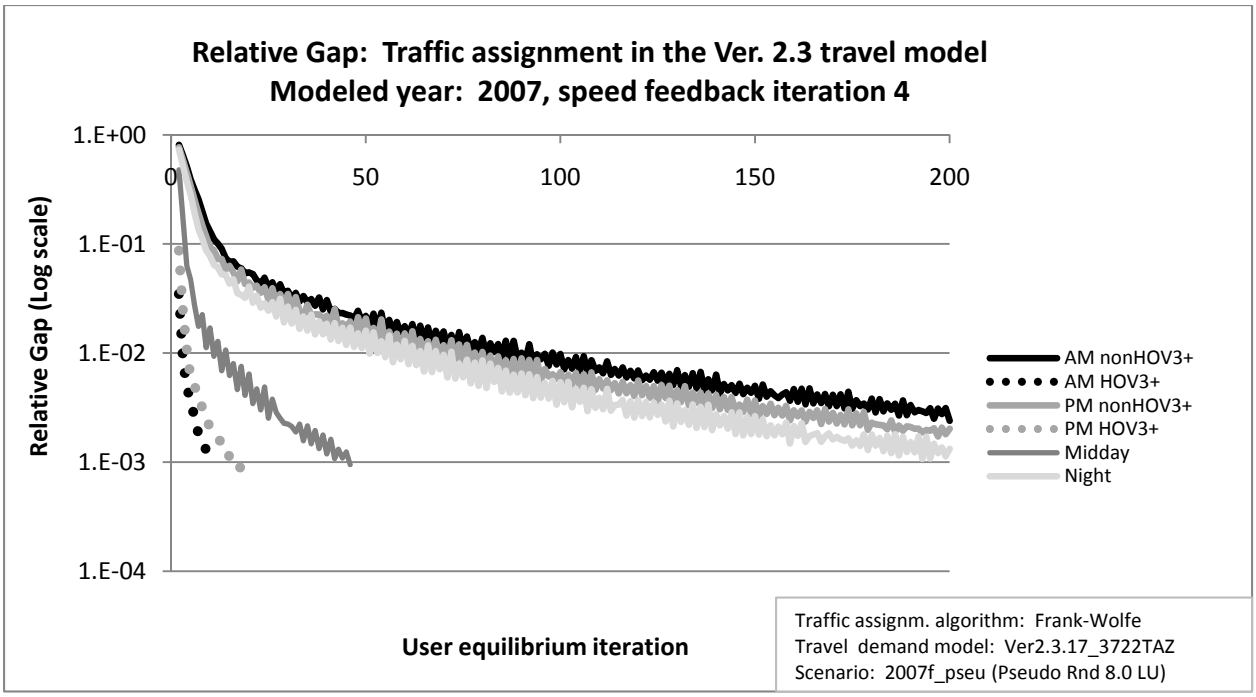

Figure 22 Relative gap by user equilibrium traffic assignment iteration: Version 2.3 Travel Model (final speed feedback iteration, i4)

The Version 2.3 travel model is reaching a similar level of convergence (as seen in Figure 22) for the AM nonHOV3+, PMnonHOV3+ and Night periods. Midday, AM HOV3+, and PM HOV3+ reach a relative gap of 10^{-3}.

8.6 Removal of queuing delay function

The TPB, like most MPOs in the U.S., uses a static traffic assignment (STA), which means that demand is assumed to be constant during the specific assignment period (in TPB's example: AM peak period, PM peak period, midday, and night). In a static traffic assignment model, link speeds are represented by volume-delay functions (VDFs), which capture the fact that as the link becomes more congested, the time to traverse the link goes up. STAs typically do not explicitly account for intersection (node) delay, however the link's VDF can be viewed as implicitly including the sum of the link delay and intersection delay. Another well known limitation of STA models is that some of the loaded links may have assigned volumes that are greater than the physical capacity of the given links, i.e., the volume-to-capacity ratio is greater than one.[79] One of the model enhancements done by TPB staff to minimize the number of overloaded links, particularly freeways and freeway ramps, was the introduction of a queuing delay function (QDF), such as that shown in Equation 9, which would act in conjunction with the VDF, but would be focused on intersection delay.

[79] Yi-Chang Chiu et al., *A Primer for Dynamic Traffic Assignment* (Transportation Research Board, 2010), http://www.nextrans.org/ADB30/UPLOAD/ssharma/dta_primer.pdf.

Equation 9 Queuing delay function (QDF): Sigmoid

$$t_D = a\frac{1}{1+e^{-b(x-c)}}$$

where
$t_D =$ delay time (minutes)
$x =$ link demand to capacity ratio $\left(\frac{\mathrm{V}}{\mathrm{C}}\right)$
$a =$ amplitude
$b =$ slope
$c =$ offset

The idea was to represent a phenomena that is not natively part of traditional STA models, namely that of queuing and traffic blockages, which result in reduced link speeds. TPB staff found that the addition of a QDF did, in fact, reduce the number of overloaded links. It also, however, may have resulted in some unintended consequences, such as unrealistically slow modeled speeds on freeways and an unrealistic shifting of volume from freeways to arterials, due to the way that QDFs were applied only to freeways and freeway ramps, but not to arterials and other types of roads. As noted by Cambridge Systematics, Inc. in a recent report, the queuing delay is not related to the length of the link, so it is possible for a very short link to have a very high level of queuing delay.[80]

Here is a summary of some of the findings/conclusions from CS's recent report:

- The TPB model is the only one that CS encountered which applies queuing delay only to freeway links.
- The No-QDF scenario achieves approximately the same results without the need for a QDF while using a VDF that has been validated for the Washington region.
- The Akçelik function also shows some promise in achieving TPB's goals.
- The QDF may not be the most accurate way to capture the desired network constraints.
- CS recommended TPB staff consider using a newly calibrated set of link-based VDFs that reflect the breakdown in traffic at higher volumes. Using this approach, TPB could
    - Continue use of an expanded and/or re-calibrated conical function
    - Switch to an Akçelik curve
    - Possibly employ different functional forms of VDFs on different facility types (e.g., conical functions for freeway versus Akçelik functions for surface streets).

From November 2010 to January 2011, TPB staff ran a series of test traffic assignments, some of which used Akçelik functions, such as that shown in Equation 10 and Equation 11. Staff tried implementing these curves as both function and lookup tables in the Cube Voyager scripts. However, it did not seem that the assigned volumes using the Akçelik function were any better at matching the observed volumes and the run times for the Akçelik function were considerably longer. Consequently, TPB staff decided to

[80] Cambridge Systematics, Inc., *Fiscal Year 2010 Task Reports*, 3-7.

continue using the conical volume delay function, implemented as a lookup table, and to drop the use of the QDF. Tests conducted by TPB staff indicated that the elimination of the QDF was beneficial for improving the traffic assignment results. Hence, based on these findings and the consultant recommendations, the QDFs were removed.

Equation 10 Akçelik curve

$$t = t_0 + 0.25T\left[(x-1) + \sqrt{(x-1)^2 + \frac{8J_A x}{CT}}\right]$$

where

t = average travel time per unit distance (hours/mile)

t_0 = free-flow travel time per unit distance (hours/mile)

T = flow period, i. e. , the time interval in hours, during which an average arrival flow rate V persists

C = capacity

x = the degree of saturation, i. e. , V/C, or volume to capacity ratio

J = the delay parameter, a calibration parameter

Equation 11 Akçelik Delay Function (HCM 2000)

$$R = R_0 + D_0 + D_M + 0.25NT\left[(x-1) + \sqrt{(x-1)^2 + \frac{16J * x * L^2}{N^2T^2}}\right]$$

where
R = link traversal time (hours)
R_0 = link traversal time under free flow conditions (hours)
D_0 = zero-flow control delay at signalized intersection (hours)
D_M = segment delay between signals- equals zero if no signals (hours)
N = number of signals (=1 if no signals)
T = expected duration of demand-Typically 1 hour (hours)
x = link demand to capacity ratio $\left(\frac{\mathrm{V}}{\mathrm{C}}\right)$
J = calibration parameter
L = link length (miles)

8.7 Volume Delay Functions

Volume delay functions (VDFs) are used to develop link speeds at the end of each loading pass. These functions represent the ratio of congested travel time to the free-flow time as a function of the volume-to-capacity (V/C) ratio. The function typically varies by facility type. Like the Version 2.2 travel model, the Version 2.3 travel model uses conical volume delay functions (see Equation 12).[81]

Equation 12 Conical VDF function (Spiess 1990)

$$\frac{t}{t_0} = f(x) = 2 + \sqrt{\alpha^2(1-x)^2 + \beta^2} - \alpha(1-x) - \beta$$

where
t = Congested link travel time
t_0 = Link free-flow travel time
$x = \frac{V}{C}$ = link volume to capacity ratio
α = slope of the function at $\frac{\mathrm{V}}{\mathrm{C}}$=1 (slope must be>1.0)
$\beta = \frac{2\alpha - 1}{2\alpha - 2}$

Table 67 shows, in tabular form, the conical VDFs used in the Version 2.3 travel model. There is a separate curve for each facility type, although ramps and freeways are assumed to have the same VDF.

[81] Heinz Spiess, "Conical Volume-Delay Functions," *Transportation Science* 24, no. 2 (May 1, 1990): 153-158, http://transci.journal.informs.org/cgi/content/abstract/24/2/153.

The conical VDFs are shown in graphical form in Figure 23 (for V/C >1) and Figure 24 (for V/C ≤ 1). In reality, no link would ever have a V/C ratio above one. However, in a typical regional travel model, V/C ratios above 1 do occur, so the VDF needs to account for this domain. Figure 23 shows the behavior of the Version 2.3 conical VDFs for large V/C ratios (V/C >1). The curve for freeways is the steepest, followed by expressways, then major arterials, minor arterials, and collectors. A steeper curve means more sensitivity to high V/C ratios, forcing excess traffic off of these facilities. Figure 24 shows the behavior of the Version 2.3 conical VDFs for V/Cs less than or equal to one. In this area of V/C ratio, the freeways show the least sensitivity to V/C ratio, but, as the V/C ratio approaches 1, the freeway VDFs have the steepest slope (a slope of 15).

In Figure 25, the vertical axis now shows congested speed (not ratio of congested to free-flow travel time). One can see that, for freeways, the congested speed drops to about 2 mph at a V/C ratio of 2.00.

Table 67 Conical volume-delay functions used in the Version 2.3 travel model: Tabular format

	Centroid (FT=0)	Freeway (FT=1)	Maj Art (FT=2)	Min Art (FT=3)	Collector (FT=4)	Exprw (FT=5)	Ramps (FT=6)
a		15	7	5.5	3	8	15
b		1.035714	1.083333	1.111111	1.25	1.071429	1.035714
v/c	**t/t0**	**t/t0**	**t/t0**	**t/t0**	**t/t0**	**t/t0**	**t/t0**
0	1.000	1.000	1.000	1.000	1.000	1.000	1.000
0.1	1.000	1.004	1.009	1.012	1.025	1.008	1.004
0.2	1.000	1.009	1.020	1.027	1.056	1.018	1.009
0.3	1.000	1.015	1.035	1.046	1.094	1.030	1.015
0.4	1.000	1.024	1.054	1.071	1.141	1.047	1.024
0.5	1.000	1.035	1.080	1.105	1.203	1.070	1.035
0.6	1.000	1.053	1.119	1.154	1.283	1.103	1.053
0.7	1.000	1.082	1.180	1.228	1.390	1.157	1.082
0.8	1.000	1.138	1.287	1.352	1.537	1.254	1.138
0.9	1.000	1.287	1.506	1.579	1.735	1.466	1.287
1	1.000	2.000	2.000	2.000	2.000	2.000	2.000
1.1	1.000	4.287	2.906	2.679	2.335	3.066	4.287
1.2	1.000	7.138	4.087	3.552	2.737	4.454	7.138
1.3	1.000	10.082	5.380	4.528	3.190	5.957	10.082
1.4	1.000	13.053	6.719	5.554	3.683	7.503	13.053
1.5	1.000	16.035	8.080	6.605	4.203	9.070	16.035
1.6	1.000	19.024	9.454	7.671	4.741	10.647	19.024
1.7	1.000	22.015	10.835	8.746	5.294	12.230	22.015
1.8	1.000	25.009	12.220	9.827	5.856	13.818	25.009
1.9	1.000	28.004	13.609	10.912	6.425	15.408	28.004
2	1.000	31.000	15.000	12.000	7.000	17.000	31.000
2.1	1.000	33.997	16.393	13.090	7.579	18.594	33.997
2.2	1.000	36.994	17.786	14.182	8.161	20.188	36.994
2.3	1.000	39.992	19.181	15.275	8.745	21.784	39.992
2.4	1.000	42.990	20.576	16.369	9.332	23.380	42.990
2.5	1.000	45.988	21.972	17.463	9.920	24.976	45.988
2.6	1.000	48.987	23.369	18.559	10.510	26.573	48.987
2.7	1.000	51.985	24.766	19.655	11.101	28.171	51.985
2.8	1.000	54.984	26.163	20.751	11.693	29.768	54.984
2.9	1.000	57.983	27.561	21.848	12.285	31.366	57.983
3	1.000	60.982	28.959	22.945	12.879	32.964	60.982
999.9	1.000	60.982	28.959	22.945	12.879	32.964	60.982

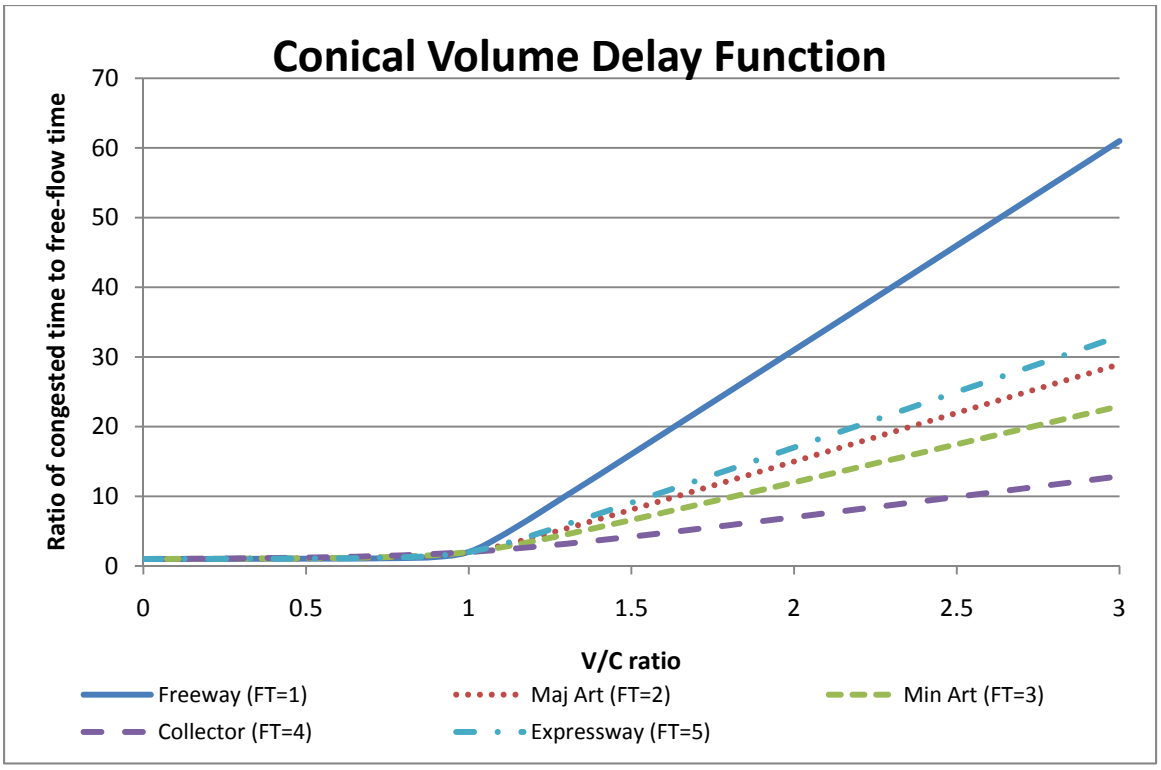

Figure 23 Conical volume-delay functions used in the Version 2.3 travel model: V/C > 1

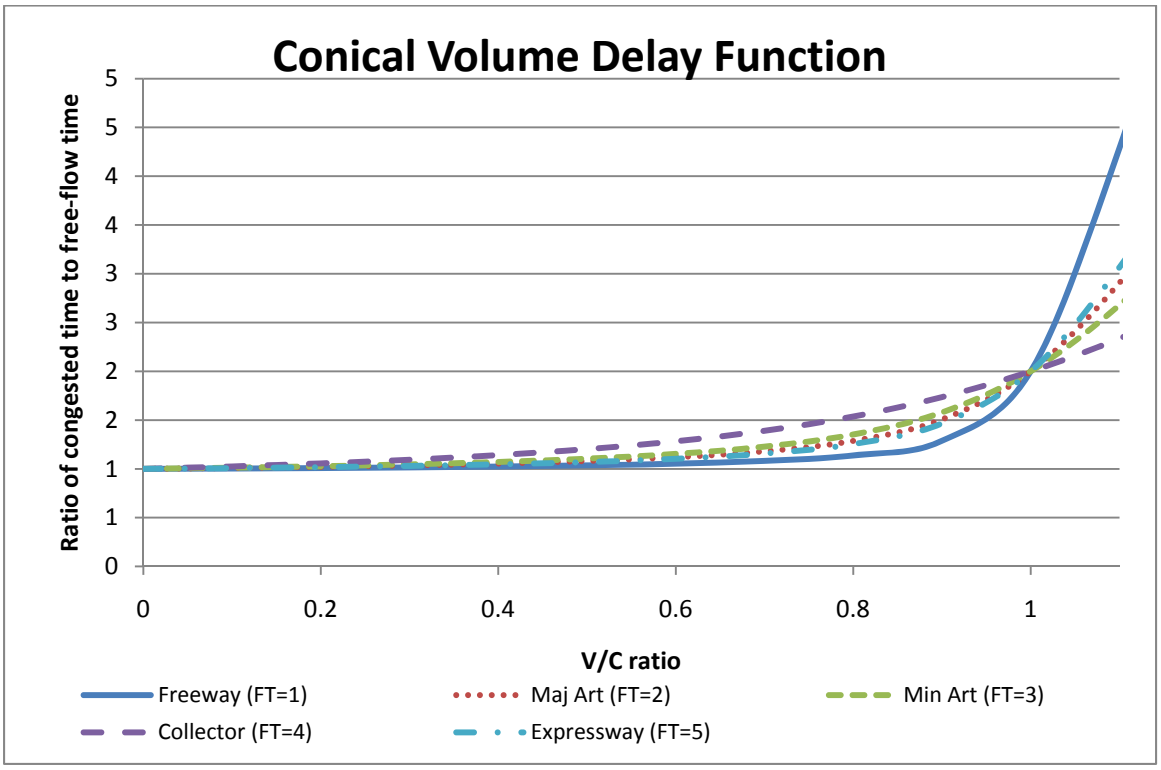

Figure 24 Conical volume-delay functions used in the Version 2.3 travel model: V/C < 1

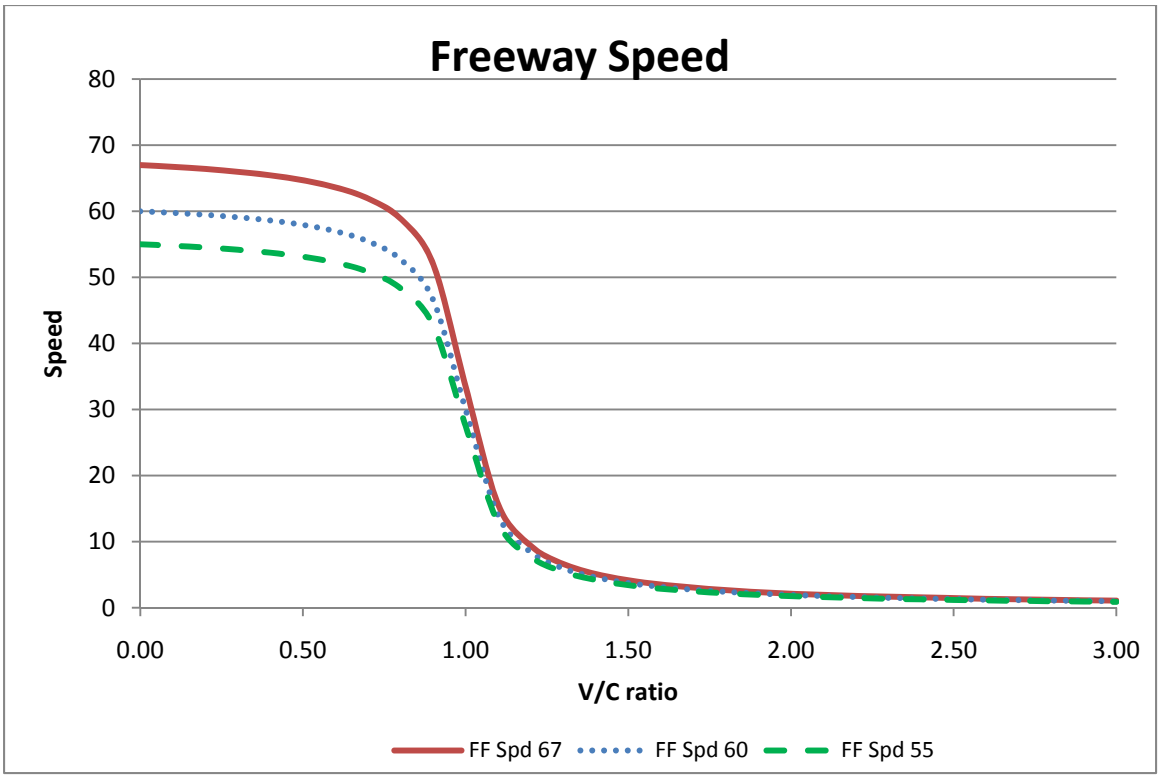

Figure 25 Freeway Speed

8.8 Speed and Capacity Tables

Two of the parameters that are necessary as inputs to the VDF are free-flow capacities and speeds. Free-flow capacity is defined as level-of-service (LOS) E capacity. The assumed free-flow speeds and capacities vary by facility type and area type. The Version 2.3 capacities and free flow speeds are defined in Table 68 and Table 69.

Table 68 Free Flow Capacities

	Area type					
	1	**2**	**3**	**4**	**5**	**6**
Freeways	1900	2000	2000	2000	2000	1900
Major Arterials	800	960	960	1100	1100	800
Minor Arterials	600	700	840	900	900	600
Collectors	500	600	800	800	800	500
Expressways	1200	1200	1400	1600	1600	1200

Table 69 Free Flow Speeds

	Area type					
	1	**2**	**3**	**4**	**5**	**6**
Freeways	55	60	60	65	65	55
Major Arterials	35	45	45	50	50	35
Minor Arterials	35	40	40	40	45	35
Collectors	30	30	35	35	35	30
Expressways	45	50	50	50	55	45

8.9 Peaking Factor Assumptions

Another important temporal parameter in the traffic assignment process is the peaking factor, which is the proportion of traffic in a given time period which occurs in the peak hour of the period. Link speeds are a function of the volume-to-capacity (V/C) ratio. The peaking factor is necessary for converting hourly lane capacities into "period lane capacities," from which V/C ratios are computed. The Version 2.3 model requires peaking factors for the AM, midday, PM, and night time periods. To arrive at regionally appropriate peaking factors, an analysis of total auto driver trips from the 2007/2008 HTS was summarized to the modeled time periods. The maximum hourly volume occurring within each time period was then determined. The resulting peaking factors are show in Table 70.

Table 70 Peak- Hour Percentage by Time Period based on Total Auto Driver Trips in Motion Distribution

Period	Percent of Travel	Hours in Period	Peak Hour in Period	Saturation Percent	Peak Hour Percent
AM Peak (6:00 - 9:00)	18.70%	3	8:00 - 9:00	33.3%	41.7%
Midday (9:00 - 15:00)	32.63%	6	12:00 - 13:00	16.7%	17.7%
PM Peak (15:00 - 19:00)	32.89%	4	17:00 - 18:00	25.0%	29.4%
All other hours	15.78%	11	19:00 – 20:00	9.1%	35.0%
Daily	100.00%	24	17:00 - 18:00	4.2%	9.7%

Chapter 9 Validation

This chapter presents highway and transit performance results of the Version 2.3 model for 2007. The model includes five speed-feedback iterations of the four-step model (pump prime, plus iterations 1 through 4). As mentioned in Chapter 8, there is a dual convergence/stopping criterion for traffic assignment: attain a relative gap of 10^{-3} (0.001) or 200 user equilibrium iterations, whichever comes first. A comparison of global demographic and travel-related statistics between the Version 2.3 model and the existing Version 2.2 model is also presented.

While the model is comprised of the numerous calibrated parameters described earlier in this report, it also includes adjustments that were subsequently deemed necessary during initial validation tests of the model. These include trip generation adjustments and K-factors used in trip distribution. Prior experience has shown that these types of adjustments are sometimes necessary to address some observed travel patterns that are not explained well by the travel model. A detailed accounting of the adjustments is documented in Appendix A.

9.1 Validation summaries

Vehicle miles of travel (VMT) is a standard metric used to assess travel model performance. Simulated VMT is also essential for the estimation of mobile emissions. TPB consulted Highway Performance Monitoring System (HPMS) summaries reported by the local state DOTs to obtain "observed" VMT figures at the jurisdiction level. Care was taken to obtain VMT figures that excluded local facilities, which are not included in the regional highway network.

A summary of estimated and observed VMT for the Washington, D.C. Metropolitan Statistical Area (MSA) is shown in Table 71. The MSA area is comprised of 12 of the central jurisdictions within the larger 22-jurisdiction modeled study area. The table indicates that the model presently overestimates VMT in the MSA by 2 percent. Maryland, Virginia, and District of Columbia portions of MSA are overestimated by 1%, 3%, and 6%, respectively.

Estimated and observed VMT for all jurisdictions within the modeled study area is shown in Table 72. The observed VMT figure of 156 million is well aligned with the VMT currently simulated by the Version 2.2 model. The simulated VMT for the region is about 1% higher than the observed figure, an excellent match overall. The table indicates that 10 of the 12 jurisdictions in the MSA match observed VMT figures within 10 percent of observed figures. Loudoun County and Frederick County are overestimated by 10% or more. An explanation for the overestimation will require more investigation.

Table 71 2007 Estimated/Observed (HPMS) VMT for the Washington, DC MSA (in thousands)

State	Observed VMT	Estimated VMT	Difference	Pct. Difference
DC	8,272	8,790	518	1.06
MD	56,366	56,909	542	1.01
VA	50,238	51,754	1,517	1.03
Total	114,876	117,453	2,577	1.02

Ref: O:\model_dev\Ver2.3.17_3722TAZ\Assignment_Summary\Jurisdictional_VMT.xlsx

Note: VMT shown excludes local traffic

Jurisdictions in the MSA are:

District of Columbia, Montgomery County, Prince George's County, Arlington County, City of Alexandria, Fairfax County, Loudoun County, Prince William County, Frederick County, Charles County, Calvert County, Stafford County.

Table 72 Year 2007 Estimated and Observed VMT Summary by Jurisdiction (in thousands)

Jurisdiction	Observed VMT	Estimated VMT	Difference (E-O)	Ratio (E/O)
District of Columbia	8,272	8,790	518	1.06
Montgomery County	19,890	20,815	925	1.05
Prince George's County	23,316	22,277	-1,039	0.96
Arlington County	4,392	4,289	-103	0.98
City of Alexandria	1,958	2,022	65	1.03
Fairfax County	26,799	26,250	-549	0.98
Loudoun County	5,260	6,414	1,154	1.22
Prince William County	8,000	8,732	732	1.09
Frederick County	7,842	8,905	1,063	1.14
Howard County	10,094	10,194	99	1.01
Anne Arundel County	15,330	14,871	-459	0.97
Charles County	3,348	3,064	-285	0.92
Carroll County	3,395	4,315	920	1.27
Calvert County	1,971	1,849	-122	0.94
St. Mary's County	2,195	2,102	-93	0.96
King George County	789	699	-90	0.89
City of Fredericksburg	948	814	-135	0.86
Stafford County	3,829	4,047	218	1.06
Spotsylvania County	3,300	2,077	-1,222	0.63
Fauquier County	3,149	3,063	-87	0.97
Clarke County	770	982	213	1.28
Jefferson County	1,082	1,376	294	1.27
Total	155,927	157,944	2,017	**1.01**

Ref: O:\model_dev\Ver2.3.17_3722TAZ\Assignment_Summary\Jurisdictional_VMT.xlsx

Estimated and observed daily link volumes on pre-defined “screenlines” in the regional network are also important performance indicators of the regional model. Screenline locations currently analyzed by TPB staff are shown on Figure 26 and Figure 27. The screenline performance of the Version 2.3 model is shown in Table 73. The table also indicates the total number of highway links crossing each screenline and the percentage of links with a coded daily ground count. The table indicates that 58% of all links crossing

regional screenlines are coded with a ground count, which is an improvement over Version 2.2 Travel Model where 37% of screenline links had a coded ground count.[82]

A comparison of year-2007 estimated and observed trips by purpose and mode is shown in Table 74. The table includes estimated and observed on-board transit surveys collected in or around 2007. The Version 2.3 mode choice model was calibrated to targets established by the on-board surveys. Overall estimated regional transit percentage is less than the observed target percentage (6.35% versus 6.50%).

A global comparison of control totals (land use, demographic, and travel) from the Version 2.2 model and Version 2.3 model results is displayed in Table 75. A direct comparison of 2007 results was not possible as the Version 2.2 model has not been executed for that particular year. Instead, the nearest available Version 2.2 simulation years were used for the comparison (2005 and 2011). Staff offers the following observations from the comparison table:

- The 2007 land use used in the Version 2.3 simulation reflects a lower average household size than that reflected in the Version 2.2 land use (about 2.5 versus 2.6). This is because the 2007 "Pseudo Round 8.0" land use was informed by recent ACS data. The Round 8.0 Cooperative land use used in the Version 2.2 model is based on 2000 Census data.
- The 2007 external travel data used in the Version 2.3 model reflects actual 2007 traffic counts. The Version 2.2 external travel is based on earlier traffic count data.
- The proportion of transit trips between the travel models, by purpose, is different as noted above.
- The HBW car occupancies are notably lower in the Version 2.3 model, in comparison with those of Version 2.2. However, the *reverse* is true for the non-work purposes -- The 2007/08 HTS reports notably larger auto occupancies, for non-work purposes, particularly for the HBO purpose. Overall, the Version 2.3 average auto occupancy is higher than that of the Version 2.2 model simulation (1.39 versus 1.26).
- The Version 2.3 motorized trip rate is about 7.39/HH, in contrast to the Version 2.2 model rate of about 10.2. This is a substantial difference and may be due, in part, to the lower average household size assumed in the Version 2.3 land activity inputs.
- Version 2.3 vehicle trip lengths are longer than that those in the Version 2.2 model (67.5 miles/HH versus 64.9 shown for the 2005 Version 2.2 model).
- The VMT appears to track well in the comparison

[82] Ronald Milone et al., *TPB Travel Forecasting Model, Version 2.2: Specification, Validation, and User's Guide*, 9-5.

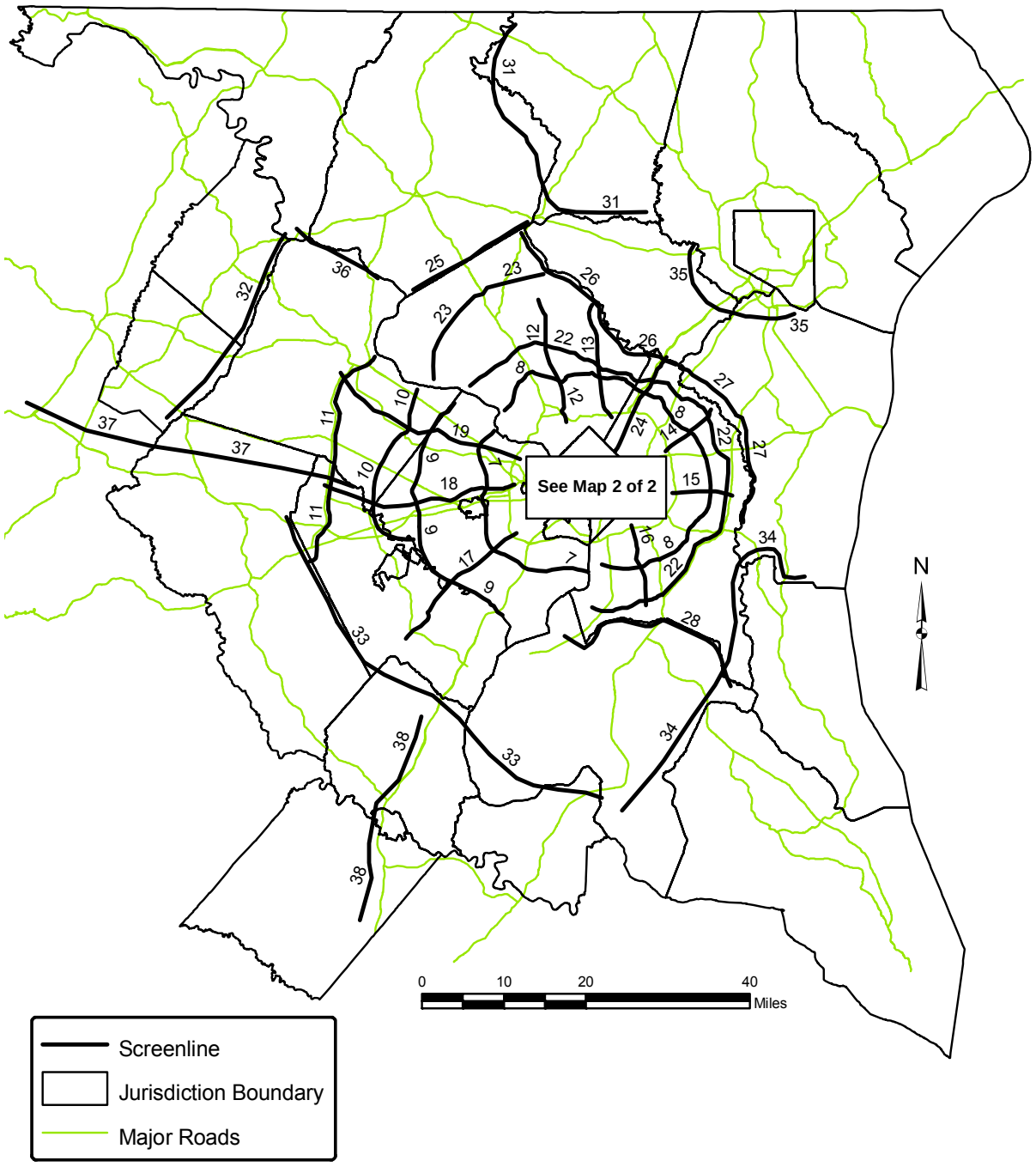

Figure 26 Highway Network Screen lines Map 1 of 2

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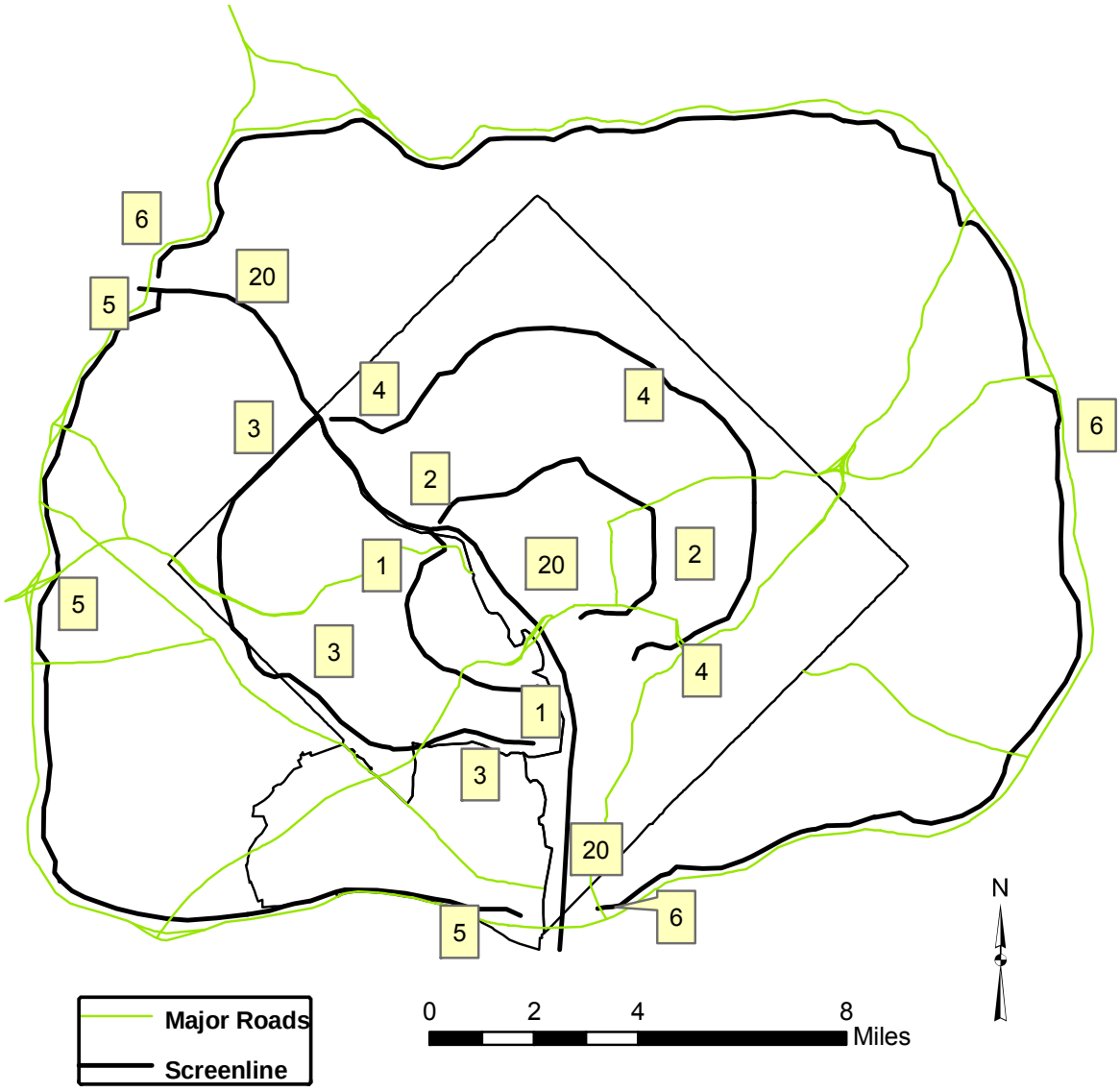

Figure 27 Highway Network Screen lines (Inside the Capital Beltway) Map 2 of 2

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Table 73 Year 2007 Estimated and Observed Daily Screenline Crossings

Screenline	Estimated	Observed	Ratio	Screenline links	Screenline links with counts	Pct. links with counts
1	436,139	541,123	0.81	46	24	52%
2	899,896	770,152	1.17	74	60	81%
3	753,565	769,828	0.98	58	44	76%
4	1,052,037	844,084	1.25	74	68	92%
5	615,541	535,254	1.15	64	22	34%
6	1,495,078	1,479,360	1.01	121	67	55%
7	609,364	630,970	0.97	74	36	49%
8	1,489,718	1,394,110	1.07	106	48	45%
9	550,901	548,542	1	56	26	46%
10	494,468	437,926	1.13	24	18	75%
11	264,730	218,070	1.21	34	20	59%
12	419,728	470,410	0.89	34	16	47%
13	437,702	376,062	1.16	20	12	60%
14	272,301	323,644	0.84	12	8	67%
15	283,047	326,882	0.87	16	8	50%
16	129,254	142,540	0.91	12	2	17%
17	165,768	175,348	0.95	42	22	52%
18	391,605	457,548	0.86	50	22	44%
19	331,108	399,939	0.83	50	28	56%
20	1,119,001	897,896	1.25	14	14	100%
22	1,153,506	1,121,760	1.03	144	50	35%
23	234,032	237,578	0.99	30	18	60%
24	345,696	364,500	0.95	32	12	38%
25	133,100	109,804	1.21	12	8	67%
26	90,167	40,888	2.21	18	8	44%
27	310,403	238,732	1.3	16	10	63%
28	175,556	231,106	0.76	26	24	92%
31	178,546	78,014	2.29	30	20	67%
32	38,055	26,900	1.41	10	2	20%
33	341,596	290,636	1.18	20	16	80%
34	117,758	96,922	1.21	18	14	78%
35	820,206	954,748	0.86	36	32	89%
36	53,877	11,702	4.6	8	6	75%
37	42,653	30,784	1.39	16	16	100%
38	193,049	266,540	0.72	32	26	81%
Total	16,439,153	15,840,302	1.04	1,429	827	58%

Ref: O:\model_dev\Ver2.3.17_3722TAZ\Assignment_Summary\Screenline_summary.xlsx

Table 74 Comparison of 2007 Estimated and Observed Trips by Purpose and Mode

		Simulated	Observed - On-Board Surveys		
		Trips	Trips	Diff. (E- O)	Ratio (E/O)
HBW	Transit	732,948	756,180	-23,232	0.97
	Auto Person	2,802,251	2,771,666	30,585	1.01
	Auto Driver	2,657,532	2,627,925	29,607	1.01
	Motorized Person	3,535,199	3,527,846	7,353	1.00
	Car Occupancy	1.05	1.05	0.00	1.00
	Pct. Transit	20.73%	21.43%	-0.70%	0.97
HBS	Transit	26,737	26,938	-201	0.99
	Auto Person	2,847,899	2,841,081	6,818	1.00
	Auto Driver	1,953,451	1,948,770	4,681	1.00
	Motorized Person	2,874,636	2,868,019	6,617	1.00
	Car Occupancy	1.46	1.46	0.00	1.00
	Pct. Transit	0.93%	0.94%	-0.01%	0.99
HBO	Transit	187,041	187,871	-830	1.00
	Auto Person	6,274,091	6,266,460	7,631	1.00
	Auto Driver	3,829,782	3,825,147	4,635	1.00
	Motorized Person	6,461,132	6,454,331	6,801	1.00
	Car Occupancy	1.64	1.64	0.00	1.00
	Pct. Transit	2.89%	2.91%	-0.02%	0.99
NHW	Transit	108,424	108,803	-379	1.00
	Auto Person	1,443,856	1,439,990	3,866	1.00
	Auto Driver	1,308,254	1,304,752	3,502	1.00
	Motorized Person	1,552,280	1,548,793	3,487	1.00
	Car Occupancy	1.10	1.10	0.00	1.00
	Pct. Transit	6.98%	7.03%	-0.04%	0.99
NHO	Transit	44,566	44,795	-229	0.99
	Auto Person	2,860,885	2,854,609	6,276	1.00
	Auto Driver	1,930,585	1,926,327	4,259	1.00
	Motorized Person	2,905,451	2,899,404	6,047	1.00
	Car Occupancy	1.48	1.48	0.00	1.00
	Pct. Transit	1.53%	1.54%	-0.01%	0.99
TOTAL	Transit	1,099,715	1,124,587	-24,872	0.98
	Auto Person	16,228,982	16,173,806	55,176	1.00
	Auto Driver	11,679,604	11,632,921	46,683	1.00
	Motorized Person	17,328,698	17,298,393	30,305	1.00
	Car Occupancy	1.39	1.39	0.00	1.00
	Pct. Transit	6.35%	6.50%	-0.15%	0.98

Ref:"O:\model_dev\Ver2.3.17_3722TAZ\summary\Compare_Mode_Choice_v2.xlsx

Table 75 Summary of Version 2.2 and Version 2.3 travel model output: Years 2005, 2007 and 2011

		Version 2.2 - 2010 CLRP 2005	Version 2.3 2007	Version 2.2 - 2010 CLRP 2011	V2.3- V2.2- 2005
1	Households	2,344,561	2,339,832	2,524,150	-4,729
2	Employment	3,700,075	3,801,935	3,982,448	101,860
3	HH Population	6,124,771	5,860,693	6,562,726	-264,078
4	HH & GQ Population	6,262,508	5,980,362	6,706,665	-282,146
5	Extl. Productions/ HBW Auto Person	296,405	294,506	328,893	-1,899
6	Extl. Productions/ HBS Auto Person	75,000	70,670	82,309	-4,330
7	Extl. Productions/ HBO Auto Person	206,939	226,003	230,075	19,064
8	Extl. Productions/ NHB Auto Person	78,096	87,025	85,912	8,929
9	Extl. Productions/ Auto Person Subtotal	656,440	678,204	727,189	21,764
10	Extl. Productions/ Medium Truck	3,965	5,986	4,405	2,021
11	Extl. Productions/ Heavy Truck	25,647	7,239	28,489	-18,408
12	Extl. Productions/ Truck Subtotal	29,612	13,225	32,894	-16,387
13	Extl. Attractions/ HBW Auto Person	182,548	183,126	201,047	578
14	Extl. Attractions/ HBS Auto Person	74,016	68,260	81,571	-5,756
15	Extl. Attractions/ HBO Auto Person	288,889	320,036	320,442	31,147
16	Extl. Attractions/ NHB Auto Person	78,087	87,006	85,902	8,919
17	Extl. Attractions/ Auto Person Subtotal	623,540	658,428	688,962	34,888
18	Extl. Attractions/ Medium Truck	3,965	5,986	4,405	2,021
19	Extl. Attractions/ Heavy Truck	25,647	7,239	28,489	-18,408
20	Extl. Attractions/ Truck Subtotal	29,612	13,225	32,894	-16,387
21	Inc. Grp 1 HHs	546,725	635,804	590,646	89,079
22	Inc. Grp 2 HHs	534,824	726,625	576,826	191,801
23	Inc. Grp 3 HHs	651,606	483,257	702,106	-168,349
24	Inc. Grp 4 HHs	611,405	494,172	654,570	-117,233
25	HHs Subtotal	2,344,560	2,339,858	2,524,149	-4,702
26	1- person HHs	594,601	664,557	645,373	69,956
27	2- person HHs	721,723	723,462	780,010	1,739
28	3- person HHs	411,997	392,844	442,560	-19,153
29	4+ person HHs	616,239	558,994	656,205	-57,245
30	HHs Subtotal	2,344,560	2,339,857	2,524,149	-4,703
31	0 Vehicle HHs	220,862	202,661	242,413	-18,201
32	1 Vehicle HHs	772,416	736,698	837,490	-35,718
33	2 Vehicle HHs	911,858	871,204	977,824	-40,654
34	3+ Vehicle HHs	439,423	529,294	466,423	89,871
35	HHs Subtotal	2,344,560	2,339,865	2,524,149	-4,695

		Version 2.2 - 2010 CLRP 2005	Version 2.3 2007	Version 2.2 - 2010 CLRP 2011	V2.3- V2.2- 2005
36	HBW Motorized Person Trips	4,425,947	3,526,212	4,756,097	-899,735
37	HBS Motorized Person Trips	3,404,738	2,867,668	3,650,705	-537,070
38	HBO Motorized Person Trips	10,480,364	6,453,793	11,215,274	-4,026,571
39	NHB Motorized Person Trips	5,795,249	4,448,368	6,216,076	-1,346,881
40	Total Motorized Person Trips	24,106,298	17,296,041	25,838,152	-6,810,257
41	Motorized Person Trips per HH	10.28	7.39	10.24	-2.89
42	Motorized Person Trips per capita	3.85	2.89	3.85	-0.96
43	Non-Motorized HBW Trips	186,955	117,323	207,633	-69,632
44	HBW Auto Driver Trips	3,417,806	2,654,345	3,684,230	-763,461
45	HBS Auto Driver Trips	2,695,175	1,947,421	2,904,137	-747,754
46	HBO Auto Driver Trips	7,684,037	3,828,053	8,239,272	-3,855,984
47	NHB Auto Driver Trips	4,419,748	3,226,389	4,763,290	-1,193,359
48	Total Auto Driver Trips	18,216,766	11,656,208	19,590,929	-6,560,558
49	HBW Auto Passenger Trips	419,737	145,221	461,494	-274,516
50	HBS Auto Passenger Trips	653,783	894,998	685,536	241,215
51	HBO Auto Passenger Trips	2,557,797	2,441,793	2,713,741	-116,004
52	NHB Auto Passenger Trips	1,218,207	1,072,748	1,289,772	-145,459
53	Total Auto Passenger Trips	4,849,524	4,554,760	5,150,543	-294,764
54	HBW Auto Occupancies	1.12	1.05	1.13	-0.07
55	HBS Auto Occupancies	1.24	1.46	1.24	0.22
56	HBO Auto Occupancies	1.33	1.64	1.33	0.31
57	NHB Auto Occupancies	1.28	1.33	1.27	0.05
58	Total Auto Occupancies	1.27	1.39	1.26	0.12
59	HBW Transit Trips	588,404	726,646	610,373	138,242
60	HBS Transit Trips	55,780	25,249	61,032	-30,531
61	HBO Transit Trips	238,530	183,947	262,261	-54,583
62	NHB Transit Trips	157,294	149,231	163,014	-8,063
63	Total Transit Trips	1,040,008	1,085,073	1,096,680	45,065
64	HBW Transit Percentage	13.29	20.61	12.83	7.32
65	HBS Transit Percentage	1.64	0.88	1.67	-0.76
66	HBO Transit Percentage	2.28	2.85	2.34	0.57
67	NHB Transit Percentage	2.71	3.35	2.62	0.64
68	Total Transit Percentage	4.31	6.27	4.24	1.96

		Version 2.2 - 2011 CLRP 2005	Version 2.3 2007	Version 2.2 - 2011 CLRP 2011	V2.3- V2.2- 2005
69	Medium Truck	328,595	462,879	356,288	134,284
70	Heavy Truck	168,507	144,974	182,503	-23,533
71	Misc. Auto Driver	636,646	652,238	685,415	15,592
72	Through (X-X) Auto&Comm.Veh	40,761	42,456	45,365	1,695
73	Through (X-X) Trucks	32,621	33,637	36,346	1,016
74	Airport Passenger Auto Drivers	49,386	60,681	56,814	11,295
75	Commercial Vehicles (Int/&Extl)	1,197,239	1,268,246	1,282,625	71,007
76	Total Vehicle Trips	20,670,521	15,352,737	22,236,285	-5,317,784
77	Freeway VMT	58,798,950	63,479,302	61,635,302	4,680,352
78	Major Art VMT	57,217,037	55,829,725	59,734,047	-1,387,312
79	Minor Art VMT	19,990,859	19,534,236	21,750,767	-456,623
80	Collector VMT	8,417,414	11,181,857	8,966,940	2,764,443
81	Express. VMT	6,411,319	6,328,089	6,963,125	-83,230
82	Ramp VMT	1,228,003	1,591,240	1,276,848	363,237
83	Total VMT	152,063,583	157,944,449	160,327,029	5,880,866
84	VMT per Capita	24.28	26.41	23.91	2.13
85	VMT per HH	64.86	67.50	63.52	2.64
86	VMT per Vehicle Trip	7.36	10.29	7.21	2.93

Ref: O:\model_dev\Ver2.3.Hotel_22_1.0nw_200ue_adjpa_kFac2Br\summary\Compare_Mode_Choice_v2.xlsx

Appendix A Model adjustment factors

The Version 2.3 travel model incorporates three sets of adjustment factors: one is applied following trip generation and two are applied to the trip distribution process.

1.1 Trip Generation

The first set of factors is applied to productions and attractions as shown in Table 1 and Table 2. Factors that are applied to productions and attractions are often called "p-mods" and "a-mods" since they modify the productions and attractions. In this case, we are using jurisdiction-level p-mods and a-mods.

Table 1 Jurisdictional Production Adjustment Factors ("P-mods")

Jurisdiction	HBW	HBS	HBO	NNW	NHO
District of Columbia	1.00	0.85	1.20	1.00	1.00
Montgomery	0.95	1.00	1.05	1.00	1.00
Prince George's	1.00	0.88	0.97	1.00	1.00
Arlington	1.00	1.11	1.08	1.00	1.00
Alexandria	1.00	1.00	1.00	1.00	1.00
Fairfax	1.02	1.02	1.02	1.00	1.00
Loudoun	1.00	0.95	0.92	1.00	1.00
Prince William	1.04	1.15	0.94	1.00	1.00
Frederick	1.13	1.00	1.04	1.00	1.00
Howard	1.00	1.00	0.94	1.00	1.00
Anne Arundel	1.00	1.12	1.03	1.00	1.00
Charles	1.00	1.00	0.93	1.00	1.00
Carroll	1.00	1.00	0.92	1.00	1.00
Calvert	1.00	1.00	1.12	1.00	1.00
St. Mary's	1.36	1.00	1.00	1.00	1.00
King George's	1.00	1.00	1.00	1.00	1.00
Fredericksburg	1.00	1.00	1.00	1.00	1.00
Stafford	1.00	1.14	0.86	1.00	1.00
Spotsylvania	1.00	1.00	1.00	1.00	1.00
Fauquier	1.00	1.00	0.88	1.00	1.00
Clarke	1.00	1.00	1.00	1.00	1.00
Jefferson	1.00	1.00	1.00	1.00	1.00

Note: Cells < 1.0 are shown in green (dark gray). Cells > 1.0 are shown in red (light gray).

Table 2 Jurisdictional Attraction Adjustment Factors ("A-mods")

Jurisdiction	HBW	HBS	HBO	NNW	NHO
District of Columbia	1.10	0.60	0.90	1.10	0.80
Montgomery	1.02	1.07	1.10	0.90	1.13
Prince George's	1.08	0.78	0.77	1.00	0.77
Arlington	1.22	0.87	0.95	1.00	0.60
Alexandria	0.77	0.85	1.00	1.00	1.14
Fairfax	1.07	1.05	1.00	0.95	0.95
Loudoun	0.89	1.07	0.87	0.85	1.00
Prince William	1.11	1.05	0.96	1.00	1.00
Frederick	1.00	1.00	0.83	0.88	1.14
Howard	0.82	1.18	0.87	0.78	1.00
Anne Arundel	0.86	1.00	0.85	0.89	0.94
Charles	1.00	1.00	1.00	1.00	1.00
Carroll	1.00	1.51	0.94	1.00	1.24
Calvert	1.00	0.78	1.29	1.00	1.00
St. Mary's	1.40	1.00	0.80	1.49	1.00
King George's	1.00	1.00	1.00	1.00	1.00
Fredericksburg	1.00	1.00	1.00	1.00	1.00
Stafford	1.00	1.72	1.00	1.00	1.00
Spotsylvania	1.00	1.00	1.00	1.00	1.00
Fauquier	1.00	1.00	1.00	1.00	1.00
Clarke	1.00	1.00	1.00	1.00	1.00
Jefferson	1.00	1.00	1.00	1.00	1.00

1.2 Trip Distribution

Trip distribution has two sets of adjustment factors. The first set is used to address physical barrier effects on trip patterns, such as the Potomac River as shown in Table 3. The second set of adjustment factors addresses jurisdictional effects (e.g., school trips and shopping trips tend to remain in a given traveler's residence jurisdiction). HBW k-factors are shown in Table 4, while all other purpose k-factors are presented in Table 5. These adjustment factors were developed by comparing estimated trip distribution results with the observed results from 2007/2008 HTS.

Table 3 K-Factors used in Trip Distribution to Calibrate Potomac River Crossings

HBW	DC/SubMD	SubVA	OuterMD	OuterVA
DC/SubMD	1.00	0.80	1.00	1.00
SubVA	0.90	1.00	0.50	1.00
OuterMD	1.00	0.70	1.00	0.50
OuterVA	0.70	1.00	0.30	1.00

HBS	DC/SubMD	SubVA	OuterMD	OuterVA
DC/SubMD	1.00	0.25	1.00	1.00
SubVA	0.25	1.00	0.50	1.00
OuterMD	1.00	1.00	1.00	1.00
OuterVA	1.00	1.00	1.00	1.00

HBO	DC/SubMD	SubVA	OuterMD	OuterVA
DC/SubMD	1.00	0.30	1.00	1.00
SubVA	0.70	1.00	0.30	1.00
OuterMD	1.00	1.00	1.00	1.00
OuterVA	1.00	1.00	1.00	1.00

NHW	DC/SubMD	SubVA	OuterMD	OuterVA
DC/SubMD	1.00	0.60	1.00	1.00
SubVA	0.60	1.00	0.50	1.00
OuterMD	1.00	1.00	1.00	1.00

NHO	DC/SubMD	SubVA	OuterMD	OuterVA
DC/SubMD	1.00	0.30	1.00	1.00
SubVA	0.30	1.00	0.50	1.00
OuterMD	1.00	0.40	1.00	0.50
OuterVA	1.00	1.00	1.00	1.00

Table 4 HBW K-Factors (Overrides to Potomac River Crossing K-Factors)

Interchange	HBW Factor
DC non-core to DC core	2
Mtg to DC core	2
Mtg to Mtg	2.5
PG to PG	1.5
Arl core to DC core	2.5
Arl non-core to DC core	1.7
Alx to DC core	2
Ffx to DC core	1.5
Ffx to Ffx	1.2
PW to Ffx	2

Table 5 Non-HBW Intra-Jurisdictional K-Factors

Interchange	HBS Factor	HBO Factor	NHW Factor	NHO Factor
DC non-core to DC non-core	2.5	2.2	1.5	2.5
Mtg to Mtg	2	2.2	2.2	1.5
PG to PG	2.5	2.5	1.5	1.7
Arl non-core to Arl non-core	2	2.2	1.7	1.7
Alx to Alx	2	2.2	1.7	1.7
Ffx to Ffx	2.5	2.5	2	2.1
Ldn to Ldn	1.5	2.2	1.7	1.5
PW to PW	1.75	2.2	1.5	1.5
Frd to Frd	1.5	2.2	1.5	1.5
Car to Car	1.5	2.2	1.5	1.5
How to How	1.5	2.2	1.7	1.7
Ann to Ann	1.5	2.2	1.5	1.7
Calv to Calv	1.5	1.5	1.5	1.7
StM to StM	1.5	1.5	1.5	1.7
Chs to Chs	1.5	1.5	1.5	1.7
Fau to Fau	1.5	1.5	1.5	1.7
Staf to Staf	1.5	1	1.5	1.7
Clrk to Clrk	1.5	1.5	1.5	1.3
Jef to Jef	1.5	1.5	1.5	1.3
Frbrg to Frbrg	1.5	1	1.5	1.7
Spots to Spots	1.5	1	1.5	1.7
KingG to KingG	1.5	1.5	1.5	1.5

Appendix B Year 2007 mode choice summary (final, i4, iteration)

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal HBW Trips MODE: Est Transit

	DESTINATION																							
ORIGIN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	10500	5404	1889	699	1437	2203	593	1094	1	2	0	0	3	2	0	0	0	0	0	0	0	0	0	23827
2 DC NC	103597	37004	18498	8566	5524	9461	2767	4839	4	8	0	0	32	25	0	0	0	0	0	0	0	0	0	190325
3 MTG	59385	12144	36551	2650	3230	3850	709	1570	0	2	0	0	20	4	0	0	0	0	0	0	0	0	0	120116
4 PG	38823	16888	8367	13593	4155	5221	1191	1582	0	1	0	0	67	45	0	0	1	0	0	0	0	0	0	89936
5 ARLCR	2745	269	122	21	173	595	117	144	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4187
6 ARNCR	33498	3648	1506	270	3995	8649	2453	2619	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	56644
7 ALX	17690	1721	634	142	1771	4016	2424	1791	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	30196
8 FFX	40032	4853	2375	373	5812	10482	4063	11531	51	41	0	0	6	7	0	0	0	0	0	0	0	0	0	79625
9 LDN	2984	382	179	16	516	701	81	349	324	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5532
10 PW	9875	2266	1108	272	2382	3648	1444	1444	33	886	0	0	14	16	0	0	0	0	0	0	1	0	0	23390
11 FRD	1988	207	492	15	126	108	13	203	0	0	936	0	0	0	0	0	0	0	0	0	0	0	0	4088
12 CAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 HOW	6679	1681	1339	444	583	608	98	130	0	0	0	0	372	16	0	0	0	0	0	0	0	0	0	11949
14 AAR	7575	1891	822	457	783	806	128	186	0	0	0	0	27	58	0	0	0	0	0	0	0	0	0	12732
15 CAL	851	256	75	33	165	140	21	38	0	0	0	0	0	1	18	0	0	0	0	0	0	0	0	1599
16 STM	472	92	33	10	74	59	9	33	0	0	0	0	0	0	1	74	12	0	0	0	0	0	0	870
17 CHS	3875	1073	309	123	456	476	88	94	0	0	0	0	0	0	0	2	305	0	0	0	0	0	0	6802
18 FAU	81	30	11	1	35	46	18	56	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	283
19 STA	1076	188	67	8	305	329	88	379	0	18	0	0	0	0	0	0	0	0	1	0	0	0	0	2461
20 CL/JF	88	44	39	3	33	35	7	173	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	422
21 SP/FB	790	187	66	8	250	300	116	638	0	60	0	0	0	0	0	0	0	0	1	0	2	0	0	2419
22 KGEO	20	8	2	0	7	9	4	29	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	83
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	342626		74485		31813		16433		414		936		541		19		318		2		4		0	
		90236		27707		51742		28923		1035		0		176		77		0		0		0		667485

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal HBW Trips MODE: Est Auto Person

	DESTINATION																							
ORIGIN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	4208	615	618	794	108	121	122	1213	71	23	7	0	66	132	3	3	28	1	0	0	0	0	0	8133
2 DC NC	12296	7324	8120	11183	903	939	702	7047	428	149	116	3	901	1802	73	42	377	10	2	2	2	0	0	52423
3 MTG	67828	31657	206233	31716	4108	8558	3240	25847	1489	520	4889	452	7992	6918	169	242	514	59	21	187	32	4	0	402673
4 PG	47368	43072	35219	154062	4618	9470	5045	17286	579	369	334	51	7237	15733	953	825	5309	25	14	11	20	21	0	347621
5 ARLCR	189	132	132	77	583	365	112	627	25	11	1	0	2	5	0	0	1	0	0	0	0	0	0	2264
6 ARNCR	7143	3720	3469	1722	4308	14756	4473	21948	716	410	26	0	61	134	5	12	38	19	10	4	9	0	0	62984
7 ALX	7009	3008	2286	1674	2277	6366	9903	19494	476	563	17	0	46	120	8	16	64	18	20	3	16	1	0	53384
8 FFX	77466	24620	27237	12635	13031	34507	25921	306923	22199	15043	385	20	496	1113	79	237	498	843	417	217	401	18	0	564306
9 LDN	8595	4798	7975	2366	2078	4952	2326	54942	52627	4048	1676	99	377	467	18	81	96	753	93	1618	120	7	0	150111
10 PW	15453	7796	8351	4137	3876	9564	7396	59321	7834	81897	239	15	174	423	29	122	173	3446	2257	278	1312	63	0	214155
11 FRD	3672	3237	19429	3044	579	1212	450	4845	2175	264	80382	5797	8218	4539	39	75	107	53	3	1108	5	0	0	139233
12 CAR	2873	1859	7867	2008	305	572	211	1644	364	62	8592	44064	5173	3039	31	42	78	11	1	164	2	0	0	78963
13 HOW	7512	6652	16233	10941	607	1371	595	2918	187	76	3664	1214	53866	18829	104	157	238	6	2	86	4	1	0	125264
14 AAR	13963	11312	13351	20547	1128	2545	1245	4537	221	153	1043	324	17471	139120	1382	660	1070	7	4	34	7	5	0	230129
15 CAL	4375	2891	2077	4503	331	760	426	1491	64	61	51	10	403	2783	18374	5940	2288	3	5	1	12	14	0	46863
16 STM	3238	2162	1404	3426	295	610	375	1320	50	68	30	4	235	1034	4119	51394	5853	7	20	0	41	74	0	75759
17 CHS	8845	6059	3261	9970	744	1615	1016	3276	107	116	56	8	437	1732	1725	3141	30623	6	13	1	34	78	0	72862
18 FAU	1254	643	980	357	362	891	543	9067	2209	5401	59	3	23	43	4	24	24	10131	846	218	649	35	0	33764
19 STA	1659	1068	1164	746	484	1441	1120	9588	1089	8932	33	2	31	90	26	139	151	1858	21180	90	10973	427	0	62290
20 CL/JF	631	370	1941	307	166	392	194	4692	3793	798	1419	90	310	187	1	1	4	385	19	16700	22	1	0	32425
21 SP/FB	888	576	717	484	251	824	652	6439	809	5204	24	1	17	61	32	143	189	1542	8169	74	31042	494	0	58632
22 KGEO	718	414	266	525	146	284	167	1139	125	841	3	0	15	58	45	152	329	216	994	11	1350	3919	0	11716
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	297182		368327		41289		66235		97638		103047		103552		27216		48052		34093		46053		0	
		163985		277223		102114		565604		125010		52158		198361		63448		19400		20806		5162		2825955

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal HBW Trips MODE: Est Auto Driver

	DESTINATION																							
ORIGIN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	3962	588	605	780	103	119	119	1184	70	23	7	0	65	129	3	3	28	1	0	0	0	0	0	7789
2 DC NC	11694	7017	7859	10867	858	917	684	6852	419	148	115	3	874	1741	73	42	371	10	2	2	2	0	0	50550
3 MTG	64439	30273	195648	30320	3901	8169	3096	24477	1437	510	4663	442	7600	6579	167	234	502	57	21	184	32	4	0	382756
4 PG	44960	41243	33474	146914	4375	9066	4826	16531	566	363	327	51	6886	14959	928	797	5091	25	14	11	20	21	0	331449
5 ARLCR	181	127	127	75	549	348	107	598	24	11	1	0	2	5	0	0	1	0	0	0	0	0	0	2158
6 ARNCR	6927	3593	3337	1682	4092	14081	4268	20919	690	401	26	0	60	131	5	11	38	19	10	4	9	0	0	60305
7 ALX	6809	2920	2195	1629	2183	6138	9472	18558	456	546	17	0	45	117	8	16	63	17	20	3	16	1	0	51229
8 FFX	74849	23780	26141	12206	12529	33204	25029	292422	21254	14486	378	20	486	1077	79	231	491	814	409	213	394	18	0	540509
9 LDN	8112	4543	7620	2262	1930	4619	2200	51951	50376	3907	1614	98	366	447	17	78	95	726	92	1552	118	7	0	142728
10 PW	14744	7448	7744	3872	3668	9054	7078	55765	7494	78433	232	15	162	391	29	117	170	3301	2175	270	1264	62	0	203485
11 FRD	3463	3089	18210	2906	541	1145	428	4520	2061	255	76213	5487	7653	4228	39	72	104	51	3	1048	5	0	0	131522
12 CAR	2707	1777	7361	1919	286	542	201	1540	346	60	8076	41960	4853	2846	31	40	76	11	1	155	2	0	0	74790
13 HOW	7124	6344	15343	10417	575	1309	568	2766	182	74	3462	1158	51200	17842	102	150	230	6	2	83	4	1	0	118941
14 AAR	13148	10722	12551	19495	1062	2414	1180	4284	214	148	985	312	16477	132038	1314	626	1019	7	4	34	7	5	0	218044
15 CAL	4112	2746	1955	4277	310	721	404	1411	61	59	50	10	379	2613	17485	5625	2155	3	5	1	12	14	0	44409
16 STM	3018	2051	1316	3246	274	578	355	1250	48	65	29	4	222	965	3884	48845	5506	7	20	0	41	71	0	71794
17 CHS	8337	5771	3077	9497	700	1536	967	3109	104	113	55	8	414	1633	1639	2983	29134	6	13	1	34	75	0	69206
18 FAU	1135	588	903	333	321	800	504	8350	2097	5152	58	3	22	39	4	23	23	9678	810	208	620	34	0	31706
19 STA	1603	1040	1011	664	464	1382	1063	8862	1031	8504	31	2	26	76	26	133	147	1759	20291	87	10481	409	0	59092
20 CL/JF	592	353	1807	293	151	356	179	4273	3545	750	1337	86	286	174	1	1	4	361	19	15981	22	1	0	30573
21 SP/FB	856	563	605	425	240	787	613	5868	756	4916	23	1	14	51	31	137	182	1445	7799	71	29685	472	0	55540
22 KGEO	698	404	245	502	141	273	158	1036	118	792	3	0	15	56	43	145	313	201	947	10	1282	3754	0	11134
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	283469	156979	349135	264582	39251	97558	63500	536527	93349	119717	97702	49660	98106	188138	25906	60309	45745	18505	32658	19919	44048	4949	0	2689709

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal HBW Trips MODE: Est Motr Psn

	DESTINATION																							
ORIGIN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	14708	6018	2507	1493	1545	2324	715	2308	72	25	7	0	69	134	3	3	28	1	0	0	0	0	0	31960
2 DC NC	115893	44328	26618	19749	6427	10400	3470	11886	432	157	116	3	933	1828	73	42	377	10	2	2	2	0	0	242748
3 MTG	127213	43801	242783	34366	7338	12408	3949	27417	1489	522	4889	452	8012	6922	169	242	514	59	21	187	32	4	0	522789
4 PG	86191	59959	43586	167655	8773	14691	6236	18868	579	370	334	51	7304	15779	953	825	5311	25	14	11	20	21	0	437557
5 ARLCR	2934	401	254	98	757	960	229	771	25	12	1	0	2	5	0	0	1	0	0	0	0	0	0	6451
6 ARNCR	40641	7368	4975	1992	8303	23405	6926	24567	717	414	26	0	61	134	5	12	38	19	10	4	9	0	0	119628
7 ALX	24699	4730	2920	1816	4048	10382	12326	21286	476	568	17	0	46	120	8	16	64	18	20	3	16	1	0	83579
8 FFX	117498	29473	29611	13009	18843	44989	29984	318453	22250	15084	385	20	502	1120	79	237	498	843	417	217	401	18	0	643931
9 LDN	11578	5181	8154	2383	2594	5653	2407	55291	52951	4048	1676	99	377	467	18	81	96	753	93	1618	120	7	0	155643
10 PW	25328	10062	9459	4409	6258	13212	8840	60766	7867	82784	239	15	188	439	29	122	173	3446	2257	278	1313	63	0	237545
11 FRD	5660	3444	19921	3059	705	1319	463	5048	2175	264	81318	5797	8218	4539	39	75	107	53	3	1108	5	0	0	143320
12 CAR	2873	1859	7867	2008	305	572	211	1644	364	62	8592	44064	5173	3039	31	42	78	11	1	164	2	0	0	78963
13 HOW	14191	8333	17573	11385	1190	1978	694	3048	187	76	3664	1214	54238	18845	104	157	238	6	2	86	4	1	0	137213
14 AAR	21537	13202	14173	21004	1911	3352	1373	4724	221	153	1043	324	17498	139178	1382	660	1070	7	4	34	7	5	0	242862
15 CAL	5226	3147	2152	4535	496	899	447	1529	64	61	51	10	403	2784	18392	5941	2288	3	5	1	12	14	0	48462
16 STM	3711	2254	1437	3436	369	669	383	1353	50	68	30	4	235	1034	4120	51469	5865	7	20	0	41	74	0	76629
17 CHS	12720	7132	3570	10093	1200	2091	1105	3370	107	116	56	8	437	1732	1725	3143	30928	6	13	1	34	78	0	79664
18 FAU	1335	673	991	359	397	936	561	9123	2209	5406	59	3	23	43	4	24	24	10131	846	218	649	35	0	34048
19 STA	2735	1257	1231	754	789	1771	1207	9967	1089	8950	33	2	31	90	26	139	151	1858	21181	90	10973	427	0	64751
20 CL/JF	719	414	1979	311	199	426	201	4865	3793	798	1419	90	310	187	1	1	4	385	19	16700	22	1	0	32847
21 SP/FB	1678	763	783	492	501	1124	768	7078	809	5263	24	1	17	61	32	143	189	1542	8170	74	31044	494	0	61051
22 KGEO	738	422	268	525	153	293	171	1168	125	844	3	0	15	58	45	152	329	216	994	11	1350	3919	0	11798
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	639808	254222	442813	304930	73102	153856	82668	594527	98052	126044	103983	52158	104093	198537	27235	63525	48370	19400	34094	20806	46057	5162	0	3493440

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal HBW Trips MODE: Est Auto Occ.

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	1.06	1.04	1.02	1.02	1.05	1.01	1.02	1.02	1.02	1.00	1.00	0	1.02	1.02	1.00	1.01	1.00	1.00	1.00	1.00	1.00	0	0	1.04
2 DC NC	1.05	1.04	1.03	1.03	1.05	1.02	1.03	1.03	1.02	1.01	1.01	1.00	1.03	1.04	1.00	1.01	1.02	1.00	1.00	1.00	1.00	1.00	0	1.04
3 MTG	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.06	1.04	1.02	1.05	1.02	1.05	1.05	1.01	1.03	1.02	1.03	1.00	1.02	1.00	1.00	0	1.05
4 PG	1.05	1.04	1.05	1.05	1.06	1.04	1.05	1.05	1.02	1.02	1.02	1.00	1.05	1.05	1.03	1.03	1.04	1.01	1.00	1.00	1.00	1.01	0	1.05
5 ARLCR	1.05	1.03	1.04	1.02	1.06	1.05	1.05	1.05	1.03	1.01	1.00	0	1.00	1.02	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0	0	1.05
6 ARNCR	1.03	1.04	1.04	1.02	1.05	1.05	1.05	1.05	1.04	1.02	1.00	1.00	1.01	1.02	1.00	1.01	1.01	1.02	1.00	1.00	1.00	1.00	0	1.04
7 ALX	1.03	1.03	1.04	1.03	1.04	1.04	1.05	1.05	1.04	1.03	1.00	1.00	1.01	1.02	1.00	1.02	1.01	1.03	1.01	1.00	1.01	1.00	0	1.04
8 FFX	1.03	1.04	1.04	1.04	1.04	1.04	1.04	1.05	1.04	1.04	1.02	1.00	1.02	1.03	1.00	1.03	1.01	1.04	1.02	1.02	1.02	1.00	0	1.04
9 LDN	1.06	1.06	1.05	1.05	1.08	1.07	1.06	1.06	1.04	1.04	1.04	1.01	1.03	1.05	1.01	1.04	1.02	1.04	1.01	1.04	1.01	1.00	0	1.05
10 PW	1.05	1.05	1.08	1.07	1.06	1.06	1.05	1.06	1.05	1.04	1.03	1.00	1.07	1.08	1.00	1.04	1.02	1.04	1.04	1.03	1.04	1.02	0	1.05
11 FRD	1.06	1.05	1.07	1.05	1.07	1.06	1.05	1.07	1.05	1.04	1.05	1.06	1.07	1.07	1.01	1.04	1.02	1.04	1.00	1.06	1.00	1.00	0	1.06
12 CAR	1.06	1.05	1.07	1.05	1.07	1.06	1.05	1.07	1.05	1.03	1.06	1.05	1.07	1.07	1.01	1.05	1.03	1.04	1.00	1.06	1.00	1.00	0	1.06
13 HOW	1.05	1.05	1.06	1.05	1.06	1.05	1.05	1.05	1.03	1.02	1.06	1.05	1.05	1.06	1.03	1.05	1.04	1.02	1.00	1.04	1.00	1.00	0	1.05
14 AAR	1.06	1.06	1.06	1.05	1.06	1.05	1.06	1.06	1.03	1.03	1.06	1.04	1.06	1.05	1.05	1.06	1.05	1.01	1.00	1.01	1.00	1.01	0	1.06
15 CAL	1.06	1.05	1.06	1.05	1.07	1.05	1.05	1.06	1.03	1.03	1.03	1.00	1.06	1.07	1.05	1.06	1.06	1.02	1.01	1.00	1.01	1.03	0	1.06
16 STM	1.07	1.05	1.07	1.06	1.08	1.06	1.06	1.06	1.03	1.05	1.02	1.01	1.06	1.07	1.06	1.05	1.06	1.04	1.01	1.00	1.02	1.05	0	1.06
17 CHS	1.06	1.05	1.06	1.05	1.06	1.05	1.05	1.05	1.03	1.03	1.02	1.00	1.06	1.06	1.05	1.05	1.05	1.01	1.01	1.00	1.01	1.04	0	1.05
18 FAU	1.10	1.09	1.08	1.07	1.13	1.11	1.08	1.09	1.05	1.05	1.02	1.00	1.04	1.08	1.01	1.04	1.02	1.05	1.04	1.04	1.05	1.03	0	1.06
19 STA	1.03	1.03	1.15	1.12	1.04	1.04	1.05	1.08	1.06	1.05	1.06	1.03	1.21	1.17	1.01	1.04	1.03	1.06	1.04	1.04	1.05	1.04	0	1.05
20 CL/JF	1.07	1.05	1.07	1.05	1.10	1.10	1.09	1.10	1.07	1.07	1.06	1.05	1.08	1.07	1.00	1.04	1.00	1.07	1.03	1.04	1.02	1.00	0	1.06
21 SP/FB	1.04	1.02	1.19	1.14	1.04	1.05	1.06	1.10	1.07	1.06	1.03	1.00	1.26	1.18	1.02	1.04	1.04	1.07	1.05	1.05	1.05	1.05	0	1.06
22 KGEO	1.03	1.03	1.09	1.05	1.04	1.04	1.05	1.10	1.06	1.06	1.00	1.00	1.04	1.05	1.04	1.05	1.05	1.07	1.05	1.02	1.05	1.04	0	1.05
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1.05	1.04	1.05	1.05	1.05	1.05	1.04	1.05	1.05	1.04	1.05	1.04	1.06	1.05	1.05	1.05	1.05	1.04	1.04	1.04	1.05	1.04	0	1.05

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal HBW Trips MODE: Est Pct. Tran

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	71.4	89.8	75.4	46.8	93.0	94.8	82.9	47.4	1.6	8.3	0	0	4.5	1.8	0	0	0	0	0	0	0	0	0	74.6
2 DC NC	89.4	83.5	69.5	43.4	85.9	91.0	79.8	40.7	0.9	5.3	0	0	3.4	1.4	0	0	0	0	0	0	0	0	0	78.4
3 MTG	46.7	27.7	15.1	7.7	44.0	31.0	18.0	5.7	0.0	0.4	0.0	0	0.3	0.1	0	0	0	0	0	0	0	0	0	23.0
4 PG	45.0	28.2	19.2	8.1	47.4	35.5	19.1	8.4	0	0.3	0	0	0.9	0.3	0	0	0.0	0	0	0	0	0	0	20.6
5 ARLCR	93.5	67.2	48.0	21.6	22.9	61.9	51.2	18.7	0.2	1.5	0	0	0	0.2	0	0	0	0	0	0	0	0	0	64.9
6 ARNCR	82.4	49.5	30.3	13.6	48.1	37.0	35.4	10.7	0.1	0.8	0	0	0.0	0.1	0	0	0	0	0	0	0	0	0	47.4
7 ALX	71.6	36.4	21.7	7.8	43.8	38.7	19.7	8.4	0.0	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	36.1
8 FFX	34.1	16.5	8.0	2.9	30.8	23.3	13.5	3.6	0.2	0.3	0.0	0	1.2	0.6	0	0	0	0	0	0	0.1	0	0	12.4
9 LDN	25.8	7.4	2.2	0.7	19.9	12.4	3.4	0.6	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.6
10 PW	39.0	22.5	11.7	6.2	38.1	27.6	16.3	2.4	0.4	1.1	0.0	0	7.2	3.7	0	0	0	0	0	0	0.1	0	0	9.8
11 FRD	35.1	6.0	2.5	0.5	17.9	8.2	2.9	4.0	0	0	1.2	0	0.0	0	0	0	0	0	0	0	0	0	0	2.9
12 CAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 HOW	47.1	20.2	7.6	3.9	49.0	30.7	14.2	4.3	0	0.0	0	0	0.7	0.1	0	0	0	0	0	0	0	0	0	8.7
14 AAR	35.2	14.3	5.8	2.2	41.0	24.1	9.3	3.9	0	0.0	0	0	0.2	0.0	0	0	0	0	0	0	0	0	0	5.2
15 CAL	16.3	8.1	3.5	0.7	33.3	15.5	4.7	2.5	0	0	0	0	0	0.0	0.1	0.0	0	0	0	0	0	0	0	3.3
16 STM	12.7	4.1	2.3	0.3	20.1	8.8	2.3	2.5	0	0	0	0	0	0	0.0	0.1	0.2	0	0	0	0	0	0	1.1
17 CHS	30.5	15.0	8.7	1.2	38.0	22.8	8.0	2.8	0	0	0	0	0.0	0.0	0	0.1	1.0	0	0	0	0	0	0	8.5
18 FAU	6.1	4.5	1.1	0.4	8.8	4.9	3.3	0.6	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8
19 STA	39.3	15.0	5.5	1.1	38.7	18.6	7.3	3.8	0	0.2	0	0	0	0	0	0	0	0	0.0	0	0	0	0	3.8
20 CL/JF	12.3	10.6	2.0	1.1	16.6	8.2	3.3	3.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.3
21 SP/FB	47.1	24.5	8.5	1.7	49.9	26.7	15.1	9.0	0	1.1	0	0	0	0	0	0	0	0	0.0	0	0.0	0	0	4.0
22 KGEO	2.7	1.9	0.9	0.1	4.6	3.1	2.4	2.5	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	53.6	35.5	16.8	9.1	43.5	33.6	19.9	4.9	0.4	0.8	0.9	0	0.5	0.1	0.1	0.1	0.7	0	0.0	0	0.0	0	0	19.1

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal HBS Trips MODE: Est Transit

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	497	360	198	23	29	215	45	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1405
2 DC NC	1702	4653	1430	476	55	598	177	116	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	9207
3 MTG	389	147	4403	81	12	14	1	1	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	5053
4 PG	533	311	422	1675	23	74	23	6	0	1	0	0	7	5	0	0	1	0	0	0	0	0	0	3080
5 ARLCR	41	3	1	0	3	107	12	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	182
6 ARNCR	207	10	3	0	56	1092	132	236	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1737
7 ALX	55	1	0	0	7	152	344	163	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	723
8 FFX	108	13	30	23	4	123	104	1569	6	67	2	0	11	10	1	4	24	0	0	0	0	0	0	2100
9 LDN	3	0	0	0	0	0	0	26	85	20	0	0	0	0	0	0	0	0	0	0	0	0	0	133
10 PW	19	31	79	54	11	86	62	618	49	412	5	0	27	29	2	9	52	0	0	0	0	0	0	1543
11 FRD	0	0	0	0	0	0	0	0	0	0	117	0	0	0	0	0	0	0	0	0	0	0	0	118
12 CAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 HOW	1	0	1	3	0	0	0	3	0	3	0	0	30	2	0	0	0	0	0	0	0	0	0	42
14 AAR	8	0	0	4	0	0	0	12	0	4	0	0	1	6	0	0	0	0	0	0	0	0	0	36
15 CAL	1	0	0	0	0	0	0	1	0	1	0	0	0	0	4	0	0	0	0	0	0	0	0	7
16 STM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	1	0	0	0	0	0	0	8
17 CHS	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	97	0	0	0	0	0	0	99
18 FAU	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
19 STA	0	0	0	0	0	0	0	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31
20 CL/JF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 SP/FB	0	0	0	0	0	0	0	76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	76
22 KGEO	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	3563	6567	201	901	139	124	78	7	175	0	1	0												
	5530	2339	2462	2936	514	0	52	20	0	0	0	25607												

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal HBS Trips MODE: Est Auto Person

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	3977	2258	1536	860	181	855	337	1587	61	14	0	0	32	41	0	0	12	1	0	0	0	0	0	11752
2 DC NC	13011	61314	18179	15981	798	4251	2135	9897	363	111	3	0	605	768	0	0	248	5	0	0	0	0	0	127670
3 MTG	4151	11753	385278	19377	97	556	130	2194	106	5	1873	256	3751	2229	0	0	84	0	0	0	0	0	0	431840
4 PG	4968	13444	19353	256992	304	1931	2102	6883	130	70	1	1	4749	7244	16	53	6742	2	0	0	0	0	0	324985
5 ARLCR	150	131	49	41	585	1199	316	1129	25	13	0	0	0	2	0	0	2	0	0	0	0	0	0	3642
6 ARNCR	2184	2052	648	763	2294	49893	5836	19950	292	166	5	0	6	48	0	0	61	1	0	0	0	0	0	84200
7 ALX	750	796	135	567	670	6091	28292	15066	118	207	0	0	1	23	0	1	105	0	0	0	0	0	0	52822
8 FFX	4308	5541	3144	4535	2001	18568	17215	440627	7711	6426	163	1	100	454	0	7	1062	71	0	3	30	0	0	511968
9 LDN	494	615	688	553	169	1234	555	17216	96234	1062	4034	103	52	152	0	0	156	141	0	1414	3	0	0	124875
10 PW	377	369	141	385	194	1529	1782	26197	1651	192770	61	0	8	55	0	0	205	1451	65	9	209	0	0	227459
11 FRD	9	16	7275	33	6	39	4	678	2136	5	89859	4235	1165	113	0	0	0	0	0	30	0	0	0	105605
12 CAR	0	0	859	14	0	1	0	40	67	0	1416	74543	1551	116	0	0	0	0	0	0	0	0	0	78606
13 HOW	75	249	3813	5427	6	25	10	119	10	0	754	1617	110052	12414	0	0	12	0	0	0	0	0	0	134583
14 AAR	442	1047	1842	10434	69	395	349	1184	37	22	4	22	12406	240034	223	54	484	0	0	0	0	0	0	269049
15 CAL	186	435	288	3106	40	242	304	971	20	22	0	0	73	1532	26188	4707	1740	0	0	0	0	0	0	39854
16 STM	4	4	6	212	5	33	74	245	0	3	0	0	1	14	320	40897	4438	0	0	0	0	0	0	46256
17 CHS	82	124	43	1471	28	181	357	1171	18	22	0	0	5	22	182	772	62593	0	0	0	0	1	0	67070
18 FAU	57	53	56	52	8	58	32	2291	545	3183	8	0	0	0	0	0	7	19945	89	20	187	0	0	26592
19 STA	310	347	192	361	61	483	634	6802	138	15230	0	0	1	10	0	2	96	554	29311	0	9995	21	0	64547
20 CL/JF	2	1	833	0	1	11	2	1064	5889	204	2013	59	98	4	0	0	0	155	0	16028	0	0	0	26364
21 SP/FB	31	8	45	10	18	157	200	3395	92	4341	0	0	0	0	0	0	4	224	1623	0	44668	3	0	54819
22 KGEO	6	4	1	78	4	33	57	717	3	883	0	0	0	1	5	212	2484	56	359	0	884	3462	0	9249
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	35576	444406	7538	60724	115645	100196	134659	26934	80536	31447	55976	0												
	100561	321251	87766	559421	224757	80837	265275	46706	22606	17505	3487	2823808												

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal HBS Trips MODE: Est Auto Driver

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	2730	1549	1033	601	122	579	226	1054	39	9	0	0	21	27	0	0	8	0	0	0	0	0	0	7999
2 DC NC	8860	42065	12246	11076	534	2839	1410	6477	225	71	2	0	384	489	0	0	162	3	0	0	0	0	0	86843
3 MTG	2925	8162	265665	13353	67	388	92	1460	67	3	1275	177	2526	1503	0	0	58	0	0	0	0	0	0	297722
4 PG	3435	9333	12884	177299	207	1314	1401	4444	78	45	0	1	3138	4827	12	38	4587	1	0	0	0	0	0	223043
5 ARLCR	104	91	33	29	401	820	214	754	16	8	0	0	0	2	0	0	2	0	0	0	0	0	0	2475
6 ARNCR	1521	1427	455	543	1582	34435	3998	13562	187	110	4	0	5	34	0	0	43	0	0	0	0	0	0	57906
7 ALX	521	554	97	400	458	4181	19482	10214	74	137	0	0	1	16	0	1	72	0	0	0	0	0	0	36208
8 FFX	3024	3889	2203	3184	1381	12836	11822	303445	5273	4418	112	1	72	306	0	5	721	48	0	3	22	0	0	352765
9 LDN	346	438	476	386	114	839	375	11689	66543	729	2719	69	35	98	0	0	101	96	0	963	2	0	0	86020
10 PW	271	282	103	281	131	1039	1192	17465	1094	133310	41	0	6	36	0	0	137	991	46	6	144	0	0	156575
11 FRD	7	12	4671	23	4	25	2	393	1328	2	61933	2871	735	72	0	0	0	0	0	21	0	0	0	72098
12 CAR	0	0	545	9	0	0	0	18	35	0	935	51700	1009	74	0	0	0	0	0	0	0	0	0	54327
13 HOW	55	181	2581	3732	4	18	7	76	6	0	508	1105	76264	8493	0	0	8	0	0	0	0	0	0	93038
14 AAR	305	720	1193	7051	46	254	221	705	19	13	3	14	8217	165674	152	36	319	0	0	0	0	0	0	184941
15 CAL	125	291	178	2056	25	150	186	562	10	12	0	0	44	997	18106	3176	1113	0	0	0	0	0	0	27029
16 STM	3	3	2	137	3	19	43	128	0	1	0	0	0	7	210	28243	2843	0	0	0	0	0	0	31642
17 CHS	57	90	27	1001	18	117	229	723	9	13	0	0	3	14	125	528	43270	0	0	0	0	0	0	46227
18 FAU	40	38	37	35	5	40	21	1440	348	2096	6	0	0	0	0	0	5	13741	61	14	127	0	0	18054
19 STA	209	234	121	239	39	308	401	4174	75	10075	0	0	1	6	0	1	62	352	20360	0	6866	14	0	43538
20 CL/JF	2	1	468	0	1	5	1	595	3578	120	1278	35	52	2	0	0	0	96	0	11122	0	0	0	17354
21 SP/FB	20	5	21	7	11	94	118	1894	43	2655	0	0	0	0	0	0	2	129	1096	0	30946	2	0	37044
22 KGEO	4	3	1	48	2	17	32	373	1	505	0	0	0	0	3	136	1558	29	238	0	585	2408	0	5944
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	24563	69370	305040	221488	5155	60316	41473	381647	79047	154330	68817	55974	92515	182677	18608	32163	55074	15488	21801	12129	38692	2425	0	1938794

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal HBS Trips MODE: Est Motr Psn

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	4474	2618	1734	883	210	1070	382	1625	61	14	0	0	32	41	0	0	12	1	0	0	0	0	0	13157
2 DC NC	14713	65967	19609	16457	852	4849	2312	10013	363	112	3	0	605	768	0	0	248	5	0	0	0	0	0	136877
3 MTG	4540	11900	389681	19458	110	570	131	2194	106	6	1873	256	3753	2229	0	0	84	0	0	0	0	0	0	436893
4 PG	5501	13755	19774	258667	326	2005	2125	6889	130	71	1	1	4756	7249	16	53	6743	2	0	0	0	0	0	328065
5 ARLCR	191	134	50	41	588	1306	328	1143	25	13	0	0	0	2	0	0	2	0	0	0	0	0	0	3825
6 ARNCR	2390	2062	651	763	2350	50985	5969	20186	292	168	5	0	6	48	0	0	61	1	0	0	0	0	0	85937
7 ALX	805	797	135	567	678	6243	28637	15228	118	208	0	0	1	23	0	1	105	0	0	0	0	0	0	53545
8 FFX	4416	5554	3175	4558	2005	18691	17319	442197	7717	6493	165	1	110	464	1	11	1087	71	0	3	30	0	0	514068
9 LDN	497	615	688	553	169	1234	555	17242	96318	1082	4034	103	52	152	0	0	156	141	0	1414	3	0	0	125009
10 PW	396	401	220	439	206	1615	1844	26815	1699	193182	66	0	35	83	2	9	257	1451	65	9	210	0	0	229003
11 FRD	10	16	7275	33	6	39	4	678	2136	5	89977	4235	1165	113	0	0	0	0	0	30	0	0	0	105723
12 CAR	0	0	859	14	0	1	0	40	67	0	1416	74543	1551	116	0	0	0	0	0	0	0	0	0	78606
13 HOW	77	249	3814	5430	6	25	10	122	10	3	754	1617	110082	12416	0	0	12	0	0	0	0	0	0	134626
14 AAR	450	1048	1843	10438	69	395	349	1197	37	26	4	22	12407	240040	223	54	484	0	0	0	0	0	0	269085
15 CAL	187	435	288	3106	40	242	304	972	20	22	0	0	73	1532	26192	4707	1740	0	0	0	0	0	0	39861
16 STM	4	4	6	212	5	33	74	245	0	3	0	0	1	14	320	40904	4439	0	0	0	0	0	0	46264
17 CHS	83	124	43	1471	28	181	357	1172	18	22	0	0	5	22	182	772	62690	0	0	0	0	1	0	67170
18 FAU	57	53	56	52	8	58	32	2301	545	3183	8	0	0	0	0	0	7	19945	89	20	187	0	0	26602
19 STA	310	347	192	361	61	483	634	6834	138	15230	0	0	1	10	0	2	96	554	29311	0	9995	21	0	64578
20 CL/JF	2	1	833	0	1	11	2	1064	5889	204	2013	59	98	4	0	0	0	155	0	16028	0	0	0	26364
21 SP/FB	31	8	45	10	18	157	200	3471	92	4341	0	0	0	0	0	0	4	224	1623	0	44668	3	0	54895
22 KGEO	6	4	1	78	4	33	57	730	3	883	0	0	0	1	5	212	2484	56	359	0	884	3462	0	9262
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	39140	106091	450973	323590	7739	90228	61625	562356	115784	225271	100320	80837	134736	265327	26941	46726	80711	22606	31447	17505	55977	3487	0	2849415

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal HBS Trips MODE: Est Auto Occ.

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	1.46	1.46	1.49	1.43	1.48	1.48	1.49	1.51	1.59	1.53	1.00	0	1.53	1.55	0	0	1.47	1.78	0	0	0	0	0	1.47
2 DC NC	1.47	1.46	1.48	1.44	1.49	1.50	1.51	1.53	1.62	1.56	1.31	0	1.57	1.57	0	0	1.53	1.80	0	0	0	0	0	1.47
3 MTG	1.42	1.44	1.45	1.45	1.45	1.43	1.42	1.50	1.57	1.49	1.47	1.45	1.48	1.48	0	0	1.44	2.00	0	1.29	0	0	0	1.45
4 PG	1.45	1.44	1.50	1.45	1.47	1.47	1.50	1.55	1.68	1.57	1.54	1.50	1.51	1.50	1.42	1.42	1.47	2.12	0	0	0	0	0	1.46
5 ARLCR	1.44	1.44	1.46	1.42	1.46	1.46	1.48	1.50	1.60	1.57	1.50	0	1.40	1.44	0	0	1.41	1.67	0	0	0	0	0	1.47
6 ARNCR	1.44	1.44	1.42	1.40	1.45	1.45	1.46	1.47	1.56	1.51	1.28	0	1.29	1.41	0	0	1.43	1.57	0	0	0	0	0	1.45
7 ALX	1.44	1.44	1.39	1.42	1.46	1.46	1.45	1.48	1.60	1.51	1.44	0	1.20	1.41	0	1.47	1.45	1.65	0	0	0	0	0	1.46
8 FFX	1.42	1.42	1.43	1.42	1.45	1.45	1.46	1.45	1.46	1.45	1.45	1.51	1.39	1.48	1.50	1.48	1.47	1.47	1.13	1.29	1.36	0	0	1.45
9 LDN	1.43	1.40	1.45	1.43	1.48	1.47	1.48	1.47	1.45	1.46	1.48	1.49	1.48	1.54	0	0	1.54	1.47	1.50	1.47	1.49	0	0	1.45
10 PW	1.39	1.31	1.38	1.37	1.49	1.47	1.49	1.50	1.51	1.45	1.50	1.50	1.49	1.52	0	0	1.49	1.46	1.41	1.39	1.45	0	0	1.45
11 FRD	1.37	1.41	1.56	1.44	1.52	1.59	1.74	1.73	1.61	2.38	1.45	1.47	1.59	1.57	0	0	1.56	2.24	0	1.44	0	0	0	1.46
12 CAR	1.50	1.28	1.57	1.45	5.33	2.90	0.03	2.16	1.91	0.01	1.51	1.44	1.54	1.56	0	0	0	0	0	1.00	0	0	0	1.45
13 HOW	1.38	1.37	1.48	1.45	1.37	1.43	1.43	1.56	1.64	1.56	1.48	1.46	1.44	1.46	0	0	1.47	0	0	1.21	0	0	0	1.45
14 AAR	1.45	1.45	1.54	1.48	1.51	1.56	1.58	1.68	1.97	1.78	1.52	1.54	1.51	1.45	1.47	1.52	1.51	6.00	0	0	0	0	0	1.45
15 CAL	1.49	1.49	1.62	1.51	1.57	1.62	1.64	1.73	2.07	1.88	0	0	1.66	1.54	1.45	1.48	1.56	0	0	0	0	0	0	1.47
16 STM	1.59	1.48	2.29	1.55	1.69	1.75	1.74	1.91	2.33	2.38	0	0	4.00	2.02	1.52	1.45	1.56	0	0	0	0	1.55	0	1.46
17 CHS	1.44	1.37	1.57	1.47	1.52	1.54	1.56	1.62	1.94	1.69	0	0	1.75	1.58	1.46	1.46	1.45	0.03	0	0	0	1.43	0	1.45
18 FAU	1.41	1.40	1.52	1.48	1.48	1.47	1.50	1.59	1.56	1.52	1.50	0	1.53	1.52	0	0	1.55	1.45	1.47	1.45	1.48	1.00	0	1.47
19 STA	1.48	1.48	1.59	1.51	1.57	1.57	1.58	1.63	1.84	1.51	1.50	0	1.61	1.58	0	1.51	1.54	1.57	1.44	0	1.46	1.43	0	1.48
20 CL/JF	1.39	1.55	1.78	2.00	1.81	2.02	2.36	1.79	1.65	1.71	1.58	1.68	1.89	2.12	0	0	0	1.61	0	1.44	0	0	0	1.52
21 SP/FB	1.52	1.50	2.18	1.52	1.70	1.67	1.70	1.79	2.13	1.64	0	0	0	0	0	1.50	1.57	1.74	1.48	0	1.44	1.40	0	1.48
22 KGEO	1.57	1.52	2.68	1.61	1.84	1.91	1.82	1.92	2.25	1.75	0	0	0	1.97	1.61	1.55	1.59	1.92	1.51	0	1.51	1.44	0	1.56
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1.45	1.45	1.46	1.45	1.46	1.46	1.47	1.46	1.46	1.46	1.46	1.44	1.46	1.45	1.45	1.45	1.46	1.46	1.44	1.44	1.45	1.44	0	1.46

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal HBS Trips MODE: Est Pct. Tran

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	11.1	13.7	11.4	2.6	13.8	20.1	11.8	2.3	0	1.2	0	0	0	0.0	0	0	0	0	0	0	0	0	0	10.7
2 DC NC	11.6	7.1	7.3	2.9	6.4	12.3	7.7	1.2	0	0.8	0	0	0.1	0.0	0	0	0.0	0	0	0	0	0	0	6.7
3 MTG	8.6	1.2	1.1	0.4	11.3	2.5	0.7	0.0	0	23.3	0	0	0.1	0.0	0	0	0	0	0	0	0	0	0	1.2
4 PG	9.7	2.3	2.1	0.6	7.0	3.7	1.1	0.1	0	1.1	0	0	0.1	0.1	0	0	0.0	0	0	0	0	0	0	0.9
5 ARLCR	21.4	2.6	2.2	0	0.5	8.2	3.7	1.2	0	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	4.8
6 ARNCR	8.6	0.5	0.4	0.0	2.4	2.1	2.2	1.2	0	1.3	0	0	0	0	0	0	0	0	0	0	0	0	0	2.0
7 ALX	6.8	0.1	0.1	0	1.1	2.4	1.2	1.1	0	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	1.4
8 FFX	2.4	0.2	1.0	0.5	0.2	0.7	0.6	0.4	0.1	1.0	1.2	0	9.6	2.1	77.4	37.1	2.2	0	0	0	0.8	0	0	0.4
9 LDN	0.5	0	0	0	0	0	0	0.2	0.1	1.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
10 PW	4.8	7.7	35.8	12.3	5.6	5.3	3.3	2.3	2.9	0.2	6.9	0	75.9	34.4	100.0	100.0	20.3	0	0	0	0.2	0	0	0.7
11 FRD	1.7	0	0.0	0	0	0	0	0.0	0	6.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0.1
12 CAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 HOW	1.6	0	0.0	0.1	0	0	0	2.4	0	94.9	0	0	0.0	0.0	0	0	0	0	0	0	0	0	0	0.0
14 AAR	1.8	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0	15.1	0	0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0.0
15 CAL	0.5	0.0	0.0	0	0	0.0	0.0	0.1	0	2.9	0	0	0	0	0.0	0.0	0	0	0	0	0	0	0	0.0
16 STM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0	0	0	0	0	0	0.0
17 CHS	0.8	0	0	0.0	0	0.0	0	0.1	0	3.2	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0.1
18 FAU	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
19 STA	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
20 CL/JF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 SP/FB	0	0	0	0	0	0	0	2.2	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
22 KGEO	0	0	0	0	0	0	0	1.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	9.1	5.2	1.5	0.7	2.6	2.7	1.5	0.5	0.1	0.2	0.1	0	0.1	0.0	0.0	0.0	0.2	0	0	0	0.0	0	0	0.9

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal HBO Trips MODE: Est Transit

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	4719	2742	859	150	751	975	240	314	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	10752
2 DC NC	22583	32587	6119	2058	2214	2913	927	1011	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	70424
3 MTG	7131	2332	22277	594	333	185	22	126	0	56	0	0	4	0	0	0	0	0	0	0	0	0	0	33060
4 PG	13799	5619	2978	7840	934	801	280	269	0	48	0	0	22	8	0	0	1	0	0	0	0	0	0	32599
5 ARLCR	881	77	23	3	49	304	75	102	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1515
6 ARNCR	7536	508	96	13	431	4345	755	908	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	14612
7 ALX	2364	189	27	3	174	892	2035	515	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	6213
8 FFX	6074	582	150	47	566	1871	1340	5553	10	325	1	0	4	2	7	4	7	0	0	0	12	0	0	16553
9 LDN	236	13	3	0	15	26	2	135	215	67	0	0	0	0	0	0	0	0	0	0	0	0	0	713
10 PW	310	126	167	92	58	164	149	1014	57	987	2	0	8	4	13	7	13	0	0	0	23	0	0	3195
11 FRD	7	1	1	0	2	1	0	6	0	4	324	0	0	0	0	0	0	0	0	0	0	0	0	344
12 CAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 HOW	166	24	22	19	24	10	0	95	0	46	0	0	137	2	0	0	0	0	0	0	0	0	0	546
14 AAR	550	63	17	21	133	62	6	358	0	61	0	0	5	16	0	0	0	0	0	0	0	0	0	1292
15 CAL	9	1	0	0	2	1	0	3	0	2	0	0	0	0	16	0	0	0	0	0	0	0	0	34
16 STM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	22	2	0	0	0	0	0	0	24
17 CHS	116	13	1	1	40	24	5	29	0	18	0	0	0	0	0	0	210	0	0	0	0	0	0	458
18 FAU	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
19 STA	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
20 CL/JF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 SP/FB	0	0	0	0	0	0	0	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34
22 KGEO	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	66484		32739		5725		5838		282		327		180		36		232		0		35		0	
		44876		10843		12574		10499		1663		0		31		34		0		0		0		192397

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal HBO Trips MODE: Est Auto Person

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	12756	7810	3067	1648	496	1668	941	3292	97	26	0	0	43	47	1	1	25	4	14	0	5	0	0	31943
2 DC NC	45715	200181	37705	28448	3285	9369	6093	20136	597	209	26	4	743	785	49	23	340	29	107	1	50	4	0	353898
3 MTG	19030	47452	890899	39381	1142	3410	1381	10923	565	73	5837	1735	7999	4991	127	86	375	51	195	356	250	20	0	1036276
4 PG	27106	78091	57514	515045	2467	7312	8879	22625	454	298	13	24	9599	13085	1631	956	11632	34	246	0	117	155	0	757283
5 ARLCR	197	617	232	111	1603	1821	619	1896	54	31	0	0	0	1	0	0	1	1	6	0	4	0	0	7193
6 ARNCR	7209	10229	3266	2185	10117	96246	13392	36251	803	598	3	0	5	29	1	6	37	29	157	1	136	6	0	180705
7 ALX	3597	4603	963	1697	3752	11404	61613	25431	319	646	0	0	2	14	3	9	71	13	177	0	136	9	0	114456
8 FFX	23277	28491	12699	12039	10879	41741	43918	942359	19810	18610	120	16	85	297	58	144	691	1311	4469	280	4618	259	0	1166171
9 LDN	2195	2441	1785	982	655	2155	1189	30638	209389	2106	1970	173	21	60	3	1	51	935	312	8415	447	27	0	265948
10 PW	1459	1504	462	500	681	2204	2837	41820	3095	335197	11	1	1	9	1	4	35	5579	10020	139	6499	232	0	412290
11 FRD	217	303	21624	136	147	527	166	5392	7503	75	188262	7489	2672	231	0	0	1	19	1	2899	1	0	0	237665
12 CAR	31	59	6502	113	23	81	17	723	504	2	3109	138927	5363	258	0	0	0	0	0	59	0	0	0	155773
13 HOW	724	1872	11169	9024	116	301	184	1180	92	8	1437	4360	234135	16585	24	6	44	1	2	92	4	2	0	281364
14 AAR	2706	5543	7509	19943	674	1868	1624	5420	261	123	36	127	22060	458742	3016	260	515	5	25	2	13	14	0	530485
15 CAL	384	549	381	1730	152	420	605	1683	27	30	0	0	49	1100	88459	2191	834	0	2	0	1	14	0	98610
16 STM	305	393	138	1526	146	443	1026	2340	24	36	0	0	11	114	4519	77802	7254	1	27	0	35	254	0	96393
17 CHS	947	1380	494	4730	376	1203	2182	6368	126	159	0	0	32	110	1834	2537	112538	3	32	0	34	763	0	135849
18 FAU	45	31	15	9	16	43	30	2554	712	2723	2	0	0	2	0	0	3	42178	1274	139	699	22	0	50498
19 STA	62	30	31	4	45	162	238	3258	80	4913	0	0	0	0	0	0	1	808	83708	0	15774	365	0	109481
20 CL/JF	5	12	1411	2	9	32	6	2715	8089	313	767	14	84	2	0	0	0	430	1	41536	1	0	0	55430
21 SP/FB	30	8	32	0	33	146	199	3041	66	2286	0	0	0	0	0	0	0	282	12281	0	95979	146	0	114531
22 KGEO	10	8	1	35	10	30	81	654	3	588	0	0	0	0	0	3	9	333	63	2233	0	1718	15142	0	20921
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	148007		1057898		36823		147220		252669		201592		282904		99730		134780		115287		126522		0	
		391609		639291		182585		1170699		369048		152871		496462		84038		51777		53920		17433		6213165

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal HBO Trips MODE: Est Auto Driver

ORIGIN	DESTINATION 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	7765	4770	1843	1022	301	997	555	1931	57	16	0	0	26	29	1	1	16	3	9	0	4	0	0	19344
2 DC NC	27754	122412	22748	17562	1966	5519	3543	11685	345	127	16	3	439	471	31	14	209	17	66	1	32	2	0	214963
3 MTG	11995	29487	547449	24149	706	2080	829	6359	328	44	3520	1039	4823	2996	78	51	227	30	118	208	148	12	0	636676
4 PG	16574	48230	33961	316791	1488	4299	5171	12769	252	176	8	15	5730	7877	980	567	7091	18	147	0	71	91	0	462307
5 ARLCR	123	377	139	69	981	1101	370	1125	31	19	0	0	0	0	0	0	1	1	3	0	2	0	0	4342
6 ARNCR	4518	6295	1983	1349	6315	59055	8142	21876	467	362	2	0	3	18	1	4	23	17	95	1	82	4	0	110611
7 ALX	2240	2829	576	1046	2341	6990	37530	15243	181	385	0	0	1	9	2	5	44	8	105	0	80	5	0	69622
8 FFX	14573	17719	7703	7340	6836	25952	26835	575183	12025	11321	75	10	54	182	36	86	422	783	2642	164	2680	152	0	712772
9 LDN	1344	1492	1079	598	400	1307	708	18334	128960	1279	1193	103	13	36	2	1	31	562	185	5060	259	16	0	162960
10 PW	905	933	279	313	410	1312	1654	24466	1815	206718	7	1	0	6	1	2	22	3372	6010	83	3824	137	0	252269
11 FRD	125	174	11910	80	78	279	87	2707	4111	40	115948	4534	1496	131	0	0	0	10	0	1718	1	0	0	143429
12 CAR	17	29	3361	58	12	39	9	348	246	1	1804	86157	2988	139	0	0	0	0	0	34	0	0	0	95242
13 HOW	445	1144	6652	5492	69	176	106	643	50	4	857	2647	144648	10084	15	4	27	1	1	53	3	1	0	173120
14 AAR	1583	3274	4217	11869	385	1033	884	2835	135	66	21	75	13003	282667	1824	151	304	2	14	1	7	8	0	324359
15 CAL	202	302	185	966	78	209	296	806	13	15	0	0	25	636	54816	1308	474	0	1	0	1	8	0	60341
16 STM	145	188	64	760	69	208	472	1090	12	18	0	0	5	54	2620	47966	4071	0	14	0	19	147	0	57923
17 CHS	532	803	258	2824	208	649	1185	3311	65	87	0	0	18	62	1107	1529	69676	2	18	0	20	452	0	82807
18 FAU	28	19	9	5	9	26	17	1354	402	1586	1	0	0	1	0	0	2	26001	762	83	412	13	0	30732
19 STA	34	18	14	3	24	80	120	1658	38	2854	0	0	0	0	0	0	1	477	51798	0	9598	222	0	66937
20 CL/JF	2	5	651	1	4	14	2	1282	4242	156	419	8	39	1	0	0	0	237	0	25687	1	0	0	32752
21 SP/FB	10	2	8	0	15	59	88	1397	27	1193	0	0	0	0	0	0	0	151	7330	0	59268	88	0	69638
22 KGEO	4	3	0	15	4	12	34	289	1	282	0	0	0	0	2	5	179	31	1276	0	985	9385	0	12510
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	90918	240506	645088	392310	22699	111396	88637	706693	153803	226750	123872	94592	173313	305400	61515	51694	82820	31722	70596	33091	77495	10745	0	3795655

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal HBO Trips MODE: Est Motr Psn

ORIGIN	DESTINATION 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	17474	10552	3926	1798	1248	2643	1182	3605	97	27	0	0	43	47	1	1	25	4	14	0	5	0	0	42695
2 DC NC	68298	232768	43823	30506	5498	12282	7020	21146	597	222	26	4	743	785	49	23	340	29	107	1	50	4	0	424322
3 MTG	26161	49784	913177	39976	1475	3595	1403	11048	565	129	5837	1735	8002	4991	127	86	375	51	195	356	250	20	0	1069336
4 PG	40905	83710	60492	522885	3401	8113	9159	22893	454	346	13	24	9621	13093	1631	956	11633	34	246	0	117	155	0	789881
5 ARLCR	1078	693	255	114	1652	2124	694	1997	54	32	0	0	0	1	0	0	1	1	6	0	4	0	0	8708
6 ARNCR	14745	10737	3362	2199	10547	100591	14147	37159	803	619	3	0	5	29	1	6	37	29	157	1	136	6	0	195318
7 ALX	5961	4792	989	1700	3925	12296	63648	25946	319	659	0	0	2	14	3	9	71	13	177	0	136	9	0	120669
8 FFX	29352	29072	12849	12087	11445	43612	45258	947912	19820	18935	121	16	89	299	65	148	697	1311	4470	280	4630	259	0	1182724
9 LDN	2431	2454	1788	982	670	2181	1191	30773	209604	2173	1970	173	21	60	3	1	51	935	312	8415	447	27	0	266661
10 PW	1769	1630	629	592	740	2368	2986	42834	3151	336184	13	1	8	13	14	12	48	5579	10020	139	6522	232	0	415485
11 FRD	224	303	21625	136	149	528	166	5398	7503	78	188586	7489	2672	231	0	0	1	19	1	2899	1	0	0	238009
12 CAR	31	59	6502	113	23	81	17	723	504	2	3109	138927	5363	258	0	0	0	0	0	59	0	0	0	155773
13 HOW	891	1897	11191	9044	140	311	185	1274	92	54	1437	4360	234272	16587	24	6	44	1	2	92	4	2	0	281910
14 AAR	3256	5605	7525	19964	807	1929	1630	5778	261	184	36	127	22066	458758	3017	260	515	5	25	2	13	14	0	531777
15 CAL	393	551	381	1730	154	421	605	1686	27	31	0	0	49	1100	88475	2191	834	0	2	0	1	14	0	98645
16 STM	305	393	138	1526	146	443	1026	2340	24	36	0	0	11	114	4519	77825	7256	1	27	0	35	254	0	96417
17 CHS	1063	1393	495	4731	415	1227	2188	6397	126	177	0	0	32	110	1834	2538	112748	3	32	0	34	763	0	136307
18 FAU	46	31	15	9	16	43	30	2570	712	2723	2	0	0	2	0	0	3	42178	1274	139	699	22	0	50514
19 STA	62	30	31	4	45	162	238	3268	80	4913	0	0	0	0	0	0	1	808	83708	0	15774	365	0	109491
20 CL/JF	5	12	1411	2	9	32	6	2715	8089	313	767	14	84	2	0	0	0	430	1	41536	1	0	0	55430
21 SP/FB	30	8	32	0	33	146	199	3074	66	2286	0	0	0	0	0	0	0	282	12281	0	95979	146	0	114564
22 KGEO	10	8	1	35	10	30	81	659	3	588	0	0	0	0	0	3	9	333	63	2233	0	1718	15142	0	20926
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	214490	436485	1090637	650134	42548	195159	153058	1181197	252950	370711	201919	152871	283084	496493	99767	84072	135012	51777	115288	53920	126557	17433	0	6405562

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal HBO Trips MODE: Est Auto Occ.

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	1.64	1.64	1.66	1.61	1.65	1.67	1.70	1.70	1.70	1.61	1.50	0	1.63	1.64	1.50	1.68	1.60	1.74	1.57	0	1.52	1.50	0	1.65
2 DC NC	1.65	1.64	1.66	1.62	1.67	1.70	1.72	1.72	1.73	1.64	1.59	1.55	1.69	1.67	1.56	1.67	1.63	1.76	1.61	1.50	1.58	1.57	0	1.65
3 MTG	1.59	1.61	1.63	1.63	1.62	1.64	1.67	1.72	1.72	1.64	1.66	1.67	1.66	1.67	1.64	1.69	1.65	1.72	1.65	1.71	1.69	1.66	0	1.63
4 PG	1.64	1.62	1.69	1.63	1.66	1.70	1.72	1.77	1.80	1.69	1.55	1.59	1.68	1.66	1.66	1.69	1.64	1.85	1.67	0	1.64	1.71	0	1.64
5 ARLCR	1.60	1.64	1.66	1.61	1.63	1.65	1.67	1.68	1.74	1.68	0	0	1.55	1.56	0	1.71	1.61	1.66	1.65	0	1.61	1.67	0	1.66
6 ARNCR	1.60	1.62	1.65	1.62	1.60	1.63	1.64	1.66	1.72	1.65	1.53	0	1.54	1.59	1.50	1.66	1.58	1.66	1.65	1.51	1.67	1.63	0	1.63
7 ALX	1.61	1.63	1.67	1.62	1.60	1.63	1.64	1.67	1.76	1.68	1.50	0	1.57	1.59	1.54	1.64	1.61	1.66	1.68	0	1.70	1.64	0	1.64
8 FFX	1.60	1.61	1.65	1.64	1.59	1.61	1.64	1.64	1.65	1.64	1.61	1.55	1.59	1.64	1.59	1.68	1.64	1.67	1.69	1.70	1.72	1.70	0	1.64
9 LDN	1.63	1.64	1.65	1.64	1.64	1.65	1.68	1.67	1.62	1.65	1.65	1.67	1.59	1.66	1.63	1.63	1.63	1.66	1.69	1.66	1.72	1.71	0	1.63
10 PW	1.61	1.61	1.66	1.60	1.66	1.68	1.71	1.71	1.71	1.62	1.61	1.56	1.50	1.60	1.55	1.66	1.58	1.65	1.67	1.68	1.70	1.70	0	1.63
11 FRD	1.74	1.74	1.82	1.71	1.88	1.89	1.91	1.99	1.83	1.85	1.62	1.65	1.79	1.76	1.50	0	1.59	1.85	2.10	1.69	1.71	0	0	1.66
12 CAR	1.84	2.03	1.93	1.96	1.94	2.05	1.93	2.08	2.05	1.99	1.72	1.61	1.79	1.86	0	0	0	1.95	0	1.75	0	0	0	1.64
13 HOW	1.63	1.64	1.68	1.64	1.69	1.71	1.74	1.84	1.85	1.84	1.68	1.65	1.62	1.64	1.65	1.66	1.65	1.72	1.61	1.75	1.60	1.70	0	1.63
14 AAR	1.71	1.69	1.78	1.68	1.75	1.81	1.84	1.91	1.93	1.85	1.67	1.69	1.70	1.62	1.65	1.73	1.69	1.89	1.82	1.83	1.78	1.74	0	1.64
15 CAL	1.90	1.82	2.06	1.79	1.95	2.01	2.04	2.09	2.01	1.98	0	1.50	1.97	1.73	1.61	1.67	1.76	2.15	1.72	0	1.67	1.70	0	1.63
16 STM	2.11	2.09	2.18	2.01	2.09	2.12	2.17	2.15	2.06	2.02	0	0	1.99	2.12	1.72	1.62	1.78	2.16	1.86	0	1.86	1.72	0	1.66
17 CHS	1.78	1.72	1.92	1.68	1.81	1.85	1.84	1.92	1.93	1.83	0	0	1.84	1.77	1.66	1.66	1.62	1.89	1.75	0	1.69	1.69	0	1.64
18 FAU	1.61	1.60	1.68	1.60	1.69	1.69	1.73	1.89	1.77	1.72	1.60	1.50	1.56	1.62	1.54	0	1.61	1.62	1.67	1.67	1.70	1.65	0	1.64
19 STA	1.80	1.67	2.22	1.55	1.91	2.03	1.98	1.97	2.11	1.72	0	0	0	1.64	0	1.50	1.55	1.70	1.62	0	1.64	1.65	0	1.64
20 CL/JF	2.22	2.66	2.17	3.14	2.18	2.29	2.54	2.12	1.91	2.01	1.83	1.83	2.16	2.16	0	0	0	1.82	1.93	1.62	1.66	0	0	1.69
21 SP/FB	2.88	4.18	4.16	4.22	2.18	2.45	2.26	2.18	2.42	1.92	0	0	0	0	0	1.60	0	1.87	1.68	0	1.62	1.66	0	1.64
22 KGEO	2.69	2.57	3.43	2.35	2.22	2.43	2.35	2.26	2.21	2.09	0	0	0.02	3.20	1.87	1.71	1.86	2.03	1.75	0	1.74	1.61	0	1.67
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1.63	1.63	1.64	1.63	1.62	1.64	1.66	1.66	1.64	1.63	1.63	1.62	1.63	1.63	1.62	1.63	1.63	1.63	1.63	1.63	1.63	1.62	0	1.64

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal HBO Trips MODE: Est Pct. Tran

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	27.0	26.0	21.9	8.4	60.2	36.9	20.3	8.7	0	4.7	0	0	0.0	0	0	0	0	0	0	0	0	0	0	25.2
2 DC NC	33.1	14.0	14.0	6.7	40.3	23.7	13.2	4.8	0	5.6	0	0	0.0	0	0	0	0	0	0	0	0	0	0	16.6
3 MTG	27.3	4.7	2.4	1.5	22.6	5.1	1.5	1.1	0	43.5	0.0	0	0.0	0.0	0	0	0	0	0	0	0	0	0	3.1
4 PG	33.7	6.7	4.9	1.5	27.5	9.9	3.1	1.2	0	13.9	0	0	0.2	0.1	0	0	0.0	0	0	0	0	0	0	4.1
5 ARLCR	81.7	11.0	9.2	2.5	3.0	14.3	10.9	5.1	0	3.0	0	0	0	0	0	0	0	0	0	0	0	0	0	17.4
6 ARNCR	51.1	4.7	2.8	0.6	4.1	4.3	5.3	2.4	0	3.4	0	0	0	0	0	0	0	0	0	0	0	0	0	7.5
7 ALX	39.7	3.9	2.7	0.2	4.4	7.3	3.2	2.0	0	2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.1
8 FFX	20.7	2.0	1.2	0.4	4.9	4.3	3.0	0.6	0.0	1.7	0.7	0	3.9	0.6	10.7	2.7	0.9	0	0.0	0	0.3	0	0	1.4
9 LDN	9.7	0.5	0.2	0.0	2.3	1.2	0.2	0.4	0.1	3.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3
10 PW	17.5	7.7	26.5	15.5	7.9	6.9	5.0	2.4	1.8	0.3	13.7	0	93.2	30.3	93.8	64.3	26.8	0	0.0	0	0.4	0	0	0.8
11 FRD	2.9	0.2	0.0	0	1.2	0.1	0.0	0.1	0	4.9	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0.1
12 CAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 HOW	18.7	1.3	0.2	0.2	17.3	3.3	0.2	7.4	0	85.3	0	0	0.1	0.0	0	0	0	0	0	0	0	0	0	0.2
14 AAR	16.9	1.1	0.2	0.1	16.5	3.2	0.4	6.2	0	33.3	0	0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0.2
15 CAL	2.3	0.2	0.0	0.0	1.5	0.3	0.0	0.2	0	5.4	0	0	0	0	0.0	0.0	0	0	0	0	0	0	0	0.0
16 STM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0	0	0	0	0	0	0.0
17 CHS	11.0	0.9	0.2	0.0	9.5	2.0	0.3	0.5	0	10.3	0	0	0	0	0	0.0	0.2	0	0	0	0	0	0	0.3
18 FAU	1.0	0	0	0	0.1	0	0	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
19 STA	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
20 CL/JF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 SP/FB	1.2	0	0	0	0.1	0.0	0.0	1.1	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
22 KGEO	0	0	0	0	0	0	0	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	31.0	10.3	3.0	1.7	13.5	6.4	3.8	0.9	0.1	0.4	0.2	0	0.1	0.0	0.0	0.0	0.2	0	0.0	0	0.0	0	0	3.0

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal NHW Trips MODE: Est Transit

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	18889	9188	2580	1699	2311	3242	1313	1018	0	26	0	0	2	3	1	0	0	0	0	0	1	0	0	40275
2 DC NC	11574	8399	2601	1370	1145	1471	553	398	0	12	0	0	1	0	0	0	0	0	0	0	0	0	0	27525
3 MTG	3835	907	7233	145	294	203	68	107	0	15	0	0	1	0	0	0	0	0	0	0	0	0	0	12809
4 PG	3540	672	227	792	183	136	45	63	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	5673
5 ARLCR	2264	379	126	35	277	735	330	176	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	4324
6 ARNCR	3429	532	183	43	1045	2035	629	483	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	8386
7 ALX	1430	164	65	19	282	525	1054	193	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	3739
8 FFX	2385	175	126	52	356	587	370	1754	4	68	3	0	7	4	2	1	7	0	0	0	2	0	0	5901
9 LDN	163	3	2	0	24	20	3	22	22	5	0	0	0	0	0	0	0	0	0	0	0	0	0	263
10 PW	305	16	19	13	38	42	32	86	2	55	1	0	2	1	1	0	2	0	0	0	1	0	0	616
11 FRD	8	1	1	0	1	0	0	0	0	0	129	0	0	0	0	0	0	0	0	0	0	0	0	141
12 CAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 HOW	194	21	16	5	13	8	2	14	0	3	0	0	4	0	0	0	0	0	0	0	0	0	0	279
14 AAR	436	36	14	7	22	14	5	37	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	574
15 CAL	8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
16 STM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	1	0	0	0	0	0	0	9
17 CHS	146	18	5	0	8	6	1	6	0	2	0	0	0	0	0	0	46	0	0	0	0	0	0	239
18 FAU	2	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
19 STA	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
20 CL/JF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 SP/FB	1	0	0	0	0	0	0	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22
22 KGEO	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	48607	20512	13198	4180	5998	9024	4405	4398	27	223	134	0	17	9	4	11	57	0	0	0	3	0	0	110807

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal NHW Trips MODE: Est Auto Person

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	29043	14310	4983	9952	1602	3006	2310	5929	465	820	343	89	627	1618	187	130	668	125	225	47	157	15	0	76652
2 DC NC	11981	31945	7623	12620	991	2257	1879	4900	383	621	346	90	781	1757	184	114	644	99	172	44	121	12	0	79562
3 MTG	3883	9563	153814	10828	657	1838	1059	6823	745	679	2379	481	2452	2379	146	85	339	158	159	178	125	9	0	198779
4 PG	8532	13615	10749	107336	848	1871	2206	4344	314	616	420	179	3165	7089	658	340	2278	98	189	54	143	28	0	165071
5 ARLCR	1446	1715	784	947	4647	3268	1490	3248	200	366	39	9	49	126	17	12	58	31	55	11	38	3	0	18559
6 ARNCR	2624	3103	1770	1886	2911	20525	3546	9774	548	915	85	17	103	266	32	22	123	80	126	25	86	6	0	48572
7 ALX	2094	2182	1024	2118	1462	3647	19532	9145	343	1063	59	13	83	240	42	34	201	64	165	20	108	9	0	43648
8 FFX	3978	4691	6072	4099	2924	9352	8749	223590	8892	8622	335	64	328	632	90	74	398	720	718	182	464	26	0	285000
9 LDN	227	301	595	254	157	478	299	8727	38371	1087	227	22	44	65	5	5	25	204	50	269	39	2	0	51453
10 PW	450	543	579	537	305	830	973	8169	1041	54748	43	8	42	103	15	14	69	736	1158	54	519	21	0	70960
11 FRD	310	331	2423	426	38	87	60	399	294	60	44521	1068	608	372	15	10	35	32	21	484	19	1	0	51613
12 CAR	89	92	527	192	9	18	15	85	32	12	1090	25849	539	277	7	4	14	6	5	56	5	0	0	28923
13 HOW	545	856	2610	3467	46	114	93	403	59	54	553	507	32175	4853	49	29	93	20	21	48	18	3	0	46616
14 AAR	1314	1822	2552	7448	115	276	259	766	95	137	361	272	5099	86683	395	128	367	39	62	46	53	11	0	108298
15 CAL	175	179	151	663	16	33	44	102	8	21	15	6	52	407	13285	935	374	5	12	3	13	11	0	16510
16 STM	121	109	87	345	11	22	34	79	7	18	10	4	32	134	945	36372	746	6	22	2	38	47	0	39189
17 CHS	537	632	356	2311	51	121	193	403	31	79	33	12	96	368	368	735	25246	19	47	6	53	95	0	31791
18 FAU	94	75	122	76	25	65	54	675	205	746	24	4	16	30	4	5	16	7969	153	42	119	6	0	10524
19 STA	168	127	124	144	41	97	124	606	48	1121	16	3	16	47	9	15	38	149	12135	6	2297	62	0	17392
20 CL/JF	34	31	140	40	8	20	15	164	256	52	362	40	40	35	2	1	5	40	6	9965	6	0	0	11264
21 SP/FB	111	84	89	100	27	62	78	374	35	471	12	3	13	38	9	26	39	109	2154	6	19840	87	0	23766
22 KGEO	11	8	7	22	3	5	7	23	2	22	1	0	2	9	9	36	77	6	64	0	95	1892	0	2299
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	67768	86313	197179	165810	16893	47992	43019	288730	52375	72329	51277	28740	46361	107528	16471	39127	31851	10716	17717	11545	24353	2346	0	1426440

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal NHW Trips MODE: Est Auto Driver

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	26436	12994	4489	9555	1496	2726	1972	5307	363	728	203	53	551	1329	146	67	583	74	150	20	80	5	0	69328
2 DC NC	10720	29368	6982	12209	900	2015	1562	4349	287	551	204	52	694	1476	141	54	576	49	100	15	49	3	0	72355
3 MTG	3622	8789	139505	9553	523	1576	772	5022	445	399	1803	350	2092	1725	68	25	183	70	67	84	42	2	0	176719
4 PG	8175	12831	9085	101802	778	1677	1785	3043	129	338	180	86	2693	5926	499	178	1942	31	75	15	43	9	0	151322
5 ARLCR	1323	1557	690	897	4225	2958	1301	2908	150	321	24	5	42	97	12	6	49	20	39	4	21	1	0	16650
6 ARNCR	2411	2837	1562	1804	2674	18957	3152	8858	429	830	44	7	85	199	22	8	107	49	88	8	41	2	0	44175
7 ALX	1909	1992	847	2000	1344	3392	17586	8285	239	950	25	4	60	169	29	17	180	36	121	7	59	3	0	39255
8 FFX	3826	4559	4945	3410	2763	9036	7843	201217	7982	7874	146	18	174	312	30	17	259	513	482	83	230	6	0	255726
9 LDN	175	247	338	109	123	395	196	7124	37128	913	160	6	14	20	1	1	6	150	19	216	11	0	0	47351
10 PW	395	493	329	318	261	748	768	6783	866	53187	11	1	12	33	3	3	28	651	1042	22	374	9	0	66338
11 FRD	164	185	1698	179	32	47	22	148	200	16	41983	906	396	170	3	2	9	11	5	365	4	0	0	46546
12 CAR	43	44	334	84	7	8	4	21	8	2	882	25041	428	156	1	1	3	1	1	28	1	0	0	27097
13 HOW	474	730	2103	2944	44	88	53	179	20	16	358	425	30510	4291	22	8	40	6	6	21	4	1	0	42344
14 AAR	1056	1456	1735	6199	108	202	149	329	31	45	165	164	4470	81646	293	51	207	12	20	16	15	3	0	98368
15 CAL	122	120	63	483	14	20	22	29	1	5	3	1	22	292	12822	801	292	1	3	0	3	5	0	15124
16 STM	52	47	24	178	8	9	13	16	1	3	2	1	9	52	818	34871	599	1	5	0	11	25	0	36745
17 CHS	441	511	173	1951	49	95	134	202	8	30	8	3	41	205	291	594	24288	5	16	1	19	65	0	29130
18 FAU	53	45	52	25	17	45	27	416	151	653	8	1	5	9	1	1	4	7735	124	27	84	3	0	9484
19 STA	103	88	50	58	30	71	80	354	18	996	4	1	4	14	2	3	13	121	11841	1	2181	56	0	16088
20 CL/JF	15	11	63	10	4	7	5	65	200	21	269	21	17	12	0	0	1	26	1	9732	1	0	0	10481
21 SP/FB	57	41	29	31	17	34	41	167	10	344	3	0	3	10	2	7	13	78	2061	1	19308	78	0	22335
22 KGEO	4	3	1	7	1	1	2	4	0	9	0	0	0	2	4	20	55	3	58	0	83	1855	0	2112
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	61576	78945	175095	153808	15418	44106	37489	254826	48665	68230	46485	27146	42323	98146	15212	36734	29437	9643	16325	10669	22664	2132	0	1295074

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal NHW Trips MODE: Est Motr Psn

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	47932	23498	7563	11651	3913	6248	3623	6947	465	847	343	89	629	1621	188	130	668	125	225	47	158	15	0	116927
2 DC NC	23555	40345	10224	13990	2136	3728	2432	5298	383	633	346	90	782	1757	184	114	644	99	172	44	121	12	0	107087
3 MTG	7718	10470	161047	10974	951	2041	1127	6930	745	694	2379	481	2453	2379	146	85	339	158	159	178	125	9	0	211587
4 PG	12072	14287	10975	108128	1031	2007	2251	4407	314	631	420	179	3166	7089	658	340	2278	98	189	54	143	28	0	170744
5 ARLCR	3710	2094	910	981	4924	4003	1820	3424	200	369	39	9	49	126	17	12	58	31	55	11	38	3	0	22884
6 ARNCR	6052	3635	1953	1929	3955	22560	4176	10257	548	922	85	17	103	266	32	22	123	80	126	25	86	6	0	56957
7 ALX	3524	2345	1089	2137	1744	4172	20586	9337	343	1071	59	13	83	240	42	34	201	64	165	20	108	9	0	47386
8 FFX	6363	4866	6198	4150	3280	9938	9119	225344	8896	8690	339	64	335	636	93	75	405	720	718	182	465	26	0	290902
9 LDN	390	304	597	254	181	498	302	8749	38393	1092	227	22	44	65	5	5	25	204	50	269	39	2	0	51716
10 PW	756	559	598	550	343	872	1006	8255	1043	54803	44	8	44	105	16	14	71	736	1158	54	519	21	0	71576
11 FRD	318	331	2424	426	39	87	60	400	294	60	44650	1068	608	372	15	10	35	32	21	484	19	1	0	51754
12 CAR	89	92	527	192	9	18	15	85	32	12	1090	25849	539	277	7	4	14	6	5	56	5	0	0	28923
13 HOW	739	877	2625	3471	58	122	96	417	59	57	553	507	32179	4853	49	29	93	20	21	48	18	3	0	46895
14 AAR	1750	1857	2565	7455	137	290	264	803	95	140	361	272	5099	86683	395	128	367	39	62	46	53	11	0	108871
15 CAL	183	180	151	663	16	33	44	103	8	21	15	6	52	407	13285	935	374	5	12	3	13	11	0	16520
16 STM	121	109	87	345	11	22	34	79	7	18	10	4	32	134	945	36381	747	6	22	2	38	47	0	39198
17 CHS	683	650	361	2311	60	127	194	409	31	80	33	12	96	368	368	735	25292	19	47	6	53	95	0	32030
18 FAU	96	75	122	76	25	65	54	683	205	746	24	4	16	30	4	5	16	7969	153	42	119	6	0	10533
19 STA	168	127	124	144	41	97	124	617	48	1121	16	3	16	47	9	15	38	149	12135	6	2297	62	0	17404
20 CL/JF	34	31	140	40	8	20	15	164	256	52	362	40	40	35	2	1	5	40	6	9965	6	0	0	11264
21 SP/FB	111	84	89	100	27	62	78	396	35	471	12	3	13	38	9	26	39	109	2154	6	19840	87	0	23788
22 KGEO	11	8	7	22	3	5	7	23	2	22	1	0	2	9	9	36	77	6	64	0	95	1892	0	2300
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	116375	106825	210377	169990	22891	57016	47424	293127	52402	72552	51410	28740	46378	107537	16476	39138	31908	10716	17717	11545	24357	2346	0	1537247

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal NHW Trips MODE: Est Auto Occ.

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	1.10	1.10	1.11	1.04	1.07	1.10	1.17	1.12	1.28	1.13	1.69	1.67	1.14	1.22	1.28	1.94	1.15	1.69	1.49	2.38	1.95	2.95	0	1.11
2 DC NC	1.12	1.09	1.09	1.03	1.10	1.12	1.20	1.13	1.33	1.13	1.70	1.72	1.13	1.19	1.31	2.13	1.12	2.03	1.71	2.91	2.48	3.46	0	1.10
3 MTG	1.07	1.09	1.10	1.13	1.26	1.17	1.37	1.36	1.68	1.70	1.32	1.37	1.17	1.38	2.13	3.38	1.85	2.25	2.39	2.11	3.00	4.49	0	1.12
4 PG	1.04	1.06	1.18	1.05	1.09	1.12	1.24	1.43	2.43	1.82	2.33	2.07	1.18	1.20	1.32	1.91	1.17	3.13	2.51	3.59	3.29	3.10	0	1.09
5 ARLCR	1.09	1.10	1.14	1.06	1.10	1.10	1.15	1.12	1.33	1.14	1.65	1.72	1.18	1.30	1.35	1.98	1.18	1.56	1.40	2.41	1.82	2.34	0	1.11
6 ARNCR	1.09	1.09	1.13	1.04	1.09	1.08	1.13	1.10	1.28	1.10	1.92	2.47	1.21	1.33	1.47	2.69	1.16	1.64	1.43	3.02	2.12	3.60	0	1.10
7 ALX	1.10	1.10	1.21	1.06	1.09	1.08	1.11	1.10	1.44	1.12	2.36	3.17	1.37	1.42	1.44	2.00	1.11	1.81	1.36	2.82	1.84	2.72	0	1.11
8 FFX	1.04	1.03	1.23	1.20	1.06	1.03	1.12	1.11	1.11	1.10	2.29	3.56	1.88	2.03	2.97	4.37	1.53	1.40	1.49	2.18	2.02	4.66	0	1.11
9 LDN	1.30	1.22	1.76	2.32	1.28	1.21	1.52	1.22	1.03	1.19	1.42	3.92	3.27	3.31	7.94	7.78	3.97	1.36	2.60	1.24	3.50	8.05	0	1.09
10 PW	1.14	1.10	1.76	1.69	1.17	1.11	1.27	1.20	1.20	1.03	3.96	6.15	3.40	3.13	4.76	5.36	2.46	1.13	1.11	2.42	1.39	2.36	0	1.07
11 FRD	1.89	1.79	1.43	2.38	1.21	1.85	2.69	2.69	1.47	3.84	1.06	1.18	1.53	2.18	4.59	5.31	3.80	2.96	3.93	1.32	4.57	7.06	0	1.11
12 CAR	2.04	2.10	1.58	2.28	1.28	2.39	3.78	4.08	3.98	5.95	1.24	1.03	1.26	1.77	6.44	7.33	4.38	4.89	5.95	1.99	9.18	9.67	0	1.07
13 HOW	1.15	1.17	1.24	1.18	1.03	1.30	1.77	2.25	2.98	3.32	1.54	1.19	1.05	1.13	2.20	3.57	2.33	3.25	3.58	2.31	4.06	4.57	0	1.10
14 AAR	1.24	1.25	1.47	1.20	1.07	1.37	1.74	2.33	3.10	3.06	2.19	1.66	1.14	1.06	1.35	2.52	1.78	3.29	3.12	2.86	3.60	3.48	0	1.10
15 CAL	1.44	1.50	2.41	1.37	1.12	1.66	1.96	3.56	7.18	4.59	4.58	6.26	2.33	1.39	1.04	1.17	1.28	5.34	4.29	8.50	3.95	2.47	0	1.09
16 STM	2.34	2.34	3.63	1.94	1.42	2.44	2.67	4.84	7.54	5.34	5.25	6.83	3.52	2.55	1.15	1.04	1.25	5.50	4.32	10.95	3.29	1.86	0	1.07
17 CHS	1.22	1.24	2.06	1.18	1.05	1.28	1.43	1.99	3.85	2.64	3.99	4.69	2.36	1.79	1.27	1.24	1.04	3.75	2.95	4.83	2.86	1.45	0	1.09
18 FAU	1.79	1.68	2.36	3.08	1.48	1.46	1.96	1.62	1.36	1.14	3.00	4.71	3.45	3.43	5.19	5.18	3.85	1.03	1.23	1.54	1.42	2.28	0	1.11
19 STA	1.63	1.44	2.49	2.47	1.37	1.37	1.56	1.71	2.74	1.13	4.17	5.80	3.68	3.27	4.54	5.03	2.94	1.23	1.02	4.24	1.05	1.10	0	1.08
20 CL/JF	2.32	2.84	2.22	3.93	2.05	2.68	3.11	2.53	1.28	2.54	1.35	1.92	2.36	2.98	16.09	12.64	5.55	1.57	4.37	1.02	4.95	21.00	0	1.07
21 SP/FB	1.94	2.05	3.09	3.27	1.56	1.84	1.92	2.24	3.65	1.37	4.67	11.50	4.15	3.77	4.81	3.49	2.93	1.40	1.05	4.95	1.03	1.11	0	1.06
22 KGEO	3.03	3.08	5.25	3.16	1.94	3.34	2.97	5.37	8.05	2.43	9.25	16.00	4.93	3.82	2.45	1.82	1.41	2.32	1.12	12.00	1.15	1.02	0	1.09
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1.10	1.09	1.13	1.08	1.10	1.09	1.15	1.13	1.08	1.06	1.10	1.06	1.10	1.10	1.08	1.07	1.08	1.11	1.09	1.08	1.07	1.10	0	1.10

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal NHW Trips MODE: Est Pct. Tran

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	39.4	39.1	34.1	14.6	59.1	51.9	36.2	14.7	0	3.1	0.0	0	0.3	0.2	0.4	0.0	0.1	0	0	0	0.7	0	0	34.4
2 DC NC	49.1	20.8	25.4	9.8	53.6	39.5	22.7	7.5	0	1.9	0	0	0.1	0.0	0.0	0	0.0	0	0	0	0.1	0	0	25.7
3 MTG	49.7	8.7	4.5	1.3	30.9	10.0	6.0	1.5	0	2.2	0.0	0	0.0	0	0.0	0	0.0	0	0	0	0	0	0	6.1
4 PG	29.3	4.7	2.1	0.7	17.8	6.8	2.0	1.4	0	2.4	0	0	0.0	0.0	0	0	0.0	0	0	0	0	0	0	3.3
5 ARLCR	61.0	18.1	13.8	3.5	5.6	18.4	18.1	5.1	0	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	18.9
6 ARNCR	56.7	14.6	9.4	2.2	26.4	9.0	15.1	4.7	0	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0	14.7
7 ALX	40.6	7.0	5.9	0.9	16.2	12.6	5.1	2.1	0	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	7.9
8 FFX	37.5	3.6	2.0	1.2	10.8	5.9	4.1	0.8	0.0	0.8	1.0	0	2.1	0.6	2.7	1.8	1.7	0	0.0	0	0.4	0	0	2.0
9 LDN	41.7	1.0	0.4	0.0	13.2	4.0	0.9	0.3	0.1	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5
10 PW	40.4	2.8	3.1	2.4	11.1	4.8	3.2	1.0	0.2	0.1	1.6	0	4.7	1.2	4.5	3.1	2.8	0	0	0	0.1	0	0	0.9
11 FRD	2.5	0.2	0.1	0	1.7	0.5	0.1	0.1	0	0.2	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0.3
12 CAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 HOW	26.3	2.4	0.6	0.1	21.5	6.6	2.5	3.4	0	5.3	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0.6
14 AAR	24.9	1.9	0.5	0.1	16.0	4.7	1.9	4.6	0	2.4	0	0	0	0.0	0	0	0	0	0	0	0	0	0	0.5
15 CAL	4.1	0.5	0.2	0.0	2.8	0.9	0.1	0.3	0	0.3	0	0	0	0	0.0	0	0	0	0	0	0	0	0	0.1
16 STM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.1	0	0	0	0	0	0	0.0
17 CHS	21.4	2.8	1.4	0.0	14.1	4.4	0.5	1.4	0	2.1	0	0	0	0	0	0.1	0.2	0	0	0	0	0	0	0.7
18 FAU	1.7	0	0	0	0.1	0	0.1	1.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
19 STA	0.3	0	0	0	0	0	0	1.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
20 CL/JF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 SP/FB	0.5	0	0	0	0	0	0	5.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
22 KGEO	0	0	0	0	0	0	0	2.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	41.8	19.2	6.3	2.5	26.2	15.8	9.3	1.5	0.1	0.3	0.3	0	0.0	0.0	0.0	0.0	0.2	0	0.0	0.0	0.0	0	0	7.2

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal NHO Trips MODE: Est Transit

	DESTINATION																							
ORIGIN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	4682	3062	895	613	615	780	255	226	0	17	0	0	1	2	0	0	0	0	0	0	0	0	0	11147
2 DC NC	4051	6708	1485	866	461	459	128	89	0	18	0	0	0	1	0	0	0	0	0	0	0	0	0	14266
3 MTG	1162	486	4071	166	100	52	10	87	0	61	0	0	0	0	0	0	0	0	0	0	0	0	0	6195
4 PG	978	342	159	795	103	88	8	62	0	44	0	0	0	0	0	0	0	0	0	0	0	0	0	2579
5 ARLCR	450	52	8	1	38	234	94	16	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	898
6 ARNCR	1378	101	13	1	216	1106	320	94	0	24	0	0	0	0	0	0	0	0	0	0	0	0	0	3251
7 ALX	759	25	3	0	66	286	683	80	0	31	0	0	0	0	0	0	0	0	0	0	0	0	0	1932
8 FFX	734	26	51	32	57	282	246	855	8	224	4	0	12	6	4	2	12	0	0	0	3	0	0	2558
9 LDN	21	0	0	0	0	1	0	40	0	23	0	0	0	0	0	0	0	0	0	0	0	0	0	85
10 PW	73	12	33	23	5	31	44	254	11	192	2	0	8	5	3	1	8	0	0	0	3	0	0	710
11 FRD	0	0	0	0	0	0	0	1	0	1	127	0	0	0	0	0	0	0	0	0	0	0	0	129
12 CAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 HOW	52	0	2	1	3	2	0	34	0	18	0	0	4	0	0	0	0	0	0	0	0	0	0	115
14 AAR	99	1	1	1	14	11	0	80	0	20	0	0	0	1	0	0	0	0	0	0	0	0	0	227
15 CAL	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	3
16 STM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	15
17 CHS	17	0	0	0	2	2	0	14	0	10	0	0	0	0	0	0	128	0	0	0	0	0	0	174
18 FAU	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
19 STA	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
20 CL/JF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 SP/FB	0	0	0	0	0	0	0	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38
22 KGEO	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	14457	10816	6721	2500	1679	3334	1789	1997	19	687	134	0	24	15	7	18	149	0	0	0	6	0	0	44351

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal NHO Trips MODE: Est Auto Person

	DESTINATION																							
ORIGIN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	18406	12333	4812	6975	105	1657	1605	2447	66	166	35	3	144	422	24	3	169	17	42	1	15	0	0	49446
2 DC NC	12023	68090	13393	19512	92	1531	1614	2586	60	125	57	5	394	939	45	3	312	13	40	1	10	0	0	120845
3 MTG	5221	15456	398803	22159	199	1433	861	5513	449	321	3900	616	5098	2523	41	1	125	59	42	99	13	0	0	462932
4 PG	7465	21219	22134	237325	174	935	1970	2767	48	244	85	41	5150	10137	588	104	3751	11	55	1	16	7	0	314225
5 ARLCR	40	317	172	169	960	1821	1225	1894	53	146	3	0	5	17	1	0	9	4	8	0	3	0	0	6847
6 ARNCR	248	1157	806	579	1752	24054	6817	14741	388	854	10	0	20	61	4	0	33	22	41	1	14	0	0	51602
7 ALX	511	1083	490	1096	1163	6743	39791	19886	243	1627	7	0	21	82	11	2	115	20	98	0	37	1	0	73028
8 FFX	692	1314	2496	1413	1492	12691	18249	421966	15452	17270	42	2	55	117	11	1	166	550	460	34	161	1	0	494634
9 LDN	5	17	130	10	33	254	165	14306	101662	1732	236	3	2	2	0	0	1	237	6	538	1	0	0	119340
10 PW	24	62	96	84	97	605	1173	15024	1617	185523	1	0	1	6	0	0	13	1637	2058	22	533	11	0	208587
11 FRD	33	56	3513	73	3	14	9	73	425	4	115260	2399	695	84	0	0	0	3	0	840	0	0	0	123483
12 CAR	4	7	609	39	0	1	1	4	7	0	2476	78522	1069	109	0	0	0	0	0	28	0	0	0	82875
13 HOW	165	544	5611	5793	7	36	38	125	11	6	718	1126	103385	10175	10	0	19	1	0	17	0	0	0	127787
14 AAR	458	1162	2777	11030	10	88	129	221	8	20	94	123	10483	235401	564	9	169	1	3	2	1	0	0	262752
15 CAL	29	57	37	558	2	5	16	16	0	2	0	0	9	549	36663	1203	482	0	0	0	0	4	0	39632
16 STM	2	3	1	88	0	0	2	1	0	0	0	0	0	8	1155	50572	934	0	0	0	1	35	0	52802
17 CHS	177	356	121	3783	9	45	146	206	2	25	0	0	18	163	497	1011	75554	1	7	0	8	169	0	82297
18 FAU	4	2	10	2	1	10	10	387	207	1391	1	0	0	0	0	0	0	22549	234	50	100	2	0	24961
19 STA	12	8	8	12	4	19	50	281	4	1797	0	0	0	0	0	0	2	253	29991	0	4775	148	0	37365
20 CL/JF	0	0	24	0	0	0	0	20	424	14	283	8	4	0	0	0	0	42	0	22529	0	0	0	23348
21 SP/FB	1	0	1	2	1	5	17	82	1	408	0	0	0	0	0	0	2	101	4539	0	53378	164	0	58701
22 KGEO	0	0	0	1	0	0	0	0	0	7	0	0	0	0	0	1	10	52	2	130	0	145	4444	0	4792
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	45521	123243	456044	310700	6103	51946	73886	502546	121127	211683	123206	82848	126553	260797	39614	52919	81909	25522	37755	24161	59211	4985	0	2822280

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal NHO Trips MODE: Est Auto Driver

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	12528	7878	3207	5349	38	1023	888	1671	29	92	8	0	83	212	10	0	92	4	12	0	2	0	0	33125
2 DC NC	7628	45642	9296	15528	32	907	840	1759	22	61	12	1	231	492	21	0	189	3	7	0	1	0	0	82670
3 MTG	3919	9694	258349	12766	61	721	334	2231	128	74	1744	287	2667	1059	8	0	31	13	8	27	1	0	0	294124
4 PG	6063	14545	12840	165098	54	445	893	1080	7	56	16	9	2962	5410	250	35	2084	2	11	0	2	1	0	211864
5 ARLCR	12	211	103	116	679	1244	716	1195	22	71	1	0	2	6	0	0	3	1	3	0	1	0	0	4385
6 ARNCR	117	763	456	392	1244	17325	4102	9433	159	419	1	0	5	18	1	0	12	5	11	0	3	0	0	34463
7 ALX	290	679	233	714	868	4703	23912	12776	85	815	1	0	5	24	2	0	54	4	32	0	10	0	0	45206
8 FFX	664	841	1063	632	1120	8826	9504	264903	9311	9466	6	0	8	23	1	0	46	192	150	8	39	0	0	306802
9 LDN	2	4	30	1	16	95	49	7421	74575	802	114	0	0	0	0	0	0	102	1	269	0	0	0	83482
10 PW	16	14	17	16	56	265	443	7678	773	137140	0	0	0	1	0	0	2	874	1140	5	187	2	0	148630
11 FRD	7	11	1518	13	1	2	1	12	199	0	82122	1408	285	22	0	0	0	0	0	369	0	0	0	85972
12 CAR	0	1	266	9	0	0	0	0	1	0	1407	61752	593	35	0	0	0	0	0	8	0	0	0	64073
13 HOW	97	235	2910	3223	2	8	10	25	1	1	288	644	73710	5925	2	0	4	0	0	4	0	0	0	87090
14 AAR	235	489	1166	5768	3	23	37	49	1	3	25	41	6085	168284	319	2	53	0	0	0	0	0	0	182583
15 CAL	10	17	7	229	0	1	3	2	0	0	0	0	2	312	28239	684	241	0	0	0	0	1	0	29748
16 STM	0	0	0	31	0	0	0	0	0	0	0	0	0	1	678	37702	518	0	0	0	0	11	0	38942
17 CHS	94	155	30	2192	2	11	51	55	0	5	0	0	4	53	245	568	56600	0	1	0	1	66	0	60133
18 FAU	1	0	2	0	0	2	2	124	91	745	0	0	0	0	0	0	0	16913	129	23	39	0	0	18072
19 STA	2	1	1	2	2	4	13	84	1	969	0	0	0	0	0	0	0	141	23209	0	3068	87	0	27583
20 CL/JF	0	0	5	0	0	0	0	4	212	3	121	2	1	0	0	0	0	19	0	17634	0	0	0	18002
21 SP/FB	0	0	0	0	0	1	3	17	0	147	0	0	0	0	0	0	0	41	3058	0	40177	85	0	43530
22 KGEO	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	3	20	0	76	0	70	3512	0	3683
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	31683	81179	291499	212079	4179	35604	41802	310519	85617	150870	85868	64145	86641	181878	29776	38994	59950	18315	27849	18349	43601	3766	0	1904162

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal NHO Trips MODE: Est Motr Psn

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	23088	15394	5707	7588	720	2437	1860	2673	66	183	35	3	145	424	24	3	169	17	42	1	15	0	0	60594
2 DC NC	16074	74799	14878	20378	553	1990	1741	2675	60	143	57	5	394	940	45	3	312	13	40	1	10	0	0	135110
3 MTG	6384	15942	402873	22325	298	1485	871	5600	449	381	3900	616	5098	2523	41	1	125	59	42	99	13	0	0	469127
4 PG	8443	21561	22293	238120	277	1023	1978	2829	48	289	85	41	5150	10137	588	104	3751	11	55	1	16	7	0	316804
5 ARLCR	490	370	180	169	998	2055	1319	1910	53	150	3	0	5	17	1	0	9	4	8	0	3	0	0	7744
6 ARNCR	1626	1258	819	580	1968	25160	7137	14835	388	878	10	0	20	61	4	0	33	22	41	1	14	0	0	54854
7 ALX	1270	1108	493	1096	1228	7029	40474	19965	243	1658	7	0	21	82	11	2	115	20	98	0	37	1	0	74960
8 FFX	1426	1339	2547	1445	1548	12973	18495	422821	15459	17495	46	2	67	123	14	3	178	550	460	34	164	1	0	497191
9 LDN	26	17	130	10	33	256	165	14346	101662	1755	236	3	2	2	0	0	1	237	6	538	1	0	0	119425
10 PW	97	74	129	107	101	637	1217	15278	1628	185715	3	0	9	11	3	1	22	1637	2058	22	536	11	0	209296
11 FRD	33	56	3513	73	3	14	9	74	425	4	115387	2399	695	84	0	0	0	3	0	840	0	0	0	123612
12 CAR	4	7	609	39	0	1	1	4	7	0	2476	78522	1069	109	0	0	0	0	0	28	0	0	0	82875
13 HOW	217	544	5613	5793	10	38	38	159	11	24	718	1126	103389	10175	10	0	19	1	0	17	0	0	0	127902
14 AAR	557	1163	2778	11031	25	99	129	300	8	40	94	123	10483	235402	564	9	169	1	3	2	1	0	0	262979
15 CAL	30	57	37	558	2	5	16	17	0	2	0	0	9	549	36663	1203	482	0	0	0	0	4	0	39635
16 STM	2	3	1	88	0	0	2	1	0	0	0	0	0	8	1155	50587	935	0	0	0	1	35	0	52817
17 CHS	195	356	121	3783	11	47	146	220	2	35	0	0	18	163	497	1011	75682	1	7	0	8	169	0	82471
18 FAU	4	2	10	2	1	10	10	399	207	1391	1	0	0	0	0	0	0	22549	234	50	100	2	0	24973
19 STA	12	8	8	12	4	19	50	295	4	1797	0	0	0	0	0	0	2	253	29991	0	4775	148	0	37379
20 CL/JF	0	0	24	0	0	0	0	20	424	14	283	8	4	0	0	0	0	42	0	22529	0	0	0	23348
21 SP/FB	1	0	1	2	1	5	17	120	1	408	0	0	0	0	0	0	2	101	4539	0	53378	164	0	58738
22 KGEO	0	0	0	1	0	0	0	1	0	7	0	0	0	0	1	10	52	2	130	0	145	4444	0	4794
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	59978	134059	462765	313200	7782	55281	75675	504543	121146	212369	123339	82848	126578	260812	39621	52937	82058	25522	37755	24161	59217	4985	0	2866631

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal NHO Trips MODE: Est Auto Occ.

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	1.47	1.57	1.50	1.30	2.78	1.62	1.81	1.46	2.32	1.81	4.35	8.86	1.75	1.99	2.45	7.85	1.84	4.81	3.41	0.65	6.40	0.12	0	1.49
2 DC NC	1.58	1.49	1.44	1.26	2.90	1.69	1.92	1.47	2.76	2.06	4.53	9.30	1.71	1.91	2.15	5.22	1.65	5.08	5.40	0.57	18.17	0.12	0	1.46
3 MTG	1.33	1.59	1.54	1.74	3.24	1.99	2.58	2.47	3.52	4.34	2.24	2.15	1.91	2.38	5.00	9.71	4.04	4.46	5.15	3.60	9.59	0.08	0	1.57
4 PG	1.23	1.46	1.72	1.44	3.21	2.10	2.21	2.56	6.78	4.39	5.19	4.37	1.74	1.87	2.35	2.92	1.80	6.15	4.85	0.89	7.99	5.96	0	1.48
5 ARLCR	3.48	1.51	1.67	1.45	1.41	1.46	1.71	1.59	2.44	2.04	4.73	0.18	2.59	2.74	4.06	0.07	2.52	4.03	3.28	10.50	4.20	0.04	0	1.56
6 ARNCR	2.13	1.52	1.77	1.48	1.41	1.39	1.66	1.56	2.43	2.04	7.17	0.47	4.36	3.49	6.05	0.24	2.85	4.60	3.85	32.00	5.06	0.05	0	1.50
7 ALX	1.76	1.60	2.11	1.54	1.34	1.43	1.66	1.56	2.86	2.00	7.18	0.21	4.25	3.39	5.06	10.81	2.13	4.68	3.11	41.00	3.82	22.67	0	1.62
8 FFX	1.04	1.56	2.35	2.24	1.33	1.44	1.92	1.59	1.66	1.82	7.07	19.56	6.70	5.10	10.18	59.50	3.61	2.87	3.07	4.47	4.10	128.00	0	1.61
9 LDN	2.66	4.18	4.34	7.24	2.08	2.67	3.41	1.93	1.36	2.16	2.08	7.26	8.78	8.23	0.02	0	6.18	2.33	6.40	2.00	8.93	0	0	1.43
10 PW	1.49	4.43	5.67	5.17	1.71	2.28	2.65	1.96	2.09	1.35	27.00	0	31.50	9.04	19.50	0.03	5.99	1.87	1.80	4.21	2.85	4.82	0	1.40
11 FRD	4.73	5.03	2.31	5.44	4.66	6.10	7.15	5.91	2.13	12.72	1.40	1.70	2.44	3.83	0	0	0.20	6.36	0.16	2.28	0.02	0	0	1.44
12 CAR	16.73	12.94	2.29	4.44	6.50	19.75	0.56	13.45	5.38	0.11	1.76	1.27	1.80	3.15	0	0	0.02	0.02	0	3.36	0	0	0	1.29
13 HOW	1.70	2.32	1.93	1.80	3.86	4.49	3.93	4.95	7.99	9.56	2.49	1.75	1.40	1.72	4.68	0.24	4.42	5.93	0.49	3.83	0.02	0	0	1.47
14 AAR	1.95	2.38	2.38	1.91	3.61	3.88	3.46	4.47	6.54	6.98	3.75	2.98	1.72	1.40	1.77	5.02	3.20	5.11	8.63	6.00	58.00	31.00	0	1.44
15 CAL	2.95	3.32	5.11	2.44	4.33	7.68	5.03	7.85	0.09	12.00	0.01	0	5.05	1.76	1.30	1.76	2.00	0.02	0.16	0	0.01	3.91	0	1.33
16 STM	19.18	10.36	9.44	2.87	0.06	0.21	10.59	102.00	0	0.09	0	0	0.16	5.27	1.70	1.34	1.80	0	0.23	0	46.50	3.12	0	1.36
17 CHS	1.89	2.30	4.03	1.73	3.74	4.02	2.88	3.72	8.67	5.19	0.21	0.02	4.38	3.07	2.03	1.78	1.33	8.29	6.61	0	6.11	2.57	0	1.37
18 FAU	4.92	14.24	5.89	13.08	3.82	4.99	5.18	3.13	2.28	1.87	9.00	0	0.03	0.12	0	0	0.12	1.33	1.81	2.14	2.57	4.45	0	1.38
19 STA	5.17	12.39	8.59	6.89	2.21	4.42	3.75	3.35	7.23	1.85	0	0	0	0.37	0	0	12.77	1.79	1.29	0	1.56	1.70	0	1.35
20 CL/JF	0	0	4.71	0	0.05	0.08	0.03	5.18	2.00	4.66	2.33	3.98	5.65	15.50	0	0	0	2.17	0	1.28	0	0	0	1.30
21 SP/FB	17.71	0.48	34.67	21.75	4.50	9.02	5.12	4.86	12.00	2.78	0	0	0	0	0	0.03	8.56	2.43	1.48	0	1.33	1.93	0	1.35
22 KGEO	0	0	0	10.78	0	0	0.06	0.18	0	5.14	0	0	0	0	4.22	3.47	2.63	4.27	1.71	0	2.08	1.27	0	1.30
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1.44	1.52	1.56	1.47	1.46	1.46	1.77	1.62	1.41	1.40	1.43	1.29	1.46	1.43	1.33	1.36	1.37	1.39	1.36	1.32	1.36	1.32	0	1.48

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Internal NHO Trips MODE: Est Pct. Tran

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	20.3	19.9	15.7	8.1	85.4	32.0	13.7	8.5	0	9.5	0	0	0.4	0.5	0	0	0	0	0	0	0.1	0	0	18.4
2 DC NC	25.2	9.0	10.0	4.2	83.3	23.1	7.3	3.3	0	12.5	0	0	0.0	0.1	0	0	0	0	0	0	0	0	0	10.6
3 MTG	18.2	3.0	1.0	0.7	33.4	3.5	1.2	1.6	0	15.9	0	0	0.0	0	0	0	0	0	0	0	0	0	0	1.3
4 PG	11.6	1.6	0.7	0.3	37.3	8.6	0.4	2.2	0	15.4	0	0	0.0	0.0	0	0	0.0	0	0	0	0	0	0	0.8
5 ARLCR	91.8	14.2	4.3	0.5	3.8	11.4	7.2	0.8	0	2.8	0	0	0	0	0	0	0	0	0	0	0	0	0	11.6
6 ARNCR	84.7	8.0	1.6	0.2	11.0	4.4	4.5	0.6	0	2.7	0	0	0	0	0	0	0	0	0	0	0	0	0	5.9
7 ALX	59.8	2.3	0.6	0.0	5.3	4.1	1.7	0.4	0	1.9	0	0	0	0	0	0	0	0	0	0	0	0	0	2.6
8 FFX	51.5	1.9	2.0	2.2	3.7	2.2	1.3	0.2	0.0	1.3	9.0	0	17.4	4.8	25.5	60.5	6.7	0	0.0	0	2.1	0	0	0.5
9 LDN	79.8	0	0.0	0	0.3	0.5	0.0	0.3	0	1.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
10 PW	75.2	16.7	25.9	21.6	4.8	4.9	3.6	1.7	0.7	0.1	68.5	0	86.7	45.8	86.8	97.9	38.8	0	0.0	0	0.5	0	0	0.3
11 FRD	1.0	0	0.0	0	2.6	0.2	0	1.2	0	14.4	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0.1
12 CAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 HOW	24.0	0.0	0.0	0.0	30.4	4.9	0	21.4	0	74.4	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0.1
14 AAR	17.7	0.1	0.0	0.0	58.0	11.5	0.0	26.5	0	49.5	0	0	0	0.0	0	0	0	0	0	0	0	0	0	0.1
15 CAL	2.5	0	0	0	4.5	1.1	0	3.5	0	21.6	0	0	0	0	0.0	0	0	0	0	0	0	0	0	0.0
16 STM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0	0	0	0	0	0	0.0
17 CHS	8.9	0.1	0	0	18.0	3.5	0	6.5	0	28.5	0	0	0	0	0	0.0	0.2	0	0	0	0	0	0	0.2
18 FAU	0.3	0	0	0	0	0	0	3.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
19 STA	0	0	0	0	0	0	0	4.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
20 CL/JF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 SP/FB	0	0	0	0	0	0	0	31.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
22 KGEO	0	0	0	0	0	0	0	87.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	24.1	8.1	1.5	0.8	21.6	6.0	2.4	0.4	0.0	0.3	0.1	0	0.0	0.0	0.0	0.0	0.2	0	0.0	0	0.0	0	0	1.5

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Total Internal Trips MODE: Est Transit

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	39287	20756	6422	3184	5143	7415	2446	2690	1	47	0	0	6	8	1	0	0	0	0	0	1	0	0	87407
2 DC NC	143506	89352	30133	13336	9398	14902	4552	6453	4	52	0	0	33	26	0	0	0	0	0	0	0	0	0	311748
3 MTG	71902	16017	74535	3637	3968	4305	810	1891	0	135	0	0	27	4	0	0	0	0	0	0	0	0	0	177232
4 PG	57673	23832	12152	24695	5398	6320	1547	1982	0	109	0	0	97	59	0	0	3	0	0	0	0	0	0	133867
5 ARLCR	6381	781	280	59	540	1975	629	452	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	11107
6 ARNCR	46048	4799	1800	327	5741	17227	4290	4339	1	57	0	0	0	0	0	0	0	0	0	0	0	0	0	84630
7 ALX	22298	2099	729	164	2300	5872	6540	2742	0	59	0	0	0	0	0	0	0	0	0	0	0	0	0	42802
8 FFX	49332	5649	2732	528	6795	13344	6123	21262	78	725	10	0	39	28	14	11	50	0	0	0	18	0	0	106737
9 LDN	3406	399	184	16	556	748	86	572	645	115	0	0	0	0	0	0	0	0	0	0	0	0	0	6727
10 PW	10583	2451	1406	455	2494	3971	1731	3416	152	2532	9	0	58	55	18	18	75	0	0	0	28	0	0	29453
11 FRD	2003	208	495	15	128	109	14	210	0	5	1634	0	0	0	0	0	0	0	0	0	0	0	0	4820
12 CAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 HOW	7093	1726	1380	472	623	628	101	275	0	69	0	0	546	19	0	0	0	0	0	0	0	0	0	12932
14 AAR	8668	1990	853	490	952	893	139	674	0	88	0	0	34	80	0	0	0	0	0	0	0	0	0	14861
15 CAL	870	258	76	33	168	141	21	42	0	3	0	0	0	1	39	0	0	0	0	0	0	0	0	1653
16 STM	472	92	33	10	74	59	9	33	0	0	0	0	0	0	1	127	15	0	0	0	0	0	0	926
17 CHS	4155	1104	315	124	506	508	95	143	0	31	0	0	0	0	0	3	787	0	0	0	0	0	0	7772
18 FAU	84	30	11	1	35	46	18	101	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	330
19 STA	1077	188	67	8	305	329	88	446	0	18	0	0	0	0	0	0	0	1	0	0	0	0	0	2528
20 CL/JF	88	44	39	3	33	35	7	173	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	422
21 SP/FB	791	187	66	8	250	300	116	807	0	60	0	0	0	0	0	0	0	1	0	2	0	0	0	2589
22 KGEO	20	8	2	0	7	9	4	49	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	102
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	475737	171970	133710	47569	45415	79136	29365	48752	881	4121	1654	0	839	282	73	160	931	0	2	0	49	0	0	1040646

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Total Internal Trips MODE: Est Auto Person

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	68390	37325	15015	20228	2493	7308	5315	14468	761	1049	385	92	912	2261	216	136	902	149	281	48	178	16	0	177926
2 DC NC	95027	368855	85020	87744	6068	18346	12423	44565	1831	1214	548	103	3424	6051	350	182	1921	157	321	47	183	16	0	734397
3 MTG	100113	1158812035026	123461	6203	15794	6672	51299	3354	1597	18878	3541	27292	19040	482	414	1437	326	418	820	419	33	0	2532500
4 PG	95439	169440	1449691270759	8410	21518	20202	53904	1525	1597	853	297	29900	53288	3846	2279	29712	170	504	66	295	212	0	1909184
5 ARLCR	2023	2912	1369	1344	8378	8474	3761	8794	356	567	43	9	58	151	18	12	71	37	69	11	45	3	0	38505
6 ARNCR	19407	20261	9959	7135	21382	205474	34065	102664	2747	2943	130	17	195	538	42	40	293	150	334	31	245	12	0	428063
7 ALX	13961	11672	4897	7152	9323	34250	159131	89022	1498	4106	82	13	152	479	64	62	556	116	461	23	298	19	0	337338
8 FFX	109722	64656	51649	34721	30327	116859	1140522335465	74064	65971	1045	103	1064	2614	238	464	2816	3496	6064	716	5673	304	0	3022080
9 LDN	11516	8172	11173	4165	3092	9074	4535	125829	498282	10035	8144	400	497	746	26	87	329	2270	461	12254	609	35	0	711728
10 PW	17763	10275	9629	5643	5154	14732	14162	150532	15237	850136	356	23	226	596	46	140	495	12848	15558	501	9073	327	0	1133452
11 FRD	4242	3943	54263	3712	773	1879	688	11387	12532	408	518284	20987	13359	5339	54	85	142	108	26	5361	25	1	0	657598
12 CAR	2997	2017	16363	2365	338	674	243	2496	975	76	16682	361905	13695	3799	38	47	92	18	6	307	6	1	0	425141
13 HOW	9022	10174	39436	34651	781	1847	920	4745	360	144	7126	8824	533614	62856	188	193	407	28	25	242	25	6	0	715613
14 AAR	18882	20885	28030	69402	1997	5172	3606	12128	622	455	1538	867	675191159980	5580	1112	2604	52	94	85	73	30	0	1400713
15 CAL	5149	4111	2934	10561	540	1460	1395	4264	119	134	67	16	585	6372	182968	14976	5717	9	19	4	26	44	0	241469
16 STM	3671	2671	1636	5597	457	1108	1510	3985	80	125	40	8	279	1302	11057	257038	19226	14	69	3	115	409	0	310399
17 CHS	10588	8551	4274	22265	1208	3165	3894	11425	284	401	89	20	588	2394	4606	8196	306553	28	99	7	129	1105	0	389870
18 FAU	1454	804	1184	495	411	1067	668	14975	3879	13443	95	7	40	75	8	29	50	102772	2597	468	1755	65	0	146340
19 STA	2211	1581	1520	1266	634	2202	2166	20536	1360	31993	49	5	48	147	34	156	288	3622	176324	96	43815	1022	0	291075
20 CL/JF	673	415	4349	351	185	454	217	8654	18451	1382	4845	212	536	229	3	2	9	1053	26	106758	29	2	0	148831
21 SP/FB	1060	677	885	596	331	1194	1147	13331	1004	12709	36	4	30	98	40	169	233	2258	28766	80	244906	894	0	310448
22 KGEO	745	435	275	661	163	351	312	2533	132	2341	4	0	17	68	63	418	3275	343	3781	11	4192	28858	0	48977
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	594054	865712	2523854	1714275	108646	472403	391084	3086999	639452	1002826	579317	397454	694030	1328423	209966	286238	377128	130022	236299	127937	312115	33413	0	16111648

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Total Internal Trips MODE: Est Auto Driver

ORIGIN	DESTINATION 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	53396	27706	11085	17170	2059	5413	3744	11005	549	850	218	54	732	1705	158	71	714	82	171	20	87	5	0	136994
2 DC NC	66534	246262	58814	66697	4282	12098	7978	30716	1281	934	353	59	2570	4590	263	112	1473	82	181	18	86	6	0	505389
3 MTG	86765	860721	406092	89765	5251	12823	5076	39276	2413	1062	12951	2286	19619	13808	327	313	1005	175	221	505	228	18	0	1786052
4 PG	78943	125555	101826	906708	6890	16631	13972	37497	1037	996	549	168	21330	38818	2646	1617	20711	78	254	27	140	124	0	1376517
5 ARLCR	1740	2354	1085	1176	6834	6467	2707	6565	240	426	25	5	46	110	13	6	55	22	45	5	24	1	0	29951
6 ARNCR	15451	14810	7705	5675	15902	143792	23635	74412	1908	2076	80	7	157	397	28	24	218	91	205	14	137	6	0	306729
7 ALX	11741	8906	3902	5707	7192	25372	107965	64943	1023	2798	44	4	111	333	42	40	405	67	279	11	166	10	0	241061
8 FFX	96726	50418	41771	26436	24608	89633	809151	636025	55661	47219	724	52	799	1905	154	342	1919	2347	3691	473	3375	178	0	2165370
9 LDN	9928	6641	9494	3310	2578	7206	3506	96280	357368	7570	5777	274	428	599	20	79	232	1626	298	8044	391	22	0	521672
10 PW	16259	9063	8471	4784	4519	12342	11095	111753	11962	608417	294	17	185	475	35	123	360	9155	10385	387	5780	212	0	826073
11 FRD	3772	3473	37912	3227	653	1488	540	7742	7869	317	378127	15180	10547	4630	43	73	115	74	9	3513	10	0	0	479313
12 CAR	2774	1856	11838	2090	304	588	214	1922	634	65	13079	266600	9858	3248	33	41	79	12	2	224	2	0	0	315462
13 HOW	8166	8572	29502	25726	693	1590	741	3691	263	102	5458	5966	376315	46609	144	163	312	13	9	160	10	3	0	514209
14 AAR	16293	16572	20794	50197	1600	3907	2460	8182	401	281	1206	604	48227	830276	3892	867	1898	21	38	51	28	16	0	1007811
15 CAL	4565	3458	2381	7970	427	1093	910	2793	86	92	53	12	471	4840	131460	11581	4261	4	9	1	16	28	0	176512
16 STM	3219	2281	1405	4335	354	809	878	2462	60	88	30	4	236	1080	8199	197605	13512	8	40	1	71	255	0	236932
17 CHS	9434	7282	3561	17379	975	2391	2554	7359	186	250	64	11	483	1966	3395	6181	222910	12	50	2	75	659	0	287181
18 FAU	1255	687	1004	402	352	906	571	11641	3071	10183	75	4	28	50	5	24	36	74057	1882	354	1277	50	0	107914
19 STA	1957	1378	1211	982	556	1836	1673	15100	1160	23345	36	3	33	102	28	139	225	2843	127463	89	32166	783	0	213109
20 CL/JF	610	371	2988	306	159	382	186	6205	11757	1045	3417	151	393	188	1	1	5	737	21	80155	24	1	0	109104
21 SP/FB	948	622	679	479	283	973	862	9336	839	9224	25	1	18	63	33	146	201	1840	21315	72	179361	720	0	228042
22 KGEO	711	413	248	571	149	304	226	1698	121	1584	3	0	15	59	52	308	2121	263	2588	11	2998	20912	0	35352
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	491187	624752	1763768	1241094	86621	348042	272408	2186602	459888	718924	422588	291462	492602	955851	150970	219858	272769	93610	169156	94136	226453	24011	0	11606751

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Total Internal Trips MODE: Est Motr Psn

ORIGIN	DESTINATION 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	107677	58081	21437	23413	7636	14722	7761	17158	762	1096	385	92	917	2269	216	136	903	149	281	48	179	16	0	265332
2 DC NC	238533	458207	115153	101080	15466	33248	16975	51018	1835	1266	548	103	3458	6077	350	182	1921	157	321	47	183	16	0	1046144
3 MTG	172016	1318982	109561	127099	10171	20099	7482	53190	3354	1732	18878	3541	27319	19044	482	414	1437	326	418	820	419	33	0	2709732
4 PG	153111	193272	1571211	295455	13808	27839	21749	55886	1525	1707	853	297	29997	53347	3846	2279	29715	170	504	66	295	212	0	2043051
5 ARLCR	8404	3693	1649	1403	8918	10449	4391	9245	356	576	43	9	58	151	18	12	71	37	69	11	45	3	0	49612
6 ARNCR	65455	25060	11759	7462	27124	222701	38355	107003	2747	3001	130	17	195	538	42	40	293	150	334	31	245	12	0	512694
7 ALX	36259	13771	5626	7316	11623	40122	165671	91763	1498	4164	82	13	152	479	64	62	556	116	461	23	298	19	0	380140
8 FFX	159054	70304	54380	35249	37122	130202	1201752	356727	74142	66696	1056	103	1103	2642	252	475	2865	3496	6064	716	5690	304	0	3128817
9 LDN	14922	8571	11357	4182	3647	9822	4620	126401	498927	10150	8144	400	497	746	26	87	329	2270	461	12254	609	35	0	718455
10 PW	28346	12727	11035	6097	7648	18704	15893	153948	15389	852667	365	23	285	651	64	157	571	12848	15558	501	9101	327	0	1162905
11 FRD	6245	4151	54758	3727	901	1988	702	11597	12532	412	519918	20987	13359	5339	54	85	142	108	26	5361	25	1	0	662418
12 CAR	2997	2017	16363	2365	338	674	243	2496	975	76	16682	361905	13695	3799	38	47	92	18	6	307	6	1	0	425141
13 HOW	16115	11900	40816	35123	1404	2475	1021	5020	360	213	7126	8824	534159	62875	188	193	407	28	25	242	25	6	0	728546
14 AAR	27549	22875	28883	69892	2948	6065	3745	12802	622	543	1538	867	675531	160060	5580	1112	2604	52	94	85	73	30	0	1415574
15 CAL	6019	4370	3009	10593	708	1601	1417	4306	119	137	67	16	585	6373	183007	14977	5717	9	19	4	26	44	0	243122
16 STM	4143	2763	1669	5607	531	1167	1519	4018	80	125	40	8	279	1302	11058	257165	19241	14	69	3	115	409	0	311325
17 CHS	14743	9655	4589	22389	1714	3673	3989	11568	284	431	89	20	588	2395	4606	8199	307340	28	99	7	129	1105	0	397642
18 FAU	1537	834	1195	497	446	1113	687	15076	3879	13448	95	7	40	75	8	29	50	102772	2597	468	1755	65	0	146671
19 STA	3287	1769	1587	1275	939	2532	2254	20982	1360	32011	49	5	48	147	34	156	288	3622	176325	96	43815	1022	0	293603
20 CL/JF	761	458	4388	354	218	489	224	8827	18451	1382	4845	212	536	229	3	2	9	1053	26	106758	29	2	0	149253
21 SP/FB	1852	864	951	605	580	1494	1263	14138	1004	12769	36	4	30	98	40	169	233	2258	28767	80	244908	894	0	313037
22 KGEO	765	443	278	661	170	361	317	2582	132	2344	4	0	17	68	63	418	3275	343	3781	11	4192	28858	0	49080
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1069791	1037681	2657564	1761844	154062	551539	420450	3135751	640334	1006947	580971	397454	694869	1328705	210039	286398	378059	130022	236301	127937	312164	33413	0	17152294

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Total Internal Trips MODE: Est Auto Occ.

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	1.28	1.35	1.35	1.18	1.21	1.35	1.42	1.31	1.39	1.23	1.77	1.72	1.25	1.33	1.36	1.93	1.26	1.81	1.64	2.38	2.04	2.92	0	1.30
2 DC NC	1.43	1.50	1.45	1.32	1.42	1.52	1.56	1.45	1.43	1.30	1.55	1.74	1.33	1.32	1.33	1.63	1.30	1.92	1.77	2.57	2.13	2.60	0	1.45
3 MTG	1.15	1.35	1.45	1.38	1.18	1.23	1.31	1.31	1.39	1.50	1.46	1.55	1.39	1.38	1.48	1.32	1.43	1.86	1.89	1.62	1.84	1.82	0	1.42
4 PG	1.21	1.35	1.42	1.40	1.22	1.29	1.45	1.44	1.47	1.60	1.55	1.77	1.40	1.37	1.45	1.41	1.43	2.17	1.98	2.43	2.11	1.71	0	1.39
5 ARLCR	1.16	1.24	1.26	1.14	1.23	1.31	1.39	1.34	1.48	1.33	1.70	1.75	1.25	1.38	1.42	1.95	1.28	1.66	1.53	2.40	1.88	2.32	0	1.29
6 ARNCR	1.26	1.37	1.29	1.26	1.34	1.43	1.44	1.38	1.44	1.42	1.63	2.43	1.25	1.36	1.48	1.68	1.34	1.66	1.63	2.21	1.79	2.17	0	1.40
7 ALX	1.19	1.31	1.26	1.25	1.30	1.35	1.47	1.37	1.46	1.47	1.86	3.03	1.37	1.44	1.54	1.56	1.37	1.73	1.65	2.19	1.79	1.98	0	1.40
8 FFX	1.13	1.28	1.24	1.31	1.23	1.30	1.41	1.43	1.33	1.40	1.44	1.97	1.33	1.37	1.55	1.36	1.47	1.49	1.64	1.51	1.68	1.71	0	1.40
9 LDN	1.16	1.23	1.18	1.26	1.20	1.26	1.29	1.31	1.39	1.33	1.41	1.46	1.16	1.24	1.29	1.10	1.42	1.40	1.55	1.52	1.56	1.56	0	1.36
10 PW	1.09	1.13	1.14	1.18	1.14	1.19	1.28	1.35	1.27	1.40	1.21	1.37	1.22	1.25	1.30	1.13	1.37	1.40	1.50	1.30	1.57	1.55	0	1.37
11 FRD	1.12	1.14	1.43	1.15	1.18	1.26	1.28	1.47	1.59	1.28	1.37	1.38	1.27	1.15	1.27	1.16	1.24	1.45	2.78	1.53	2.55	3.26	0	1.37
12 CAR	1.08	1.09	1.38	1.13	1.11	1.15	1.14	1.30	1.54	1.17	1.28	1.36	1.39	1.17	1.16	1.14	1.16	1.46	3.45	1.37	2.77	1.76	0	1.35
13 HOW	1.10	1.19	1.34	1.35	1.13	1.16	1.24	1.29	1.37	1.42	1.31	1.48	1.42	1.35	1.30	1.18	1.30	2.14	2.78	1.52	2.41	2.03	0	1.39
14 AAR	1.16	1.26	1.35	1.38	1.25	1.32	1.47	1.48	1.55	1.62	1.28	1.44	1.40	1.40	1.43	1.28	1.37	2.46	2.46	1.68	2.59	1.89	0	1.39
15 CAL	1.13	1.19	1.23	1.33	1.26	1.34	1.53	1.53	1.38	1.46	1.25	1.39	1.24	1.32	1.39	1.29	1.34	2.17	2.10	2.79	1.66	1.56	0	1.37
16 STM	1.14	1.17	1.16	1.29	1.29	1.37	1.72	1.62	1.34	1.42	1.31	1.81	1.18	1.21	1.35	1.30	1.42	1.70	1.74	4.43	1.62	1.61	0	1.31
17 CHS	1.12	1.17	1.20	1.28	1.24	1.32	1.52	1.55	1.52	1.60	1.40	1.87	1.22	1.22	1.36	1.33	1.38	2.27	1.98	3.47	1.71	1.68	0	1.36
18 FAU	1.16	1.17	1.18	1.23	1.17	1.18	1.17	1.29	1.26	1.32	1.27	1.70	1.42	1.50	1.72	1.20	1.42	1.39	1.38	1.32	1.37	1.29	0	1.36
19 STA	1.13	1.15	1.26	1.29	1.14	1.20	1.29	1.36	1.17	1.37	1.36	2.10	1.47	1.44	1.21	1.12	1.28	1.27	1.38	1.08	1.36	1.30	0	1.37
20 CL/JF	1.10	1.12	1.46	1.15	1.16	1.19	1.16	1.39	1.57	1.32	1.42	1.41	1.36	1.22	2.89	2.23	1.86	1.43	1.24	1.33	1.24	1.15	0	1.36
21 SP/FB	1.12	1.09	1.30	1.24	1.17	1.23	1.33	1.43	1.20	1.38	1.42	3.23	1.71	1.56	1.21	1.16	1.16	1.23	1.35	1.10	1.37	1.24	0	1.36
22 KGEO	1.05	1.05	1.11	1.16	1.10	1.16	1.38	1.49	1.10	1.48	1.24	4.75	1.15	1.16	1.21	1.36	1.54	1.30	1.46	1.04	1.40	1.38	0	1.39
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1.21	1.39	1.43	1.38	1.25	1.36	1.44	1.41	1.39	1.39	1.37	1.36	1.41	1.39	1.39	1.30	1.38	1.39	1.40	1.36	1.38	1.39	0	1.39

Year: 2007 Estimate/Observed Trips - (Note: All Est & Obs NonWork trips are factored by 1.00)
Purpose: Total Internal Trips MODE: Est Pct. Tran

ORIGIN \ DESTINATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1 DC CR	36.5	35.7	30.0	13.6	67.4	50.4	31.5	15.7	0.2	4.3	0.0	0	0.6	0.3	0.3	0.0	0.0	0	0	0	0.6	0	0	32.9
2 DC NC	60.2	19.5	26.2	13.2	60.8	44.8	26.8	12.6	0.2	4.1	0	0	1.0	0.4	0.0	0	0.0	0	0	0	0.1	0	0	29.8
3 MTG	41.8	12.1	3.5	2.9	39.0	21.4	10.8	3.6	0.0	7.8	0.0	0	0.1	0.0	0.0	0	0.0	0	0	0	0	0	0	6.5
4 PG	37.7	12.3	7.7	1.9	39.1	22.7	7.1	3.5	0	6.4	0	0	0.3	0.1	0	0	0.0	0	0	0	0	0	0	6.6
5 ARLCR	75.9	21.1	17.0	4.2	6.1	18.9	14.3	4.9	0.0	1.5	0	0	0	0.0	0	0	0	0	0	0	0	0	0	22.4
6 ARNCR	70.4	19.2	15.3	4.4	21.2	7.7	11.2	4.1	0.0	1.9	0	0	0.0	0.0	0	0	0	0	0	0	0	0	0	16.5
7 ALX	61.5	15.2	13.0	2.2	19.8	14.6	3.9	3.0	0.0	1.4	0	0	0	0	0	0	0	0	0	0	0	0	0	11.3
8 FFX	31.0	8.0	5.0	1.5	18.3	10.2	5.1	0.9	0.1	1.1	1.0	0	3.5	1.1	5.5	2.4	1.7	0	0.0	0	0.3	0	0	3.4
9 LDN	22.8	4.7	1.6	0.4	15.2	7.6	1.9	0.5	0.1	1.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9
10 PW	37.3	19.3	12.7	7.5	32.6	21.2	10.9	2.2	1.0	0.3	2.6	0	20.4	8.5	28.1	11.3	13.2	0	0.0	0	0.3	0	0	2.5
11 FRD	32.1	5.0	0.9	0.4	14.3	5.5	1.9	1.8	0	1.2	0.3	0	0.0	0	0	0	0	0	0	0	0	0	0	0.7
12 CAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 HOW	44.0	14.5	3.4	1.3	44.3	25.4	9.9	5.5	0	32.3	0	0	0.1	0.0	0	0	0	0	0	0	0	0	0	1.8
14 AAR	31.5	8.7	3.0	0.7	32.3	14.7	3.7	5.3	0	16.2	0	0	0.1	0.0	0.0	0	0	0	0	0	0	0	0	1.0
15 CAL	14.5	5.9	2.5	0.3	23.7	8.8	1.5	1.0	0	2.1	0	0	0	0.0	0.0	0.0	0	0	0	0	0	0	0	0.7
16 STM	11.4	3.3	2.0	0.2	14.0	5.1	0.6	0.8	0	0	0	0	0	0	0.0	0.0	0.1	0	0	0	0	0	0	0.3
17 CHS	28.2	11.4	6.9	0.6	29.5	13.8	2.4	1.2	0	7.1	0	0	0.0	0.0	0	0.0	0.3	0	0	0	0	0	0	2.0
18 FAU	5.4	3.6	0.9	0.3	7.9	4.1	2.7	0.7	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2
19 STA	32.8	10.7	4.2	0.7	32.5	13.0	3.9	2.1	0	0.1	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0.9
20 CL/JF	11.6	9.6	0.9	1.0	15.2	7.1	3.0	2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3
21 SP/FB	42.7	21.6	7.0	1.4	43.1	20.1	9.2	5.7	0	0.5	0	0	0	0	0	0	0	0	0.0	0	0.0	0	0	0.8
22 KGEO	2.6	1.8	0.9	0.0	4.2	2.5	1.3	1.9	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2
23 EXTL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	44.5	16.6	5.0	2.7	29.5	14.3	7.0	1.6	0.1	0.4	0.3	0	0.1	0.0	0.0	0.1	0.2	0	0.0	0	0.0	0	0	6.1

Appendix C Year 2007 mode choice output vs. targets

Ref: O:\model_dev\nest_log\calibms_2011-04sim\newSegSumm5purps2007.xlsx, targets
I:\ateam\docum\FY11\Ver2.3\modelDoc\01_calib\newSegSumm5purps2007.xlsx, targets

Appendix C. Year 2007 mode choice output vs. targets

Seg	Path #	HBW		HBS		HBO		NHW		NHO	
		Target	Model	Target	Model	Target	Model	Target	Model	Target	Model
(1) DC CORE / URBAN-DC CORE	DR ALONE	12,158	12,138	7,662	7,677	18,408	18,410	34,490	34,542	12,822	12,844
	SR2	1,415	1,409	5,579	5,582	20,538	20,541	7,863	7,870	10,430	10,448
	SR3+	57	50	3,591	3,598	15,664	15,668	213	210	7,034	7,041
	WK-CR	0	0	0	0	0	0	0	0	38	0
	WK-BUS	43,051	42,953	1,502	1,502	12,653	12,643	4,810	4,827	2,883	2,897
	WK-BU/MR	16,438	16,439	279	270	3,640	3,632	2,342	2,271	898	888
	WK-MR	51,755	51,529	664	662	14,539	14,535	20,682	20,790	4,423	4,450
	PNR-CR	0	22	0	0	0	0	0	0	0	0
	KNR-CR	15	10	0	0	0	0	0	0	0	0
	PNR-BUS	964	951	0	3	72	70	55	50	61	60
	KNR-BUS	207	199	0	0	147	140	99	90	210	210
	PNR-BU/MR	1,011	1,022	0	1	47	40	119	110	75	70
	KNR-BU/MR	332	329	0	0	52	50	225	214	45	40
	PNR-MR	5,461	5,459	57	46	1,274	1,272	761	760	497	492
	KNR-MR	1,922	1,916	14	10	269	261	723	725	300	301
(2) DC CORE / URBAN-VA CORE	DR ALONE	1,484	1,539	910	916	1,954	1,953	3,638	3,639	4	2
	SR2	170	169	700	705	2,281	2,284	749	743	8	4
	SR3+	4	8	472	473	1,829	1,823	22	20	58	93
	WK-CR	0	0	0	0	0	0	0	0	0	0
	WK-BUS	503	619	0	4	50	48	0	195	10	126
	WK-BU/MR	2,410	2,688	0	10	555	522	681	591	255	244
	WK-MR	6,734	6,074	145	118	2,448	2,278	3,135	3,056	1,410	1,283
	PNR-CR	0	1	0	0	0	0	0	0	0	0
	KNR-CR	0	0	0	0	0	0	0	0	0	0
	PNR-BUS	0	19	0	0	0	3	0	1	0	1
	KNR-BUS	0	1	0	0	8	0	0	0	0	9
	PNR-BU/MR	154	161	0	0	0	13	8	5	0	0
	KNR-BU/MR	16	11	0	0	0	0	0	0	0	1
	PNR-MR	503	535	0	2	0	169	113	104	14	9
	KNR-MR	155	165	0	6	81	76	344	339	191	184
(3) DC CORE / URBAN-URBAN	DR ALONE	7,520	8,172	35,870	36,014	84,185	84,287	49,900	50,143	40,333	40,477
	SR2	768	826	26,017	26,114	93,035	93,147	11,519	11,564	35,173	35,300
	SR3+	15	11	16,629	16,686	70,286	70,365	270	271	22,190	22,270
	WK-CR	0	0	0	12	0	49	0	194	0	17
	WK-BUS	24,338	27,425	3,132	3,137	24,891	24,885	7,291	7,260	4,780	4,790
	WK-BU/MR	14,825	16,706	1,167	1,162	5,167	5,153	2,810	2,794	971	972
	WK-MR	27,917	21,696	2,365	2,364	10,030	10,027	13,087	13,036	4,667	4,668
	PNR-CR	0	24	0	0	0	0	0	0	0	0
	KNR-CR	0	3	0	0	0	0	0	0	0	0
	PNR-BUS	225	262	0	14	133	130	26	20	107	101
	KNR-BUS	98	108	37	30	189	180	231	231	200	201
	PNR-BU/MR	65	71	50	45	241	240	23	20	125	120
	KNR-BU/MR	430	504	49	40	107	100	250	251	215	211
	PNR-MR	1,636	1,870	105	90	764	762	635	634	28	20
	KNR-MR	1,482	1,738	36	30	392	391	639	634	442	442
(4) DC CORE / URBAN-OTHER	DR ALONE	26,316	29,589	18,254	18,563	25,393	25,634	40,473	41,092	23,326	24,126
	SR2	2,490	2,677	14,320	14,566	29,538	29,815	10,496	10,606	14,466	14,959
	SR3+	1	124	9,804	9,970	23,746	23,972	121	121	6,373	6,571
	WK-CR	64	67	21	19	134	131	0	196	235	217
	WK-BUS	3,667	4,074	682	657	1,273	1,283	322	337	427	439
	WK-BU/MR	7,973	8,941	280	271	2,060	2,080	1,410	1,488	574	595
	WK-MR	7,667	3,386	255	241	1,181	1,175	3,992	3,534	1,123	1,161
	PNR-CR	23	28	0	0	0	0	0	2	15	7
	KNR-CR	10	14	0	0	24	19	0	0	130	117
	PNR-BUS	16	13	0	2	49	37	67	65	0	2
	KNR-BUS	83	107	0	2	0	9	46	43	42	47
	PNR-BU/MR	189	245	0	7	0	13	76	76	0	2
	KNR-BU/MR	412	557	0	17	75	68	39	32	55	59
	PNR-MR	391	513	0	9	117	101	500	495	16	9
	KNR-MR	443	583	0	24	115	106	181	185	64	71

Appendix C. Year 2007 mode choice output vs. targets

		HBW		HBS		HBO		NHW		NHO	
Seg	Path #	Target	Model	Target	Model	Target	Model	Target	Model	Target	Model
(5) MD URBAN-DC CORE	DR ALONE	6,352	6,468	810	823	2,593	2,594	2,126	2,142	1,443	1,450
	SR2	756	764	579	579	2,891	2,894	523	500	1,040	1,047
	SR3+	35	31	367	365	2,205	2,203	8	24	625	624
	WK-CR	0	0	0	0	0	0	0	0	0	0
	WK-BUS	1,387	1,513	25	19	374	375	136	131	50	50
	WK-BU/MR	4,005	4,395	78	66	656	659	272	272	22	20
	WK-MR	10,454	9,241	99	84	1,783	1,742	1,226	1,236	261	261
	PNR-CR	0	75	0	0	0	0	0	0	0	0
	KNR-CR	0	23	0	0	0	0	0	0	0	0
	PNR-BUS	24	20	0	1	0	35	0	6	0	3
	KNR-BUS	102	101	0	0	0	4	0	0	0	0
	PNR-BU/MR	218	213	0	0	165	150	63	59	34	29
	KNR-BU/MR	197	197	0	0	24	19	0	0	0	0
	PNR-MR	3,028	3,116	0	4	397	369	289	278	49	38
	KNR-MR	961	999	0	7	94	88	103	100	51	50
(6) MD URBAN-VA CORE	DR ALONE	893	896	39	34	220	224	12	10	4	2
	SR2	93	86	32	34	261	265	35	31	10	11
	SR3+	3	4	42	46	211	214	413	418	124	130
	WK-CR	0	0	0	0	0	0	0	0	0	0
	WK-BUS	24	21	0	1	31	29	0	4	0	1
	WK-BU/MR	302	313	0	4	65	57	42	36	0	2
	WK-MR	787	735	32	24	87	76	150	141	35	27
	PNR-CR	0	9	0	0	0	0	0	0	0	0
	KNR-CR	0	4	0	0	0	0	0	0	0	0
	PNR-BUS	0	3	0	0	0	0	0	0	0	0
	KNR-BUS	0	1	0	0	0	0	0	0	0	0
	PNR-BU/MR	30	28	0	0	0	0	0	0	0	0
	KNR-BU/MR	0	1	0	0	0	0	0	0	0	0
	PNR-MR	378	364	0	1	0	4	0	3	0	1
	KNR-MR	232	228	0	2	0	7	0	8	0	2
(7) MD URBAN-URBAN	DR ALONE	16,918	17,125	13,999	14,017	27,024	27,055	23,164	23,231	15,048	15,078
	SR2	1,933	1,954	10,076	10,089	30,037	30,069	6,356	6,367	12,209	12,229
	SR3+	70	71	6,397	6,402	22,839	22,859	226	220	8,395	8,407
	WK-CR	0	0	0	0	0	4	0	7	0	1
	WK-BUS	6,421	6,523	690	645	3,496	3,496	694	691	534	526
	WK-BU/MR	2,864	2,890	118	103	620	620	288	278	80	79
	WK-MR	4,729	4,445	92	84	2,179	2,143	882	880	187	179
	PNR-CR	0	19	0	0	0	1	0	0	0	0
	KNR-CR	1	13	0	0	0	0	0	0	0	0
	PNR-BUS	23	20	0	6	143	140	2	4	160	149
	KNR-BUS	61	60	0	5	39	29	46	40	23	20
	PNR-BU/MR	60	60	0	3	23	20	41	38	0	1
	KNR-BU/MR	173	172	0	3	0	3	53	50	0	0
	PNR-MR	584	578	0	11	122	120	47	38	0	17
	KNR-MR	494	495	0	28	34	29	31	30	30	30
(8) MD URBAN-OTHER	DR ALONE	19,432	20,009	13,042	13,132	20,330	20,414	21,325	21,396	15,771	15,855
	SR2	2,233	2,298	9,639	9,698	23,024	23,114	3,922	3,937	13,543	13,612
	SR3+	39	31	6,335	6,374	17,868	17,933	61	61	8,917	8,958
	WK-CR	27	21	0	1	0	8	0	8	19	10
	WK-BUS	3,003	3,044	288	255	1,519	1,488	1,363	1,359	891	883
	WK-BU/MR	1,411	1,440	0	16	191	187	157	148	60	59
	WK-MR	1,259	1,150	25	18	317	305	321	320	26	20
	PNR-CR	0	7	0	0	0	2	0	0	0	0
	KNR-CR	2	3	0	0	0	0	0	0	0	0
	PNR-BUS	35	30	0	1	604	556	0	1	0	1
	KNR-BUS	57	51	77	64	17	9	0	0	60	56
	PNR-BU/MR	45	41	0	3	0	32	0	1	0	1
	KNR-BU/MR	72	72	0	2	11	10	0	1	0	1
	PNR-MR	124	120	0	6	0	39	22	19	0	10
	KNR-MR	21	20	0	6	0	2	38	28	0	7

Appendix C. Year 2007 mode choice output vs. targets

Seg	Path #	HBW		HBS		HBO		NHW		NHO	
		Target	Model	Target	Model	Target	Model	Target	Model	Target	Model
(9) VA CORE / URBAN-DC CORE	DR ALONE	5,292	6,372	975	996	3,021	3,064	5,277	5,300	0	1
	SR2	603	722	692	708	3,179	3,217	1,273	1,279	6	8
	SR3+	18	11	428	431	2,274	2,304	23	20	416	502
	WK-CR	4	142	0	0	0	0	0	0	0	0
	WK-BUS	2,502	3,830	0	6	251	272	0	160	40	83
	WK-BU/MR	9,581	14,462	0	14	1,191	1,313	509	480	160	326
	WK-MR	30,058	21,200	169	130	5,387	5,110	4,277	4,165	1,988	1,562
	PNR-CR	22	0	0	0	0	0	0	0	0	0
	KNR-CR	0	0	0	0	0	0	0	0	0	0
	PNR-BUS	315	431	0	0	0	3	0	1	0	11
	KNR-BUS	0	36	0	0	0	1	0	0	0	0
	PNR-BU/MR	228	304	0	1	72	73	79	70	31	42
	KNR-BU/MR	215	285	28	17	87	76	27	20	45	29
	PNR-MR	1,332	1,867	0	11	426	433	132	131	150	203
	KNR-MR	2,020	2,799	0	4	275	290	403	403	126	204
(10) VA CORE / URBAN-VA CORE	DR ALONE	7,901	8,046	3,744	3,738	7,380	7,386	11,270	11,298	3,427	3,431
	SR2	929	938	2,643	2,639	7,795	7,796	2,261	2,265	2,242	2,248
	SR3+	41	39	1,650	1,650	5,634	5,634	59	50	1,301	1,304
	WK-CR	0	0	0	0	0	0	0	0	0	0
	WK-BUS	2,403	2,502	247	213	62	57	278	272	26	19
	WK-BU/MR	658	672	0	1	34	28	134	130	0	18
	WK-MR	3,675	3,474	0	22	842	752	2,353	2,351	432	396
	PNR-CR	0	0	0	0	0	0	0	0	0	0
	KNR-CR	0	0	0	0	0	0	0	0	0	0
	PNR-BUS	32	29	0	0	0	3	0	12	0	7
	KNR-BUS	0	2	0	0	0	2	13	10	0	4
	PNR-BU/MR	0	11	0	0	0	0	31	27	0	0
	KNR-BU/MR	0	1	0	0	0	0	0	0	38	27
	PNR-MR	166	157	0	1	0	6	128	111	0	14
	KNR-MR	226	226	0	9	0	73	40	40	90	86
(11) VA CORE / URBAN-URBAN	DR ALONE	18,519	19,734	23,909	23,952	38,401	38,419	31,474	31,535	18,749	18,795
	SR2	2,049	2,176	17,073	17,107	42,556	42,571	8,126	8,141	14,872	14,914
	SR3+	62	63	10,720	10,744	32,240	32,257	241	241	9,213	9,237
	WK-CR	8	12	0	0	0	0	0	0	0	0
	WK-BUS	5,065	6,041	793	721	2,410	2,422	1,016	1,012	640	605
	WK-BU/MR	3,733	4,472	59	46	953	949	548	538	111	104
	WK-MR	10,467	6,794	525	466	1,973	1,933	2,843	2,854	1,262	1,169
	PNR-CR	1	0	0	0	0	0	0	0	0	0
	KNR-CR	7	0	0	0	0	0	0	0	0	0
	PNR-BUS	86	96	0	2	0	23	0	7	0	49
	KNR-BUS	0	24	0	11	42	37	17	10	0	11
	PNR-BU/MR	80	98	0	0	60	52	31	28	0	2
	KNR-BU/MR	78	84	0	20	0	12	0	1	188	161
	PNR-MR	282	343	20	17	129	104	114	105	0	88
	KNR-MR	647	762	0	88	114	101	57	50	59	45
(12) VA CORE / URBAN-OTHER	DR ALONE	28,439	29,324	15,148	15,241	22,537	22,655	25,897	26,038	15,312	15,476
	SR2	3,095	3,190	11,171	11,245	25,306	25,440	6,773	6,815	13,489	13,619
	SR3+	61	61	7,228	7,268	19,483	19,589	168	161	10,277	10,374
	WK-CR	0	9	0	0	19	10	0	5	21	18
	WK-BUS	1,828	1,823	466	419	1,006	1,006	422	428	194	178
	WK-BU/MR	1,694	1,713	0	24	327	322	241	245	17	9
	WK-MR	1,595	922	0	9	512	486	767	733	117	102
	PNR-CR	0	0	0	0	0	0	0	0	0	0
	KNR-CR	0	0	0	0	27	0	0	0	0	0
	PNR-BUS	57	50	0	4	0	2	33	31	0	15
	KNR-BUS	65	69	0	2	7	6	48	41	25	18
	PNR-BU/MR	0	18	0	1	0	1	50	51	0	5
	KNR-BU/MR	65	71	0	7	0	19	20	20	0	1
	PNR-MR	90	91	0	1	20	17	109	98	0	4
	KNR-MR	79	81	0	4	73	65	13	10	0	1

Appendix C. Year 2007 mode choice output vs. targets

Seg	Path #	HBW		HBS		HBO		NHW		NHO	
		Target	Model	Target	Model	Target	Model	Target	Model	Target	Model
(13) MD OTHER-DC CORE	DR ALONE	118,259	121,490	4,221	4,333	17,654	17,751	11,387	11,545	6,830	7,043
	SR2	13,433	13,809	2,998	3,071	19,155	19,264	2,597	2,625	3,119	3,201
	SR3+	597	606	1,768	1,808	14,107	14,189	84	80	1,256	1,283
	WK-CR	958	914	0	0	42	39	0	1	54	44
	WK-BUS	7,510	7,196	48	40	1,349	1,347	180	183	101	107
	WK-BU/MR	16,167	15,501	80	78	1,381	1,382	655	656	72	75
	WK-MR	12,772	10,256	0	13	1,828	1,803	1,066	1,070	79	75
	PNR-CR	7,875	7,800	0	1	207	202	0	38	167	165
	KNR-CR	470	467	0	1	11	10	0	10	12	10
	PNR-BUS	1,073	1,056	32	31	194	190	0	5	0	2
	KNR-BUS	337	326	0	0	0	1	19	10	8	1
	PNR-BU/MR	7,428	7,415	18	10	486	475	371	348	40	41
	KNR-BU/MR	1,742	1,739	38	30	165	159	119	109	77	71
	PNR-MR	54,824	54,568	78	72	4,916	4,943	1,775	1,780	263	267
	KNR-MR	10,972	10,910	83	82	574	572	516	509	93	93
(14) MD OTHER-VA CORE	DR ALONE	16,375	16,422	534	556	2,156	2,174	2,156	2,191	4	5
	SR2	1,931	1,945	409	420	2,597	2,621	123	115	18	11
	SR3+	83	81	269	273	2,240	2,271	2	7	484	513
	WK-CR	12	10	0	0	0	0	0	0	0	0
	WK-BUS	241	233	0	0	0	10	0	4	0	1
	WK-BU/MR	1,489	1,438	27	18	82	78	127	119	0	3
	WK-MR	846	787	0	3	187	173	71	71	35	28
	PNR-CR	314	302	0	0	0	9	0	2	11	13
	KNR-CR	10	9	0	0	0	9	0	1	74	71
	PNR-BUS	192	185	0	0	0	1	0	0	0	28
	KNR-BUS	0	32	0	0	0	0	0	0	0	0
	PNR-BU/MR	1,358	1,317	0	0	102	97	0	0	76	36
	KNR-BU/MR	318	296	0	0	29	20	25	20	0	3
	PNR-MR	8,255	8,090	0	0	590	589	195	192	47	52
	KNR-MR	1,037	984	0	0	446	435	75	70	52	53
(15) MD OTHER-URBAN	DR ALONE	168,300	171,052	29,755	30,000	84,117	84,347	38,907	39,174	29,192	29,504
	SR2	18,816	19,137	21,348	21,520	90,908	91,157	8,799	8,855	24,749	24,998
	SR3+	475	478	13,188	13,292	67,509	67,692	173	171	16,165	16,326
	WK-CR	323	309	0	1	0	8	0	5	16	10
	WK-BUS	16,313	15,776	1,269	1,270	8,934	8,953	1,331	1,339	1,136	1,143
	WK-BU/MR	11,985	11,526	149	141	2,190	2,193	640	644	187	182
	WK-MR	6,961	5,960	235	232	967	962	523	525	117	111
	PNR-CR	1,869	1,844	0	0	53	50	0	7	15	9
	KNR-CR	213	208	0	0	56	50	0	14	0	4
	PNR-BUS	2,199	2,199	0	4	284	281	44	40	0	12
	KNR-BUS	788	784	0	2	638	632	358	346	97	90
	PNR-BU/MR	3,628	3,628	0	3	509	502	194	189	105	94
	KNR-BU/MR	1,355	1,353	21	19	339	331	137	128	259	250
	PNR-MR	17,059	17,144	92	83	1,935	1,937	551	551	64	56
	KNR-MR	5,369	5,400	13	9	573	572	206	198	81	80
(16) MD OTHER-OTHER	DR ALONE	992,446	995,414	635,114	635,723	999,077	999,802	465,875	466,494	638,775	639,112
	SR2	112,838	113,270	451,441	451,876	1,093,420	1,094,216	101,042	101,222	480,458	480,711
	SR3+	4,532	4,552	285,162	285,433	820,413	821,004	2,605	2,624	287,812	288,047
	WK-CR	122	120	0	9	15	10	0	3	17	10
	WK-BUS	25,851	25,810	5,231	5,209	17,871	17,885	3,358	3,352	2,606	2,543
	WK-BU/MR	5,666	5,657	72	70	1,517	1,510	267	260	73	73
	WK-MR	1,110	1,103	33	30	241	240	227	220	14	10
	PNR-CR	706	693	0	0	0	39	0	0	0	12
	KNR-CR	194	188	0	6	56	55	0	16	0	1
	PNR-BUS	2,643	2,648	27	14	1,081	929	22	19	1,180	1,056
	KNR-BUS	1,049	1,042	81	73	597	586	441	428	80	72
	PNR-BU/MR	1,220	1,223	0	16	51	180	13	12	0	110
	KNR-BU/MR	739	731	0	4	156	150	97	88	0	3
	PNR-MR	1,636	1,629	0	0	134	112	56	48	0	65
	KNR-MR	1,159	1,153	0	5	90	89	24	20	0	7

Appendix C. Year 2007 mode choice output vs. targets

Seg	Path #	HBW		HBS		HBO		NHW		NHO	
		Target	Model	Target	Model	Target	Model	Target	Model	Target	Model
(17) VA OTHER-DC CORE	DR ALONE	93,123	98,999	2,803	2,919	11,595	11,715	5,123	5,249	1,245	1,386
	SR2	7,000	7,257	1,981	2,064	12,081	12,210	1,232	1,193	367	383
	SR3+	111	98	1,139	1,178	8,522	8,612	3	69	9	20
	WK-CR	114	102	0	0	0	12	0	4	0	0
	WK-BUS	2,601	2,446	20	17	241	237	74	70	0	25
	WK-BU/MR	16,081	14,995	0	17	1,157	1,142	504	500	123	119
	WK-MR	9,604	6,607	95	66	1,110	1,023	360	334	123	110
	PNR-CR	1,303	1,258	0	1	0	12	0	10	0	0
	KNR-CR	136	126	0	0	0	7	0	2	0	0
	PNR-BUS	3,622	3,570	0	2	204	199	10	10	0	9
	KNR-BUS	567	553	0	0	0	5	0	35	0	5
	PNR-BU/MR	5,957	5,912	44	37	528	521	261	263	52	54
	KNR-BU/MR	1,417	1,388	0	1	241	238	79	68	81	86
	PNR-MR	26,121	25,734	59	48	2,970	2,975	1,313	1,324	284	302
	KNR-MR	8,507	8,445	0	14	741	732	619	585	90	97
(18) VA OTHER-VA CORE	DR ALONE	24,565	25,873	2,959	2,971	7,715	7,751	5,546	5,601	2,405	2,433
	SR2	2,173	2,216	2,099	2,105	7,947	7,982	934	883	1,083	1,093
	SR3+	29	16	1,316	1,319	5,598	5,620	3	56	611	618
	WK-CR	49	38	0	0	0	1	0	0	0	0
	WK-BUS	2,850	2,728	17	6	100	101	26	20	34	27
	WK-BU/MR	3,140	2,993	0	19	94	90	53	50	68	54
	WK-MR	1,467	1,231	0	0	259	243	43	40	0	9
	PNR-CR	1,146	1,093	0	0	0	1	0	0	0	0
	KNR-CR	92	87	0	0	0	0	0	0	0	0
	PNR-BUS	2,500	2,447	4	0	5	25	4	26	0	1
	KNR-BUS	242	234	0	0	0	6	0	17	0	0
	PNR-BU/MR	1,099	1,066	0	0	22	19	21	18	0	0
	KNR-BU/MR	275	263	0	0	53	47	53	46	0	0
	PNR-MR	6,304	6,213	0	5	471	446	301	278	21	18
	KNR-MR	2,248	2,232	0	1	57	47	175	158	0	3
(19) VA OTHER-URBAN	DR ALONE	109,860	114,085	20,957	21,408	43,404	43,702	24,170	24,323	13,753	13,998
	SR2	9,829	9,994	15,070	15,400	46,019	46,333	3,239	3,259	11,456	11,667
	SR3+	57	42	9,172	9,371	33,085	33,317	26	20	6,787	6,913
	WK-CR	118	102	0	0	0	3	0	3	0	0
	WK-BUS	4,876	4,524	282	236	1,549	1,529	383	380	238	235
	WK-BU/MR	9,040	8,355	157	136	1,359	1,338	429	421	258	255
	WK-MR	3,779	2,861	100	82	908	848	482	439	75	71
	PNR-CR	2,650	2,551	0	0	0	47	0	3	0	7
	KNR-CR	235	222	0	27	0	21	0	3	0	9
	PNR-BUS	1,499	1,458	0	0	114	108	0	19	0	11
	KNR-BUS	258	245	0	5	104	98	0	12	0	9
	PNR-BU/MR	3,997	3,909	0	5	279	265	72	66	21	20
	KNR-BU/MR	983	959	0	34	297	285	51	48	0	2
	PNR-MR	9,446	9,294	58	42	1,274	1,245	230	217	130	114
	KNR-MR	4,200	4,179	0	16	378	362	191	182	149	123
(20) VA OTHER-OTHER	DR ALONE	813,987	813,953	480,050	480,886	725,534	725,937	370,044	370,497	423,380	423,660
	SR2	91,745	91,644	343,102	343,716	800,511	801,006	83,481	83,630	338,564	338,828
	SR3+	2,938	2,692	217,680	218,081	604,930	605,348	1,672	1,666	227,437	227,686
	WK-CR	50	47	0	38	0	107	0	4	0	17
	WK-BUS	17,400	16,541	3,741	2,492	8,984	7,918	2,001	1,949	1,634	1,229
	WK-BU/MR	2,680	2,536	21	29	457	410	308	292	31	108
	WK-MR	529	442	19	7	126	105	92	84	54	38
	PNR-CR	738	730	0	0	0	136	0	3	0	0
	KNR-CR	87	80	0	295	23	53	0	18	0	64
	PNR-BUS	462	471	19	1	147	392	92	83	15	28
	KNR-BUS	639	640	4	176	216	600	108	94	135	246
	PNR-BU/MR	758	772	0	117	115	342	29	30	0	62
	KNR-BU/MR	429	422	0	617	97	261	35	31	0	65
	PNR-MR	364	359	0	0	118	17	0	6	0	0
	KNR-MR	620	620	0	13	130	14	0	3	13	4

Appendix C. Year 2007 mode choice output vs. targets

		HBW		HBS		HBO		NHW		NHO	
Seg	Path #	Target	Model	Target	Model	Target	Model	Target	Model	Target	Model
All 20 Segments	DR ALONE	2,488,139	2,516,701	1,310,755	1,313,900	2,142,698	2,145,275	1,172,254	1,175,443	1,261,823	1,264,678
	SR2	274,299	276,480	936,969	939,238	2,353,079	2,355,943	261,343	261,902	977,302	979,290
	SR3+	9,228	9,070	593,357	594,762	1,770,683	1,772,873	6,393	6,512	615,484	616,917
	WK-CR	1,849	1,892	21	81	210	382	0	432	400	344
	WK-BUS	171,834	175,621	18,433	16,849	87,044	85,983	23,685	23,973	16,224	15,908
	WK-BU/MR	132,142	138,134	2,487	2,493	23,696	23,666	12,417	12,214	3,960	4,187
	WK-MR	194,165	159,891	4,853	4,656	46,904	45,959	56,579	55,878	16,428	15,729
	PNR-CR	16,647	16,458	0	2	260	497	0	66	208	213
	KNR-CR	1,472	1,457	0	330	197	225	0	65	216	276
	PNR-BUS	15,967	15,958	82	84	3,030	3,128	355	400	1,523	1,547
	KNR-BUS	4,553	4,613	199	372	2,004	2,347	1,426	1,408	880	999
	PNR-BU/MR	27,525	27,512	112	250	2,700	3,037	1,482	1,411	559	689
	KNR-BU/MR	9,248	9,432	136	812	1,733	1,848	1,210	1,127	1,003	1,010
	PNR-MR	137,984	138,044	469	450	15,657	15,659	7,271	7,172	1,563	1,783
	KNR-MR	42,794	43,936	146	358	4,436	4,312	4,378	4,279	1,831	1,881
	TOTALS	3,527,846	3,535,199	2,868,019	2,874,636	6,454,331	6,461,132	1,548,793	1,552,280	2,899,404	2,905,451

Total person trips by market segment

Market	HBW		HBS		HBO		NHW		NHO		ALL	
Segment	Target	Model	Target	Model	Target	Model	Target	Model	Target	Model	Target	Model
1	134,786	134,427	19,348	19,352	87,303	87,263	72,382	72,460	39,716	39,739	353,535	353,241
2	12,133	11,990	2,227	2,235	9,206	9,169	8,690	8,695	1,950	1,955	34,206	34,044
3	79,319	79,415	85,457	85,738	289,420	289,716	86,681	87,053	109,231	109,589	650,108	651,510
4	49,745	50,918	43,616	44,349	83,705	84,443	57,723	58,272	46,846	48,384	281,635	286,365
5	27,519	27,155	1,958	1,949	11,182	11,133	4,746	4,750	3,575	3,573	48,980	48,559
6	2,742	2,692	145	147	875	876	652	653	173	176	4,587	4,543
7	34,331	34,424	31,372	31,397	86,556	86,589	31,830	31,875	36,666	36,716	220,755	221,001
8	27,760	28,338	29,406	29,575	63,881	64,099	27,209	27,279	39,287	39,473	187,543	188,764
9	52,190	52,461	2,292	2,318	16,163	16,156	12,000	12,029	2,962	2,973	85,607	85,936
10	16,031	16,095	8,284	8,273	21,747	21,737	16,567	16,567	7,556	7,553	70,185	70,225
11	41,084	40,698	53,099	53,175	118,878	118,881	44,467	44,520	45,094	45,181	302,622	302,455
12	37,068	37,421	34,013	34,225	69,317	69,619	34,541	34,675	39,452	39,821	214,391	215,760
13	254,417	254,051	9,364	9,571	62,069	62,327	18,769	18,970	12,171	12,477	356,790	357,396
14	32,461	32,129	1,239	1,271	8,429	8,486	2,774	2,793	801	815	45,704	45,494
15	255,653	256,798	66,070	66,577	259,012	259,667	51,863	52,187	72,183	72,871	704,781	708,100
16	1,151,911	1,155,234	1,377,161	1,378,466	2,934,719	2,936,808	574,027	574,808	1,411,015	1,411,833	7,448,833	7,457,149
17	176,264	177,492	6,141	6,364	39,390	39,639	9,578	9,716	2,374	2,597	233,747	235,808
18	48,179	48,732	6,395	6,427	22,321	22,377	7,159	7,195	4,222	4,258	88,276	88,989
19	160,827	162,780	45,796	46,763	128,770	129,499	29,273	29,395	32,867	33,433	397,533	401,870
20	933,426	931,950	1,044,636	1,046,466	2,141,388	2,142,647	457,862	458,389	991,263	992,035	5,568,575	5,571,488
Total Person	3,527,846	3,535,199	2,868,019	2,874,636	6,454,331	6,461,132	1,548,793	1,552,280	2,899,404	2,905,451	17,298,393	17,328,698
Total Transit	756,180	732,948	26,938	26,737	187,871	187,041	108,803	108,424	44,795	44,566	1,124,587	1,099,715
Transit Pct	21.4%	20.7%	0.9%	0.9%	2.9%	2.9%	7.0%	7.0%	1.5%	1.5%	6.5%	6.3%

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Transit person trips by market segment

Market	HBW		HBS		HBO		NHW		NHO		ALL	
Segment	Target	Model	Target	Model	Target	Model	Target	Model	Target	Model	Target	Model
1	121,156	120,830	2,516	2,494	32,693	32,643	29,816	29,838	9,430	9,407	195,611	195,211
2	10,475	10,274	145	140	3,142	3,110	4,281	4,292	1,880	1,857	19,923	19,673
3	71,016	70,406	6,941	6,925	41,914	41,917	24,992	25,074	11,535	11,542	156,398	155,863
4	20,938	18,528	1,238	1,250	5,028	5,021	6,633	6,453	2,681	2,728	36,518	33,980
5	20,376	19,892	202	182	3,493	3,441	2,089	2,083	467	453	26,627	26,051
6	1,753	1,706	32	33	183	173	192	193	35	32	2,195	2,138
7	15,410	15,275	900	889	6,656	6,605	2,084	2,056	1,014	1,002	26,064	25,827
8	6,056	5,999	390	372	2,659	2,638	1,901	1,885	1,056	1,047	12,062	11,941
9	46,277	45,356	197	183	7,689	7,572	5,427	5,429	2,540	2,461	62,130	61,001
10	7,160	7,073	247	246	938	922	2,977	2,953	586	570	11,908	11,763
11	20,454	18,725	1,397	1,371	5,681	5,634	4,626	4,604	2,260	2,235	34,418	32,569
12	5,473	4,846	466	471	1,991	1,935	1,703	1,662	374	352	10,007	9,264
13	122,128	118,147	377	358	11,153	11,123	4,701	4,719	966	951	139,325	135,298
14	14,072	13,682	27	22	1,436	1,420	493	479	295	287	16,323	15,890
15	68,062	66,130	1,779	1,765	16,478	16,471	3,984	3,988	2,077	2,043	92,380	90,397
16	42,095	41,998	5,444	5,434	21,809	21,786	4,505	4,468	3,970	3,963	77,823	77,648
17	76,030	71,137	218	202	7,192	7,102	3,220	3,205	753	808	87,413	82,454
18	21,412	20,626	21	32	1,061	1,025	676	654	123	114	23,293	22,451
19	41,081	38,659	597	584	6,262	6,148	1,838	1,792	871	855	50,649	48,038
20	24,756	23,661	3,804	3,784	10,413	10,356	2,665	2,596	1,882	1,861	43,520	42,257
Total Transit	756,180	732,948	26,938	26,737	187,871	187,041	108,803	108,424	44,795	44,566	1,124,587	1,099,715