

**Catching the Next Big Wave:
Are the Observed Behavioral Dynamics of the Baby Boomers
Forcing us to Rethink Regional Travel Demand Models?**

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Executive Summary

Aging American baby-boomers create a variety of new policy contexts and problems. Their changing demand for transportation services may be positive or negative depending on the preparedness of our institutions and the baby boomers' behavior. In this paper we describe this potential change in demand through an analysis of individual longitudinal histories over a long period (1989 to 2003) exploring the impacts of person-specific changes (e.g., entry into and exit from the labour force) household changes (e.g., relocation and dissolution) and land use. To do this we use the Puget Sound Transportation Panel (PSTP), which is a record of approximately 20,000 person diaries of Seattle residents who provided reports of their travel in two-days repeatedly for ten contacts (waves). In the analysis we study within-household dynamics and the impact events of within-household change have on individual as well as household behavior.

First, we employ focus groups to extract behavioral themes that are in turn verified by a first order data analysis of PSTP data. Then, using Latent Class Cluster analysis we identify representative groups of behavior and study the transitions among these groups as well as their relationship to a few key determinants of change. Third, we analyze change in key travel behavior indicators in more detail using an array of regression models of change to identify key determinants underlying behavioral dynamics. Key findings point to a need to focus on employment dynamics for individuals and their households. The findings also show differential impacts of land use indicators, and the significant role played by changes in household composition. All this implies a need for models that can handle more diverse behavior and a need to accommodate employment status and within household demographics in the forecasting models. This analysis also points to a need for a more comprehensive and detailed analysis of change.

Keywords: Baby boomers, panel analysis, longitudinal, cluster analysis, focus groups

1. Introduction

Baby boomers are persons that were born between the years 1946 and 1964 and they are estimated to make up 25 percent of the U.S. population, approximately seventy-five million Americans. They are part of what some experts are calling a demographic revolution. Their aging constitutes a critical public policy issue of unknown implications unprecedented in modern history. These implications may include the need for radical changes in our retirement, health care, and welfare systems and services. Their aging is also expected to cause a major change in labor markets, banking, and stock markets. Transportation is expecting changes that may be positive or negative depending on the preparedness of our institutions. Preparedness, however, requires a better understanding of the baby boomers. The character of this wave is shaped by a diversity of radically different lifestyles because baby boomers live in a completely different social and economic era than their counterpart older persons, both past and present. It is also shaped by medical and technological advances that are producing increased longevity and the possibility of increased activity at later ages. That we will all have longer and healthier lives is a positive development. This good news, however, is accompanied by many worrisome issues, including transportation.

Retired baby boomers are more likely to continue to live in suburban areas, and will need to drive to services either by themselves (e.g., serving on a variety of volunteer organizations, pursuing new careers, or simply getting a job to maintain acquired habits and lifestyles) or with others (e.g., older relatives, friends, and spouses in poor health). More persons than today will be driving at times that are less predictable. If their health does not allow driving, different kinds of transport, including public and private transportation services, may be needed . . .

Baby boomers' travel demand remains somewhat of a mystery. Bush (2005) offers some information and predictions about the travel behavior of the baby boomers, concluding that they will travel more than predicted by traditional methods that do not account for cohort differences. Her analysis, although interesting and addressing the entire United States, is limited to the number of trips taken (called sojourns in her paper) and does not analyze the time allocated to activities, departure times, and traveling with other persons. Organizations that are dedicated to the present and future of older individuals are conducting surveys to

understand needs, attitudes, intentions, and behavior of baby boomers (see <http://www.genpolicy.com/> and <http://www.aarp.org/>).

The first age group of baby boomers is only recently starting to reach retirement age. Using the first and only transportation panel survey in the United States, we answer a few questions that shed light on the baby boomer heterogeneity in behavior and compare them to the age group of current retirees. Similarity between these two groups lends support for analyses that examine the behavior of today's retirees and, from that, extrapolates baby boomers' behavior as they start reaching retirement age. It should be noted that within the analysis here we also find senior participants of age 65 and older who are employed outside their residences and can be used as informants of baby boomer behavior as well.

In this report we examine modeling needs using three tools. First, we examine information from four focus groups combined with data about baby boomers. Second, using a pattern recognition model we identify distinct behavioral groups and study transitions among these groups. Then, models of the propensity to change travel behavior are used to understand determinants of change. These tools allow us to discover areas of inquiry that can help us build better models for travel demand forecasting.

2. The Puget Sound Transportation Panel

The Puget Sound Transportation Panel (PSTP) was designed as a “general purpose” urban household panel survey tailored to transportation analysis. The PSTP was also created as a tracking device of changes in employment, work characteristics, household composition, vehicle availability, travel behavior and responses to changes in the transportation environment, and attitudes and values (Murakami and Watterson, 1990, Murakami and Ulberg, 1997). The PSTP data used here are a longitudinal record of travel behavior sampled from approximately 3.3 million residents (based on data from the US Census of 2000) in Seattle and its surroundings. The survey started in 1989 and continued through 2002 in the four counties of King, Kitsap, Pierce, and Snohomish – the Puget Sound region in the Northwest corner of the continental United States. In each wave, a household questionnaire and two-day travel diaries were administered by design to the same households (with replacement) and their members 15 years or older. In this way, data were accumulated on households that participated at multiple time points. Unlike more traditional transportation cross-sectional surveys, PSTP takes similar measurements (i.e., surveys) repeatedly on the same variables over time. Each wave of the PSTP includes a questionnaire that collects information on household demographics, personal social and economic circumstances, and a travel diary that records reported travel behavior on two consecutive days for each person in the recruited household that is 15 years or older, to capture driving age individual behavior.

The PSTP currently has data from ten surveys in the years 1989, 1990, 1992, 1993, 1994, 1996, 1997, 1999, 2000, and 2002. This provides a database with unique capability in studying behavioral change as households and persons move from one life-cycle stage to another. PSTP since 1989 contains more than 1700 households at each wave. Each survey wave includes three main groups of data: household demographics, people’s social and economic information, and reported travel behavior. In the travel diary each person of driving age reports every trip made during two consecutive weekdays. In subsequent contacts respondents are asked to report trips in the same weekdays as their first contact. For each wave the data are stored in three databases (files): one for the household (each record is a household), one for the person (each record is a person), and one for the trips (each record is a trip, in addition to a record indicating where the person began each day). Suitable identifiers are also included to match trips, persons, and households that belong together. Using the

panel observations we can study paths of change over time and develop individual and household longitudinal histories allowing us to study in more detail individual and household changes. However, PSTP does not contain questions about intentions nor is it designed exclusively for baby boomers. For this reason a set of focus group meetings were created with participants from PSTP.

3. Focus group findings and PSTP data evidence

Four focus groups of retired individuals who are 60 years or older were organized by the Northwest Research Group(NRG) using a small sample from PSTP. Table 1 provides a summary of their numbers of trips and daily travel expenditures in the waves during which they provided complete information. Certain themes that emerged from these four groups are summarized in a brief report (NRG, 2004). In this section we use the same themes and findings, combine them with other notes from the meetings and offer additional evidence from the PSTP data either finding agreement, disagreement, or complementary information to the focus group findings.

The targeted population for the focus groups are people 60 years or older that were in the labor force at some point in their life. PSRC staff identified more than 400 panel participants for recruitment. One younger (50 to 60 year old) group of baby boomers was also selected for comparison with their older counterparts in the other three focus groups. As NRG points out, the focus group participants are not a statistically representative sample of the Puget Sound population – they simply allow identification of themes for further scrutiny. However, the focus groups offer insights about possible implications for policy and areas for further examination using more sophisticated tools. The participants are King county (the county surrounding and including the Seattle Metropolitan area) residents who were recruited by telephone. Each participant received a 70 USD incentive to attend the focus groups and NRG called them randomly from the list PSRC generated. Recruiting was conducted in late September and early October 2004. All focus group meetings took place on October 11th and 12th, 2004.

Although there were only four focus groups and only a few of the participants meet the strict definition of a baby-boomer, past studies and the analysis here show some similarity in

behavior between today's seniors who are still working and the older baby-boomers. When people are not working, however, we find differences as one would expect due to wider variety in personal arrangements and circumstances within this group of persons. Some reached early retirement, are active in organized groups and exercise clubs, and engage in regular shopping. Others care for elderly parents or friends, and when their care is no longer needed returned to part time work. Among the focus group participants we also find another group that continues working in regular full time jobs and expect to continue working even after retirement from a life-long career/job. Most persons live alone but they went through a period of living with an older relative and often caring for that person. The majority of the focus group participants feels good about their added freedom in traveling at times of their own choice. They enjoy having free time to spend with family and friends, in hobbies, and in volunteer organizations. When asked about changes and different perceptions since retirement the focus group participants made a variety of comments that offer some insight about the type of travel behavior changes one could expect. Most retirees thought that everything changed in terms of commitments and required work tasks. For example, there was a clear decrease in travel because the commute trips were gone. This change, however, took some time to get adjusted to, and the long commutes were replaced by shorter shopping and personal business trips.

The focus group participants are not representative of the population in the PSRC region, nor of PSTP. Overall focus group participants show substantial variation in their trip making indicators across days and waves. In summary, the idea of a *typical day* traveling is challenged by retirement, which is accompanied by increased flexibility and consolidation of travel in one day. Employed baby boomers, however, cannot enjoy this flexibility and continue typical work weeks and the associated travel. In terms of *cars and driving*, the majority of focus group participants are car owners, have more cars than drivers in their household, learned how to drive early in their lives, still have a driver's license, and have no intention of either stopping driving or disposing of their vehicle(s). This also confirmed by the PSTP data in which only 718 out of 10,612 observations of persons 65 and older do not have a valid driver's license. From among the employed, 98% have a driver's license. The average number of vehicles in the 55 to 64 group is 2.33 and in the 65 to 98 group it is 1.81, reflecting the lower household size in this group. Only 341 observations have no car (84 are in the age group 55-64 and 257 in the age group 65 to 98).

As mentioned earlier the baby boomers *lifestyles* differ from other retirement groups. They are active in full time and part time jobs, and they are involved in volunteer organizations and other types of civic activities. They are also characterized by a tendency to live alone. In the PSTP, women represent nearly 81 percent of the single adult households over 65. Caring for others including family members is prevalent among older women . In *information technology*, the majority of the focus group participants use the internet frequently and they have access to broadband connections (high-speed internet). They also seem to rely on the internet to reach services such as banking and shopping. A few of them mentioned the substitution effect of using the internet instead of travelling Working baby boomers said they use online mapping sites to locate new or unfamiliar destinations

Table 1 Average trip making characteristics of focus group participants*

Year of wave		Total number of trips in day 1	Total Number of trips in day 2	Total travel time in day1	Total travel time in day2
1989	Mean	6.87	5.50	86.00	83.13
	N	8	8	8	8
	Std. Deviation	3.563	4.106	44.307	53.818
1990	Mean	4.90	6.30	86.20	103.50
	N	10	10	10	10
	Std. Deviation	2.183	2.359	44.669	58.100
1992	Mean	5.25	4.92	94.00	102.92
	N	12	12	12	12
	Std. Deviation	3.334	3.343	72.784	95.632
1993	Mean	5.14	6.00	95.50	101.57
	N	14	14	14	14
	Std. Deviation	2.852	2.689	71.521	65.932
1994	Mean	4.36	5.64	103.43	84.21
	N	14	14	14	14
	Std. Deviation	3.388	2.977	97.727	64.007
1996	Mean	4.40	5.15	77.75	91.70
	N	20	20	20	20
	Std. Deviation	2.873	3.297	57.708	73.352
1997	Mean	3.88	4.25	84.92	79.46
	N	24	24	24	24
	Std. Deviation	1.849	2.507	50.825	53.346
1999	Mean	4.74	4.78	82.07	101.56
	N	27	27	27	27
	Std. Deviation	2.379	2.940	43.189	55.306
2000	Mean	3.87	4.13	76.26	78.52
	N	23	23	23	23

2002	Std. Deviation	2.399	2.492	44.700	42.369
	Mean	4.39	4.82	89.21	100.14
	N	28	28	28	28
Total	Std. Deviation	2.780	2.374	67.639	124.078
	Mean	4.56	4.96	86.24	92.38
	N	180	180	180	180
	Std. Deviation	2.701	2.833	59.319	74.037

*Note: Not all focus group participants are included here due to missing data and unverifiable records (Appendix A contains a list of the identification number of those included in this table)

Confirmation of these findings comes from the PSTP sample in which, in the year 2000, approximately 41% of the seniors (65 and above) had access to the internet at home while 67% of the baby boomer group (55 to 64 years old) had such access. Both groups at that time experienced growth in technology use between 2000 and 2002.

Relocation is an important theme for baby boomers (PSTP does not provide the required data to examine this - people moving out of the study region are dropped from the panel). The focus group participants indicate unwillingness to leave the region. Some move into the city after retirement, while others move further away from the city. Relocating is possibly motivated by a desire to decrease home maintenance and the expense and time required. In addition, some opt for in-home caregivers. But from among the employed, none planned relocation after retirement. In terms of *stress and health* participants said it is more difficult to travel today than in the past due to congestion, speeding, and aggressive and disrespectful drivers. They also believe that medical advances will help them. All enjoyed good health, were physically fit, and many exercised regularly. In a *comparison with past generations* all participants pointed out many differences between them and their parents. Overall they perceive their generation as more active and “outgoing” than their parents. They are also wealthier, less thrifty, more dependent on the private automobile, technologically more savvy, and more able to communicate with others using modern technologies. However, they also expect later retirement ages and the need to plan for longer lives.

Interestingly, the working focus group participants expect to retire when they reach “normal” retirement age (and some of them earlier) although they expect younger baby boomers to retire at later ages because "Social Security" may not be available to them and their poor financial planning will force them to continue working. Others gave different reasons for this

expectation, including increased debt among the younger baby boomers and having children later in life.

4. Analysis of activity and travel patterns

Before analyzing change we go through a step of pattern recognition and identification of homogeneous clusters using *latent class cluster analysis (LCCA)*. This technique is described in Vermunt and Magidson (2002). Six behavioral clusters are identified using as criteria variables:

- Total number of trips on the first day of the travel diary
- Total number of trips on the second day of the travel diary
- Total out-of-home activity duration on the first day of the travel diary
- Total out-of-home activity duration on the second day of the travel diary
- Number of trips car sharing on the first day of the travel diary
- Number of trips car sharing on the second day of the travel diary

Using these variables and starting from a one-cluster model, we build in a sequence -- models with more clusters -- until the cluster sizes become too small to be meaningful and the difference in goodness of fit between successive models is not significant. In this way we derive six distinct patterns of behavior presented in Table 2. The analysis here is focused on persons that are close to retirement age. For this reason we select only persons that were older than 50 years old were they took part in PSTP.

Approximately one-third of the sample is in the "traveller" group that makes the most trips per day and travels with relatives. The second largest group, of about another one-third of the sample, are the "loners" that make approximately 4 trips per day but no trips with relatives. Both groups spend a considerable amount of time out of home (with the loners spending about one hour more than the travellers). The third group, or approximately 15% of the sample, contains persons that make about 4 trips per day but a little less than a fourth of these trips are with relatives. We call this group the "moderates". The next two groups confirm one of the focus group findings that people consolidate trips into one day and stay home the next when they can (Appendix B shows that approximately 80% of the persons in

these two groups are not working outside their homes). These two groups, however, also include persons who work outside their home, implying that some of these persons may be working only 2 or 3 days a week, rather than the typical 5 days . The last group are persons that stayed home for both days (again Appendix B shows we have very few respondents on Fridays and the rest are on Mondays, Tuesdays, Wednesdays and Thursdays). Taken together, the last three groups and their substantial popularity show that a typical day may no longer be a defensible approach for modelling and simulation.

Table 2 Latent Class Six Clusters in the Sample Used

Cluster		Number of trips in day 1	Number of trips in day 2	Total activity time in day 1	Total activity time in day 2	Carpool trips with relatives in day 1	Carpool trips with relatives in day 2
Traveler	Mean	5.68	5.59	436.53	442.51	2.55	2.65
	N	4441	4440	4422	4413	4441	4440
	SD	2.788	2.646	225.738	231.139	2.288	2.190
Loner	Mean	4.20	4.10	509.83	505.74	.02	.02
	N	4470	4469	4424	4403	4470	4469
	SD	2.281	2.268	175.698	178.484	.154	.129
Moderate	Mean	3.31	3.13	116.16	110.36	.72	.76
	N	2124	2124	2080	2069	2124	2124
	SD	1.543	1.418	84.213	80.704	1.175	1.177
Homestay B	Mean	3.99	.00	226.44	.00	1.55	.00
	N	1328	1328	1291	1328	1328	1328
	SD	2.274	.000	196.865	.000	2.148	.000
Homestay A	Mean	.00	3.95	.00	209.11	.00	1.68
	N	999	999	999	970	999	999
	SD	.000	2.205	.000	185.985	.000	2.147
Inactive	Mean	.00	.00	.00	.00	.00	.00
	N	831	831	831	831	831	831
	SD	.000	.000	.000	.000	.000	.000
Total	Mean	3.97	3.78	336.00	329.01	1.06	1.07
	N	14193	14191	14047	14014	14193	14191
	SD	2.817	2.784	256.975	262.265	1.871	1.840

Using the longitudinal nature of the data at hand, the emphasis in this paper is on the propensity to change behavior from one wave to the next. Table 3a shows the transitions taking place among the different groups between 1999 and 2000. This is a subsample of the persons in Table 1 that participated in both waves of years 1999 and 2000. The "loner" is the most stable group with very few transitions to other behaviors except to become travellers (14.5%). Similarly the "traveller" group has a high percentage of persons staying in the same group between 1999 and 2000 but more than 50% switch patterns across years. All the other groups are not "stable" between 1999 and 2000. Overall, Table 3a shows a remarkable

movement in behavioral patterns from one year to the next. Similar results are offered in Table 3b by the transitions of 977 persons between the years 2000 and 2002 where again the "loners" display relatively more stability in their patterns.

A first pass at the data analysis showed very little change in home-based land use characteristics. In addition, studying the correlation between cluster membership change and a variety of explanatory variables, we found that changes in household composition lead to travel behavior changes. From the cluster analysis no land use variables were found significant in explaining transitions from cluster to cluster. This is most likely due to masking of small changes when clustering people together and when combining behavioral indicators. This motivates the person by person and indicator by indicator analysis that follows. For completeness, Appendix C contains cluster membership distributions for 1999 and 2000 for the focus group participants. Interestingly we do not observe predominance of the "homestay" patterns among the focus group participants. This also supports the argument that two-day activity or travel diaries are not sufficient for capturing behavioral heterogeneity and behavioral dynamics, and that longer survey periods are needed.

Table 3a Change of Behavioral Pattern between 1999 and 2000

			Cluster In 2000					Total	
			Traveller	Loner	Moderate	Home stay B	Home stay A		Inactive
Cluster	Traveller	Count	178	84	49	29	28	12	380
		% within Cluster	46.8%	22.1%	12.9%	7.6%	7.4%	3.2%	100.0%
Loner		Count	50	208	26	29	18	15	346
		% within Cluster	14.5%	60.1%	7.5%	8.4%	5.2%	4.3%	100.0%
Moderate		Count	17	19	43	27	20	8	134
		% within Cluster	12.7%	14.2%	32.1%	20.1%	14.9%	6.0%	100.0%
Homestay B		Count	21	15	24	22	10	15	107
		% within Cluster	19.6%	14.0%	22.4%	20.6%	9.3%	14.0%	100.0%
Homestay A		Count	13	12	14	12	9	9	69
		% within Cluster	18.8%	17.4%	20.3%	17.4%	13.0%	13.0%	100.0%
Inactive		Count	2	5	8	6	6	14	41

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	% within Cluster	4.9%	12.2%	19.5%	14.6%	14.6%	34.1%	100.0%
Total	Count	281	343	164	125	91	73	1077
	% within Cluster	26.1%	31.8%	15.2%	11.6%	8.4%	6.8%	100.0%

Table 3b Change of Behavioral Pattern between 2000 and 2002

		Cluster In 2002						Total	
		Traveler	Loner	Moderate	Home stay B	Home stay A	Inactive		
Cluster	Traveler	Count	141	57	33	16	15	9	271
		% Cluster In 2000	52.0%	21.0%	12.2%	5.9%	5.5%	3.3%	100.0%
Traveler	Loner	Count	59	207	39	8	14	7	334
		% Cluster In 2000	17.7%	62.0%	11.7%	2.4%	4.2%	2.1%	100.0%
Moderate		Count	33	23	48	21	11	9	145
		% Cluster In 2000	22.8%	15.9%	33.1%	14.5%	7.6%	6.2%	100.0%
Home stay B		Count	17	26	22	16	12	14	107
		% Cluster In 2000	15.9%	24.3%	20.6%	15.0%	11.2%	13.1%	100.0%
Home stay A		Count	11	13	21	11	10	11	77
		% Cluster In 2000	14.3%	16.9%	27.3%	14.3%	13.0%	14.3%	100.0%
Inactive		Count	4	9	6	11	4	9	43
		% Cluster In 2000	9.3%	20.9%	14.0%	25.6%	9.3%	20.9%	100.0%
Total		Count	265	335	169	83	66	59	977
		% Cluster In 2000	27.1%	34.3%	17.3%	8.5%	6.8%	6.0%	100.0%

5. Propensity to change behavior

In addition to the cluster memberships and switching from year to year among clusters a variety of other variables were identified as worthy of a more in-depth analysis. Table 4 lists the variables used for 1077 participants in the two PSTP waves of 1999 and 2000. A set of land use indicators was also developed in a preliminary step using land use information from a grid of 150 meters by 150 meters raster map. To decrease the number of variables in the analysis and capture as much variance as possible in the data we select groups of variables to summarize using factor analysis employing the principal components method. In this analysis we identify a few underlying variables that explain the pattern of correlations within the large group of land use indicators. The resulting principal components are:

- Four factors capturing 94.1% of the variance are extracted using the TAZ distances from urban centers and the indicators of water presence in the vicinity of the residence

(indicated as TAZF1, TAZF2, TAZF3, and TAZF4). In the following regression models we use DTAZF1 to show the difference in TAZF1 between the two waves that is used as the explanatory variable.

- Four factors capturing 84.5% of the variance are extracted to capture land use density and composition (number of persons, households, units, jobs, and square feet for industry, government, and commercial land use). These factors are named DENF1, DENF2, DENF3, DENF4 and their difference across years DDENFx.
- Seven factors capturing 67.0% of the variance (indicated as Mix1 to Mix7) were extracted to capture the job mix for each household location based on 20 different job categories and counts within a 750 by 750 square around each residence.

Average factor values are reported in Appendix D.

Table 4 Household and Person Level Variables Tested

H ou se ho ld Le ve l V ar ia bl es	King_9 = 1 if participant resides in King County; 0 otherwise	
	Kitsap_9 = 1 if participant resides in Kitsap County; 0 otherwise	
	Snoho_9 = 1 if participant resides in Snohomish County; 0 otherwise	
	SOV = 1 if participant is in the SOV sample; 0 otherwise	
	TRANSIT = 1 if participant is in the transit sample; 0 otherwise	
	LOWINC_9 = 1 if Household Income < \$35,000; 0=Otherwise	
	MIDINC_9 = 1 if \$35,000 ≤ Household Income < \$75,000; 0=Otherwise	
	HHSIZE = Number of persons in household	
	INVEHL_9 = 1 if an increase in household vehicles took place between 1999 and 2000; 0 otherwise	
	ENVEHL_9 = 1 if no change in household vehicles took place between 1999 and 2000; 0 otherwise	
	IRVEHLI_9 = 1 if increase in ratio vehicles/licenses; 0 otherwise	
	DRVEHLI_9 = 1 if decrease in ratio vehicles/licenses; 0 otherwise	
	INBABY_9 = 1 if increase in number of children 1-5 years old; 0 otherwise	
	DNBABY_9 = 1 if decrease in number of children 1-5 years old; 0 otherwise	
	INKID_9 = 1 if increase in number of children 6-17 years old; 0 otherwise	
	DNKID_9 = 1 if decrease in number of children 6-17 years old; 0 otherwise	
	INADUL_9 = 1 if increase in number of 18 and older; 0 otherwise	
	DNADUL_9 = 1 if decrease in number of 18 and older; 0 otherwise	
	INEMP_9 = 1 if increase in number of employed; 0 otherwise	
	ENEMP_9 = 1 if no change in the number of employed; 0 otherwise	
	INLICE_9 = 1 if increase in number of drivers with license; 0 otherwise	
	ENLICE_9 = 1 if no change in the number of drivers with license; 0 otherwise	
	INPUPI_9 = 1 if increase in number of students; 0 otherwise	
	DNPUPI_9 = 1 if decrease in number of students; 0 otherwise	
	PELAP = time elapsed since entry in PSTP	
	PELAP2 = square of time elapsed since entry in PSTP	
	IINCOM = 1 if increase in income; 0 otherwise	
	EINCOM = 1 if no change in income; 0 otherwise	
	DKINCOM = 1 if decrease in income; 0 otherwise	
	Pe rs on Le ve l V ar ia bl es	MALE = 1 if person is male; 0 otherwise
		Asenior = 1 if person is 50 to 64 years old; 0 otherwise
		Bsenior = 1 if person is 65 to 79 years old; 0 otherwise
		Csenior = 1 if person is 80 years and above; 0 otherwise
EXPEMP_9 = 1 if worked outside the home in both current and previous wave; 0 otherwise		
NOVEMP_9 = 1 if started working outside the home in current wave; 0 otherwise		
QUITEMP_9 = 1 if stopped working outside the home in current wave; 0 otherwise		
EXPLICE_9 = 1 if has driver's license in both current and previous wave; 0 otherwise		
NOVLICE_9 = 1 if started having a driver's license in current wave; 0 otherwise		
QUITLIC_9 = 1 if stopped having a driver's license in current wave; 0 otherwise		
L an d Us e an d Le ve l	INT450_9 = Count of arterial intersections per surrounding 450 by 450 meters gridcells	
	INT750_9 = Count of arterial intersections per surrounding 750 by 750 meters gridcells	
	PTAM75_A = Transit availability in the AM average per gridcell of surrounding 750 by 750 METERS gridcells	
	PTMD75_A = Transit availability in mid-day average per gridcell of surrounding 750 by 750 METERS gridcells	
	INT150_9 = Count of arterial intersections per gridcell of 150 meters	
	INT450_9 = Count of arterial intersections per gridcell of surrounding areas at 450 meters	
INT750_9 = Count of arterial intersections per gridcell of surrounding areas at 750 meters		
ARTL_D_A = Distance to nearest arterial line (from each gridcell centroid)		

of ARTL_I_A = Distance to nearest arterial line (from each gridcell centroid)
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One of the analysis objectives is to find out if trip rates change over time and how they change with social and economic variables (e.g., household size, workers, and income). Trip rates, however, are also a function of other behavioral indicators (e.g., travel distances, activity time, consolidation of trips into chains and so forth). We turn our attention here to variables that are two day sums of the number of trips, total time for travel, total time to non-work travel, total amount of time at home, and trip chains. We address the travel behavior change question by studying change of behavioral indicators and their relationship with many other variables representing changes within the household, personal changes, and changes in land use characteristics (e.g., when a household moves). For each of the four variables we create regression models that use as explanatory variables each person’s characteristics, household characteristics, land use indicators, and level of service measured by the presence of public transportation and distances to arterials to capture connectivity. To account for the relationship among the travel behavior indicators we also build a model that examines the relationship among the regression error terms (called the Seemingly Unrelated Regression Estimation).

Tables 5 and 6 show the regression results for the single equation regression models. A negative coefficient means the independent variable causes a decrease in the dependent variable (behavioral indicator). A positive coefficient indicates the opposite. A ratio of $b/St.Er.$ greater than 1.96 indicates a significant effect of the variable on behavioral change at the 5% confidence level.

Change in the number of trips

The sample average shows a decrease by 1.23 trips in two days and a standard deviation of 4.9 trips. The regression model shows that persons in households that increase their car ownership also increase their trip making. As children grow older they also motivate an increase in trips. Increases in number of adults decreases trip making (either by sharing chores or just staying home to care for the older adults). Increasing the number of driver

licenses also increases trips. Change in land use characteristics has two opposite and almost equal effects with the net result minimal or no change at all. It is also worth noting that all the personal characteristics and change variables were not significantly different than zero (age, gender, employment, occupation).

Table 5 Regression estimates for change in trip and travel time

Difference in the number of trips				
	Coeff.	Std.Err.	t-ratio	P-value
Constant	-2.42	0.523	-4.63	0.00
INVEHL_9 = 1 if vehicles increased; 0 otherwise*	1.14	0.514	2.22	0.03
INKID_9 = 1 if # of children 6-17 years old increased; 0 otherwise	2.61	1.227	2.13	0.03
INADUL_9 = 1 if increase in number of 18 and older; 0 otherwise	-3.30	1.135	-2.91	0.00
ENADUL_9 = 1 if no change in number of 18 and older; 0 otherwise	-1.05	0.660	-1.59	0.11
INLICE_A = 1 if drivers increased; 0 otherwise	3.39	0.984	3.44	0.00
ENLICE_A = 1 if no change in drivers; 0 otherwise	2.26	0.716	3.16	0.00
DTAZF1* = 1 if change in TAZ factor 1; 0 otherwise	5.26	1.342	3.92	0.00
DDMIX1 = 1 if change in DMIX factor 1; 0 otherwise	-5.79	0.168	-34.48	0.00
Difference in the amount of travel time				
	Coeff.	Std.Err.	t-ratio	P-value
Constant	-19.33	12.472	-1.55	0.12
MALE=1 if male; 0 otherwise	-11.49	7.191	-1.60	0.11
INVEH_9 = 1 if vehicles increased; 0 otherwise	19.82	12.831	1.54	0.12
INKID_9*=1 if # of children 6-17 years old increased; 0 otherwise	48.77	21.954	2.22	0.03
INADUL_A=1 if increase in number of 18 and older; 0 otherwise	-34.66	23.076	-1.50	0.13
ENADUL_A = 1 if no change in number of 18 and older; 0 otherwise	-21.79	13.899	-1.57	0.12
INLICE_A* = 1 if drivers increased; 0 otherwise	40.55	19.910	2.04	0.04
ENLICE_A = 1 if no change in drivers; 0 otherwise	22.29	13.830	1.61	0.11
DTAZF1* = 1 if change in TAZ factor 1; 0 otherwise	120.98	37.274	3.25	0.00
DDMIX1* = 1 if change in DMIX factor 1; 0 otherwise	-165.52	5.847	-28.31	0.00
INT450_9 = # arterial intersections in 450 X 450 square meters	1.68	0.900	1.86	0.06
INT750_9* = # arterial intersections in 750 X 750 square meters	-0.78	0.375	-2.09	0.04
PTAM75_A = Transit frequency in 750 X 750 square meters	1.36	0.649	2.09	0.04
Difference in the number of trip chains				
	Coeff.	Std.Err.	t-ratio	P-value
Constant	-0.15	0.089	-1.67	0.09
CSENIOR = 1 if person is 80 years and above; 0 otherwise	-0.22	0.156	-1.41	0.16
DNBABY_9*=1 if children 1-5 years old decreased; 0 otherwise	0.84	0.342	2.46	0.01
DNKID_9=1 if children 6-17 years old decreased; 0 otherwise	-0.72	0.267	-2.68	0.01
INPUPI_A=1 if students increased; 0 otherwise	0.38	0.248	1.53	0.13
NOVEMP_9=1 if the person joined the labor force; 0 otherwise	-0.60	0.260	-2.32	0.02
QUITLI_A=1 if person lost driver's license; 0 otherwise	-0.99	0.644	-1.54	0.12
DDMIX1* = 1 if change in DMIX factor1; 0 otherwise	-0.82	0.405	-2.02	0.04
INT750_9=# arterial intersections in 750 X 750 square meters	0.00	0.002	-1.48	0.14

* indicates large difference between SURE and single equation GLS impacting conclusions about significance

Table 6 Change in the amount of time at home and for nonwork travel

Difference in nonwork travel				
	Coeff.	Std.Err.	t-ratio	P-value
Constant	-10.93	13.213	-0.83	0.41
KING_9= 1 if participant resides in King County; 0 otherwise	-16.37	6.895	-2.37	0.02
KITSAP_9= 1 if participant resides in Kitsap County; 0 otherwise	-18.76	13.240	-1.42	0.16
MIDINC_9= 1 if \$35,000 ≤ Household Income < \$75,000; 0=Otherwise	11.73	6.322	1.86	0.06
IINCOM_A*= 1 if increase in income; 0 otherwise	-15.33	8.445	-1.82	0.07
EINCOM_A*= 1 if no change in income; 0 otherwise	-11.59	7.729	-1.50	0.13
INKID_9*=1 if children 6-17 years old increased; 0 otherwise	42.28	19.281	2.19	0.03
DNBABY_9=1 if children 1-5 years old decreased; 0 otherwise	50.49	25.961	1.95	0.05
INADUL_A=1 if increase in number of 18 and older; 0 otherwise	-33.85	19.408	-1.74	0.08
ENADUL_A=1 in no change in 18 and older;0 otherwise	-22.55	12.375	-1.82	0.07
INLICE_A*= 1 if drivers increased; 0 otherwise	32.15	15.140	2.12	0.03
ENLICE_A*= 1 if no change in drivers; 0 otherwise	25.00	11.896	2.10	0.04
EXPEMP_9=1 in continued working; 0 otherwise	11.93	6.491	1.84	0.07
DTAZF1*= 1 if change in TAZ factor 1; 0 otherwise	214.97	39.666	5.42	0.00
DDMIX1=1 if change in DMIX factor1; 0 otherwise	-239.79	7.845	-30.56	0.00
INT450_9= # arterial intersections in 450 X 450 square meters	1.67	0.871	1.92	0.06
INT750_9*=# arterial intersections in 750 X 750 square meters	-0.78	0.363	-2.16	0.03
PTAM75_A*= Transit frequency in 750 X 750 square meters	1.15	0.610	1.89	0.06
Difference in at home stay				
	Coeff.	Std.Err.	t-ratio	P-value
Constant	-93.09	55.309	-1.68	0.09
DNBABY_9=1 if children 1-5 years old decreased; 0 otherwise	-189.94	120.644	-1.57	0.12
INEMP_9*= 1 if workers increased in household; 0 otherwise	109.64	55.922	1.96	0.05
QUITEM_A=1 if stopped working; 0 otherwise	524.42	89.124	5.88	0.00
NOVEMP_9=1 if started working in 2000; 0 otherwise	-334.39	100.409	-3.33	0.00
DTAZF1*= 1 if change in TAZ factor 1; 0 otherwise	336.10	89.047	3.77	0.00
DDMIX1*=1 if change in DMIX factor1; 0 otherwise	-137.94	38.290	-3.60	0.00
PELAP_9	51.87	21.496	2.41	0.02
PELAP2_9	-3.84	1.608	-2.39	0.02

* indicates large difference between SURE and single equation GLS impacting conclusions about significance

Change in the amount of time for travel

The sample average shows a decrease of approximately 21 minutes in two days and the standard deviation is approximately 110 minutes. In this regression model very few variables are significantly different than zero at the 5% confidence level ($b/st.er > 1.96$). However, the majority of the significantly different than zero coefficients are for land use and level of service indicators. This may point out to a change in the spatial organization of destination choices from one wave to the next and the impact the network has on these choices.

Change in the number of trip chains

The sample average shows a decrease of 0.32 trip chains in two diary days and a standard deviation of 1.5 chains. This is not an informative regression model except for people finding a job outside the home. They are decreasing their trip chaining, confirming again that land use and closeness to major roads is important when people attempt to consolidate trips into chains.

Change in the amount of time for nonwork travel

The sample average shows a decrease of a little over 17 minutes and standard deviation of 101 minutes. This variable is another indicator of possible change in destination choice between 1999 and 2000. In this regression model King and Kitsap County residents show a decrease in their travel time by about 8 minutes per day (Snohomish and Pierce County residents show zero change between waves). As children grow older they motivate longer travel times. The increase in adults motivates a decrease in travel times and more drivers in the house motivate longer travel times. Also, land use indicators show a variety of impacts that are both positive and negative.

Change in the amount of time at home

The sample average shows an increase of approximately 53 minutes in two days of travel diary and a standard deviation of 497 minutes. The regression model shows those few persons that experienced a move that resulted in a change of land use characteristics also experienced an increase in staying at home that is the result of two opposite forces (DTAZF1 and DDMIX1). Dropping out of the labor force causes an increase in staying at home for an average of 524.4 minutes in two days. Interestingly a person is also impacted by labor force entry of other household members. On one hand, persons in households that increased their labor force participation tend to stay at home longer than the previous wave by an average of

109.6 minutes. Possibly indicating a need to stay at home for longer periods and a reallocation of tasks to the persons leaving the residence during the day. On the other hand, when the person we examine joins the labor force (getting a job outside the house), this event decreases home stay by an average of 334.4 minutes in two days.

Similar findings were also encountered when studying the change in behavioral indicators between the year 2000 and 2002 with significant differences for each regression pointing out to the possible volatility of these relationships. In addition, similar findings are also confirmed by the SURE estimation that allows for cross-correlation of change in the unobserved components of variance. However, regression coefficient values and significance of many variables are different between the GLS and SURE (identified by an * in Tables 5 and 6). These findings point to a few directions. First, the small change in the explanatory variables is unable to explain the changes in the dependent variables. Second, a model that allows for more complete and detailed correlations among the dependent variables is required to identify possible sequencing in these changes. Third, the explanatory variables used here are not sufficient informants (e.g., attitudes and knowledge are not included in this study) of change. Fourth, the time span considered here may be too short. Unfortunately, extending the period to many more years would stretch the credibility of the land use indicators that are vintage 2000. No longitudinal land use records were available for this study.

6. Conclusions

In this paper we use three analytical tools to examine the likely activity and travel behavior of baby boomers. The three tools are focus group theme extraction with descriptive analysis of data, latent class cluster analysis, and regression models estimating propensity for change in activity and travel indicators. Older and early-retiring baby boomers are not significantly different in their activity and travel behavior than other groups when one accounts for differences in factors affecting activity and travel behavior such as gender, car ownership and driver's license holding status. This enables analysis of today's seniors to be used as informants about the behavior of baby boomers when they reach seniority (see also Srinivasan, McGuckin, and Murakami, 2005). This is particularly appropriate when employment (part time or full time) continues beyond retirement age.

Both the focus group statements and themes, as well as the data analysis in this paper and an earlier report (Goulias 2005), point to a somewhat more mobile baby boomer population segment that will continue using their private vehicles until they are forced into driving cessation. Even in that case, however, they may still motivate car trips as passengers with relatives and driving friends until they are forced by context and circumstances to use costly door-to-door paratransit services or other transit services. In fact, only the group of people that owns no cars at all makes a substantial number of trips by transit. Early evidence also shows that persons 65 and older may continue to work either full time or part time and to raise children until later in life (a confirmation of this at the national level is discussed in Srinivasan, McGuckin, and Murakami, 2005). These trends indicate that many baby boomers will simply continue travel behavior patterns that are observed today (e.g., many trips, long distances, and departures that are spread throughout the day) but maybe for different reasons. If they are also unemployed, they will exhibit richer diversity in their behavior such as consolidating trips on one day and staying home the next. All these findings are not good news for planning and policy making. An increase in population heterogeneity means a need to provide wider variety of services, possibly lower degree of predictability, and potentially the need for services that may not reach suitable economies of scale.

The analysis in this paper shows that personal and household member change of employment events are more likely to motivate a change in activity and travel behavior for individuals. Changes of the household composition such as departure of children, arrival of older adults, reallocation of tasks within the household and changes in car ownership, availability, and driving roles are also associated with a change in activity and travel patterns. These findings provide evidence that a more detailed analysis of changes and within-household interactions will yield important information about changes in the lives of the baby boomers and will lead to a different set of explanatory variables to use in travel demand forecasting models.

Less clear from the analysis here are the spatial and place preferences of older individuals today and of the baby boomers as they age later. For example, we find shorter travel times and distances but we know little about specific locations. Although the focus groups participants tell us they changed their destinations after retirement, we did not perform detailed spatial analysis in this project. In addition, the focus group findings and the data analysis show a possible increase in the freedom of scheduling travel in more desirable ways than in the past. This freedom undermines the concept of a representative day, particularly

when we examine the year to year transition of behavioral patterns. The impact of all this on the activity space of individuals and households is unknown and most likely shows wide variance of activity spaces and an increase in the destination choice variability, which again undermines trip distribution procedures in the typical four step models. In addition, of particular interest for active living and related analysis are questions about non-motorized travel and acquired driving habits as well as other general time allocation and traveling habits, home and work location characteristics, and places visited and the significance of these places. This has implications for neighborhood services and opportunities for the baby boomers. Although land use changes seem to be correlated with behavioral change, the lack of a substantial number of households that experience change in land use characteristics does not allow for clear conclusions about this aspect except that there are land use indicators with exactly opposite impacts on travel behavior. From a data collection standpoint we can also explore longer period for activity-travel diaries and using tracking with GPS or other technologies that decrease respondent burden and provide more information about day to day variability.

In closing, at a minimum travel demand models and travel behavior analysis need to consider more carefully employment and job type as key explanatory variables, as argued already elsewhere and confirmed in this paper. Some of this information can be recovered from other agencies that are focused on labor force dynamics and could provide us with useful information. In addition, analysis of household composition that goes beyond the typical household life cycle stage analysis needs a more careful scrutiny. Finally, availability of land use data at the microscale used here (gridcells of 150 by 150 meters with informative variables included) offers a unique opportunity to test hypotheses about land use and travel behavior. Tracking of this type of land use information to provide a longitudinal record can provide the needed link between travel behavior and land use. In fact, we would strongly recommend that future surveys be stored in a GIS format that also contains land use information of the same vintage as the survey data.

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Appendix A
Focus Group participants in PSTP that appear in the data analysis file used to derive behavioral clusters in this report

Case Summaries(a)

	Household ID+Sub ID	Person ID		Household ID+Sub ID	Person ID
1	00123-0	1	46	02617-0	1
2	00123-0	1	47	02660-0	2
3	00123-0	1	48	02660-0	2
4	00123-0	1	49	02660-0	2
5	00123-0	1	50	02660-0	2
6	00123-0	1	51	02660-0	2
7	00123-0	1	52	02660-0	2
8	00454-0	2	53	02660-0	2
9	00454-0	2	54	03272-0	1
10	00454-0	2	55	03272-0	1
11	00454-0	2	56	03272-0	1
12	00454-0	2	57	03272-0	1
13	00454-0	2	58	03272-0	1
14	00454-0	2	59	03272-0	1
15	00454-0	2	60	03272-0	1
16	00454-0	2	61	03272-0	1
17	00454-0	2	62	03272-0	1
18	01232-0	2	63	03272-0	1
19	01232-0	2	64	03611-0	1
20	01232-0	2	65	03611-0	1
21	01232-0	2	66	03611-0	1
22	01232-0	2	67	03611-0	1
23	01232-0	2	68	03611-0	1
24	01232-0	2	69	03611-0	1
25	01232-0	2	70	03611-0	1
26	01232-0	2	71	03611-0	1
27	02594-0	2	72	03611-0	1
28	02594-0	2	73	03617-0	1
29	02594-0	2	74	03617-0	1
30	02594-0	2	75	03617-0	1
31	02594-0	2	76	03617-0	1
32	02594-0	2	77	03617-0	1
33	02594-0	2	78	03617-0	1
34	02594-0	2	79	03617-0	1
35	02594-0	2	80	03617-0	1
36	02594-0	2	81	03786-0	2
37	02617-0	1	82	03786-0	2
38	02617-0	1	83	03786-0	2
39	02617-0	1	84	03854-0	1
40	02617-0	1	85	03854-0	1
41	02617-0	1	86	03854-0	1
42	02617-0	1	87	03854-0	1
43	02617-0	1	88	03854-0	1
44	02617-0	1	89	03854-0	1
45	02617-0	1	90	03854-0	1

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	Household ID+Sub ID	Person ID		Household ID+Sub ID	Person ID
91	03854-0	1	136	16051-0	1
92	03854-0	1	137	16180-0	2
93	03854-0	1	138	16180-0	2
94	03981-0	2	139	16180-0	2
95	03981-0	2	140	16180-0	2
96	10162-0	1	141	16207-0	1
97	10162-0	1	142	16207-0	1
98	10162-0	1	143	16207-0	1
99	10162-0	1	144	16207-0	1
100	10162-0	1	145	16207-0	1
101	10162-0	1	146	16376-0	2
102	10162-0	1	147	16610-0	1
103	10162-0	1	148	16610-0	1
104	10162-0	1	149	16610-0	1
105	10299-0	1	150	16610-0	1
106	10299-0	1	151	16610-0	1
107	11323-0	2	152	17207-0	1
108	11323-0	2	153	17207-0	1
109	11323-0	2	154	17207-0	1
110	11323-0	2	155	17207-0	1
111	11323-0	2	156	18186-0	2
112	11323-0	2	157	18186-0	2
113	11323-0	2	158	18186-0	2
114	14625-0	1	159	18186-0	2
115	14699-0	2	160	18363-0	1
116	14699-0	2	161	18363-0	1
117	14699-0	2	162	18363-0	1
118	14699-0	2	163	18363-0	1
119	14699-0	2	164	18771-0	1
120	14699-0	2	165	18771-0	1
121	14699-0	2	166	19121-0	1
122	15112-0	1	167	19121-0	1
123	15112-0	1	168	19121-0	1
124	15112-0	1	169	19358-0	1
125	15325-0	1	170	19358-0	1
126	15325-0	1	171	19358-0	1
127	15325-0	1	172	19442-0	1
128	15325-0	1	173	19514-0	1
129	15325-0	1	174	19514-0	1
130	15326-0	1	175	19514-0	1
131	15326-0	1	176	20030-0	1
132	15326-0	1	177	20030-0	1
133	15326-0	1	178	20411-0	1
134	15326-0	1	179	20411-0	1
135	16051-0	1	180	20522-0	2

Appendix B
Cluster membership by employment status and day of the week

Table B.1 Cluster membership by outside home employment status

Cluster In 1999	Traveler	Count	Employed outside of home		Total
			Yes	No	
		169	210	379	
		% within Cluster In 1999	44.6%	55.4%	100.0%
	Loner	Count	269	77	346
		% within Cluster In 1999	77.7%	22.3%	100.0%
	Moderate	Count	17	117	134
		% within Cluster In 1999	12.7%	87.3%	100.0%
	Homestay B	Count	15	92	107
		% within Cluster In 1999	14.0%	86.0%	100.0%
	Homestay A	Count	11	58	69
		% within Cluster In 1999	15.9%	84.1%	100.0%
	Inactive	Count	6	35	41
		% within Cluster In 1999	14.6%	85.4%	100.0%
Total		Count	487	589	1076
		% within Cluster In 1999	45.3%	54.7%	100.0%

Table B.2 Cluster membership in 2000 by outside home employment status

Cluster In 2000			Employed outside of home		Total
			Yes	No	
Traveler	Count		113	168	281
	% within Cluster In 2000		40.2%	59.8%	100.0%
Loner	Count		272	71	343
	% within Cluster In 2000		79.3%	20.7%	100.0%
Moderate	Count		22	142	164
	% within Cluster In 2000		13.4%	86.6%	100.0%
Homestay B	Count		27	97	124
	% within Cluster In 2000		21.8%	78.2%	100.0%
Homestay A	Count		19	72	91
	% within Cluster In 2000		20.9%	79.1%	100.0%
Inactive	Count		17	56	73
	% within Cluster In 2000		23.3%	76.7%	100.0%
Total	Count		470	606	1076
	% within Cluster In 2000		43.7%	56.3%	100.0%

Table B.3 Cluster membership by day of the week in Day 1 in 1999

			Day of week for day 1					Total
			Monday	Tuesday	Wednesday	Thursday	Friday	
Cluster In 1999	Traveler	Count	77	95	93	114	1	380
		% within Cluster In 1999	20.3%	25.0%	24.5%	30.0%	.3%	100.0%
	Loner	Count	90	100	80	76	0	346
		% within Cluster In 1999	26.0%	28.9%	23.1%	22.0%	.0%	100.0%
	Moderate	Count	45	29	26	34	0	134
		% within Cluster In 1999	33.6%	21.6%	19.4%	25.4%	.0%	100.0%
	Homestay B	Count	22	23	38	24	0	107
		% within Cluster In 1999	20.6%	21.5%	35.5%	22.4%	.0%	100.0%
	Homestay A	Count	28	19	14	8	0	69
		% within Cluster In 1999	40.6%	27.5%	20.3%	11.6%	.0%	100.0%
	Inactive	Count	12	17	10	2	0	41
		% within Cluster In 1999	29.3%	41.5%	24.4%	4.9%	.0%	100.0%
	Total	Count	274	283	261	258	1	1077
		% within Cluster In 1999	25.4%	26.3%	24.2%	24.0%	.1%	100.0%

Table B.4 Cluster membership by day of the week in Day 2 in 1999

			Day of week for day 2					Total
			Monday	Tuesday	Wednesday	Thursday	Friday	
Cluster In 1999	Traveler	Count	3	79	92	92	114	380
		% within Cluster In 1999	.8%	20.8%	24.2%	24.2%	30.0%	100.0%
	Loner	Count	0	92	100	78	76	346
		% within Cluster In 1999	.0%	26.6%	28.9%	22.5%	22.0%	100.0%
	Moderate	Count	0	44	30	26	34	134
		% within Cluster In 1999	.0%	32.8%	22.4%	19.4%	25.4%	100.0%
	Homestay B	Count	0	23	24	36	24	107
		% within Cluster In 1999	.0%	21.5%	22.4%	33.6%	22.4%	100.0%
	Homestay A	Count	0	28	19	14	8	69
		% within Cluster In 1999	.0%	40.6%	27.5%	20.3%	11.6%	100.0%
	Inactive	Count	0	12	18	9	2	41
		% within Cluster In 1999	.0%	29.3%	43.9%	22.0%	4.9%	100.0%
Total		Count	3	278	283	255	258	1077
		% within clu#.8: Cluster In 1999	.3%	25.8%	26.3%	23.7%	24.0%	100.0%

Table B.5 Cluster membership by day of the week in Day 1 in 2000

Cluster	Traveler		Day of week for day 1					
			Monday	Tuesday	Wednesday	Thursday	Friday	
Cluster In 2000		Count	59	73	69	79	1	281
		% within Cluster In 2000	21.0%	26.0%	24.6%	28.1%	.4%	100.0%
	Loner	Count	97	102	75	69	0	343
		% within Cluster In 2000	28.3%	29.7%	21.9%	20.1%	.0%	100.0%
	Moderate	Count	44	43	45	32	0	164
		% within Cluster In 2000	26.8%	26.2%	27.4%	19.5%	.0%	100.0%
	Homestay B	Count	34	26	31	34	0	125
		% within Cluster In 2000	27.2%	20.8%	24.8%	27.2%	.0%	100.0%
	Homestay A	Count	21	25	21	24	0	91
		% within Cluster In 2000	23.1%	27.5%	23.1%	26.4%	.0%	100.0%
	Inactive	Count	17	23	17	16	0	73
		% within Cluster In 2000	23.3%	31.5%	23.3%	21.9%	.0%	100.0%
Total		Count	272	292	258	254	1	1077
		% within Cluster In 2000	25.3%	27.1%	24.0%	23.6%	.1%	100.0%

Table B.6 Cluster membership by day of the week in Day 2 in 2000

			Day of week for day 2					Total
			Tuesday	Wednesday	Thursday	Friday	Saturday	
Cluster In 2000	Traveler	Count	59	73	69	79	1	281
		% within Cluster In 2000	21.0%	26.0%	24.6%	28.1%	.4%	100.0%
	Loner	Count	96	102	76	69	0	343
		% within Cluster In 2000	28.0%	29.7%	22.2%	20.1%	.0%	100.0%
	Moderate	Count	44	43	45	32	0	164
		% within Cluster In 2000	26.8%	26.2%	27.4%	19.5%	.0%	100.0%
	Homestay B	Count	34	26	31	34	0	125
		% within Cluster In 2000	27.2%	20.8%	24.8%	27.2%	.0%	100.0%
	Homestay A	Count	21	25	21	24	0	91
		% within Cluster In 2000	23.1%	27.5%	23.1%	26.4%	.0%	100.0%
	Inactive	Count	17	23	17	16	0	73
		% within Cluster In 2000	23.3%	31.5%	23.3%	21.9%	.0%	100.0%
Total		Count	271	292	259	254	1	1077
		% within Cluster In 2000	25.2%	27.1%	24.0%	23.6%	.1%	100.0%

Appendix C
Cluster membership of focus group participants

Table C.1 Focus group participant cluster membership in 1999

Cluster In 1999		Count	Focus Group Participation		Total
			Not a participant	Participant*	
Traveler	Count	378	2	380	
	% within Focus Group Participation	35.8%	9.5%	35.3%	
Loner	Count	333	13	346	
	% within Focus Group Participation	31.5%	61.9%	32.1%	
Moderate	Count	128	6	134	
	% within Focus Group Participation	12.1%	28.6%	12.4%	
Homestay B	Count	107	0	107	
	% within Focus Group Participation	10.1%	.0%	9.9%	
Homestay A	Count	69	0	69	
	% within Focus Group Participation	6.5%	.0%	6.4%	
Inactive	Count	41	0	41	
	% within Focus Group Participation	3.9%	.0%	3.8%	
Total	Count	1056	21	1077	
	% within Focus Group Participation	100.0%	100.0%	100.0%	

*From among the forty focus group participants clusters were obtained for only 21 due to missing and unverifiable information.

Table C.2 Focus group participant cluster membership in 2000

Cluster In 2000	Traveler	Count	Focus Group Participation		Total
			Not a participant	Participant	
		278	3		281
		% within Focus Group Participation	26.3%	14.3%	26.1%
	Loner	Count	332	11	343
		% within Focus Group Participation	31.4%	52.4%	31.8%
	Moderate	Count	160	4	164
		% within Focus Group Participation	15.2%	19.0%	15.2%
	Homestay B	Count	123	2	125
		% within Focus Group Participation	11.6%	9.5%	11.6%
	Homestay A	Count	90	1	91
		% within Focus Group Participation	8.5%	4.8%	8.4%
	Inactive	Count	73	0	73
		% within Focus Group Participation	6.9%	.0%	6.8%
Total		Count	1056	21	1077
		% within Focus Group Participation	100.0%	100.0%	100.0%

Appendix D

Average component values used in the regression models of change

Table D.1 Descriptive statistics of the land use factors used as explanatory variables in the change models between 1999 and 2000

	N	Minimum	Maximum	Mean	Std. Deviation
tazf1	3273	-1.69743	3.55034	.0000000	1.0000000
tazf2	3273	-1.34367	2.85388	.0000000	1.0000000
tazf3	3273	-2.56664	3.69187	.0000000	1.0000000
tazf4	3273	-.61986	5.91930	.0000000	1.0000000
denf1	3273	-2.43786	13.55723	.0000000	1.0000000
denf2	3273	-2.15600	22.60597	.0000000	1.0000000
denf3	3273	-5.57732	30.19660	.0000000	1.0000000
denf4	3273	-4.53213	22.98458	.0000000	1.0000000
mix1	3273	-2.82072	26.85066	.0000000	1.0000000
mix2	3273	-3.96263	37.29471	.0000000	1.0000000
mix3	3273	-12.26637	9.71670	.0000000	1.0000000
mix4	3273	-7.02376	26.59905	.0000000	1.0000000
mix5	3273	-5.13284	26.27878	.0000000	1.0000000
mix6	3273	-11.09795	31.59819	.0000000	1.0000000
mix7	3273	-2.86746	46.96659	.0000000	1.0000000
Valid N (listwise)	3273*				

* Note: this number includes persons that appear in one wave or the other and 1077 that appeared in both waves and for this reason are included in this sample twice.

Appendix E
Land Use Indicators

Appendix E: Land Use Indicators

A “Land Use Indicators” database was developed to provide additional explanatory information for Baby Boomers’ travel behaviors in the region. Land use characteristics were assigned to the travel data locations to examine the relationship between various land use characteristics and the observed travel behavior.

The primary foundation for this developed “Land Use Indicators” database was the Puget Sound Regional Council’s 2000 UrbanSim baseyear database¹. This UrbanSim baseyear database was derived from Census Data, Covered ESD 202 Employment Data, regional assessors and parcel data. In addition, various GIS spatial analysis functions were utilized to supplement the UrbanSim baseyear database with new land use indicator fields.

The Land Use Indicators database divided the entire four county Central Puget Sound Region into 150 meter x 150 meter gridcells (5.56 acres), for a total of 793,659 gridcells. Each of these gridcells was assigned values based on various land use characteristics, for example, Households per gridcell, Jobs per gridcell, Commercial Square Feet per gridcell, etc.

The Land Use Characteristics were summed per gridcell for the following characteristics:

- Persons
- Households
- Jobs
- Jobs by Sector
- Residential Housing Units
- Industrial Square Feet
- Commercial Square Feet
- Government Square Feet
- Intersection Density – Count of intersections
- Distances from gridcell centroids to nearest arterial intersection point and arterial line
- Sum of Public Transit Availability
- Water – (Yes/no if the gridcell intersects any major water bodies)
- Distances from each TAZ (Transportation Analysis Zone) to each identified “urban center” (see below for further information)

For selected land use characteristics the surrounding 3x3 (450 meters) and 5x5 (750 meters) gridcell data were summed for each gridcell as well to provide broader land use data of the surrounding areas. Since 150 meters is not a very larger area for jobs, the

The travel data address locations of the survey participants were geocoded using GIS software to obtain exact point locations in the region as X,Y coordinates. These point locations were then superimposed onto the 793,659 regional gridcells. The land use characteristics data from the corresponding gridcells were then assigned to each of the X,Y travel data points. Thus for each travel data address location the underlying land use

¹ Documentation for developing the PSRC 2000 Baseyear can be found at http://www.urbansim.org/projects/psrc/documentation/tex/main_doc.pdf. Basic information on the UrbanSim project can be found at www.urbansim.org

characteristics were assigned to analyze the relationship between the land use characteristics and travel behavior.

For the Land Use characteristic “Distances from each TAZ (Transportation Analysis Zone) to each identified urban center” a collection of “urban centers” in the Central Puget Sound Region were identified. These “urban centers” were selected from the designated “Regional Growth Centers” and “Manufacturing/Industrial Centers” in the Central Puget Sound Region. This group of “urban centers” was identified to represent a range of various employment centers, health services centers, and shopping centers in the region distributed throughout the four counties.

“Urban Centers” are generally defined as areas of compact development where housing, employment, shopping and other activities are in close proximity. They come in a variety of sizes and types, ranging from large, established downtowns that serve major portions of the whole region, to emerging suburban crossroads with more of a neighborhood orientation. “Regional Growth Centers” are centers that are designated for regional purposes to be easily accessible areas of focused growth offering a wide variety of jobs, services, and important civic and cultural resources.

VISION 2020 is the Central Puget Sound region’s four-county regional growth, economic and transportation strategy. A central VISION 2020 goal is to foster a regional growth pattern that focuses development in urban growth areas, with an emphasis on directing a significant portion of growth to the regional growth centers. *Destination 2030*, the central Puget Sound region’s metropolitan transportation plan (MTP), recognizes the importance of linking land use with transportation planning to significantly improve mobility and accessibility in the region. Developed within the context of VISION 2020, *Destination 2030* asserts that the way land is developed significantly impacts transportation. A major policy focus of *Destination 2030* calls for coordinating transportation and land use planning to support transit and pedestrian-oriented land use patterns within the urban area, especially in the regional growth centers.

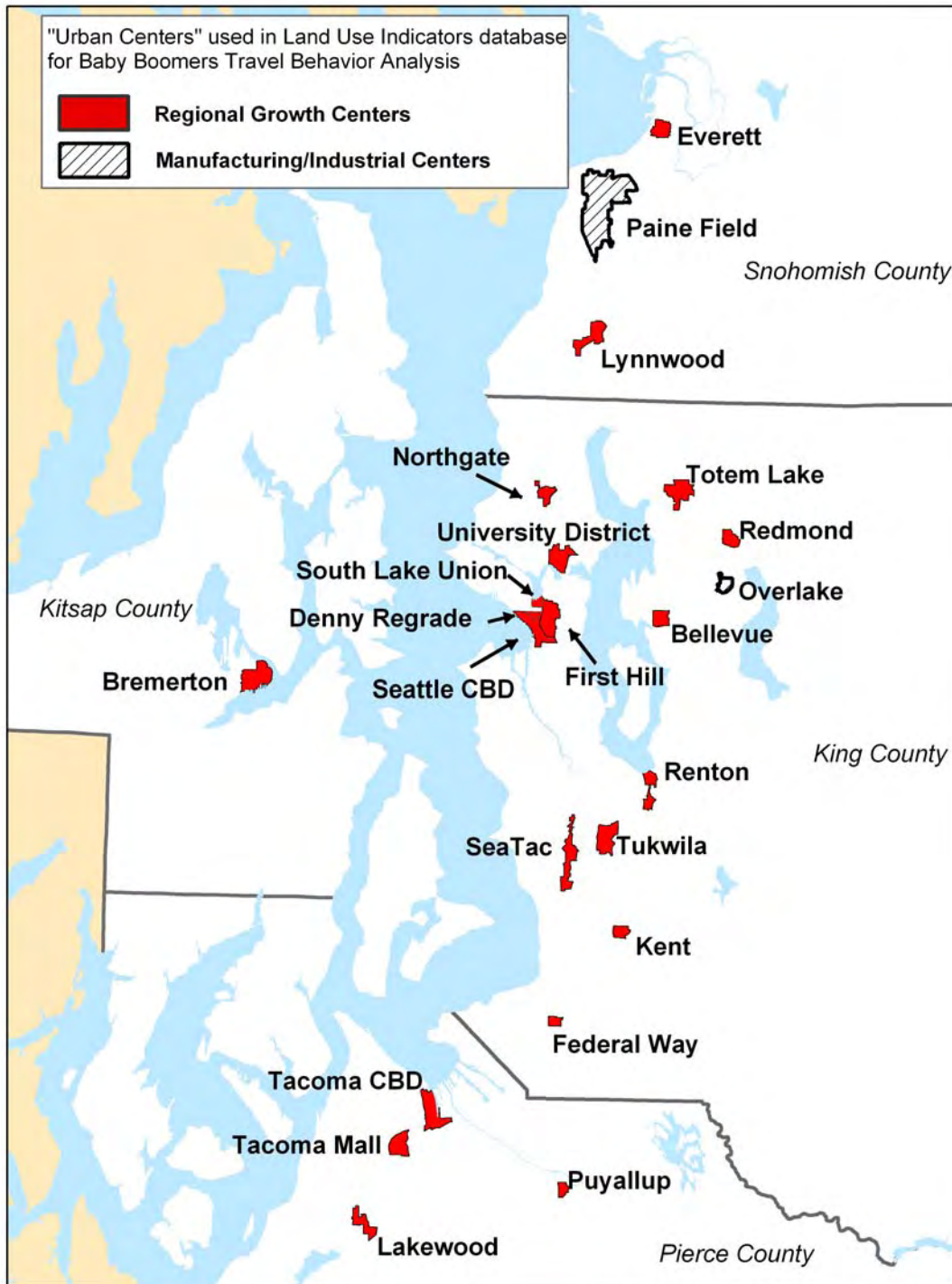
The “urban centers” used in this analysis were as follows:

- Snohomish County
 1. Everett (Regional Growth Center)
 2. Paine Field (Manufacturing / Industrial center)
 3. Lynnwood (Regional Growth Center)

- King County
 1. Federal Way (Regional Growth Center)
 2. First Hill (Health Services / Regional Growth Center)
 3. Kent (Regional Growth Center)
 4. Northgate (Shopping Center / Regional Growth Center)
 5. Overlake (Health Services and Manufacturing/Industrial Center)
 6. Redmond (Regional Growth Center)
 7. Renton (Regional Growth Center)
 8. SeaTac (Regional Growth Center)
 9. Seattle Downtown CBD (Shopping Center / Regional Growth Center)

10. South Lake Union (Employment Center)
 11. Tukwila (Regional Growth Center)
 12. Totem Lake (Regional Growth Center)
 13. University District (Regional Growth Center)
- Kitsap County
 1. Bremerton (Regional Growth Center)

 - Pierce County
 1. Lakewood (Regional Growth Center)
 2. Puyallup (Regional Growth Center)
 3. Tacoma Downtown CBD (Regional Growth Center)
 4. Tacoma Mall (Shopping Center / Regional Growth Center)



The final fields developed in the Land Use Indicators database were as follows:

DATA FIELD	DESCRIPTION
XCOORD	X COORDINATE
YCOORD	Y COORDINATE
GRIDCODE	GRIDCODE ID FOR REGIONAL GRIDCELL FILE (150 METER)
HH	HOUSEHOLDS PER GRIDCELL (150 METER)
HH3x3	HOUSEHOLDS PER SURROUNDING 3X3 GRIDCELLS (450 METERS)
HH5x5	HOUSEHOLDS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
PERS	PERSONS PER GRIDCELL (150 METER)
PERS3x3	PERSONS PER SURROUNDING 3X3 GRIDCELLS (450 METERS)
PERS5x5	PERSONS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
TAZ	TRANSIT ANALYSIS ZONE (TAZ)
TAZ_BELL	DISTANCE FROM TAZ TO BELLEVUE (METROPOLITAN CENTER)
TAZ_BREM	DISTANCE FROM TAZ TO BREMERTON (METROPOLITAN CENTER)
TAZ_EVER	DISTANCE FROM TAZ TO EVERETT (METROPOLITAN CENTER)
TAZ_FIRS	DISTANCE FROM TAZ TO FIRST HILL (URBAN CENTER)
TAZ_LYNN	DISTANCE FROM TAZ TO LYNNWOOD (URBAN CENTER)
TAZ_NORT	DISTANCE FROM TAZ TO NORTHGATE (URBAN CENTER)
TAZ_RENT	DISTANCE FROM TAZ TO RENTON (URBAN CENTER)
TAZ_SOUT	DISTANCE FROM TAZ TO SOUTH LAKE UNION (URBAN CENTER)
TAZ_STAC	DISTANCE FROM TAZ TO SEATAC (URBAN CENTER)
TAZ_SEAT	DISTANCE FROM TAZ TO SEATTLE CBD (REGIONAL CENTER)
TAZ_DENN	DISTANCE FROM TAZ TO DENNY GRADE (URBAN CENTER)
TAZ_SWPA	DISTANCE FROM TAZ TO SW PAINE FIELD (URBAN CENTER)
TAZ_TCBD	DISTANCE FROM TAZ TO TACOMA CBD (METROPOLITAN CENTER)
TAZ_TMAL	DISTANCE FROM TAZ TO TACOMA MALL (URBAN CENTER)
TAZ_UNIV	DISTANCE FROM TAZ TO SEATTLE UNIVERSITY DISTRICT (URBAN CENTER)
TAZ_FEDE	DISTANCE FROM TAZ TO FEDERAL WAY (URBAN CENTER)
TAZ_KENT	DISTANCE FROM TAZ TO KENT (URBAN CENTER)
TAZ_LKWO	DISTANCE FROM TAZ TO LAKEWOOD (URBAN CENTER)
TAZ_OVER	DISTANCE FROM TAZ TO OVERLAKE (URBAN CENTER)
TAZ_PUYA	DISTANCE FROM TAZ TO PUYALLUP (URBAN CENTER)
TAZ_REDM	DISTANCE FROM TAZ TO REDMOND (URBAN CENTER)
TAZ_TOTE	DISTANCE FROM TAZ TO TOTEM LAKE (URBAN CENTER)
TAZ_TUKW	DISTANCE FROM TAZ TO TUKWILA (URBAN CENTER)
JOBS	JOBS PER GRIDCELL (150 METER)
JOBS3X3	JOBS PER SURROUNDING 3X3 GRIDCELLS (450 METERS)
JOBS5X5	JOBS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
J_AGR15x5	AGRICULTURE, FORESTRY, FISHING AND HUNTING - JOBS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
J_MINI5x5	MINING - JOBS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
J_UTIL5x5	UTILITIES - JOBS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
J_CONS5x5	CONSTRUCTION - JOBS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
J_MANU5x5	MANUFACTURING - JOBS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
J_WHOL5x5	WHOLESALE TRADE - JOBS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
J_RETA5x5	RETAIL TRADE - JOBS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
J_TRAN5x5	TRANSPORTATION - JOBS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
J_INFO5x5	INFORMATION - JOBS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
J_FINA5x5	FINANCE AND INSURANCE - JOBS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
J_REAL5x5	REAL ESTATE AND RENTAL AND LEASING - JOBS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)

J_PROF5x5	PROFESSIONAL, SCIENTIFIC, AND TECHNICAL SERVICES - JOBS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
J_MANA5x5	MANAGEMENT OF COMPANIES AND ENTERPRISES - JOBS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
J_ADMI5x5	ADMINISTRATIVE AND SUPPORT, WASTE MANAGEMENT, REMEDIATION SERVICES - JOBS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
J_EDUC5x5	EDUCATIONAL SERVICES - JOBS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
J_HEAL5x5	HEALTH CARE AND SOCIAL ASSISTANCE - JOBS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
J_ARTS5x5	ARTS, ENTERTAINMENT, AND RECREATION - JOBS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
J_ACCO5x5	ACCOMMODATION AND FOOD SERVICES - JOBS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
J_OTHE5x5	OTHER SERVICES (EXCEPT PUBLIC ADMINISTRATION) - JOBS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
J_PUBL5x5	PUBLIC ADMINISTRATION - JOBS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
UNITS	RESIDENTIAL HOUSING UNITS PER GRIDCELL (150 METER)
UNITS3x3	RESIDENTIAL HOUSING UNITS PER SURROUNDING 3X3 GRIDCELLS (450 METERS)
UNITS5x5	RESIDENTIAL HOUSING UNITS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
COMSQFT	COMMERCIAL SQ FT PER GRIDCELL (150 METERS)
COMSQFT3x3	COMMERCIAL SQ FT PER SURROUNDING 3X3 GRIDCELLS (450 METERS)
COMSQFT5x5	COMMERCIAL SQ FT PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
INDSQFT	INDUSTRIAL SQ FT PER GRIDCELL (150 METERS)
INDSQFT3x3	INDUSTRIAL SQ FT PER SURROUNDING 3X3 GRIDCELLS (450 METERS)
INDSQFT5x5	INDUSTRIAL SQ FT PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
GOVSQFT	GOVERNMENT SQ FT PER GRIDCELL (150 METERS)
GOVSQFT3x3	GOVERNMENT SQ FT PER SURROUNDING 3X3 GRIDCELLS (450 METERS)
GOVSQFT5x5	GOVERNMENT SQ FT PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
INT	COUNT OF ARTERIAL INTERSECTIONS PER GRIDCELL (150 METERS)
INT3x3	COUNT OF ARTERIAL INTERSECTIONS PER SURROUNDING 3X3 GRIDCELLS (450 METERS)
INT5x5	COUNT OF ARTERIAL INTERSECTIONS PER SURROUNDING 5X5 GRIDCELLS (750 METERS)
ARTL_DIST	DISTANCE TO NEAREST ARTERIAL LINE (FROM EACH GRIDCELL CENTROID)
ARTL_INTER_DIST	DISTANCE TO NEAREST ARTERIAL INTERSECTION POINT (FROM EACH GRIDCELL CENTROID)
AM_AVG	TRANSIT AVAILABILITY AM AVERAGE PER GRIDCELL OF SURROUNDING 5X5 (750 METERS)
MD_AVG	TRANSIT AVAILABILITY MID-DAY AVERAGE PER GRIDCELL OF SURROUNDING 5X5 (750 METERS)
WATER	IDENTIFIES IF GRIDCELL INTERSECTS MAJOR WATER BODIES (150 METER) (1=INTERSECTS)
WATER3x3	IDENTIFIES IF SURROUNDIND 3X3 GRIDCELLS INTERSECT MAJOR WATER BODIES (450 METER) (1=INTERSECTS)
WATER5X5	IDENTIFIES IF SURROUNDIND 5X5 GRIDCELLS INTERSECT MAJOR WATER BODIES (450 METER) (1=INTERSECTS)