SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS NHTS MODEL DOCUMENTATION REPORT - *DRAFT*

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EXECUTIVE SUMMARY

Similar to other MPO's in California, the Southern California Association of Governments (SCAG) is tasked with identifying potential strategies to reduce Vehicle Miles Traveled (VMT) and Greenhouse Gas (GHG) emissions as required by Senate Bill 375 (SB 375). One key subset of these potential strategies are related to land use, which typically involve the creation of additional density, an increase in the level of mixed-use, or the development of more walkable neighborhoods.

In addition to creating these strategies, SCAG is also tasked with quantifying the potential benefits of these policies so that they might be accounted for the regional planning efforts as documented in the Regional Transportation Plan (RTP) and Sustinable Communities Strategy (SCS) document. The difficulty in quantifying these types of strategies is that traditional regional transportation planning tools, such as Regional Travel Demand or Trip-Based Models, may not fully reflect the effect of these factors.

This report addresses this issue in the context of SCAG by considering three questions:

- Is the SCAG Travel Model sufficiently sensitive to changes in the local land use form?
- If the model does not capture all potential sensitivities to local land use changes, what methodology could incorporate the additional sensitivity in SCAG's final forecasts of SCS performance?
- If this supplemental correction is needed, what adjustment factors that are based on the best empirical evidence of travel behavior patterns in the SCAG region, and that account for all of the potential relationships between transportation choices and land use form?

The key findings of our investigation related to these questions are provided below.

Key Finding #1- Sensitivity of the SCAG Trip-Based Model is not sufficiently sensitive to Local Land Use Form

An analysis of the Trip-Based model applications indicated that there was limited sensitivity to changes in the local land use form. There are several reasons for this conclusion including the fact that a subset of built environment variables is included in the Trip-Based Model. Additional investigation determined that changes in at least one major variable were not explicitly accounted for in the Trip-Based Model. Based on this data, it was concluded that the Trip-Based Model is not sufficiently sensitive to built environment variables.

Key Finding #2- NHTS Model addresses Additional Sensitivities

To provide a supplemental tool to augment the Trip-Based Model, the Project Team developed a NHTS Model, an enhancement of SCAG's current Local Sustainability Planning Tool (LSPT), using data from the National Household Travel Survey for the SCAG Region. This NHTS Model incorporates a number of key demographic, built environment, and transportation network variables. Extensive testing of this NHTS Model against data sources such as the HPMS, national studies on the effects of the D's, and other analyses indicated that this Model could produce reasonable results.

Key Finding #3- Additional Adjustment of 2.4% from Trip-Based Model can be Justified

One key test which was conducted was a comparison of the Trip-Based Model and NHTS Model when applied to a consistent set of land use data sets. This comparison indicated that a reduction of 2.4% resulted from this comparison, which was concluded to be reasonable and valid based on the investigation of the Trip-Based Model and the extensive statistical analysis conducted for the NHTS Model.

I. INTRODUCTION

This chapter provides some background information regarding this report and also discusses what is evaluated in this analysis.

BACKGROUND

Like all California Metropolitan Planning Organizations (MPO's), the Southern California Association of Governments (SCAG) is currently engaged in an effort to prepare its Regional Transportation Plan (RTP) and Sustainable Communities Strategy (SCS) within the context of the requirements of SB 375.

As part of this effort, SCAG is analyzing the potential benefits of various strategies that would reduce vehicle miles traveled (VMT) to comply with targets previously established by the California Air Resources Board (CARB). Potential strategies that SCAG is evaluating include changes to land use, demand management, transit, and other related methods.

A key aspect of these VMT reduction strategies are various measures to influence land use related to changes in density, level of mixed use, and changes in accessibility to bicycle, pedestrian, and transit facilities.

One way to determine whether SCAG's assessment of land use strategies is reasonable is to consider how well the Trip-Based Model is able to account for or is sensitive to changes in land use at the local level. The California Transportation Commission 2010 California Regional Transportation Plan Guidelines recommend that on-model or off-model calculations be formulated to produce realistic sensitivities to these localized land use variations.

To this end, SCAG retained Fehr & Peers and Renaissance Planning to assist SCAG in achieving these goals. Specific objectives of this study are:

- Determine whether the SCAG Travel Model is sufficiently sensitive to changes in the local land use form.
- If the model does not capture all potential sensitivities to local land use changes, develop a methodology to incorporate the additional sensitivity in SCAG's final forecasts of SCS performance.
- If this supplemental correction is needed, apply adjustment factors that are based on the best empirical evidence of travel behavior patterns in the SCAG region, and that account for all of the potential relationships between transportation choices and land use form

To implement this study's objectives, a new model was development for SCAG as an enhancement of SCAG's current Local Sustainability Planning Tool (LSPT). This model, termed the NHTS Model, was derived from travel survey, land use, and travel model data to quantify the effects of changes in local land use form related to vehicular travel.

The NHTS Model is therefore a tool to supplement or augment the Trip-Based Model to account for the potential effects of changes in local land use conditions, which might result in changes in travel behavior. An overview of the process by which the NHTS Model was developed and applied to the Trip-Based Model is shown on Figure 1, which provides a general overview of the process.

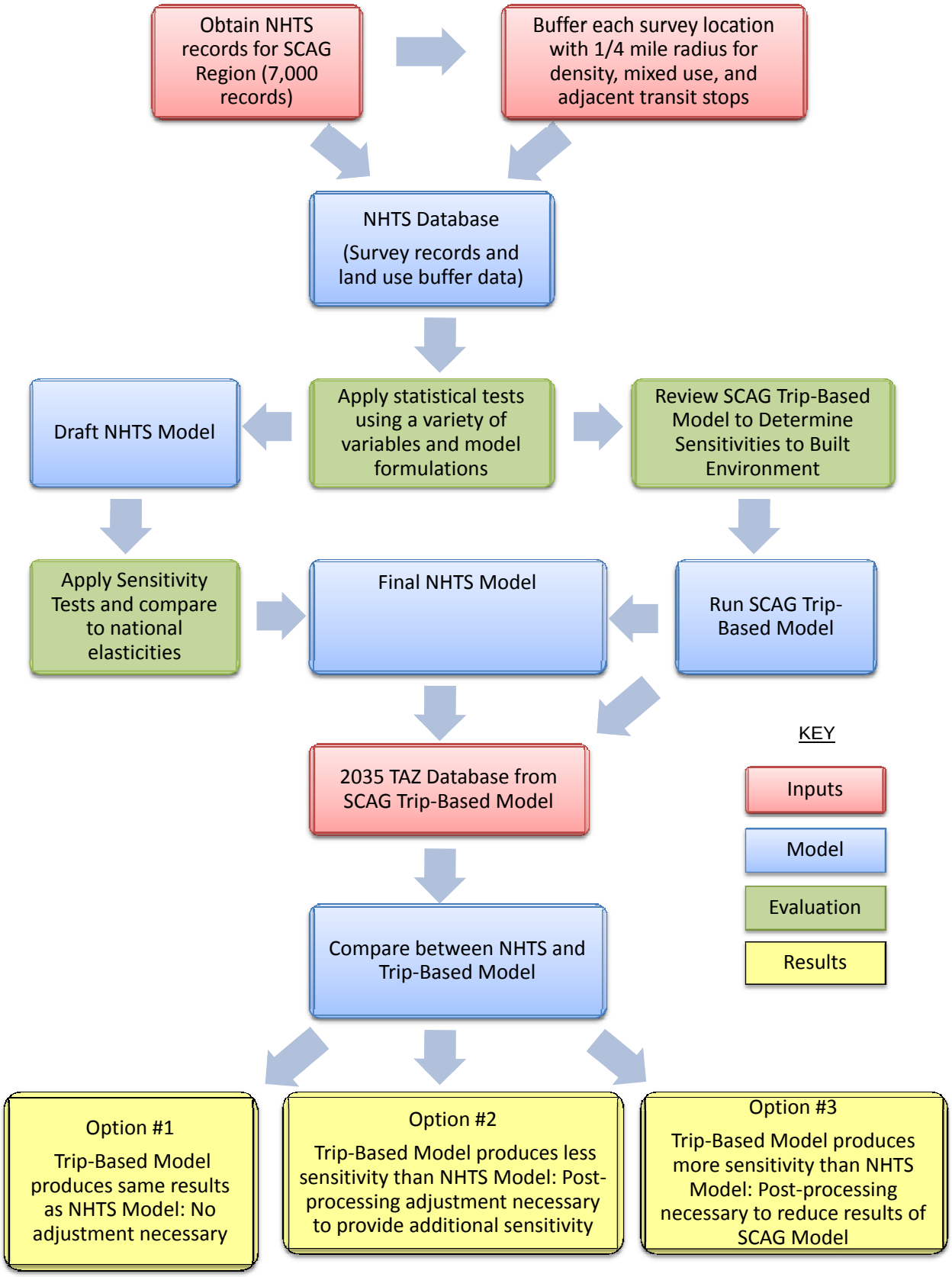

Figure 1- NHTS Model Development and Application

MODEL NOMENCLATURE

For purposes of this report, two analytical models will be addressed, which will be differentiated as follows:

- The Trip-Based Model refers to the SCAG Regional Travel Demand Model, which is used to forecast regional travel behavior. This model is the primary analysis tool used for the RTP and SCS document.
- The NHTS Model is a supplemental tool which augments the Trip-Based Model. The NHTS Model was developed using the data from travel surveys and can potentially provide additional sensitivity to local land use changes above and beyond what is accounted for in the Trip-Based Model.

LOCAL LAND USE VARIABLES

Similar to many travel demand models, the SCAG Model incorporates data regarding residences and employment to reflect the daily travel that occurs at these locations. This investigation is focused on the effect of changes to the localized land use conditions reflected in terms of the "D" factors, which include:

- *Residential and Employment **D**ensity* – This variable is measured in dwelling units or employment per acre. A wide body of research suggests that, all else being equal, denser developments generate fewer vehicle-trips per dwelling unit than less dense developments.
- *Jobs/Housing and Retail/Service Job **D**iversity* – Research suggests that having residences and jobs in close proximity will reduce the vehicle-trips generated by each, by allowing some trips to be made on foot or by bicycle. This variable measures how closely the neighborhood in question matches the regional mix of jobs and households, which is assumed to be an optimal balance of jobs and housing. Similar benefits can be obtained from co-located retail and service employment in proximate locations.
- *Walkable **D**esign* – The configuration of the roadway and pedestrian travel network has been found to also influence travel behavior. Neighborhoods with higher level of pedestrian connectivity as evidenced through a greater number of sidewalks or the presence of a grid-type street network often have less vehicle travel than similar areas lacking these facilities.
- ***D**estination Accessibility* – Research shows that, all else being equal, households situated near the regional center of activity generate fewer auto trips and VMT than households located far from destination centers. Regional accessibility can be evaluated in a variety of ways including travel time, cost for both automotive and transit modes.

ITEMS NOT ADDRESSED IN THIS REPORT

SCAG will be evaluating a number of potential strategies to reduce VMT and GHG within the context of the RTP and SCS. However, this model evaluation effort is only evaluating a sub-set of the potential strategies related to land use. Therefore, this report will not be discussing the sensitivity of the model to changes in the roadway network, pricing, and travel demand management strategies. The travel model's sensitivity to these other factors will be addressed by other documents that will be provided by SCAG. This land use sensitivity investigation is supplemental to a formal TMIP peer review SCAG undertook earlier this year, which considered the full breadth of the SCAG TDM capabilities and adherence to the standard travel modeling practice.

ORGANIZATION OF THIS REPORT

The report is organized into the following chapters:

- Chapter II provides a brief overview of the SCAG Trip-Based Model

- Chapter III documents the NHTS Model development process, including the data sources and the various variables which were evaluated
- Chapter IV describes the formulation of the NHTS Model including a description of any variables included in the various sub-models
- Chapter V documents several tests which were applied to verify the reasonableness of the NHTS Model
- Chapter VI provides the overall conclusions of the analysis
- Chapter VII discuses next steps within this analysis including additional testing, review by a peer review panel, and preparation of final documentation

II. SCAG TRIP-BASED MODEL

This chapter provides general information regarding the SCAG Trip-Based Model including an overview of its structure and the process by which local land use variables are incorporated into the analysis. This chapter is not intended to provide complete documentation on the SCAG Trip-Based Model but instead to provide some introductory material for the purposes of this report and also to provide some additional context for subsequent chapters.

SCAG TRIP-BASED MODEL

For purposes of this discussion, the SCAG Trip-Based Model refers to the regional travel demand model which was developed by SCAG for a variety of planning studies throughout the SCAG region. This reference to the Trip-Based Model is used to differentiate between other models developed and maintained by SCAG such as the NHTS Model that will be discussed in subsequent chapters.

SCAG employs this traditional 4-step travel demand model supplemented through of various sub-models and other features, including:

- The SCAG Model was recently expanded to use a zone structure of 11,267 zones to provide additional detail regarding the land use inputs. The model previously employed 4,109 travel zones.
- Regional Heavy Truck Model to account for all of the truck and logistical activity within the Southern California region
- Auto ownership model that includes a variety of socio-economic, land use, and accessibility factors
- Nested logit model for mode choice including the varied fixed guide way and bus transit modes
- Pricing component

SCAG participated in a comprehensive Peer Review Process which was completed earlier in 2011. This peer review concluded the following:

> The current SCAG travel demand model is an advanced 4-step model that meets and in many cases exceeds the state of the practice – with the exception of the lack of zero-vehicle ownership sensitivity in the destination and mode choice models. With this one change properly addressed, the model is suitable for use in preparing 2012 RTP, conformity analysis, and SCS.

In response to the peer panel recommendations, SCAG modified its model to incorporate a zero-vehicle ownership model. This version of the Model was used to perform the various evaluations for the RTP and SCS document preparation.

LOCAL LAND USE FACTORS

The SCAG Trip-Based Model includes a variety of “D” factors already within the model structure which influence outcomes such as auto ownership, which in turn affect vehicle trips and vehicle miles traveled. Major factors already included in the SCAG Trip-Based Model include: Type of housing unit (single family vs. multi-family)

- Transit accessibility to employment
- Composite measure of household, employment, and intersection density

- Walk accessibility to employment

Based on the information included above, it can be concluded that the Trip-Based Model might already account for the effects of localized land use conditions. However, an additional investigation was warranted for the following reasons:

- The effects of mixed-use factors (diversity) do not appear to be explicitly accounted for in the auto ownership model or other components of the model
- Sensitivity testing should be performed to determine whether changes in the density factors (household and employment density) or design factors (intersection density) produce results that are consistent with local or national empirical data.

III. NHTS MODEL DEVELOPMENT

This chapter outlines the development of the NHTS Model including the data used in the model development, the variables developed, the model formulations evaluated, and a discussion regarding tiered models. The final version of the model used in this analysis is presented in Chapter IV- Model Formulation.

DATA SOURCES

Data for the NHTS Model was taken from three sources including the 2009 National Household Travel Survey (NHTS), buffer data for each survey location, and the Trip-Based Model. Each of these sources is described in detail below.

NATIONAL HOUSEHOLD TRAVEL SURVEY (NHTS)

SCAG obtained data from the Federal Highway Administration (FHWA) NHTS for the SCAG region for use in this study and others. The data set included

- 6,700 households
- 15,000 persons
- 55,000 separate trips

This survey was completed in 2008 and represents the most current travel survey data for the SCAG region. Information extracted from the NHTS for use in this evaluation includes:

- Trips per household
- Household VMT
- Autos Ownership
- Household demographic characteristics (ethnicity, income, age, etc)

A complete list of the household variables contained in the NHTS is provided in Appendix A.

BUFFER ANALYSIS

For each of the surveyed households identified in the NHTS, SCAG performed a geographic information system (GIS) analysis to determine the land use characteristics in the area immediately surrounding each household. This data included land use, urban form and local accessibility within the ¼ buffer around each survey household. The transportation network characteristics within this buffer were also identified related to intersections and also the presence or absence of transit facilities. Variables identified through this buffer analysis included:

- Populations within the buffer
- Employment within the buffer
- Population and employment density within the buffer
- Jobs/housing balance

- Retail/non-retail jobs balance
- Percent of 3- & 4-way intersections
- Number of rail and bus stops

A complete listing of these variables is provided as Appendix B.

TRAVEL MODEL DATA

As mentioned previously, one factor which influences travel behavior is regional accessibility. For a region as complex and diverse as SCAG, regional accessibility can be expressed in various forms including:

- Radius accessibility as measured by number of jobs within a 10, 20, and 30 minute travel radius
- Gravity type accessibility measured by distance, time and generalized travel cost reflected as an impedance value
- Relative accessibility as determined by a ratio of auto to transit travel time
- Distance based accessibility as measured by the number of jobs within a 10, 20, or 30 mile radius

VARIABLES INCLUDED IN ANALYSIS

Table 1 documents the independent variables that were included in the NHTS Model, based on data from the sources identified above.

TABLE 1 - LIST OF VARIABLES IN NHTS MODEL

Variable	Description
WKER	Number of Household Workers
NW0015	Number of Household Members (< 16 yr old)
NW1664	Number of Household Members (16-64 yr old)
NW6500	Number of Household Members (> 64 yr old)
INC10K	Median Household income in $10,000 (in $1999)
LGRSHH	Log (Household Density) within 1/4 mile buffer of residents
LGRSEMP	Log (Job Density) within 1/4 mile buffer of residents
JOBMIX2	Diversity (mix of jobs by 13 industries)

TABLE 1 - LIST OF VARIABLES IN NHTS MODEL

Variable	Description
WALKAINX1	Density of 3-leg and 4-leg intersections, with 3-let intersections weighted at 0.5 to account for lower level of connectivity offered
LDLBUSHQ	Log of Frequent Bus Stop density (bus stops with headways less than 20 minutes)
T2AUTOTIME08M	Auto Accessibility based on Time (T2 TAZ) - in million
JH05MI08	J/H ratio in 5 miles
LBTIME08	Local Bus Accessibility based on Time - in million
BUS TPP	Household within ½ Buffer of Major Bus Stops
RAIL TPP	Household within ½ Buffer of Rail Stations
NOHQBUS	Household TAZ has no HQ Bus stop

Source: Fehr & Peers, 2011

Descriptive statistics for each of these variables is provided in Appendix C.

MODEL FORMULATIONS EVALUATED

The project team evaluated a number of NHTS Models in an effort to relate travel behavior and land use. Model formulations included:

- Hierarchical linear modeling (HLM)
- Logit models
- Tobit regression
- Probit regression
- Traditional linear regression
- Logarithmic transform linear regression

After initial investigation, HLM was dropped from further consideration. No need was found to cluster the survey points at either the micro or the macro levels. All of the survey households are within the same region rather than representing clusters of data points within disparate geographic regions. Furthermore, each of the households within the NHTS analysis dataset was individually buffered to quantify the built environment characteristics within

its unique surroundings. Households were not clustered into groups with common built environment and, for purposes of this analysis, could be considered independent of each other.

Log transformed linear regression produced some initial results that were positive. However; we determined that when the log transformed coefficients were applied to actual VMT results, a significant under prediction resulted.

One significant issue with the travel survey data was the interaction between auto ownership, household trips, and household VMT. For example, a meaningful percentage of households surveyed that owned no vehicles and therefore made no trips and had no VMT. Additionally, there were households that owned vehicles but made no trips on the day of the survey. Statistical correlations were found between auto ownership and built environment variables, suggesting the importance of capturing those relationships in our land use analysis. In keeping with the recommendations of the peer review panel on the SCAG travel model, we decided to undertake a several-stage modeling system that would address the relationships between built environment and auto ownership at one stage, accounting for higher propensity to zero auto ownership in some areas and, at subsequent stages, and account for vehicle trip generation and distance as functions of auto ownership and additional built environment and socio-demographic variables.

TIERED MODELS

The approach to address the inter-relationship between auto ownership, household trips, and household VMT was the identification of a tiered model approach in which auto ownership, vehicle trips, and VMT were evaluated in a tiered fashion.

- First, the number of household autos was estimated using an ordered probit model which predicted the number of autos owned by the household. This model was found to generally replicate the auto ownership pattern within the SCAG region.
- Second, a binary logit model was used to determine whether a household made a vehicle trip or not as a function of its auto ownership and other socio-demographic and built environment variables.
- Third, a linear regression model was used to determine the number of trips made by a household on a daily basis
- Fourth, a logit model was used to determine mode share of household trips, including as an automotive driver, an auto passenger, a transit passenger, walking/bicycling, or other modes
- Fifth, a linear regression model was used to determine VMT, using the results of the auto ownership model and mode share model as an input,

The advantage to this approach is that it mirrors, in several ways, the process by which travel choices are made, the process through which 3-step and 4-step travel models operate, and the recommendations of the SCAG model TMIP peer review panel.

IV. MODEL FORMULATION

This chapter describes the model formulation including the type of NHTS Model employed, the variables included in each model, and the model output. As noted in Chapter III, a 5-tiered model structure was employed for the NHTS Model. Each of these individual models within the larger NHTS Model is referred to in this Chapter as a sub-model. Therefore, there are five sub-models and one sub-model (Mode Choice- Sub-Model #4) has additional components as described.

SUB-MODEL #-1: AUTO OWNERSHIP

Table 2 documents the variables for the auto ownership model and provides additional information related to each of these variables and their performance within this first model. Appendix D provides the output information for this model including the various performance statistics.

TABLE 2 - VEHICLE OWNERSHIP SUB-MODEL (ORDERED PROBIT)

Variable	Description	Parameter	Standard Error	z	Prob. |z|>Z*
WKER	Number of Household Workers	.78503	0.020	38.600	0.000
NW0015	Number of Household Members (< 16 yr old)	-0.00964	0.021	-0.470	0.000
NW1664	Number of Household Members (16-64 yr old)	.57486	0.023	25.440	0.638
NW6500	Number of Household Members (> 64 yr old)	.48015	0.026	18.320	0.000
INC10K	Median Household income in $10,000 (in $1999)	.12982	0.005	25.730	0.000
LGRSHH	Log (Household Density) within 1/4 mile buffer of residents	-.12171	0.018	-6.660	0.000
LGRSEMP	Log (Job Density) within 1/4 mile buffer of residents	-.02131	0.007	-2.880	0.000
JOBMIX2	Diversity by (Tier2 TAZ)	-.14735	0.078	-1.900	0.004
WALKAINX	Walkability/Street connect (Density of 3-leg and 4-leg intersections	-.00456	0.001	-3.210	0.057
LDLBUSHQ	Log of Frequent Bus Stop density (Tier 2 TAZ - headway <= 20 minutes)	-.03950	0.014	-2.890	0.001

TABLE 2 - VEHICLE OWNERSHIP SUB-MODEL (ORDERED PROBIT)

Variable	Description	Parameter	Standard Error	z	Prob. |z|>Z*
JH5MI08	Job/HH Ratio in 5 miles	-.04715	0.024	-1.980	0.004
BS_LGRSH	Bus TPP * LGRSHH	-.10478	0.020	-5.220	0.048
RL_LGRSH	Rail TPP * LGRSHH	-.19649	0.037	-5.260	0.000
Mu(1)		1.55972	0.021	75.590	
Mu(2)		3.02768	0.019	157.350	0.000
Mu(3)		3.93686	0.025	155.990	0.000

Source: Fehr & Peers, 2011

SUB- MODEL #2- VEHICLE TRIP

This second model determines whether a household makes a vehicle trip based on the factors described in Table 3 below. This Table also provides additional information about each variable related to their level of significance within this second model. Additional information regarding the model output for this sub-model is also provided in Appendix D.

TABLE 3 - VEHICLE TRIP SUB-MODEL (BINARY LOGIT)

Variable	Description	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
INTERCEPT		-1.158	0.217	28.566	<.0001
WKER	Number of Household Workers	1.211	0.099	148.656	<.0001
NW0015	Number of Household Members (< 16 yr old)	0.113	0.087	1.681	0.195
NW1664	Number of Household Members (16-64 yr old)	0.320	0.088	13.266	0.000
NW6500	Number of Household Members (> 64 yr old)	0.511	0.091	31.574	<.0001
INC10K	Median Household income in $10,000 (in $1999)	0.109	0.020	29.999	<.0001
HHCAR	Household Cars	0.723	0.064	127.777	<.0001
WALKAINX1	Walkability/Street connect (Density of 3-leg and 4-leg intersections	-0.013	0.004	8.661	0.003
LDLBUSHQ	Log of Frequent Bus Stop density (Tier 2 TAZ - headway <= 20 minutes)	-0.073	0.044	2.757	0.097
BS_LGRSHH	Bus TPP * LGRSHH	-0.134	0.055	5.981	0.015
RL_LGRSHH	Rail TPP * LGRSHH	-0.341	0.093	13.554	0.000

Source: Fehr & Peers, 2011

SUB-MODEL #3- HOUSEHOLD TRIPS

The third component of the NHTS Model is a sub-model which estimates the number of household person trips. This model is also a linear regression model, similar to Sub-Model #2. The output statistics for this model are documented in Appendix D.

TABLE 4 - HOUSEHOLD TRIP SUB- MODEL (LINEAR REGRESSION)

Variable	Description	Parameter	Standard Error	t Value	Pr > [t]
INTERCEPT		-0.158	0.200	-0.790	0.431
WKER	Number of Household Workers	3.303	0.107	30.960	<.0001
NW0015	Number of Household Members (< 16 yr old)	4.273	0.105	40.830	<.0001
NW1664	Number of Household Members (16-64 yr old)	2.986	0.116	25.700	<.0001
NW6500	Number of Household Members (> 64 yr old)	2.532	0.132	19.220	<.0001
INC10K	Median Household income in $10,000 (in $1999)	0.214	0.026	8.320	<.0001
LGRSEMP	Log (Job Density) with 1/4 mile buffer of residents	0.093	0.032	2.920	0.004
HHCAR	Household Cars	0.274	0.077	3.550	0.000

Source: Fehr & Peers, 2011

SUB-MODEL #4- MODE CHOICE

The fourth sub-model identifies mode choice through a logit formulation and has several additional sub-components, which address the following travel modes:

- Auto passenger (Table 5)
- Transit (Table 6)
- Non-motorized mode (Table 7)
- Other mode (Table 8)

Similar to the other models, the output statistics for these models are provided in Appendix D.

TABLE 5 - MODE CHOICE SUB-MODEL- AUTO PASSENGER COMPONENT (LOGIT MODEL)

Variable	Description	Coefficient	Standard Error	z	Prob. |z|>Z*
Constant		-1.37070***	0.080	-17.110	0.000
WKER	Number of Household Workers	.11625***	0.019	6.000	0.000
NW0015	Number of Household Members (< 16 yr old)	.63480***	0.015	43.460	0.000
NW1664	Number of Household Members (16-64 yr old)	.36189***	0.020	18.160	0.000
NW6500	Number of Household Members (> 64 yr old)	.42994***	0.026	16.520	0.000
INC10K	Median Household income in $10,000 (in $1999)	0.00229	0.005	0.450	0.649
LGRSHH	Log (Household Density) within 1/4 mile buffer of residents	-0.00639	0.018	-0.360	0.716
LGRSEMP	Log (Job Density) within 1/4 mile buffer of residents	-0.00214	0.007	-0.290	0.769
WALKAINX	Walkability/Street connect (Density of 3-leg and 4-leg intersections	0.00204	0.001	1.440	0.149
LDLBUSHQ	Log of Frequent Bus Stop density (Tier 2 TAZ - headway <= 20 minutes)	0.00362	0.014	0.260	0.797
HHCAR	Household cars	-.22468***	0.018	-12.830	0.000
JH5MI08	Job/HH Ratio in 5 miles	-.11634***	0.026	-4.530	0.000
LBTIME08	Local Bus Accessibility based on Time - in million	-1.53674**	0.617	-2.490	0.013
BS_LBTIM	Bus TPP * LBTIME08M	.96059**	0.465	2.060	0.039
RL_LBTIM	Rail TPP * LBTIME08M	4.14373***	0.860	4.820	0.000

Note: ***= Significant at 1% level, **=Significant at 5% level, *= Significant at 10% level
Source: Fehr & Peers, 2011

TABLE 6 - MODE CHOICE SUB-MODEL- TRANSIT USER COMPONENT (LOGIT MODEL)

Variable	Description	Coefficient	Standard Error	z	Prob. |z|>Z*
Constant		-3.26396***	0.283	-11.550	0.000
WKER	Number of Household Workers	.71991***	0.058	12.340	0.000
NW0015	Number of Household Members (< 16 yr old)	.22233***	0.048	4.670	0.000
NW1664	Number of Household Members (16-64 yr old)	.54835***	0.058	9.510	0.000
NW6500	Number of Household Members (> 64 yr old)	.19108**	0.089	2.140	0.032
INC10K	Median Household income in $10,000 (in $1999)	-.23370***	0.021	-11.120	0.000
LGRSHH	Log (Household Density) within 1/4 mile buffer of residents	.13588*	0.073	1.860	0.063
LGRSEMP	Log (Job Density) within 1/4 mile buffer of residents	-.22179D-04	0.029	0.000	0.999
WALKAINX	Walkability/Street connect (Density of 3-leg and 4-leg intersections	0.00352	0.004	0.820	0.411
LDLBUSHQ	Log of Frequent Bus Stop density (Tier 2 TAZ - headway <= 20 minutes)	.07043*	0.040	1.770	0.076
HHCAR	Household cars	-1.33415***	0.061	-21.900	0.000
JH5MI08	Job/HH Ratio in 5 miles	.20616**	0.083	2.480	0.013
LBTIME08	Local Bus Accessibility based on Time - in million	14.3056***	2.660	5.380	0.000
BS_LBTIM	Bus TPP * LBTIME08M	3.04666**	1.354	2.250	0.024
RL_LBTIM	Rail TPP * LBTIME08M	4.59319***	1.766	2.600	0.009

Note: ***= Significant at 1% level, **=Significant at 5% level, *= Significant at 10% level
Source: Fehr & Peers, 2011

TABLE 7 - MODE CHOICE SUB-MODEL- NON-MOTORIZED TRAVEL COMPONENT (LOGIT MODEL)

Variable	Description	Coefficient	Standard Error	z	Prob. |z|>Z*
Constant		-1.59136***	0.101	-15.790	0.000
WKER	Number of Household Workers	.12842***	0.024	5.430	0.000
NW0015	Number of Household Members (< 16 yr old)	.35573***	0.018	19.480	0.000
NW1664	Number of Household Members (16-64 yr old)	.24391***	0.024	10.090	0.000
NW6500	Number of Household Members (> 64 yr old)	.05890*	0.033	1.800	0.072
INC10K	Median Household income in $10,000 (in $1999)	-.02201***	0.006	-3.670	0.000
LGRSHH	Log (Household Density) within 1/4 mile buffer of residents	.16876***	0.025	6.650	0.000
LGRSEMP	Log (Job Density) within 1/4 mile buffer of residents	0.01266	0.009	1.390	0.164
WALKAINX	Walkability/Street connect (Density of 3-leg and 4-leg intersections	.00655***	0.002	4.070	0.000
LDLBUSHQ	Log of Frequent Bus Stop density (Tier 2 TAZ - headway <= 20 minutes)	.04585***	0.016	2.790	0.005
HHCAR	Household cars	-.45850***	0.021	-21.340	0.000
JH5MI08	Job/HH Ratio in 5 miles	-0.01397	0.031	-0.450	0.649
LBTIME08	Local Bus Accessibility based on Time - in million	5.91806***	0.816	7.250	0.000
BS_LBTIM	Bus TPP * LBTIME08M	1.06221**	0.506	2.100	0.036
RL_LBTIM	Rail TPP * LBTIME08M	1.43931	0.883	1.630	0.103

Note: ***= Significant at 1% level, **=Significant at 5% level, *= Significant at 10% level
Source: Fehr & Peers, 2011

TABLE 8 - MODE CHOICE SUB-MODEL- OTHER MODE TRAVEL COMPONENT (LOGIT MODEL)

Variable	Description	Coefficient	Standard Error	z	Prob. |z|>Z*
Constant		-2.97316***	0.209	-14.230	0.000
WKER	Number of Household Workers	.16845***	0.050	3.390	0.001
NW0015	Number of Household Members (< 16 yr old)	.45242***	0.036	12.580	0.000
NW1664	Number of Household Members (16-64 yr old)	.25694***	0.051	5.020	0.000
NW6500	Number of Household Members (> 64 yr old)	0.04437	0.074	0.600	0.551
INC10K	Median Household income in $10,000 (in $1999)	-.03358**	0.013	-2.540	0.011
LGRSHH	Log (Household Density) within 1/4 mile buffer of residents	-0.03985	0.044	-0.900	0.370
LGRSEMP	Log (Job Density) within 1/4 mile buffer of residents	-0.00734	0.019	-0.380	0.700
WALKAINX	Walkability/Street connect (Density of 3-leg and 4-leg intersections	0.00362	0.004	0.990	0.324
LDLBUSHQ	Log of Frequent Bus Stop density (Tier 2 TAZ - headway <= 20 minutes)	.11553***	0.038	3.000	0.003
HHCAR	Household cars	-.24170***	0.046	-5.280	0.000
JH5MI08	Job/HH Ratio in 5 miles	0.06117	0.063	0.970	0.334
LBTIME08	Local Bus Accessibility based on Time - in million	-0.92076	1.614	-0.570	0.568
BS_LBTIM	Bus TPP * LBTIME08M	-0.48221	1.209	-0.400	0.690
RL_LBTIM	Rail TPP * LBTIME08M	-0.38262	2.327	-0.160	0.869

Note: ***= Significant at 1% level, **=Significant at 5% level, *= Significant at 10% level

Source: Fehr & Peers, 2011

SUB-MODEL 5- HOUSEHOLD VMT MODEL

This final model estimates the household VMT. This final model is linked to the auto ownership model since the number of household vehicles (HHCAR) and share of transit (TR_SHARE) and non-motorized (NM_SHARE) trips of a household is an input into this final model. The output data for this model is summarized in Appendix D as well.

TABLE 9 - HOUSEHOLD VMT SUB- MODEL (LINEAR REGRESSION)

Variable	Description	Parameter	Standard Error	t Value	Pr > [t]
INTERCEPT		21.619	3.499	6.180	<.0001
WKER	Number of Household Workers	18.785	1.104	17.010	<.0001
NW0015	Number of Household Members (< 16 yr old)	3.587	1.056	3.400	0.001
NW1664	Number of Household Members (16-64 yr old)	9.368	1.190	7.870	<.0001
NW6500	Number of Household Members (> 64 yr old)	3.603	1.365	2.640	0.008
INC10K	Median Household income in $10,000 (in $1999)	1.944	0.264	7.360	<.0001
TR_SHARE	Transit Share of Household Trips	-43.425	15.233	-2.850	0.004
NM_SHARE	NM Share of Household Trips	-28.837	4.269	-6.750	<.0001
HHCAR	Number of Household Vehicles	5.337	0.843	6.330	<.0001
LGRSHH	Log (Household Density) within 1/4 mile buffer of residents	-1.747	0.902	-1.940	0.053
T2AUTOTIME08M	Auto Accessibility based on Time (T2 TAZ) - in million	-97.176	20.098	-4.840	<.0001
JH5MI08	J/H ratio in 5 miles	-2.330	1.385	-1.680	0.093
NOHQBUS	Household TAZ has no HQ Bus stop	3.218	1.492	2.160	0.031

Source: Fehr & Peers, 2011

V. MODEL TESTING

This chapter describes the various tests which were applied to the NHTS Model and the process used to compare the NHTS Model against data provided by the Trip-Based Model and other sources. The purpose of this testing is to determine the reasonableness of the NHTS Model and determine if there are any localized land use effects which are reflected in the NHTS Model, beyond what is already included in the Trip Base Mode. This testing serves as the basis for any additional VMT reductions that might be attributed to local land use factors resulting from alternative land use scenarios identified by SCAG.

TESTS PERFORMED

Three main tests were identified as follows:

- Test #1- An initial test was conducted to determine how well the Trip-Based Model accounts for the various built-environment factors. The purpose of this test is to verify what level of sensitivity is present in the Trip-Based Model and to identify any missing effects or potential double counting of effects when compared with empirical evidence from the NHTS.

- Test #2- Elasticities for several of the key variables discovered in the SCAG NHTS analysis, particularly those related to the built environment, were compared with published research on the same variables, including statewide and national sources regarding the effects of these variables. This test evaluates the overall reasonableness of the SCAG NHTS model for evaluation sensitivities to built environment variables.

- Test #3- This final test evaluates the performance of the NHTS Model as compared to the SCAG Trip-Based Model for the same land use data sets. This test serves to quantify an initial estimate of the magnitude of 4D sensitivity that is not accounted for in the SCAG travel model. It provides a range of values for VMT reduction to be applied to the Trip-Based Model results in order to introduce appropriate 4D sensitivities.

TEST #1- SENSITIVITY OF TRIP-BASED MODEL TO BUILT ENVIRONMENT VARIABLES

This test evaluated the sensitivity of the Trip-Based Model to many of the factors which are included in the NHTS Model. While there are several factors which potentially overlap, it is necessary to determine how much sensitivity is inherent in the Trip-Based Model as it would address the potential issue of double-counting. For example, if the Trip-Based Model was determined to be highly sensitive to the built environment factors, then no additional adjustment might be needed. Alternatively, if the Trip-Based Model was insensitive to built environment factors, then any level of difference in the NHTS Model could be the justification for applying an additional reduction to account for these factors.

This investigation first evaluated the built-environment variables that were included in the Trip-Based Model. As noted in Chapter II, the Trip-Based Model includes a composite measure of household, employment, and intersection density as the one "D" variable. The model also includes relatively coarse (TAZ aggregation) measures of population and employment proximity and transit availability, as well as dynamic measures of regional accessibility. In comparison, the evaluation of the NHTS data indicated a large number of potential built environment variables have significant influence on VMT generation including, as listed in Table 2: fine-grained measures housing density, employment density, mix of jobs, nearby jobs per household, local network connectivity, bus stop frequency and proximity to rail and premium bus service, as well as regional accessibility. As these variables were shown to be related to travel choices through the statistical analysis of the NHTS results, it would appear that there is some level of missing sensitivities in the Trip-Based Model through an omission of several of these variables and inclusion of others only at aggregate levels.

A subsequent investigation determined that at least one of the built environment variables which is included in the Trip-Based Model was not updated within the land use scenarios. This variable is the intersection density component of the composite density variable identified above. According to SCAG Staff, this variable was not measured for future development scenarios and was therefore not considered in the model's travel forecasts. Examination of the trip based variables also indicated that the values associated with several built environment variables, including job density and mix, are less sensitive than empirical evidence on the nature of their influence on VMT.

Based on the considerations above, we can conclude that the Trip-Based Model has limited sensitivity to the built environment variables; therefore leading us to conclude that some level of post-processing or additional adjustment is warranted to account for these factors.

TEST #2- NHTS MODEL ELASTICITIES VS. OTHER STUDIES

A second test involved a comparison between the elasticities estimated from the NHTS Model as compared to values from several sources including CARB and a national analysis of the D's effects. The purpose of this test is to verify that the relationships identified in the NHTS Model are within the range of values observed elsewhere in a variety of sources.

The Statewide values were extracted from research compiled for the CARB by researchers at UC Irvine and UC Davis. The national elasticities are taken from a meta-analysis compiled by Robert Cervero and Reid Ewing and reflect a summary of the D's based on a wide cross-section of studies.

Table 10 documents this comparison and indicates that a majority of the elasticities calculated from the NHTS Model are generally within the range of observed values from these two sources. In cases where the SCAG region's elasticities differ from the national and statewide examples, the SCAG values are either lower or are counterbalanced by values associated with related variables. For example, the relatively low values of SCAG's walkability elasticity suggests that the SCAG's use of locally-derived elasticities results in a more conservative travel analysis than would use of national averages. SCAG's lower sensitivity to jobs mix is partially offset by its higher sensitivity to jobs/housing balance when compared with national studies.

TABLE 10 - COMPARISON OF NHTS MODEL ELASTICITIES VS. OTHER STUDIES

Built Environment Variable	Range of SCAG Values	CARB Study[1]	Meta Analysis[2]
Residential Density	-0.068 to -0.072	-0.05 to -0.12	-0.04
Employment Density	-0.004 to -0.005	N/A	0.00
Job Mix	-0.016 to -0.017	-0.02 to -0.11	-0.09
Walkability/Connectivity	-0.035 to -0.036	-0.06 to -0.12	-0.12
Jobs/Housing Balance	-0.079 to -0.083	-0.02	-0.02
Auto Accessibility	-0.270	-0.05 to -0.25	-0.20
Regional Local Bus Accessibility	-0.042 to -0.044	N/A	-0.05
High Quality Local Bus Density	-0.007 to -0.009	N/A	-0.05

Notes: 1- Summarized from research compiled by Susan Handy and Marlon Boarnett for California Air Resources Board (http://arb.ca.gov/cc/sb375/policies/policies.htm)
2- Reid Ewing & Robert Cervero (2010): Travel and the Built Environment, Journal of the American Planning Association, 76:3, 265-29 (http://www.tandfonline.com/doi/abs/10.1080/01944361003766766)

Source: Fehr & Peers, 2011

TEST #3- COMPARE TRIP-BASED AND NHTS MODEL

The final test was to compare the results of the Trip-Based Model and the NHTS Model for the same scenarios. This allows us to estimate the amount of 4D sensitivity that is not captured in the Trip model. Tale 11 documents that comparison. Both sets of results exclude the effects of TDM strategies. As indicated in the table, when both the Trip-Based Model and the NHTS Model are applied to the same database, the additional reduction in VMT associated with the NHTS Model's 4D sensitivities is 2.4%.

TABLE 11 - NHTS MODEL COMPARING ALTERNATIVE LAND USE SCENARIOS

	2008	2035 Proposed Plan (Trip-Based Model)	2035 Proposed Plan (NHTS Model)
VMT	374,033,557	435,661,031	425,286,388
VMT/Household	64.35	59.51	58.09
Percentage Reduction in VMT/HH from 2008	--	7.5%	9.7%
Percentage Reduction in VMT/HH from 2035 Trip-Based Model	--	--	2.4%

Source: Fehr & Peers, 2011

SUMMARY OF TEST RESULTS

Table 12 summarizes the various tests which were conducted and summarizes the results of these tests.

TABLE 12 - NHTS MODEL COMPARING ALTERNATIVE LAND USE SCENARIOS

Test ID	Test Description	Result	Conclusion
1	Trip-Based Model Sensitivity	Built environment variables generally missing from Trip-Based Model. At least one variable not updated between scenarios.	Adjustment to Trip-Based Model is justified based on lack of sensitivity
2	NHTS Model Elasticities	Elasticities for many built environment variables in NHTS Model similar to statewide and national studies	NHTS Model produces reasonable results
3	Compare Trip-Based and NHTS Model	Comparison of same datasets show additional reduction in per household VMT compared to 2008	Additional sensitivity provided by NHTS Model in amount of 2.4%

Source: Fehr & Peers, 2011

VI. CONCLUSIONS

As noted previously, this study and report were intended to address three main topics addressing the relationship of the built environment and travel behavior as addressed in the SCAG Trip-Based Model and RTP/SCS Document. Each of these topics is discussed in detail below to present the results of this report.

TRIP-BASED MODEL NOT FULLY SENSITIVE TO BUILT ENVIRONMENT VARIABLES

The initial investigation determined that there was limited sensitivity in the trip-based model to built environment factors. This conclusion is based on the limited number of built environment variables which are included in the Trip-Based Model and also the fact that at least one of the variables which is included was not updated between the various analysis scenarios.

RESEARCH ON REASONABLE SENSITIVITY TO BUILT ENVIRONMENT FACTORS

Thorough research was conducted, using the National Household Travel Survey, on travel sensitivity to the built environment factors in the SCAG region. As documented in Chapters III and IV, statistical analysis of the NHTS data formed the basis for a multi-tiered VMT forecasting model including a wide variety of built environment variables found to have statistically significant influence on VMT generation. Further testing of the NHTS Model in Chapter V verified that this NHTS Model produced reasonable results for use in this exercise.

QUANTIFYING ADDITIONAL REDUCTION

The final conclusion of this report is the quantification of an additional reduction that would be applied to the Trip-Based Model, given our conclusion that there this Model lacks full sensitivity to built environment variables. Based on testing conducted to date this report tentatively concludes that a reduction of approximately 2% - 3%, which is in addition to the reduction identified in the Trip-Based Model, would be appropriate. This reduction is derived from an analysis using the NHTS Model as a supplement to the Trip-Based Model.

VII. NEXT STEPS

This chapter identifies the next steps in the analysis including details regarding additional analysis that will be performed, our peer review panel review, and the preparation of final documentation.

ADDITIONAL ANALYSIS

Initial testing of the Trip-Based Model revealed a lack of sufficient sensitivity to localized land use factors. However, there is additional testing of the Trip-Based Model which will be conducted subsequent to the preparation of this report to further investigate this issue.

These additional sensitivity tests will consider the extent to which the Trip-Based Model may be sensitive to individual built environmental variables as compared to the list of variables in their entirety, which was inferred from the testing documented in Chapter V. This additional testing will evaluate the results of "land swaps", where TAZ data are switched between alternative locations. This swapping process will involve the exchange of built environment variables to determine how the Trip-Base Model reacts to these types of changes. 10 pairs of zones throughout the region will be analyzed, reflecting both intensive mixed-use areas, such as Downtown Los Angeles, and less intensive single-use locations, such as suburban Riverside and San Bernardino Counties. Once these swaps are completed, data from the Trip-Based Model will be analyzed to determine first-order (zones which were swapped) and second-order (zones adjacent to those which were swapped) effects.

PEER REVIEW PANEL REVIEW

SCAG Staff and their Consultants have been meeting with a Peer Review Panel composed of staff from Universities and Public Agencies to share the results of the process and analyses outlined in this report. Two Peer Review Panel meetings have been held previously and a final Peer Review Panel meeting is anticipated once the final set of sensitivity testing is complete. It is anticipated that any observations and recommendations from this final meeting will be incorporated into any subsequent documentation.

FINAL DOCUMENTATION

It is anticipated that a Final Report will be prepared, which will incorporate any additional testing or analysis that would occur, recommendations from the Peer Review Panel, and other comments that SCAG may receive from the California Air Resources Board (CARB) or other agencies that might review this report.

APPENDIX A- HOUSEHOLD VARIABLES IN NHTS DATA

CA-NHTS Sample Files

Trip File

Data Set Name	CA_NHTS.CA_DTRP	**Observations**	171661
Member Type	DATA	**Variables**	154
Engine	V9	**Indexes**	0
Created	Friday, February 05, 2010 08:54:20 PM	**Observation Length**	720
Last Modified	Friday, February 05, 2010 08:54:20 PM	**Deleted Observations**	0
Protection	READ/ALTER	**Compressed**	NO
Data Set Type		**Sorted**	NO
Label			
Data Representation	WINDOWS_32		
Encoding	wlatin1 Western (Windows)		

Engine/Host Dependent Information	
Data Set Page Size	16384
Number of Data Set Pages	7805
First Data Page	2
Max Obs per Page	22
Obs in First Data Page	16
Number of Data Set Repairs	0
Filename	I:\Travel Surveys\NHTS CA Data\ca_dtrp.sas7bdat
Release Created	9.0202M0
Host Created	W32_VSHOME

CA-NHTS Sample Files

Trip File

Variables in Creation Order						
#	**Variable**	**Type**	**Len**	**Format**	**Informat**	**Label**
1	HOUSEID	Char	8	$8.	$8.	HH eight-digit ID number
2	HHSTATE	Char	2	$2.	$2.	State HH location
3	HH_HISP	Char	2			Hispanic status of HH respondent
4	HH_RACE	Char	2			Race of HH respondent
5	HHR_HISP	Char	2			Hispanic Status of HH respondent
6	HHR_RACE	Char	2			Race of HH respondent
7	PERSONID	Char	2			Person ID number
8	DRIVER	Char	2			Driver status of S
9	HH_HB_F	Char	2	$2.		Imputed HH respondent's ethnicity and race combined : 1= Hispanic Black, 2=nonHispanic Black, 3=Hispanic, nonBlack, 4=nonHispanic other race
10	R_SEX	Char	2	$2.		Respondent gender
11	WORKER	Char	2			Subject worker status
12	DRVRCNT	Num	8			Number of Drivers in HH
13	CMPLTPCT	Num	8			PERCENT COMPLETE
14	HHCNTYFP	Char	3	$3.	$3.	County FIPS code for home address
15	HHCT	Char	6			HH Census Tract
16	HHFAMINC	Char	2			Derived total HH income
17	HHSIZE	Num	8			Count or HH members
18	HHVEHCNT	Num	8			Count of HH vehicles
19	HOMEOWN	Char	2	$2.		Housing unit owned or rented
20	HOMETYPE	Char	2			Type of housing unit
21	NUMADLT	Num	8			Count of adult HHMs at least 18 years old
22	FLAG100	Char	2			100% COMPLETE FLAG
23	LIF_CYC	Char	2			LIFE CYCLE CLASSIFICATION
24	TDCASEID	Char	12			Trip number
25	TRIPPURP	Char	8			TRIPPURP
26	LANDCELL	Char	2	$2.		Land line or cell phone household
27	MAINRSLT	Char	2			Respondent final result code
28	WGTYRMON	Char	8			WGT_YR MONTH
29	AWAYHMSP	Char	30			Travel day reason S was away from home - specified
30	AWAYHOME	Char	2			Travel day reason S was away from home
31	CBSACAT	Char	2			CBSA category for the HH home address
32	CBSASIZE	Char	2			CBSA population size for the HH home address

CA-NHTS Sample Files

Trip File

Variables in Creation Order						
#	**Variable**	**Type**	**Len**	**Format**	**Informat**	**Label**
33	CDIVMSAR	Char	2			Grouping of HH by combination of Census Division, MSA status, and presence of a subway system (if area > 1 million)
34	CENSUS_D	Char	2			Census division classification for home address
35	CENSUS_R	Char	2			Census region classification for home address
36	DROP_PRK	Char	2			Parked or dropped off at public transit
37	DRVR_FLG	Char	2			Subject was driver on this trip
38	EDUC	Char	2			Highest grade completed
39	ENDAMPM	Char	2			Travel day trip start time AM/PM
40	ENDHOUR	Num	3			Travel day trip end time - hour
41	ENDMINTE	Num	8			Travel day trip end time - minute
42	ENDTIME	Char	4			Trip END time in military
43	HH_CBSA	Char	5	$5.	$5.	CBSA FIPS code for HH address
44	HH_CSA	Char	3	$3.	$3.	CSA FIPS code for HH address
45	HH_MSA	Char	4	$4.	$4.	MSA FIPS code for HH address
46	HH_ONTD	Num	8			Dervied number of HHMs on trip
47	HHC_MSA	Char	4	$4.	$4.	CMSA FIPS code for HH address
48	HHCITYFP	Char	5	$5.	$5.	City FIPS code for home address
49	HHMEMDRV	Char	2			HH member drove on trip
50	HHMETDIV	Char	5	$5.	$5.	Metro Division FIPS code for HH address
51	HHP_MSA	Char	4	$4.	$4.	PMSA FIPS code for HH address
52	HHRESP	Char	2			Household respondent
53	HHSTFIPS	Char	2	$2.	$2.	State FIPS for HH address
54	HOWFRPOS	Char	30			Mode used from public transit to destination - other
55	HOWPUBOS	Char	30			Mode used to get to public tranist - other
56	IMPTAGE	Char	2	$2.		Whether R_AGE was imputed (1 = Yes, 2 = No)
57	IMPTSEX	Char	2	$2.		Whether gender was imputed (1 = Yes, 2 = No)
58	IMPTHB	Char	2	$2.		Whether the household respondent's ethnicity and race category was imputed (1 = Yes, 2 = No)
59	INTSTATE	Char	2			Any part of trip on interstate
60	LANG	Char	2			Language interview was conducted in
61	LONGFRHR	Num	3			How long to destination from public transit - hours
62	LONGFRMN	Num	4			How long to destination from public transit - minutes
63	LONGTOHR	Num	3			Time to get to public transit - hours
64	LONGTOMN	Num	4			Time to get to public transit - minutes

CA-NHTS Sample Files

Trip File

Variables in Creation Order						
#	**Variable**	**Type**	**Len**	**Format**	**Informat**	**Label**
65	MSACAT	Char	2			MSA category for the HH home address
66	MSASIZE	Char	2			MSA population size for the HH home address
67	NONHHCNT	Num	8			Derived number of non-HHMs on trip
68	NUMONTRP	Num	8			Count of total people on trip
69	PAYTOLL	Char	2			Toll paid on this interstate
70	PERINDT2	Char	8			Person interview date
71	PLCNTYNY	Char	2			County of NY
72	PRMACT	Char	2			Primary activity last week
73	PROXY	Char	2			Trip info from respondent or proxy
74	PSGR_FLG	Char	2			S was passenger on trip that only used POV
75	PUBTYPE	Char	2			Mode of public transit used on trip
76	R_AGE	Num	4			Respondent Age
77	RAIL	Char	2			MSA heavy rail status for HH
78	SAMPQTR	Char	2			Quarter in which sample was drawn
79	STRATUM	Char	2			Geographic site within SMPLSRCE
80	STRTAMPM	Char	2			Travel day trip start time AM/PM
81	STRTHR	Num	8			Travel day trip start time - hour
82	STRTMIN	Num	8			Travel day trip start time - minute
83	STRTTIME	Char	4			Trip START time in military
84	TDAYDAT2	Char	8			Travel day - date
85	TDMSDTRP	Char	2			Indicates missed trips
86	TRACC1	Char	2			1st mode used to get to public transit
87	TRACC2	Char	2			2nd mode used to get to public transit
88	TRACC3	Char	2			3rd mode used to get to public transit
89	TRACC4	Char	2			4th mode used to get to public transit
90	TRACC5	Char	2			5th mode used to get to public transit
91	TRACCTM	Num	8			Derived time to get to public transit - minutes
92	TRAVDAY	Char	2			Travel day - day of week
93	TREGR1	Char	2			1st mode used from public transit to destination
94	TREGR2	Char	2			2nd mode used from public transit to destination
95	TREGR3	Char	2			3rd mode used from public transit to destination
96	TREGR4	Char	2			4th mode used from public transit to destination
97	TREGR5	Char	2			5th mode used from public transit to destination

CA-NHTS Sample Files

Trip File

Variables in Creation Order						
#	Variable	Type	Len	Format	Informat	Label
98	TREGRTM	Num	8			How long to destination from transit - converted to minutes
99	TRIPTIME	Char	2			Entire trip took you
100	TRPACCMP	Num	3			Number of people with you on trip
101	TRPHHACC	Num	8			Number of HHM with R on trip
102	TRPHHVEH	Char	2			HH vehicle used for trip
103	TRPMILES	Num	8	6.1		Trip distance in miles
104	TRPPUB	Char	2			Public transit used on trip
105	TRPTRANS	Char	2			Transportation mode used on trip
106	TRPTRNOS	Char	30			Transportation mode used on trip - other
107	TRVL_MIN	Num	8			Derived trip time - minutes
108	TRVLCMIN	Num	8			CALCULATED TRAVEL TIME
109	TRVLHR	Num	3			Trip time - hours
110	TRVLMIN	Num	4			Trip time - minutes
111	TRWAITTM	Num	8			Derived length of wait for public transit - minutes
112	URBAN	Char	2			Home address in urbanized area
113	URBANSIZE	Char	2			Size of urban area in which home address is located
114	URBRUR	Char	2			Household in urban/rural area
115	USEINTST	Char	2			Interstate used for any trips
116	USEPUBTR	Char	2			Use public transit on travel day
117	VEHID	Char	2			HH vehicle number used for trip
118	VEHSAME	Char	2			S in the same vehicle
119	WAIT_HR	Num	3			Length of wait for public transit - hours
120	WAIT_MIN	Num	4			Length of wait for public transit - minutes
121	WHERE	Char	2			Travel day trip destination
122	WHEREOS	Char	30			Travel date trip destination - Other
123	WHOACC1	Char	2			Person number of HHMs on trip
124	WHOACC10	Char	2			Person number of HHMs on trip
125	WHOACC11	Char	2			Person number of HHMs on trip
126	WHOACC12	Char	2			Person number of HHMs on trip
127	WHOACC13	Char	2			Person number of HHMs on trip
128	WHOACC14	Char	2			Person number of HHMs on trip
129	WHOACC15	Char	2			Person number of HHMs on trip
130	WHOACC2	Char	2			Person number of HHMs on trip

CA-NHTS Sample Files

Trip File

Variables in Creation Order						
#	**Variable**	**Type**	**Len**	**Format**	**Informat**	**Label**
131	WHOACC3	Char	2			Person number of HHMs on trip
132	WHOACC4	Char	2			Person number of HHMs on trip
133	WHOACC5	Char	2			Person number of HHMs on trip
134	WHOACC6	Char	2			Person number of HHMs on trip
135	WHOACC7	Char	2			Person number of HHMs on trip
136	WHOACC8	Char	2			Person number of HHMs on trip
137	WHOACC9	Char	2			Person number of HHMs on trip
138	WHODROVE	Char	2			Person ID of driver on trip
139	WHYFROM	Char	2			Trip purpose for previous trip
140	WHYTO	Char	2			Travel day purpose of trip
141	WHYTRP1S	Char	2			Trip purpose summary
142	WHYTRPSP	Char	30			Misc reason
143	WKSTFIPS	Char	2			State FIPS code for work address
144	WORKCT	Char	6			Work place Census Tract
145	WORKLOC	Char	2			Respondent work location
146	WRKCOUNT	Num	8			Number of workers in HH
147	DD13WGT	Num	8			ORGINAL WEIGHT
148	WTTRDFIN	Num	8			FINAL ADJ_WGT
149	DWELTIME	Num	8			DWELL TIME
150	WHYTRP90	Char	2			WHYTRP90
151	TDTRPNUM	Char	12			Travel day trip number for respondent
152	TDWKND	Char	2			Travel day trip on weekend
153	TDAYDATE	Char	8			Travel Date YYYYMM
154	VMT_MILE	Num	8			

CA-NHTS Sample Files

Household File

Data Set Name	CA_NHTS.CA_HH	**Observations**	21225
Member Type	DATA	**Variables**	73
Engine	V9	**Indexes**	0
Created	Friday, February 05, 2010 08:54:11 PM	**Observation Length**	368
Last Modified	Friday, February 05, 2010 08:54:11 PM	**Deleted Observations**	0
Protection	READ/ALTER	**Compressed**	NO
Data Set Type		**Sorted**	NO
Label			
Data Representation	WINDOWS_32		
Encoding	wlatin1 Western (Windows)		

Engine/Host Dependent Information	
Data Set Page Size	16384
Number of Data Set Pages	484
First Data Page	1
Max Obs per Page	44
Obs in First Data Page	16
Number of Data Set Repairs	0
Filename	I:\Travel Surveys\NHTS CA Data\ca_hh.sas7bdat
Release Created	9.0202M0
Host Created	W32_VSHOME

CA-NHTS Sample Files

Household File

Variables in Creation Order						
#	**Variable**	**Type**	**Len**	**Format**	**Informat**	**Label**
1	HOUSEID	Char	8	$8.	$8.	HH eight-digit ID number
2	VARSTRAT	Num	8			Variance Stratum for TS Linearization Variance Estimation
3	DRVRCNT	Num	8			Number of Drivers in HH
4	CMPLTPCT	Num	8			PERCENT COMPLETE
5	TRPCNT	Num	8			No. Travl Day Trips in HH
6	CBSACAT	Char	2			CBSA category for the HH home address
7	CBSASIZE	Char	2			CBSA population size for the HH home address
8	CDIVMSAR	Char	2			Grouping of HH by combination of Census Division, MSA status, and presence of a subway system (if area > 1 million)
9	CELL1	Char	2	$2.		Reached you on a cell phone
10	CELL3	Char	2	$2.		Has a regular landline telephone at home
11	CELL4	Num	3			Number of personal cell phones
12	CELL5	Num	3			Number of other household cell phones
13	CENSUS_D	Char	2			Census division classification for home address
14	CENSUS_R	Char	2			Census region classification for home address
15	GSTRATUM	Char	2			Stratum of HH location based on geocoded address -- use in combination with SMPLSRCE and SMPLAREA
16	HH_CBSA	Char	5	$5.	$5.	CBSA FIPS code for HH address
17	HH_CSA	Char	3	$3.	$3.	CSA FIPS code for HH address
18	HHP_MSA	Char	4	$4.	$4.	PMSA FIPS code for HH address
19	HH_HISP	Char	2			Hispanic status of HH respondent
20	HH_MSA	Char	4	$4.	$4.	MSA FIPS code for HH address
21	HH_RACE	Char	2			Race of HH respondent
22	HH_RACOS	Char	30			Race of HH respondent - other specified
23	HHBG	Char	2			HH block group
24	HHC_MSA	Char	4	$4.	$4.	CMSA FIPS code for HH address
25	HHCITYFP	Char	5	$5.	$5.	City FIPS code for home address
26	HHCNTYFP	Char	3	$3.	$3.	County FIPS code for home address
27	HHCT	Char	6			HH Census Tract
28	HHFAMINC	Char	2			Derived total HH income
29	HHMETDIV	Char	5	$5.	$5.	Metro Division FIPS code for HH address
30	HHRELATD	Char	2			At least some HHMs are related
31	HHRESP	Char	2			Household respondent
32	HHSIZE	Num	8			Count or HH members

CA-NHTS Sample Files

Household File

Variables in Creation Order						
#	**Variable**	**Type**	**Len**	**Format**	**Informat**	**Label**
33	HHSTATE	Char	2	$2.	$2.	State HH location
34	HHSTFIPS	Char	2	$2.	$2.	State FIPS for HH address
35	HHVEHCNT	Num	8			Count of HH vehicles
36	HHZIP	Char	5			Zipcode of the HH location
37	HOMEGEO	Char	2			Level of home address geocode
38	HOMELAT	Num	8			HH latitude
39	HOMELONG	Num	8			HH longitude
40	HOMEOWN	Char	2	$2.		Housing unit owned or rented
41	HOMEOWOS	Char	30			Housing unit owned or rented - specified
42	HOMETYOS	Char	30			Type of housing unit - specified
43	HOMETYPE	Char	2			Type of housing unit
44	IMPTHOWN	Char	2	$2.		Whether homeownership was imputed (1 = Yes, 2 = No)
45	LANDCELL	Char	2	$2.		Land line or cell phone household
46	LANG	Char	2			Language interview was conducted in
47	MSACAT	Char	2			MSA category for the HH home address
48	MSASIZE	Char	2			MSA population size for the HH home address
49	NONFMFLG	Char	2			Income of all HHMs included
50	NONVOICE	Num	8			Number of additional phones used for business
51	NONVOX1	Char	2			Phone used exclusively for business
52	NUMADLT	Num	8			Count of adult HHMs at least 18 years old
53	OTHRPHON	Num	3			Number of additional HH phones
54	RAIL	Char	2			MSA heavy rail status for HH
55	RESP_CNT	Num	8			Count of responding persons per HH
56	SAMPQTR	Char	2			Quarter in which sample was drawn
57	SCRESP	Char	2			Screener respondent
58	STRATUM	Char	2			Geographic site within SMPLSRCE
59	TDAYDAT2	Char	8			Travel day - date
60	TRAVDAY	Char	2			Travel day - day of week
61	URBAN	Char	2			Home address in urbanized area
62	URBANSIZE	Char	2			Size of urban area in which home address is located
63	URBRUR	Char	2			Household in urban/rural area
64	WRKCOUNT	Num	8			Number of workers in HH
65	HH13WGT	Num	8			ORIGINAL WEIGHT

CA-NHTS Sample Files

Household File

Variables in Creation Order						
#	**Variable**	**Type**	**Len**	**Format**	**Informat**	**Label**
66	WGTYRMON	Char	8			WGT_YEAR MONTH
67	WTHHFIN	Num	8			FNAL ADJ_WGT
68	TDAYDATE	Char	8			Travel Date YYYYMM
69	FLAG100	Char	2			100% COMPLETE FLAG
70	HHR_HISP	Char	2			Hispanic Status of HH respondent
71	HHR_RACE	Char	2			Race of HH respondent
72	LIF_CYC	Char	2			LIFE CYCLE CLASSIFICATION
73	CNTTDHH	Char	2			No. Travel Day Trips in HH

CA-NHTS Sample Files

Location File

Data Set Name	CA_NHTS.CA_LOCATIONS	**Observations**	171661
Member Type	DATA	**Variables**	36
Engine	V9	**Indexes**	0
Created	Monday, February 15, 2010 08:56:50 PM	**Observation Length**	480
Last Modified	Monday, February 15, 2010 08:56:50 PM	**Deleted Observations**	0
Protection		**Compressed**	NO
Data Set Type		**Sorted**	NO
Label			
Data Representation	WINDOWS_32		
Encoding	wlatin1 Western (Windows)		

Engine/Host Dependent Information	
Data Set Page Size	16384
Number of Data Set Pages	5050
First Data Page	1
Max Obs per Page	34
Obs in First Data Page	22
Number of Data Set Repairs	0
Filename	I:\Travel Surveys\NHTS CA Data\ca_locations.sas7bdat
Release Created	9.0101M3
Host Created	XP_PRO

CA-NHTS Sample Files

Location File

Variables in Creation Order						
#	**Variable**	**Type**	**Len**	**Format**	**Informat**	**Label**
1	TDCASEID	Char	12			Trip number
2	HOUSEID	Char	8	$8.	$8.	HH eight-digit ID number
3	PERSONID	Char	2			Person ID number
4	FRSTHM	Char	2			S home at start of travel day
5	HOMELAT	Num	8			HH latitude
6	HOMELONG	Num	8			HH longitude
7	PLBG	Char	2	$2.		Trip Destination, Block Group
8	PLCITY	Char	20			Trip address - city
9	PLCNTYFP	Char	3			County of Trip Destination (FIPS code)
10	PLCNTYNY	Char	2			County of NY
11	PLCNTYWI	Char	2			County of WISCONSIN
12	PLCP	Char	5			Trip Destination, Census Place
13	PLCT	Char	6			Trip Destination, Census Tract
14	PLCYNYOS	Char	45			Travel day trip end, NY county
15	PLCYWIOS	Char	45			Travel day trip end, WI county
16	PLLNMRK1	Char	25			Trip landmark 1
17	PLLNMRK2	Char	25			Trip landmark 2
18	PLLNMRK3	Char	25			Trip landmark 3
19	PLMCD	Char	5			Trip Destination, MCD
20	PLMSA	Char	4	$4.	$4.	Trip Destination, MSA
21	PLROAD1	Char	45			Trip intersection - first road
22	PLROAD2	Char	45			Trip intersection - second road
23	PLSTATE	Char	2			Trip address - state
24	PLSTATFP	Char	2			State of trip destination (FIPS code)
25	PLSTNAME	Char	45			Trip address - street name
26	PLSTNUM	Char	10			Trip address - street number
27	PLZIP	Char	5			Trip address - zip code
28	TDTRPNUM	Char	2			Travel day trip number for respondent
29	TRPEDGEO	Char	2			Level of geocoding trip end location
30	TRPENDLA	Num	8			Trip end latitude
31	TRPENDLO	Num	8			Trip end longitude
32	TRPORDER	Char	2	$2.		Order in which person took trip
33	WHERE	Char	2			Travel day trip destination

CA-NHTS Sample Files

Location File

Variables in Creation Order						
#	**Variable**	**Type**	**Len**	**Format**	**Informat**	**Label**
34	WHEREOS	Char	30			Travel date trip destination - Other
35	WORKLAT	Num	8			Work latitude
36	WORKLONG	Num	8			Work longitude

CA-NHTS Sample Files

Person File

Data Set Name	CA_NHTS.CA_PERS	**Observations**	47559
Member Type	DATA	**Variables**	239
Engine	V9	**Indexes**	0
Created	Friday, February 05, 2010 08:54:13 PM	**Observation Length**	1120
Last Modified	Friday, February 05, 2010 08:54:13 PM	**Deleted Observations**	0
Protection	READ/ALTER	**Compressed**	NO
Data Set Type		**Sorted**	NO
Label			
Data Representation	WINDOWS_32		
Encoding	wlatin1 Western (Windows)		

Engine/Host Dependent Information	
Data Set Page Size	16384
Number of Data Set Pages	3400
First Data Page	3
Max Obs per Page	14
Obs in First Data Page	14
Number of Data Set Repairs	0
Filename	I:\Travel Surveys\NHTS CA Data\ca_pers.sas7bdat
Release Created	9.0202M0
Host Created	W32_VSHOME

CA-NHTS Sample Files

Person File

Variables in Creation Order						
#	**Variable**	**Type**	**Len**	**Format**	**Informat**	**Label**
1	HOUSEID	Char	8	$8.	$8.	HH eight-digit ID number
2	HHSTATE	Char	2	$2.	$2.	State HH location
3	HH_HISP	Char	2			Hispanic status of HH respondent
4	HH_RACE	Char	2			Race of HH respondent
5	HHR_HISP	Char	2			Hispanic Status of HH respondent
6	HHR_RACE	Char	2			Race of HH respondent
7	DRVRCNT	Num	8			Number of Drivers in HH
8	CMPLTPCT	Num	8			PERCENT COMPLETE
9	HHCNTYFP	Char	3	$3.	$3.	County FIPS code for home address
10	HHCT	Char	6			HH Census Tract
11	HHFAMINC	Char	2			Derived total HH income
12	HHSIZE	Num	8			Count or HH members
13	HHVEHCNT	Num	8			Count of HH vehicles
14	HOMEOWN	Char	2	$2.		Housing unit owned or rented
15	HOMETYPE	Char	2			Type of housing unit
16	NUMADLT	Num	8			Count of adult HHMs at least 18 years old
17	WRKCOUNT	Num	8			Number of workers in HH
18	FLAG100	Char	2			100% COMPLETE FLAG
19	LIF_CYC	Char	2			LIFE CYCLE CLASSIFICATION
20	PERSONID	Char	2			Person ID number
21	ORGSFWGT	Num	8			ORIGINAL SF WEIGHT
22	VARSTRAT	Num	8			Variance Stratum for TS Linearization Variance Estimation
23	CNTTDTR	Num	8			Count of Trips for this Resp
24	AGE5PLUS	Char	2			Age is 5 - 16 yrs old
25	AGERANGE	Char	2			Over/Under 18 for HHMs missing age
26	ASKSECTF	Char	2			Selected to be asked the Travel to School questions
27	BIKE_A	Char	2			Reason not biking: too busy
28	BIKE_B	Char	2			Reason not biking: poor health
29	BIKE_C	Char	2			Reason not biking: no one to bike with
30	BIKE_D	Char	2			Reason not biking: no nearby paths or trails
31	BIKE_E	Char	2			Reason not biking: not enough bike lanes
32	BIKE_F	Char	2			Reason not biking: no sidewalks
33	BIKE_G	Char	2			Reason not biking: street crossings unsafe

CA-NHTS Sample Files

Person File

Variables in Creation Order						
#	**Variable**	**Type**	**Len**	**Format**	**Informat**	**Label**
34	BIKE_H	Char	2			Reason not biking: no shops or interesting places to go
35	BIKE_I	Char	2			Reason not biking: not enough people around
36	BIKE_J	Char	2			Reason not biking: fear street crime
37	BIKE_K	Char	2			Reason not biking: too many cars
38	BIKE_L	Char	2			Reason not biking: fast traffic
39	BIKE_M	Char	2			Reason not biking: air pollution
40	BIKE_N	Char	2			Reason not biking: too many things carry
41	BIKE_O	Char	2			Reason not biking: traveling with small children
42	BIKE_P	Char	2			Reason not biking: not enough light
43	BORNINUS	Char	2			Born in U.S.
44	C13_DRVR	Char	2			Should S be recorded as driver
45	CA1_HR	Num	3			Total hours spent walking in past week
46	CA1_MIN	Num	3			Total minutes spent walking in past week
47	CA2_HR	Num	3			Total hours spent biking in past week
48	CA2_MIN	Num	3			Total minutes spent biking in past week
49	CARRODE	Num	8			Number of people in vehicle last week
50	CBSACAT	Char	2			CBSA category for the HH home address
51	CBSASIZE	Char	2			CBSA population size for the HH home address
52	CDIVMSAR	Char	2			Grouping of HH by combination of Census Division, MSA status, and presence of a subway system (if area > 1 million)
53	CENSUS_D	Char	2			Census division classification for home address
54	CENSUS_R	Char	2			Census region classification for home address
55	CONDNIGH	Char	2			Medical condition results in limiting driving to daytime
56	CONDPUB	Char	2			Medical condition results in using bus/subway less frequently
57	CONDRIDE	Char	2			Medical condition results in asking others for rides
58	CONDRIVE	Char	2			Medical condition results in giving up driving
59	CONDSPEC	Char	2			Medical condition results in using special transit services
60	CONDTAX	Char	2			Medical condition results in using a reduced fare taxi
61	CONDTRAV	Char	2			Medical condition results in reduced day-to-day travel
62	DELIVER	Num	4			Number of these internet purchases delivered to home
63	DIARY	Char	2			Indicates if travel diary was completed
64	DIARYCMP	Char	2			Was diary completed
65	DIARYHAV	Char	2			S has completed diary

CA-NHTS Sample Files

Person File

Variables in Creation Order						
#	**Variable**	**Type**	**Len**	**Format**	**Informat**	**Label**
66	DIFFDATE	Num	8			Number of days between travel date and interview date
67	DIFFDATE_FLG	Char	2			No. days b/w travel date and interview date is > 7
68	DISTTOSC	Char	2			Distance home to school
69	DRIVER	Char	2			Driver status of S
70	DRVR	Char	2			Is a driver
71	DTACDT	Char	2			Safety concerns
72	DTCONJ	Char	2			Highway congestion
73	DTCOST	Char	2			Price of travel (fees, tolls and gas)
74	DTRAGE	Char	2			Aggressive/distracted drivers
75	DTRAN	Char	2			Access or availability of public transit
76	DTWALK	Char	2			Lack of walkways or sidewalks
77	EDUC	Char	2			Highest grade completed
78	EMPLOYER	Char	30			Employer's name
79	EVERDROV	Char	2			Has been a driver in the past
80	F12	Char	2			Walk/Bike issue: other issues
81	F12_01	Char	20			Walk/Bike issue: other issue 1
82	F12_02	Char	20			Walk/Bike issue: other issue 2
83	F12_03	Char	20			Walk/Bike issue: other issue 3
84	F12_04	Char	20			Walk/Bike issue: other issue 4
85	F12_05	Char	20			Walk/Bike issue: other issue 5
86	FLEXTIME	Char	2			Can set or change start time
87	FMSCSIZE	Num	8			Number of people on from school trip
88	FRSTHM	Char	2			S home at start of travel day
89	FXDWKPL	Char	2			No fixed workplace
90	GCDWORK	Num	8			Great circle distance between home and work
91	GRADE	Char	2			Grade allowed to walk/bike to/from school without adult
92	GT1JBLWK	Char	2			Have more than one job
93	HH_CBSA	Char	5	$5.	$5.	CBSA FIPS code for HH address
94	HH_CSA	Char	3	$3.	$3.	CSA FIPS code for HH address
95	HH_HB_F	Char	2	$2.		Imputed HH respondent's ethnicity and race combined : 1= Hispanic Black, 2=nonHispanic Black, 3=Hispanic, nonBlack, 4=nonHispanic other race
96	HH_MSA	Char	4	$4.	$4.	MSA FIPS code for HH address
97	HHC_MSA	Char	4	$4.	$4.	CMSA FIPS code for HH address

CA-NHTS Sample Files

Person File

Variables in Creation Order						
#	**Variable**	**Type**	**Len**	**Format**	**Informat**	**Label**
98	HHCITYFP	Char	5	$5.	$5.	City FIPS code for home address
99	HHP_MSA	Char	4	$4.	$4.	PMSA FIPS code for HH address
100	HHMETDIV	Char	5	$5.	$5.	Metro Division FIPS code for HH address
101	HHRESP	Char	2			Household respondent
102	HHSTFIPS	Char	2	$2.	$2.	State FIPS for HH address
103	IMPTAGE	Char	2	$2.		Whether R_AGE was imputed (1 = Yes, 2 = No)
104	IMPTSEX	Char	2	$2.		Whether gender was imputed (1 = Yes, 2 = No)
105	IMPTHB	Char	2	$2.		Whether the household respondent's ethnicity and race category was imputed (1 = Yes, 2 = No)
106	ISSUE	Char	2			Most important transportation issue
107	JOBCATEG	Char	2			Job category
108	JOBCATOS	Char	45			Job category - other specify
109	LANDCELL	Char	2	$2.		Land line or cell phone household
110	LANG	Char	2			Language interview was conducted in
111	LCA3_A	Char	2			Reason for bike ride: to or from work
112	LCA3_B	Char	2			Reason for bike ride: to or from public transit
113	LCA3_C	Char	2			Reason for bike ride: escorting children to or from school
114	LCA3_D	Char	2			Reason for bike ride: shopping or errands
115	LCA3_E	Char	2			Reason for bike ride: exercise
116	LCA3_F	Char	2			Reason for bike ride: exercise the dog
117	LCA3_G	Char	2			Reason for bike ride: another reason
118	LCA3_OTH	Char	30			Reason for bike ride: other reason specified
119	LCA5_A	Char	2			Reason for walk: exercise the dog
120	LCA5_B	Char	2			Reason for walk: to or from work
121	LCA5_C	Char	2			Reason for walk: to or from public transit
122	LCA5_D	Char	2			Reason for walk: escorting children to or from school
123	LCA5_E	Char	2			Reason for walk: shopping or errands
124	LCA5_F	Char	2			Reason for walk: exercise
125	LCA5_G	Char	2			Reason for walk: another reason
126	LCA5_OTH	Char	30			Reason for walk: other specified
127	LSTTRDAY	Num	8			Approximate number of days since last trip
128	MAINRSLT	Char	2			Respondent final result code
129	MCA8_OS	Char	2			Uses other aid

CA-NHTS Sample Files

Person File

Variables in Creation Order						
#	**Variable**	**Type**	**Len**	**Format**	**Informat**	**Label**
130	MCA8_OTH	Char	30			Type of other aid used by S
131	MCUSED	Num	4			Times used motorcycle/moped on road in the past month
132	MEDCOND	Char	2			Have medical condition making it hard to travel
133	MEDCOND6	Char	2			Length of time with medical condition
134	MOROFTEN	Char	2			Would like to get out more often
135	MSACAT	Char	2			MSA category for the HH home address
136	MSASIZE	Char	2			MSA population size for the HH home address
137	NBIKETRP	Num	8			Number of bike trips in past week
138	NWALKTRP	Num	3			Number of walk trips in past week
139	OUTCNTRY	Char	2			S out of country entire travel day
140	OUTOFTWN	Char	2			S out of town entire travel day
141	PAYPROF	Char	2			Worked for pay or profit last week
142	PERINDT2	Char	8			Person interview date
143	PRMACT	Char	2			Primary activity last week
144	PRMDRVR1	Char	2			First HH vehicle number that S is primary driver
145	PRMDRVR2	Char	2			Second HH vehicle number that S is primary driver
146	PRMDRVR3	Char	2			Third HH vehicle number that S is primary driver
147	PROXY	Char	2			Trip info from respondent or proxy
148	PTUSED	Num	4			How often S used public transit in past month
149	PURCHASE	Num	4			Number of times purchased via internet in past month
150	R_AGE	Num	4			Respondent Age
151	R_RELAT	Char	2			Respondent relationship to HH respondent
152	R_SEX	Char	2	$2.		Respondent gender
153	RAIL	Char	2			MSA heavy rail status for HH
154	SAMEPLC	Char	2			Stayed at same place all day
155	SAMPQTR	Char	2			Quarter in which sample was drawn
156	SCHCARE	Char	2			Attends before or after school care
157	SCHCRIM	Char	2			Walk/Bike issue: violence/crime along route
158	SCHDIST	Char	2			Walk/Bike issue: distance between home & school
159	SCHNAME	Char	35			School Name
160	SCHSPD	Char	2			Walk/Bike issue: speed of traffice along route
161	SCHTRAF	Char	2			Walk/Bike issue: amount of traffice along route
162	SCHTRN1	Char	2			Mode to school

CA-NHTS Sample Files

Person File

Variables in Creation Order						
#	**Variable**	**Type**	**Len**	**Format**	**Informat**	**Label**
163	SCHTRN1O	Char	30			Mode to school - other specified
164	SCHTRN2	Char	2			Mode from school
165	SCHTRN2O	Char	30			Mode froom school - other specified
166	SCHTYP	Char	2			School type
167	SCHWTHR	Char	2			Walk/Bike issue: poor weather or climate in area
168	SELF_EMP	Char	2			Self-employed
169	STRATUM	Char	2			Geographic site within SMPLSRCE
170	TDAYDAT2	Char	8			Travel day - date
171	TIMETOSC	Num	3			Minutes to get to school
172	TIMETOWK	Num	4			Minutes to go from home to work last week
173	TOSCSIZE	Num	3			Number of people on to school trip
174	TRAVDAY	Char	2			Travel day - day of week
175	URBAN	Char	2			Home address in urbanized area
176	URBANSIZE	Char	2			Size of urban area in which home address is located
177	URBRUR	Char	2			Household in urban/rural area
178	USEINTST	Char	2			Interstate used for any trips
179	USEPUBTR	Char	2			Use public transit on travel day
180	VERYRMIL	Char	2			Verify annual miles driven
181	W_CANE	Char	2			Uses cane
182	W_CHAIR	Char	2			Uses manual wheelchair
183	W_CRUTCH	Char	2			Uses crutches
184	W_DOG	Char	2			Uses seeing-eye dog/other K-9 assistance
185	W_MTRCHR	Char	2			Uses motorized wheelchair
186	W_SCOOTR	Char	2			Uses motorized scooter
187	W_WHCANE	Char	2			Uses white cane
188	W_WLKR	Char	2			Uses walker
189	WALK_A	Char	2			Reason for not walking: too busy
190	WALK_B	Char	2			Reason for not walking: poor health
191	WALK_C	Char	2			Reason for not walking: no one to bike with
192	WALK_D	Char	2			Reason for not walking: no nearby paths or trails
193	WALK_E	Char	2			Reason for not walking: no nearby parks
194	WALK_F	Char	2			Reason for not walking: no sidewalks
195	WALK_G	Char	2			Reason for not walking: street crossings unsafe

CA-NHTS Sample Files

Person File

Variables in Creation Order						
#	**Variable**	**Type**	**Len**	**Format**	**Informat**	**Label**
196	WALK_H	Char	2			Reason for not walking: no shops or interesting places to go
197	WALK_I	Char	2			Reason for not walking: not enough people around
198	WALK_J	Char	2			Reason for not walking: fear street crime
199	WALK_K	Char	2			Reason for not walking: too many cars
200	WALK_L	Char	2			Reason for not walking: fast traffic
201	WALK_M	Char	2			Reason for not walking: air pollution
202	WALK_N	Char	2			Reason for not walking: streets too wide
203	WALK_O	Char	2			Reason for not walking: too many things carry
204	WALK_P	Char	2			Reason for not walking: traveling with small children
205	WALK_Q	Char	2			Reason for not walking: not enough light
206	WALKHELP	Char	2			Uses aid to help get around
207	WEBUSE	Char	2			Frequency of internet use in past month
208	WKCNFIPS	Char	3	$3.	$3.	County FIPS for work address
209	WKCNTYA	Char	50	$50.	$50.	Work county
210	WKCTFIPS	Char	5	$5.	$5.	City FIPS for work address
211	WKFMHMXX	Num	4			Frequency of working from home in past month
212	WKFTPT	Char	2			Work full or part-time
213	WKRMHM	Char	2			Has option to work at home
214	WKSTFIPS	Char	2			State FIPS code for work address
215	WORKCT	Char	6			Work place Census Tract
216	WORKER	Char	2			Subject worker status
217	WORKGEO	Char	2	$2.	$2.	Work address geocoded
218	WORKLAT	Num	8			Work latitude
219	WORKLOC	Char	2			Respondent work location
220	WORKLONG	Num	8			Work longitude
221	WORKSTAT	Char	2			Workplace address - state
222	WORKZIP	Char	5			Zipcode of work location
223	WRKAMPM	Char	2			Arrival work -AM/PM
224	WRKHR	Num	3			Arrival work - hour
225	WRKMIN	Num	3			Arrival work - minute
226	WRKR	Char	2			Has a job
227	WRKTIME	Char	8			Usual arrival time at work
228	WRKTRANS	Char	2			Transportation mode to work last week

CA-NHTS Sample Files

Person File

Variables in Creation Order						
#	**Variable**	**Type**	**Len**	**Format**	**Informat**	**Label**
229	WRKTRNOS	Char	30			Transportation mode to work last week - other specify
230	PP13WGT	Num	8			ORIGINAL WEIGHT
231	YEARMIL2	Char	2			Annual mileage range for if unable to provide actual
232	YEARMILE	Num	8			Miles drove during past 12 months
233	YRMLCAP	Char	2			Indicates YEARMILE was capped
234	YRTOUS	Num	8			Year entered U.S.
235	WGTYRMON	Char	8			WGT_YR MONTH
236	WTPERFIN	Num	8			FINAL ADJ_WGT
237	DISTTOWK	Num	8			Distance to Work in Miles
238	TDAYDATE	Char	8			Travel Date YYYYMM
239	SFWGT	Num	8			FNAL ADJ_WGT Section F weight for 5-15 yr olds

CA-NHTS Sample Files

Vehicle File

Data Set Name	CA_NHTS.CA_VEH	**Observations**	44526
Member Type	DATA	**Variables**	77
Engine	V9	**Indexes**	0
Created	Friday, February 05, 2010 08:54:37 PM	**Observation Length**	408
Last Modified	Friday, February 05, 2010 08:54:37 PM	**Deleted Observations**	0
Protection	READ/ALTER	**Compressed**	NO
Data Set Type		**Sorted**	NO
Label			
Data Representation	WINDOWS_32		
Encoding	wlatin1 Western (Windows)		

Engine/Host Dependent Information	
Data Set Page Size	16384
Number of Data Set Pages	1114
First Data Page	1
Max Obs per Page	40
Obs in First Data Page	13
Number of Data Set Repairs	0
Filename	I:\Travel Surveys\NHTS CA Data\ca_veh.sas7bdat
Release Created	9.0202M0
Host Created	W32_VSHOME

CA-NHTS Sample Files

Vehicle File

Variables in Creation Order						
#	**Variable**	**Type**	**Len**	**Format**	**Informat**	**Label**
1	HOUSEID	Char	8	$8.	$8.	HH eight-digit ID number
2	HHSTATE	Char	2	$2.	$2.	State HH location
3	HH_HISP	Char	2			Hispanic status of HH respondent
4	HH_RACE	Char	2			Race of HH respondent
5	HHR_HISP	Char	2			Hispanic Status of HH respondent
6	HHR_RACE	Char	2			Race of HH respondent
7	DRVRCNT	Num	8			Number of Drivers in HH
8	CMPLTPCT	Num	8			PERCENT COMPLETE
9	HHCNTYFP	Char	3	$3.	$3.	County FIPS code for home address
10	HHCT	Char	6			HH Census Tract
11	HHFAMINC	Char	2			Derived total HH income
12	HHSIZE	Num	8			Count or HH members
13	HHVEHCNT	Num	8			Count of HH vehicles
14	HOMEOWN	Char	2	$2.		Housing unit owned or rented
15	HOMETYPE	Char	2			Type of housing unit
16	NUMADLT	Num	8			Count of adult HHMs at least 18 years old
17	FLAG100	Char	2			100% COMPLETE FLAG
18	LIF_CYC	Char	2			LIFE CYCLE CLASSIFICATION
19	LANDCELL	Char	2	$2.		Land line or cell phone household
20	WGTYRMON	Char	8			WGT_YEAR MONTH
21	WTHHFIN	Num	8			FNAL ADJ_WGT
22	VEHID	Char	2			HH vehicle number used for trip
23	CBSACAT	Char	2	$2.		CBSA category for the HH home address
24	CBSASIZE	Char	2	$2.		CBSA population size for the HH home address
25	CDIVMSAR	Char	2	$2.		Grouping of HH by combination of Census Division, MSA status, and presence of a subway system (if area > 1 million)
26	CENSUS_D	Char	2	$2.		Census division classification for home address
27	CENSUS_R	Char	2	$2.		Census region classification for home address
28	ESTMILE2	Char	2			Mileage range for number of miles vehicle driven since S purchased
29	ESTMILES	Num	5			Miles vehicle driven since S purchased
30	HH_CBSA	Char	5	$5.	$5.	CBSA FIPS code for HH address
31	HH_CSA	Char	3	$3.	$3.	CSA FIPS code for HH address
32	HH_MSA	Char	4	$4.	$4.	MSA FIPS code for HH address

CA-NHTS Sample Files

Vehicle File

Variables in Creation Order						
#	**Variable**	**Type**	**Len**	**Format**	**Informat**	**Label**
33	HHC_MSA	Char	4	$4.	$4.	CMSA FIPS code for HH address
34	HHCITYFP	Char	5	$5.	$5.	City FIPS code for home address
35	HHP_MSA	Char	4	$4.	$4.	PMSA FIPS code for HH address
36	HHMETDIV	Char	5	$5.	$5.	Metro Division FIPS code for HH address
37	HHSTFIPS	Char	2	$2.	$2.	State FIPS for HH address
38	HYBRID	Char	2			Hybrid vehicle
39	L_MAKE	Char	2			Vehicle make name (from question L7)
40	L_MODEL	Char	3			Vehicle model name (from question L7)
41	L_VYEAR	Num	4			Vehicle model year (from question L7)
42	LANG	Char	2			Language interview was conducted in
43	MAKECODE	Char	2			NASS vehicle make code
44	MODLCODE	Char	3			NASS vehicle model code
45	MAKENAME	Char	62	$30.	$30.	Vehicle make name
46	MODLNAME	Char	30			Vehicle model name
47	MSACAT	Char	2	$2.		MSA category for the HH home address
48	MSASIZE	Char	2	$2.		MSA population size for the HH home address
49	OD_DAY	Num	3			Day of odometer reading
50	OD_MONTH	Num	3			Month of odometer reading
51	OD_READ	Num	5			Odometer reading
52	OD_YEAR	Num	8			Year of odometer reading
53	OWNUNIT	Char	2			How long vehicle owned - unit
54	RAIL	Char	2			MSA heavy rail status for HH
55	SAMPQTR	Char	2			Quarter in which sample was drawn
56	STRATUM	Char	2			Geographic site within SMPLSRCE
57	TDAYDAT2	Char	8			Travel day - date
58	TRAVDAY	Char	2			Travel day - day of week
59	URBAN	Char	2	$2.		Home address in urbanized area
60	URBANSIZE	Char	2	$2.		Size of urban area in which home address is located
61	URBRUR	Char	2			Household in urban/rural area
62	VEH12MNT	Char	2			Vehicle received in the last 12 months
63	VEHCOMM	Char	2			Commercial license plate
64	VEHMILE2	Char	2			Annual mileage range for vehicle if S unable to provide actual
65	VEHMILES	Num	8			Miles vehicle driven last 12 months

CA-NHTS Sample Files

Vehicle File

Variables in Creation Order						
#	**Variable**	**Type**	**Len**	**Format**	**Informat**	**Label**
66	VEHOWNED	Num	8			How long vehicle owned - number
67	VEHOWNMO	Num	8			How long vehicle owned - Months
68	VEHTYPE	Char	3			Vehicle type
69	VEHTYOS	Char	30			Vehicle Type - Other
70	VEHYEAR	Num	4			Vehicle year
71	VERESTML	Char	2			Verify number of miles vehicle driven since S purchased
72	VERMILES	Char	2			Verify miles vehicle driven last 12 months
73	WHOMAIN	Char	2			Person number of primary driver
74	WRKCOUNT	Num	8			Number of workers in HH
75	HH13WGT	Num	8			Final HH weight
76	TDAYDATE	Char	8			Travel Date YYYYMM
77	VEHAGE	Num	8			Vehicle Age

APPENDIX B- VARIABLES IN NHTS MODEL

Land Use Variables Created with 1/4 miles buffer of each NHTS Household

Basic Quantities	**FIELD NAME**	**DESCRIPTION**
POPULATION	POP	Total popluation
HOUSEHOLDS	HH	Total household
EMPLOYMENT	EMP	Total empoloyment
RETAIL EMP	RETAIL	Retail employment (NAICS2D = 44 and 45 which is the same as SCAG Retail Trade)
GOV EMP	GOV	Governmnet empolyment (NAICS = SCAG #13. Government)
IND EMP	IND	Industrial employment (NAICS 13 = 3.Manufacturing))
SERV IMP	SERV	Service empolyment (NAICS2D =51,54,55,56,61,62, and 81)
DEVLOPED LAND	DEVLAND	Acreages of all parcels except vacant, recreational, agricultural, and transportation and utilities
SFDU	SFHH	Total multi family dwelling units
MFDU	MFHH	Total Single family dwelling units
ACTIVITY	ACTIVITY	Total Job + Total popluation
POPAREA	RESI_ACRE	Residential parcel acreages
EMPAREA	EMP_ACRE	Empolyment parcel acerages
FAR	FAR	Average Net FAR (IMPSQFT/LOTSQFT)
RETFAR	RETAIL_FAR	Average retail parcel net FAR

Density Variables		
GRPOPDEN	GRS_POPDEN	Gross population density (POP/Total acres of the buffer)
NTPOPDEN	NET_POPDEN	Net population density (POP/RESI_ACRE)
NTHHDEN	NET_HHDEN	Net household density (HH/RESI_ACRE)
GREMPDEN	GRS_EMPDEN	Gross empolyment density (EMP/Total acres of the buffer)
NTEMPDEN	NET_EMPDEN	Net employment density (EMP/EMP_ACRE)
ACTDEN	GRS_ACTDEN	Gross activity density (ACTIVITY/Total acres of the buffer)
NETACTDEN	NET_ACTDEN	Net activity density (ACTIVITY / DEVLAND)

Diversity Variables		
JOBPOP	JOBPOP	Job/population balance
RETPOP	RETAILPOP	Retai job/population balance
LANDMIX	LANDMIX	LANDMIX = [SF share*LN (single family share) + MF share*LN (multifamily share)+Commercial share*LN (commercial share)+ ind share*LN (industrial share)+public share*LN(public share)]/LN (5)

JOBMIX	JOBMIX	Job mix (-(Retail Share X LN(Retail Share))+ (Service Share X LN(Service Share)) + (FIRE Share X LN(FIRE Share))+ (TCPU Share X LN(TCPU Share)) / LN(4))
		FIRE (NAICS2D =52 and 53 Which are the same as NAICS13 =08. FIRE) , TCPU (NAICS2D = 48 And 22)
Dissimilarity	DISSIM13_G	13 categories land use
	DISSIM6_G	6 categories land use
Net Dissimilarity	DISSIM13_N	13 categories land use
	DISSIM6_N	6 categories land use
Entropy		
Design		
4WATINT	4WAY_INT	The percent of 4way intersections
CONNECT	WalkaInx1	3-leg and 4-leg node density
RETFOOD	RETAILFOOD	Number of food or restaurant bussiness (NAICS2D = 72)
STOPDEN	BusStops	Number of bus stops
STADEN	RailStops	Number of rail stations
STRDEN	ST_DENSITY	Sreet centerline density (Total miles of all streets / Total acres of the buffer)
INTDEN	INT_DEN	Intersection density (INTERSEC / Total acres of the buffer) - INTERSEC field stroing the number of intersection

Methodology to Calculate JOBMIX2 variable and Accessibility

JOBMIX2

SCAG TAZ data contains employment by 13 sectors (i =1 to 13).

SLNS_i = (TAZ job share of sector i) * LN (TAZ job share of sector i)

JOBMIX2 = SUM(SLNS_i)/Ln(13)

i: 13 employment sectors in TAZ

Accessibility

For each trip production TAZ, accessibility is calculated by sum of employment dividing by zone-to-zone travel time of each attraction TAZ

For Auto: use 11268 Tier2 TAZ

For Local Bus: use 4109 Tier1 TAZ

Major Transit Stop for Bus (BUS TPP) and Rail (Rail TPP):

A site containing an existing rail transit station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service interval of 15 minutes or less during the morning and afternoon peak commute periods (CA Public Resource Code Section 21064.3). It also includes major transit stops that are included in the applicable regional transportation plan.

APPENDIX C- DESCRIPTIVE STATISTICS FOR VARIABLES IN NHTS MODEL

Sub-Model # 1: Auto Ownership

The CORR Procedure

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	hhcar	wker	nw0015	nw1664	nw6500	inc10K	LGRSHH	LGRSEMP
hhcar	1.00000	0.47930	0.10949	0.15620	-0.16891	0.42151	-0.21036	-0.19621
		<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	6663	6663	6663	6663	6663	6663	6663	6663
wker	0.47930	1.00000	0.19898	-0.09037	-0.51141	0.39610	-0.01522	-0.04591
	<.0001		<.0001	<.0001	<.0001	<.0001	0.2142	0.0002
	6663	6663	6663	6663	6663	6663	6663	6663
nw0015	0.10949	0.19898	1.00000	0.16947	-0.22189	0.06808	-0.01406	-0.03178
	<.0001	<.0001		<.0001	<.0001	<.0001	0.2511	0.0095
	6663	6663	6663	6663	6663	6663	6663	6663
nw1664	0.15620	-0.09037	0.16947	1.00000	-0.30329	-0.03581	-0.01648	-0.03320
	<.0001	<.0001	<.0001		<.0001	0.0035	0.1786	0.0067
	6663	6663	6663	6663	6663	6663	6663	6663
nw6500	-0.16891	-0.51141	-0.22189	-0.30329	1.00000	-0.23594	-0.05707	-0.03508
	<.0001	<.0001	<.0001	<.0001		<.0001	<.0001	0.0042
	6663	6663	6663	6663	6663	6663	6663	6663

The CORR Procedure

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	hhcar	wker	nw0015	nw1664	nw6500	inc10K	LGRSHH	LGRSEMP
inc10K	0.42151	0.39610	0.06808	-0.03581	-0.23594	1.00000	-0.11511	-0.15625
	<.0001	<.0001	<.0001	0.0035	<.0001		<.0001	<.0001
	6663	6663	6663	6663	6663	6663	6663	6663
LGRSHH	-0.21036	-0.01522	-0.01406	-0.01648	-0.05707	-0.11511	1.00000	0.46562
	<.0001	0.2142	0.2511	0.1786	<.0001	<.0001		<.0001
	6663	6663	6663	6663	6663	6663	6663	6663
LGRSEMP	-0.19621	-0.04591	-0.03178	-0.03320	-0.03508	-0.15625	0.46562	1.00000
	<.0001	0.0002	0.0095	0.0067	0.0042	<.0001	<.0001	
	6663	6663	6663	6663	6663	6663	6663	6663

Jobmix2	-0.08146	-0.02471	-0.03606	-0.03276	-0.01171	-0.01946	0.17641	0.16788
	<.0001	0.0437	0.0033	0.0075	0.3391	0.1122	<.0001	<.0001
	6661	6661	6661	6661	6661	6661	6661	6661
WalkaInx1	-0.13948	-0.04091	-0.04894	-0.05120	-0.01477	-0.03156	0.33617	0.25436
	<.0001	0.0009	<.0001	<.0001	0.2289	0.0101	<.0001	<.0001
	6635	6635	6635	6635	6635	6635	6635	6635
Ldlbushq	-0.15356	-0.02875	0.01213	0.00956	-0.03956	-0.12750	0.30443	0.28242
	<.0001	0.0189	0.3220	0.4352	0.0012	<.0001	<.0001	<.0001
	6663	6663	6663	6663	6663	6663	6663	6663
JH5mi08	-0.04781	0.01629	-0.00104	-0.00370	-0.02630	0.05713	0.21120	0.20312
	<.0001	0.1837	0.9323	0.7629	0.0318	<.0001	<.0001	<.0001
	6661	6661	6661	6661	6661	6661	6661	6661
bs_LGRSHH	-0.18953	-0.04402	-0.02455	-0.00578	-0.03973	-0.14660	0.45328	0.34415
	<.0001	0.0003	0.0451	0.6372	0.0012	<.0001	<.0001	<.0001
	6663	6663	6663	6663	6663	6663	6663	6663
rl_LGRSHH	-0.11444	-0.01138	-0.01279	-0.00898	-0.03575	-0.10568	0.20671	0.17075
	<.0001	0.3531	0.2965	0.4638	0.0035	<.0001	<.0001	<.0001
	6663	6663	6663	6663	6663	6663	6663	6663

The CORR Procedure

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	Jobmix2	Walka Inx1	Ldlbushq	JH5mi08	bs_LGRSHH	rl_LGRSHH
hhcar	-0.08146	-0.13948	-0.15356	-0.04781	-0.18953	-0.11444
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	6661	6635	6663	6661	6663	6663
wker	-0.02471	-0.04091	-0.02875	0.01629	-0.04402	-0.01138
	0.0437	0.0009	0.0189	0.1837	0.0003	0.3531
	6661	6635	6663	6661	6663	6663
nw0015	-0.03606	-0.04894	0.01213	-0.00104	-0.02455	-0.01279
	0.0033	<.0001	0.3220	0.9323	0.0451	0.2965
	6661	6635	6663	6661	6663	6663
nw1664	-0.03276	-0.05120	0.00956	-0.00370	-0.00578	-0.00898
	0.0075	<.0001	0.4352	0.7629	0.6372	0.4638
	6661	6635	6663	6661	6663	6663
nw6500	-0.01171	-0.01477	-0.03956	-0.02630	-0.03973	-0.03575

	0.3391	0.2289	0.0012	0.0318	0.0012	0.0035
	6661	6635	6663	6661	6663	6663
inc10K	-0.01946	-0.03156	-0.12750	0.05713	-0.14660	-0.10568
	0.1122	0.0101	<.0001	<.0001	<.0001	<.0001
	6661	6635	6663	6661	6663	6663
LGRSHH	0.17641	0.33617	0.30443	0.21120	0.45328	0.20671
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	6661	6635	6663	6661	6663	6663
LGRSEMP	0.16788	0.25436	0.28242	0.20312	0.34415	0.17075
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	6661	6635	6663	6661	6663	6663
Jobmix2	1.00000	0.08760	0.05435	0.04045	0.11762	0.04214
		<.0001	<.0001	0.0010	<.0001	0.0006
	6661	6633	6661	6661	6661	6661
Walkalnx1	0.08760	1.00000	0.18918	0.13079	0.26037	0.07688
	<.0001		<.0001	<.0001	<.0001	<.0001
	6633	6635	6635	6633	6635	6635
Ldlbushq	0.05435	0.18918	1.00000	0.07640	0.39714	0.18998
	<.0001	<.0001		<.0001	<.0001	<.0001
	6661	6635	6663	6661	6663	6663

The CORR Procedure

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	Jobmix2	Walka lnx1	Ldlbushq	JH5mi08	bs_LGRSHH	rl_LGRSHH
JH5mi08	0.04045	0.13079	0.07640	1.00000	0.10947	0.01455
	0.0010	<.0001	<.0001		<.0001	0.2350
	6661	6633	6661	6661	6661	6661
bs_LGRSHH	0.11762	0.26037	0.39714	0.10947	1.00000	-0.08822
	<.0001	<.0001	<.0001	<.0001		<.0001
	6661	6635	6663	6661	6663	6663
rl_LGRSHH	0.04214	0.07688	0.18998	0.01455	-0.08822	1.00000
	0.0006	<.0001	<.0001	0.2350	<.0001	
	6661	6635	6663	6661	6663	6663

The MEANS Procedure

Variable	N	Mean	Minimum	Maximum	Std Dev	5th Pctl
hhcar	6663	2.0400720	0	5.0000000	1.1109496	0
wker	6663	0.9869428	0	5.0000000	0.9151863	0
nw0015	6663	0.2962629	0	5.0000000	0.6798530	0
nw1664	6663	0.4672070	0	5.0000000	0.6758013	0
nw6500	6663	0.4311872	0	4.0000000	0.6688371	0
inc10K	6663	4.8446549	0.1845000	9.2250000	3.0072699	0.9225000
LGRSHH	6663	1.2181075	-11.1880433	3.8314517	0.9505185	-0.2997618
LGRSEMP	6663	-0.2468652	-12.7939171	5.6542977	2.1488105	-3.4028034
Jobmix2	6661	0.6029978	0	0.9167701	0.1768198	0.2444364
Walkalnx1	6635	16.6874544	0	46.3500000	10.2409558	3.1000000
Ldlbushq	6663	-3.0484582	-11.8581772	1.9992292	1.1171087	-5.0253038
JH5mi08	6661	1.3425122	0	16.5000000	0.5793517	0.5271507
bs_LGRSHH	6663	0.4273639	-2.9957323	3.6171777	0.8354232	0
rl_LGRSHH	6663	0.0680774	-2.9957323	3.8314517	0.3948115	0

Variable	10th Pctl	25th Pctl	50th Pctl	75th Pctl	95th Pctl	99th Pctl
hhcar	1.0000000	1.0000000	2.0000000	3.0000000	4.0000000	5.0000000
wker	0	0	1.0000000	2.0000000	3.0000000	3.0000000
nw0015	0	0	0	0	2.0000000	3.0000000
nw1664	0	0	0	1.0000000	2.0000000	3.0000000
nw6500	0	0	0	1.0000000	2.0000000	2.0000000
inc10K	1.2915000	2.3985000	4.2435000	9.2250000	9.2250000	9.2250000
LGRSHH	0.2354035	0.8736418	1.3210785	1.7262196	2.4793933	3.1116669
LGRSEMP	-2.9957323	-1.9648803	0.2884614	1.3481284	2.5659057	3.5244595
Jobmix2	0.3525014	0.5074766	0.6419962	0.7345186	0.8236766	0.8621536
Walkalnx1	5.0000000	9.0000000	14.7000000	22.8000000	38.8000000	41.8000000
Ldlbushq	-4.4064620	-3.3273236	-2.9957323	-2.9957323	-1.0224635	0.0162428
JH5mi08	0.7053992	1.0417913	1.2961989	1.5829435	2.2829983	3.1622773
bs_LGRSHH	0	0	0	0	2.2978877	2.9606244
rl_LGRSHH	0	0	0	0	0	2.2928653

Sub- Model #2 - Vehicle

The CORR Procedure

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	DA	wker	nw0015	nw1664	nw6500	inc10K
DA	1.00000	-0.31220	-0.09448	-0.03341	0.11142	-0.28241
		<.0001	<.0001	0.0208	<.0001	<.0001
	4787	4787	4787	4787	4787	4787
wker	-0.31220	1.00000	0.19719	-0.09892	-0.50405	0.39073
	<.0001		<.0001	<.0001	<.0001	<.0001
	4787	4787	4787	4787	4787	4787
nw0015	-0.09448	0.19719	1.00000	0.16378	-0.21394	0.05192
	<.0001	<.0001		<.0001	<.0001	0.0003
	4787	4787	4787	4787	4787	4787
nw1664	-0.03341	-0.09892	0.16378	1.00000	-0.29638	-0.04855
	0.0208	<.0001	<.0001		<.0001	0.0008
	4787	4787	4787	4787	4787	4787
nw6500	0.11142	-0.50405	-0.21394	-0.29638	1.00000	-0.22917
	<.0001	<.0001	<.0001	<.0001		<.0001
	4787	4787	4787	4787	4787	4787
inc10K	-0.28241	0.39073	0.05192	-0.04855	-0.22917	1.00000
	<.0001	<.0001	0.0003	0.0008	<.0001	
	4787	4787	4787	4787	4787	4787

The CORR Procedure

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	DA	wker	nw0015	nw1664	nw6500	inc10K
hhcar	-0.35968	0.47923	0.10191	0.14963	-0.17003	0.41204
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	4787	4787	4787	4787	4787	4787
Walkalnx1	0.11619	-0.04976	-0.05618	-0.04812	-0.00496	-0.02701
	<.0001	0.0006	0.0001	0.0009	0.7318	0.0622
	4768	4768	4768	4768	4768	4768
Ldlbushq	0.12331	-0.03170	0.02216	0.01446	-0.03580	-0.12672
	<.0001	0.0283	0.1253	0.3171	0.0132	<.0001
	4787	4787	4787	4787	4787	4787

bs_LGRSHH	0.13508	-0.04837	-0.02057	-0.00562	-0.02656	-0.14613
	<.0001	0.0008	0.1547	0.6977	0.0661	<.0001
	4787	4787	4787	4787	4787	4787
rl_LGRSHH	0.10601	-0.00896	-0.00687	-0.02070	-0.03705	-0.10660
	<.0001	0.5353	0.6345	0.1521	0.0104	<.0001
	4787	4787	4787	4787	4787	4787

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	hhcar	Walka lnx1	Ldlbushq	bs_LGRSHH	rl_LGRSHH
DA	-0.35968	0.11619	0.12331	0.13508	0.10601
	<.0001	<.0001	<.0001	<.0001	<.0001
	4787	4768	4787	4787	4787
wker	0.47923	-0.04976	-0.03170	-0.04837	-0.00896
	<.0001	0.0006	0.0283	0.0008	0.5353
	4787	4768	4787	4787	4787
nw0015	0.10191	-0.05618	0.02216	-0.02057	-0.00687
	<.0001	0.0001	0.1253	0.1547	0.6345
	4787	4768	4787	4787	4787
nw1664	0.14963	-0.04812	0.01446	-0.00562	-0.02070
	<.0001	0.0009	0.3171	0.6977	0.1521
	4787	4768	4787	4787	4787

The CORR Procedure

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	hhcar	Walka lnx1	Ldlbushq	bs_LGRSHH	rl_LGRSHH
nw6500	-0.17003	-0.00496	-0.03580	-0.02656	-0.03705
	<.0001	0.7318	0.0132	0.0661	0.0104
	4787	4768	4787	4787	4787
inc10K	0.41204	-0.02701	-0.12672	-0.14613	-0.10660
	<.0001	0.0622	<.0001	<.0001	<.0001
	4787	4768	4787	4787	4787
hhcar	1.00000	-0.13949	-0.15556	-0.19017	-0.11153
		<.0001	<.0001	<.0001	<.0001
	4787	4768	4787	4787	4787

Walkalnx1	-0.13949	1.00000	0.19536	0.26113	0.07541
	<.0001		<.0001	<.0001	<.0001
	4768	4768	4768	4768	4768
Ldlbushq	-0.15556	0.19536	1.00000	0.39880	0.19335
	<.0001	<.0001		<.0001	<.0001
	4787	4768	4787	4787	4787
bs_LGRSHH	-0.19017	0.26113	0.39880	1.00000	-0.09232
	<.0001	<.0001	<.0001		<.0001
	4787	4768	4787	4787	4787
rl_LGRSHH	-0.11153	0.07541	0.19335	-0.09232	1.00000
	<.0001	<.0001	<.0001	<.0001	
	4787	4768	4787	4787	4787

The MEANS Procedure

Variable	N	Mean	Minimum	Maximum	Std Dev	5th Pctl
DA	4787	0.1727596	0	1.0000000	0.3780788	0
wker	4787	0.9945686	0	5.0000000	0.9107542	0
nw0015	4787	0.2893253	0	5.0000000	0.6684153	0
nw1664	4787	0.4616670	0	5.0000000	0.6748599	0
nw6500	4787	0.4288699	0	4.0000000	0.6662621	0
inc10K	4787	4.8538878	0.1845000	9.2250000	3.0056758	0.9225000
hhcar	4787	2.0288281	0	5.0000000	1.1014201	0
Walkalnx1	4768	16.5280390	0	46.3500000	10.1829664	3.0000000
Ldlbushq	4787	-3.0539513	-11.8581772	1.9992292	1.1316296	-5.0460919
bs_LGRSHH	4787	0.4298598	-2.9957323	3.6171777	0.8400545	0
rl_LGRSHH	4787	0.0736702	-2.9957323	3.8019815	0.4084371	0

Variable	10th Pctl	25th Pctl	50th Pctl	75th Pctl	95th Pctl	99th Pctl
DA	0	0	0	0	1.0000000	1.0000000
wker	0	0	1.0000000	2.0000000	3.0000000	3.0000000
nw0015	0	0	0	0	2.0000000	3.0000000
nw1664	0	0	0	1.0000000	2.0000000	3.0000000
nw6500	0	0	0	1.0000000	2.0000000	2.0000000
inc10K	1.2915000	2.3985000	4.2435000	9.2250000	9.2250000	9.2250000
hhcar	1.0000000	1.0000000	2.0000000	3.0000000	4.0000000	5.0000000
Walkalnx1	4.9000000	8.9000000	14.5000000	22.6000000	38.5000000	41.6300000
Ldlbushq	-4.4294055	-3.3595317	-2.9957323	-2.9957323	-0.9959028	-0.0028353
bs_LGRSHH	0	0	0	0	2.3072962	2.9618277
rl_LGRSHH	0	0	0	0	0	2.3705318

Sub-Model #3 - Household Trips

The CORR Procedure

Pearson Correlation Coefficients, N = 4787
Prob > |r| under H0: Rho=0

	trip	wker	nw0015	nw1664	nw6500	inc10K	LGRSEMP	hhcar
trip	1.00000	0.44249	0.52903	0.25755	-0.18894	0.23956	-0.05020	0.34621
		<.0001	<.0001	<.0001	<.0001	<.0001	0.0005	<.0001
wker	0.44249	1.00000	0.19719	-0.09892	-0.50405	0.39073	-0.05321	0.47923
	<.0001		<.0001	<.0001	<.0001	<.0001	0.0002	<.0001
nw0015	0.52903	0.19719	1.00000	0.16378	-0.21394	0.05192	-0.03363	0.10191
	<.0001	<.0001		<.0001	<.0001	0.0003	0.0200	<.0001
nw1664	0.25755	-0.09892	0.16378	1.00000	-0.29638	-0.04855	-0.03633	0.14963
	<.0001	<.0001	<.0001		<.0001	0.0008	0.0119	<.0001
nw6500	-0.18894	-0.50405	-0.21394	-0.29638	1.00000	-0.22917	-0.02374	-0.17003
	<.0001	<.0001	<.0001	<.0001		<.0001	0.1005	<.0001
inc10K	0.23956	0.39073	0.05192	-0.04855	-0.22917	1.00000	-0.16000	0.41204
	<.0001	<.0001	0.0003	0.0008	<.0001		<.0001	<.0001
LGRSEMP	-0.05020	-0.05321	-0.03363	-0.03633	-0.02374	-0.16000	1.00000	-0.19740
	0.0005	0.0002	0.0200	0.0119	0.1005	<.0001		<.0001
hhcar	0.34621	0.47923	0.10191	0.14963	-0.17003	0.41204	-0.19740	1.00000
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	

The MEANS Procedure

Variable	N	Mean	Minimum	Maximum	Std Dev	5th Pctl
trip	4787	8.4010863	0	47.0000000	6.5702656	0
wker	4787	0.9945686	0	5.0000000	0.9107542	0
nw0015	4787	0.2893253	0	5.0000000	0.6684153	0
nw1664	4787	0.4616670	0	5.0000000	0.6748599	0
nw6500	4787	0.4288699	0	4.0000000	0.6662621	0
inc10K	4787	4.8538878	0.1845000	9.2250000	3.0056758	0.9225000
LGRSEMP	4787	-0.2328571	-12.0936951	4.9590131	2.1668504	-3.4124839
hhcar	4787	2.0288281	0	5.0000000	1.1014201	0

Variable	10th Pctl	25th Pctl	50th Pctl	75th Pctl	95th Pctl	99th Pctl
trip	2.0000000	4.0000000	7.0000000	12.0000000	21.0000000	30.0000000
wker	0	0	1.0000000	2.0000000	3.0000000	3.0000000
nw0015	0	0	0	0	2.0000000	3.0000000
nw1664	0	0	0	1.0000000	2.0000000	3.0000000
nw6500	0	0	0	1.0000000	2.0000000	2.0000000
inc10K	1.2915000	2.3985000	4.2435000	9.2250000	9.2250000	9.2250000
LGRSEMP	-2.9957323	-1.9984345	0.3333864	1.3712058	2.5972710	3.5428241
hhcar	1.0000000	1.0000000	2.0000000	3.0000000	4.0000000	5.0000000

Sub-Model #4 - Mode Choice

The CORR Procedure

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	wker	nw0015	nw1664	nw6500	inc10K	LGRSHH	LGRSEMP	Walka lnx1
wker	1.00000	0.13547	-0.16202	-0.45494	0.32802	-0.01124	-0.06206	-0.03298
		<.0001	<.0001	<.0001	<.0001	0.0242	<.0001	<.0001
	40216	40216	40216	40216	40216	40216	40216	40190
nw0015	0.13547	1.00000	0.12434	-0.24039	0.00834	-0.01767	-0.03610	-0.04343
	<.0001		<.0001	<.0001	0.0946	0.0004	<.0001	<.0001
	40216	40216	40216	40216	40216	40216	40216	40190
nw1664	-0.16202	0.12434	1.00000	-0.24697	-0.11811	-0.01477	-0.03639	-0.03866
	<.0001	<.0001		<.0001	<.0001	0.0031	<.0001	<.0001
	40216	40216	40216	40216	40216	40216	40216	40190
nw6500	-0.45494	-0.24039	-0.24697	1.00000	-0.21042	-0.03980	-0.01302	-0.00751
	<.0001	<.0001	<.0001		<.0001	<.0001	0.0090	0.1324
	40216	40216	40216	40216	40216	40216	40216	40190
inc10K	0.32802	0.00834	-0.11811	-0.21042	1.00000	-0.11853	-0.17046	0.00809
	<.0001	0.0946	<.0001	<.0001		<.0001	<.0001	0.1049
	40216	40216	40216	40216	40216	40216	40216	40190

The CORR Procedure

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	wker	nw0015	nw1664	nw6500	inc10K	LGRSHH	LGRSEMP	Walka lnx1
LGRSHH	-0.01124	-0.01767	-0.01477	-0.03980	-0.11853	1.00000	0.45479	0.28491
	0.0242	0.0004	0.0031	<.0001	<.0001		<.0001	<.0001
	40216	40216	40216	40216	40216	40216	40216	40190
LGRSEMP	-0.06206	-0.03610	-0.03639	-0.01302	-0.17046	0.45479	1.00000	0.23627
	<.0001	<.0001	<.0001	0.0090	<.0001	<.0001		<.0001
	40216	40216	40216	40216	40216	40216	40216	40190
Walkalnx1	-0.03298	-0.04343	-0.03866	-0.00751	0.00809	0.28491	0.23627	1.00000
	<.0001	<.0001	<.0001	0.1324	0.1049	<.0001	<.0001	
	40190	40190	40190	40190	40190	40190	40190	40190

Ld|bushq	-0.03197	0.03562	0.01411	-0.02212	-0.13258	0.29183	0.26157	0.16419
	<.0001	<.0001	0.0047	<.0001	<.0001	<.0001	<.0001	<.0001
	40216	40216	40216	40216	40216	40216	40216	40190
hhcar	0.48117	0.04772	0.12670	-0.14571	0.35846	-0.20063	-0.18059	-0.10815
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	40216	40216	40216	40216	40216	40216	40216	40190
JH5mi08	0.01037	-0.00447	-0.02954	-0.00873	0.08159	0.23487	0.22261	0.13016
	0.0375	0.3697	<.0001	0.0799	<.0001	<.0001	<.0001	<.0001
	40189	40189	40189	40189	40189	40189	40189	40163
LBtime08M	0.00270	-0.03188	-0.00273	-0.01561	-0.07094	0.51277	0.41676	0.27274
	0.5890	<.0001	0.5841	0.0018	<.0001	<.0001	<.0001	<.0001
	40189	40189	40189	40189	40189	40189	40189	40163
bs_LBtime	-0.04887	-0.02748	0.01334	-0.00954	-0.12711	0.36475	0.33199	0.22898
	<.0001	<.0001	0.0075	0.0557	<.0001	<.0001	<.0001	<.0001
	40189	40189	40189	40189	40189	40189	40189	40163
r|_LBtime	-0.00743	-0.01311	-0.03088	-0.02234	-0.11580	0.17001	0.17265	0.05644
	0.1362	0.0086	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	40189	40189	40189	40189	40189	40189	40189	40163

The CORR Procedure

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	Ld|bushq	hhcar	JH5mi08	LBtime08M	bs_LBtime	r|_LBtime
wker	-0.03197	0.48117	0.01037	0.00270	-0.04887	-0.00743
	<.0001	<.0001	0.0375	0.5890	<.0001	0.1362
	40216	40216	40189	40189	40189	40189
nw0015	0.03562	0.04772	-0.00447	-0.03188	-0.02748	-0.01311
	<.0001	<.0001	0.3697	<.0001	<.0001	0.0086
	40216	40216	40189	40189	40189	40189
nw1664	0.01411	0.12670	-0.02954	-0.00273	0.01334	-0.03088
	0.0047	<.0001	<.0001	0.5841	0.0075	<.0001
	40216	40216	40189	40189	40189	40189
nw6500	-0.02212	-0.14571	-0.00873	-0.01561	-0.00954	-0.02234
	<.0001	<.0001	0.0799	0.0018	0.0557	<.0001
	40216	40216	40189	40189	40189	40189
inc10K	-0.13258	0.35846	0.08159	-0.07094	-0.12711	-0.11580
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	40216	40216	40189	40189	40189	40189
LGRSHH	0.29183	-0.20063	0.23487	0.51277	0.36475	0.17001
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

	40216	40216	40189	40189	40189	40189
LGRSEMP	0.26157	-0.18059	0.22261	0.41676	0.33199	0.17265
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	40216	40216	40189	40189	40189	40189
Walkalnx1	0.16419	-0.10815	0.13016	0.27274	0.22898	0.05644
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	40190	40190	40163	40163	40163	40163
Ldlbushq	1.00000	-0.15273	0.07909	0.32363	0.39458	0.18843
		<.0001	<.0001	<.0001	<.0001	<.0001
	40216	40216	40189	40189	40189	40189
hhcar	-0.15273	1.00000	-0.04696	-0.11475	-0.15104	-0.11389
	<.0001		<.0001	<.0001	<.0001	<.0001
	40216	40216	40189	40189	40189	40189
JH5mi08	0.07909	-0.04696	1.00000	0.24465	0.11163	0.01471
	<.0001	<.0001		<.0001	<.0001	0.0032
	40189	40189	40189	40189	40189	40189

The CORR Procedure

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	Ldlbushq	hhcar	JH5mi08	LBtime08M	bs_LBtime	rl_LBtime
LBtime08M	0.32363	-0.11475	0.24465	1.00000	0.48908	0.22015
	<.0001	<.0001	<.0001		<.0001	<.0001
	40189	40189	40189	40189	40189	40189
bs_LBtime	0.39458	-0.15104	0.11163	0.48908	1.00000	-0.09222
	<.0001	<.0001	<.0001	<.0001		<.0001
	40189	40189	40189	40189	40189	40189
rl_LBtime	0.18843	-0.11389	0.01471	0.22015	-0.09222	1.00000
	<.0001	<.0001	0.0032	<.0001	<.0001	
	40189	40189	40189	40189	40189	40189

The MEANS Procedure

Variable	N	Mean	Minimum	Maximum	Std Dev	5th Pctl
wker	40216	1.3096777	0	5.0000000	0.9638147	0
nw0015	40216	0.5658196	0	5.0000000	0.8899927	0
nw1664	40216	0.5975731	0	5.0000000	0.7514605	0
nw6500	40216	0.3304406	0	4.0000000	0.6288235	0
inc10K	40216	5.4169028	0.1845000	9.2250000	3.0307777	0.9225000
LGRSHH	40216	1.1904603	-11.1880433	3.8019815	0.9267119	-0.2454715
LGRSEMP	40216	-0.3179095	-12.0936951	4.9590131	2.1474511	-3.6154494
Walkalnx1	40190	16.0178077	0	46.3500000	10.0794075	2.8000000
Ldlbushq	40216	-3.0811344	-11.8581772	1.9992292	1.0902015	-5.0179872
hhcar	40216	2.3269843	0	5.0000000	1.1062666	1.0000000
JH5mi08	40189	1.3552300	0	6.0874862	0.5544806	0.5276912
LBtime08M	40189	0.0651248	0	0.1398773	0.0279731	0.000539051
bs_LBtime	40189	0.0190144	0	0.1278706	0.0372310	0
rl_LBtime	40189	0.0031329	0	0.1398773	0.0173515	0

Variable	10th Pctl	25th Pctl	50th Pctl	75th Pctl	95th Pctl	99th Pctl
wker	0	1.0000000	1.0000000	2.0000000	3.0000000	4.0000000
nw0015	0	0	0	1.0000000	2.0000000	3.0000000
nw1664	0	0	0	1.0000000	2.0000000	3.0000000
nw6500	0	0	0	0	2.0000000	2.0000000
inc10K	1.2915000	2.7675000	4.9815000	9.2250000	9.2250000	9.2250000
LGRSHH	0.2437868	0.8449275	1.2895494	1.6732914	2.3969613	3.0433003
LGRSEMP	-2.9957323	-2.0952147	0.2100944	1.2930311	2.4944230	3.4839586
Walkalnx1	4.6000000	8.4000000	13.8000000	21.9000000	37.8000000	41.6300000
Ldlbushq	-4.4123498	-3.3261242	-2.9957323	-2.9957323	-1.0698755	-0.0162525
hhcar	1.0000000	2.0000000	2.0000000	3.0000000	5.0000000	5.0000000
JH5mi08	0.7303260	1.0514261	1.3111223	1.5880562	2.3193082	3.2663207
LBtime08M	0.0275186	0.0518140	0.0678672	0.0844816	0.1041315	0.1184709
bs_LBtime	0	0	0	0	0.1013539	0.1153015
rl_LBtime	0	0	0	0	0	0.1044149

Sub-Model #5: Household VMT

The CORR Procedure

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	autovmt1	wker	nw0015	nw1664	nw6500	inc10K	tr_share
autovmt1	1.00000	0.38809	0.12824	0.09102	-0.20076	0.25406	-0.03352
		<.0001	<.0001	<.0001	<.0001	<.0001	0.0346
	3975	3975	3975	3975	3975	3975	3975
wker	0.38809	1.00000	0.17881	-0.11327	-0.50776	0.34241	0.08326
	<.0001		<.0001	<.0001	<.0001	<.0001	<.0001
	3975	3975	3975	3975	3975	3975	3975
nw0015	0.12824	0.17881	1.00000	0.16116	-0.20355	0.04182	0.05684
	<.0001	<.0001		<.0001	<.0001	0.0084	0.0003
	3975	3975	3975	3975	3975	3975	3975
nw1664	0.09102	-0.11327	0.16116	1.00000	-0.26118	-0.06498	0.06372
	<.0001	<.0001	<.0001		<.0001	<.0001	<.0001
	3975	3975	3975	3975	3975	3975	3975
nw6500	-0.20076	-0.50776	-0.20355	-0.26118	1.00000	-0.23508	-0.05529
	<.0001	<.0001	<.0001	<.0001		<.0001	0.0005
	3975	3975	3975	3975	3975	3975	3975

The CORR Procedure

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	autovmt1	wker	nw0015	nw1664	nw6500	inc10K	tr_share
inc10K	0.25406	0.34241	0.04182	-0.06498	-0.23508	1.00000	-0.07293
	<.0001	<.0001	0.0084	<.0001	<.0001		<.0001
	3975	3975	3975	3975	3975	3975	3975
tr_share	-0.03352	0.08326	0.05684	0.06372	-0.05529	-0.07293	1.00000
	0.0346	<.0001	0.0003	<.0001	0.0005	<.0001	
	3975	3975	3975	3975	3975	3975	3975
nm_share	-0.08828	0.05697	0.09046	0.06374	-0.05487	0.00979	0.04073
	<.0001	0.0003	<.0001	<.0001	0.0005	0.5373	0.0102
	3975	3975	3975	3975	3975	3975	3975
hhcar	0.34375	0.44946	0.08506	0.16616	-0.16126	0.33196	-0.05965

	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.0002
	3975	3975	3975	3975	3975	3975	3975
LGRSHH	-0.14012	0.00503	-0.01699	-0.02026	-0.04429	-0.07994	0.06757
	<.0001	0.7514	0.2841	0.2016	0.0052	<.0001	<.0001
	3975	3975	3975	3975	3975	3975	3975
T2autotime08M	-0.15192	0.01446	-0.02554	-0.03374	-0.01403	-0.00793	0.07645
	<.0001	0.3621	0.1074	0.0334	0.3766	0.6172	<.0001
	3974	3974	3974	3974	3974	3974	3974
JH5mi08	-0.06968	0.03045	-0.00203	-0.03292	-0.01359	0.09031	0.05082
	<.0001	0.0549	0.8983	0.0379	0.3917	<.0001	0.0014
	3974	3974	3974	3974	3974	3974	3974
NoHQBus	0.10822	0.03680	0.05307	0.00237	0.03146	0.06232	-0.02608
	<.0001	0.0203	0.0008	0.8812	0.0473	<.0001	0.1002
	3975	3975	3975	3975	3975	3975	3975

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	nm_share	hhcar	LGRSHH	T2autotime08M	JH5mi08	NoHQBus
autovmt1	-0.08828	0.34375	-0.14012	-0.15192	-0.06968	0.10822
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	3975	3975	3975	3974	3974	3975
wker	0.05697	0.44946	0.00503	0.01446	0.03045	0.03680
	0.0003	<.0001	0.7514	0.3621	0.0549	0.0203
	3975	3975	3975	3974	3974	3975

The CORR Procedure

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	nm_share	hhcar	LGRSHH	T2autotime08M	JH5mi08	NoHQBus
nw0015	0.09046	0.08506	-0.01699	-0.02554	-0.00203	0.05307
	<.0001	<.0001	0.2841	0.1074	0.8983	0.0008
	3975	3975	3975	3974	3974	3975
nw1664	0.06374	0.16616	-0.02026	-0.03374	-0.03292	0.00237
	<.0001	<.0001	0.2016	0.0334	0.0379	0.8812
	3975	3975	3975	3974	3974	3975
nw6500	-0.05487	-0.16126	-0.04429	-0.01403	-0.01359	0.03146
	0.0005	<.0001	0.0052	0.3766	0.3917	0.0473
	3975	3975	3975	3974	3974	3975

inc10K	0.00979	0.33196	-0.07994	-0.00793	0.09031	0.06232
	0.5373	<.0001	<.0001	0.6172	<.0001	<.0001
	3975	3975	3975	3974	3974	3975
tr_share	0.04073	-0.05965	0.06757	0.07645	0.05082	-0.02608
	0.0102	0.0002	<.0001	<.0001	0.0014	0.1002
	3975	3975	3975	3974	3974	3975
nm_share	1.00000	-0.05323	0.11803	0.11326	0.05090	-0.02885
		0.0008	<.0001	<.0001	0.0013	0.0689
	3975	3975	3975	3974	3974	3975
hhcar	-0.05323	1.00000	-0.16814	-0.10491	-0.04878	0.09254
	0.0008		<.0001	<.0001	0.0021	<.0001
	3975	3975	3975	3974	3974	3975
LGRSHH	0.11803	-0.16814	1.00000	0.53778	0.22730	-0.27519
	<.0001	<.0001		<.0001	<.0001	<.0001
	3975	3975	3975	3974	3974	3975
T2autotime08M	0.11326	-0.10491	0.53778	1.00000	0.41394	-0.29938
	<.0001	<.0001	<.0001		<.0001	<.0001
	3974	3974	3974	3974	3974	3974
JH5mi08	0.05090	-0.04878	0.22730	0.41394	1.00000	-0.12847
	0.0013	0.0021	<.0001	<.0001		<.0001
	3974	3974	3974	3974	3974	3974
NoHQBus	-0.02885	0.09254	-0.27519	-0.29938	-0.12847	1.00000
	0.0689	<.0001	<.0001	<.0001	<.0001	
	3975	3975	3975	3974	3974	3975

The MEANS Procedure

Variable	N	Mean	Minimum	Maximum	Std Dev	5th Pctl
autovmt1	3975	51.4273166	0.2222222	278.1000000	50.3862234	4.0000000
wker	3975	1.1217610	0	5.0000000	0.9111328	0
nw0015	3975	0.3177358	0	5.0000000	0.6892115	0
nw1664	3975	0.4737107	0	5.0000000	0.6857898	0
nw6500	3975	0.3957233	0	4.0000000	0.6633188	0
inc10K	3975	5.2363653	0.1845000	9.2250000	2.9559231	0.9225000
tr_share	3975	0.0068134	0	0.8000000	0.0468212	0
nm_share	3975	0.0956457	0	0.8888889	0.1668760	0
hhcar	3975	2.2075472	0	5.0000000	1.0338719	1.0000000
LGRSHH	3975	1.1715716	-11.1880433	3.7099062	0.9440064	-0.3449489
T2autotime08M	3974	0.1383959	0.0261250	0.3134901	0.0448914	0.0656209
JH5mi08	3974	1.3493699	0	6.0874862	0.5576174	0.5154695
NoHQBus	3975	0.4518239	0	1.0000000	0.4977363	0

Variable	10th Pctl	25th Pctl	50th Pctl	75th Pctl	95th Pctl
autovmt1	7.0000000	16.0000000	35.0000000	70.2222222	150.2222222
wker	0	0	1.0000000	2.0000000	3.0000000
nw0015	0	0	0	0	2.0000000
nw1664	0	0	0	1.0000000	2.0000000
nw6500	0	0	0	1.0000000	2.0000000
inc10K	1.6605000	2.7675000	4.6125000	9.2250000	9.2250000
tr_share	0	0	0	0	0
nm_share	0	0	0	0.1538462	0.5000000
hhcar	1.0000000	1.0000000	2.0000000	3.0000000	4.0000000
LGRSHH	0.1928441	0.8320425	1.2839318	1.6782463	2.3779591
T2autotime08M	0.0713590	0.1021719	0.1451369	0.1752062	0.2006492
JH5mi08	0.7066559	1.0490086	1.2997309	1.5835868	2.3235170
NoHQBus	0	0	0	1.0000000	1.0000000

Variable	99th Pctl
autovmt1	251.2000000
wker	4.0000000
nw0015	3.0000000
nw1664	3.0000000
nw6500	2.0000000
inc10K	9.2250000
tr_share	0.2352941
nm_share	0.6666667
hhcar	5.0000000
LGRSHH	2.9703049
T2autotime08M	0.2178261
JH5mi08	3.2663207
NoHQBus	1.0000000

APPENDIX D- NHTS SUB-MODEL OUTPUTS

HH VO Model (the number of household vehicles)

- Ordered Probit Model (will be used for parcel data)
- Dependent variable HHCAR1 (0, 1, 2, 3, 4+)

Ordered Probability Model

Dependent variable	HHCAR1
Log likelihood function	-7551.76223
Restricted log likelihood	-9350.38912
Chi squared [13 d.f.]	3597.2538
Significance level	0.00000
McFadden Pseudo R-squared	0.1923585
Estimation based on N = 6633,	K = 17
Inf.Cr.AIC	15137.5
AIC/N	2.282

Model estimated: Dec 08, 2011, 09:36:49

Underlying probabilities based on Normal

		Parameter Estimate	Standard Error	z	Prob. |z|>Z*
Constant		.64322***	0.086	7.460	0.000
WKER	Number of Household Workers	.78503***	0.020	38.600	0.000
NW0015	Number of HouseholdMembers (< 16 yr old)	-0.00964	0.021	-0.470	0.638
NW1664	Number of HouseholdMembers (16-64 yr old)	.57486***	0.023	25.440	0.000
NW6500	Number of HouseholdMembers (> 64 yr old)	.48015***	0.026	18.320	0.000
INC10K	Median Household income in $10,000 (in $1999)	.12982***	0.005	25.730	0.000
LGRSHH	Log (Household Density) with 1/4 mile buffer of residents	-.12171***	0.018	-6.660	0.000
LGRSEMP	Log (Job Density) with 1/4 mile buffer of residents	-.02131***	0.007	-2.880	0.004
JOBMIX2	Diversity by (Tier2 TAZ)	-.14735*	0.078	-1.900	0.057
WALKAINX	Walkability/Street connect (Density of 3-leg and 4-leg intersections	-.00456***	0.001	-3.210	0.001
LDLBUSHQ	Log of Frequent Bus Stop density (Tier 2 TAZ - headway <= 20 minutes)	-.03950***	0.014	-2.890	0.004
JH5MI08	Job/HH Ratio in 5 miles	-.04715**	0.024	-1.980	0.048
BS_LGRSH	Bus TPP * LGRSHH	-.10478***	0.020	-5.220	0.000
RL_LGRSH	Rail TPP * LGRSHH	-.19649***	0.037	-5.260	0.000
Mu(1)		1.55972***	0.021	75.590	0.000
Mu(2)		3.02768***	0.019	157.350	0.000
Mu(3)		3.93686***	0.025	155.990	0.000

* Bus TPP: 1/2 mile buffer from major bus stops

* Rail TPP: 1/2 mile buffer from rail staions

Note: ***, **, * ==> Significance at 1%, 5%, 10% level.

HH VT Model (likelihood of household making at least one vehicle trip during weekday)
- Binary Logit Model

* Weekday

Number of Observations Read	4787
Number of Observations Used	4768

Association of Predicted Probabilities and Observed Responses

Percent Concordant	83	Somers' D	0.662
Percent Discordant	16.8	Gamma	0.663
Percent Tied	0.3	Tau-a	0.187
Pairs	3218556	c	0.831

Parameter		Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept		-1.158	0.217	28.566	<.0001
wker	Number of Household Workers	1.211	0.099	148.656	<.0001
nw0015	Number of HouseholdMembers (< 16 yr old)	0.113	0.087	1.681	0.195
nw1664	Number of HouseholdMembers (16-64 yr old)	0.320	0.088	13.266	0.000
nw6500	Number of HouseholdMembers (> 64 yr old)	0.511	0.091	31.574	<.0001
inc10K	Median Household income in $10,000 (in $1999)	0.109	0.020	29.999	<.0001
hhcar	Household cars	0.723	0.064	127.777	<.0001
WalkaInx1	Walkability/Street connect (Density of 3-leg and 4-leg intersections	-0.013	0.004	8.661	0.003
Ldlbushq	Log of Frequent Bus Stop density (Tier 2 TAZ - headway <= 20 minutes)	-0.073	0.044	2.757	0.097
bs_LGRSHH	Bus TPP * LGRSHH	-0.134	0.055	5.981	0.015
rl_LGRSHH	Rail TPP * LGRSHH	-0.341	0.093	13.554	0.000

HH Person Trips (Total Person Trips of Household)
- Linear Regression

* Weekday

Number of Observations Read	4787
Number of Observations Used	4787

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	103485	14784	685.14	<.0001
Error	4779	103119	21.57748		
Corrected Total	4786	206604			

Root MSE	4.64516	R-Square	0.5009
Dependent Mean	8.40109	Adj R-Sq	0.5002
Coeff Var	55.29233		

Variable		Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept		-0.158	0.200	-0.790	0.431	0.000
wker	Number of Household Workers	3.303	0.107	30.960	<.0001	2.095
nw0015	Number of HouseholdMembers (< 16 yr old)	4.273	0.105	40.830	<.0001	1.085
nw1664	Number of HouseholdMembers (16-64 yr old)	2.986	0.116	25.700	<.0001	1.364
nw6500	Number of HouseholdMembers (> 64 yr old)	2.532	0.132	19.220	<.0001	1.708
inc10K	Median Household income in $10,000 (in $1999)	0.214	0.026	8.320	<.0001	1.321
LGRSEMP	Log (Job Density) with 1/4 mile buffer of residents	0.093	0.032	2.920	0.004	1.058
hhcar	Household cars	0.274	0.077	3.550	0.000	1.608

HH Mode Choice
- Logit Model
- Data: Weekday

*** Weekday
0 = Auto Driver
1 = Auto Passenger
2 = Transit
3 = NM
4 = Other

Multinomial Logit Model

Dependent variable	TPMODE
Log likelihood function	-38440.00535
Restricted log likelihood	-41424.91545
Chi squared [56 d.f.]	5969.82019
Significance level	0.00000
McFadden Pseudo R-squared	0.0720559
Estimation based on N = 40163,	**K = 60 (40163 weekday trips)**
Inf.Cr.AIC	77000.0
AIC/N	1.917

Model estimated: Dec 08, 2011, 11:04:47

	Coefficient		Standard Error	z	Prob. z |z|>Z*
Mode = 1 (Auto Passenger)					
Constant	-1.37070***		0.080	-17.110	0.000
WKER	.11625***	Number of Household Workers	0.019	6.000	0.000
NW0015	.63480***	Number of HouseholdMembers (< 16 yr old)	0.015	43.460	0.000
NW1664	.36189***	Number of HouseholdMembers (16-64 yr old)	0.020	18.160	0.000
NW6500	.42994***	Number of HouseholdMembers (> 64 yr old)	0.026	16.520	0.000
INC10K	0.00229	Median Household income in $10,000 (in $1999)	0.005	0.450	0.649
LGRSHH	-0.00639	Log (Household Density) with 1/4 mile buffer of residents	0.018	-0.360	0.716
LGRSEMP	-0.00214	Log (Job Density) with 1/4 mile buffer of residents	0.007	-0.290	0.769
WALKAINX	0.00204	Walkability/Street connect (Density of 3-leg and 4-leg intersections	0.001	1.440	0.149
LDLBUSHQ	0.00362	Log of Frequent Bus Stop density (Tier 2 TAZ - headway <= 20 minutes)	0.014	0.260	0.797
HHCAR	-.22468***	Household cars	0.018	-12.830	0.000
JH5MI08	-.11634***	Job/HH Ratio in 5 miles	0.026	-4.530	0.000
LBTIME08	-1.53674**	Local Bus Accessibility based on Time - in million	0.617	-2.490	0.013
BS_LBTIM	.96059**	Bus TPP * LBYIME08M	0.465	2.060	0.039
RL_LBTIM	4.14373***	Rail TPP * LBYIME08M	0.860	4.820	0.000
Mode = 2 (Transit)					
Constant	-3.26396***		0.283	-11.550	0.000
WKER	.71991***	Number of Household Workers	0.058	12.340	0.000
NW0015	.22233***	Number of HouseholdMembers (< 16 yr old)	0.048	4.670	0.000
NW1664	.54835***	Number of HouseholdMembers (16-64 yr old)	0.058	9.510	0.000
NW6500	.19108**	Number of HouseholdMembers (> 64 yr old)	0.089	2.140	0.032
INC10K	-.23370***	Median Household income in $10,000 (in $1999)	0.021	-11.120	0.000
LGRSHH	.13588*	Log (Household Density) with 1/4 mile buffer of residents	0.073	1.860	0.063
LGRSEMP	-.22179D-04	Log (Job Density) with 1/4 mile buffer of residents	0.029	0.000	0.999
WALKAINX	0.00352	Walkability/Street connect (Density of 3-leg and 4-leg intersections	0.004	0.820	0.411
LDLBUSHQ	.07043*	Log of Frequent Bus Stop density (Tier 2 TAZ - headway <= 20 minutes)	0.040	1.770	0.076
HHCAR	-1.33415***	Household cars	0.061	-21.900	0.000
JH5MI08	.20616**	Job/HH Ratio in 5 miles	0.083	2.480	0.013
LBTIME08	14.3056***	Local Bus Accessibility based on Time - in million	2.660	5.380	0.000
BS_LBTIM	3.04666**	Bus TPP * LBYIME08M	1.354	2.250	0.024
RL_LBTIM	4.59319***	Rail TPP * LBYIME08M	1.766	2.600	0.009
Mode = 3 (NM)					
Constant	-1.59136***		0.101	-15.790	0.000
WKER	.12842***	Number of Household Workers	0.024	5.430	0.000
NW0015	.35573***	Number of HouseholdMembers (< 16 yr old)	0.018	19.480	0.000
NW1664	.24391***	Number of HouseholdMembers (16-64 yr old)	0.024	10.090	0.000
NW6500	.05890*	Number of HouseholdMembers (> 64 yr old)	0.033	1.800	0.072
INC10K	-.02201***	Median Household income in $10,000 (in $1999)	0.006	-3.670	0.000
LGRSHH	.16876***	Log (Household Density) with 1/4 mile buffer of residents	0.025	6.650	0.000
LGRSEMP	0.01266	Log (Job Density) with 1/4 mile buffer of residents	0.009	1.390	0.164
WALKAINX	.00655***	Walkability/Street connect (Density of 3-leg and 4-leg intersections	0.002	4.070	0.000
LDLBUSHQ	.04585***	Log of Frequent Bus Stop density (Tier 2 TAZ - headway <= 20 minutes)	0.016	2.790	0.005
HHCAR	-.45850***	Household cars	0.021	-21.340	0.000
JH5MI08	-0.01397	Job/HH Ratio in 5 miles	0.031	-0.450	0.649
LBTIME08	5.91806***	Local Bus Accessibility based on Time - in million	0.816	7.250	0.000
BS_LBTIM	1.06221**	Bus TPP * LBYIME08M	0.506	2.100	0.036
RL_LBTIM	1.43931	Rail TPP * LBYIME08M	0.883	1.630	0.103

Mode = 4 (Other)

Constant	-2.97316***		0.209	-14.230	0.000
WKER	.16845***	Number of Household Workers	0.050	3.390	0.001
NW0015	.45242***	Number of HouseholdMembers (< 16 yr old)	0.036	12.580	0.000
NW1664	.25694***	Number of HouseholdMembers (16-64 yr old)	0.051	5.020	0.000
NW6500	0.04437	Number of HouseholdMembers (> 64 yr old)	0.074	0.600	0.551
INC10K	-.03358**	Median Household income in $10,000 (in $1999)	0.013	-2.540	0.011
LGRSHH	-0.03985	Log (Household Density) with 1/4 mile buffer of residents	0.044	-0.900	0.370
LGRSEMP	-0.00734	Log (Job Density) with 1/4 mile buffer of residents	0.019	-0.380	0.700
WALKAINX	0.00362	Walkability/Street connect (Density of 3-leg and 4-leg intersections	0.004	0.990	0.324
LDLBUSHQ	.11553***	Log of Frequent Bus Stop density (Tier 2 TAZ - headway <= 20 minutes)	0.038	3.000	0.003
HHCAR	-.24170***	Household cars	0.046	-5.280	0.000
JH5MI08	0.06117	Job/HH Ratio in 5 miles	0.063	0.970	0.334
LBTIME08	-0.92076	Local Bus Accessibility based on Time - in million	1.614	-0.570	0.568
BS_LBTIM	-0.48221	Bus TPP * LBYIME08M	1.209	-0.400	0.690
RL_LBTIM	-0.38262	Rail TPP * LBYIME08M	2.327	-0.160	0.869

Household VMT Model
Linear Regression Model

Number of Observations Read	3975
Number of Observations Used	3974
Number of Observations with Missing Values	1

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Model	12	2417642	201470	104.03	<.0001
Error	3961	7671057	1936.64662		
Corrected Total	3973	10088699			

Root MSE	44.00735
R-Square	0.2396
Dependent Mean	51.42242
Adjusted R-Square	0.2373
Coefficient of Variance	85.58008

Variable	Description	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standardized Estimate	Variance Inflation
Intercept		21.619	3.499	6.180	<.0001	0.000	0.000
wker	Number of Household Workers	18.785	1.104	17.010	<.0001	0.340	2.076
nw0015	Number of HouseholdMembers (< 16 yr old)	3.587	1.056	3.400	0.001	0.049	1.086
nw1664	Number of HouseholdMembers (16-64 yr old)	9.368	1.190	7.870	<.0001	0.128	1.367
nw6500	Number of HouseholdMembers (> 64 yr old)	3.603	1.365	2.640	0.008	0.047	1.680
inc10K	Median Household income in $10,000 (in $1999)	1.944	0.264	7.360	<.0001	0.114	1.251
tr_share	Transit Share	-43.425	15.233	-2.850	0.004	-0.040	1.044
nm_share	NM Share	-28.837	4.269	-6.750	<.0001	-0.096	1.041
hhcar	Number of Household Vehicles	5.337	0.843	6.330	<.0001	0.109	1.557
LGRSHH	Log (Household Density) with 1/4 mile buffer of residents	-1.747	0.902	-1.940	0.053	-0.033	1.479
T2autotime08M	Auto Accessibility based on Time (T2 TAZ) - in million	-97.176	20.098	-4.840	<.0001	-0.087	1.670
JH5mi08	J/H ratio in 5 miles	-2.330	1.385	-1.680	0.093	-0.026	1.224
NoHQBus	Tier2 TAZ has no HQ Bus stop	3.218	1.492	2.160	0.031	0.032	1.131