PORTLAND PLAN

Housing and Transportation Cost Study

PORTLAND PLAN BACKGROUND REPORT
FALL 2009

PLANNING AND SUSTAINABILITY COMMISSION
RECOMMENDED DRAFT
DECEMBER 14, 2010

City of Portland Bureau of
Planning and Sustainability
Sam Adams, Mayor | Susan Anderson, Director

Acknowledgments

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Housing and Transportation Cost Study

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Economic and Policy Analysis

May 2009

HOUSING AND TRANSPORTATION COST STUDY

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City of Portland
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SUMMARY

The City of Portland's and the region's approach to planning has helped make our region one of the most livable in the world. Even so, the city's livability is threatened by economic instability, changing settlement patterns, and global climate change. As it undergoes periodic review, the City is trying to find new ways to address these global issues. And, recent volatility in fuel prices has led to an interest in incorporating the cost of transportation along with the cost of housing when examining housing affordability. This analysis begins to make that link between the two policy priorities—the need for affordable housing and transportation accessibility.

This report develops a framework to guide the City's efforts toward calculating a combined housing and transportation cost burden, particularly as it pertains to housing affordability. This document reports on a preliminary analytic framework, including recommendations and refinement to the Metroscope model, suggested inclusions in subsequent work products, and an exploration of policy tools and choices.

Key findings from this preliminary analysis include the following:

- The smallest proportion of household income earmarked for housing and transportation (for all housing types and tenures and all household groups) was estimated at about 32 percent, for small areas in close-in on the eastside and the southern part of downtown Portland.

- Lower-income groups in the rental multi-family market (for the household groups defined and estimated by Metroscope) tend to spend higher proportions of their income on transportation costs than their higher-income counterparts, though the proportion spent on transportation varies somewhat.

- Lower-income groups in the rental multi-family market tend to spend higher proportions of their income on transportation and housing costs combined. One of the lowest-income household groups (Metroscope's Group 2) in the rental multi-family market faces the highest combined housing and transportation cost burden of all demographic groups, averaging 79 percent region-wide, followed by the other lowest-income household group (Group 1), at about 64 percent, with the higher-income groups requiring relatively lower proportions of their household income committed to housing and transportation.

- Even in the most location-efficient areas, the lowest-income households are still cost burdened, with a high proportion of household income committed to housing and transportation.

- Location-efficiency of housing can lessen the cost burden of housing and transportation, but must be viewed as one of many potential tools to increase housing affordability for low-income households.

This preliminary analysis recommends continuing to refine the Metroscope model for the housing and transportation cost burden analysis. Metroscope provides a realistic understanding of what housing will be supplied in particular areas given transportation infrastructure investments, land supply restrictions, and household preferences for community and housing costs. However, use of the model can be refined in a variety of ways to better satisfy the goals of the housing and transportation cost burden analysis. Further analysis might include:

- ***Developing a quantitative standard for combined housing and transportation cost burden*:** With the generally-accepted definition of cost burden for housing alone at 30 percent of household income, a suitable standard for housing and transportation combined might be in the 45- to 50-percent range.
- ***Developing a quantitative standard or index for location-efficient housing:*** The general definition of a location-efficient area is one that is well-served by transit, and is conducive to biking, walking and other modes of transportation. The empirical definition might be based on the proportion of trips captured by non-driving modes, adjacency to a well-served transit station (light-rail or streetcar station or frequent bus service), proximity to employment, retail and other services, or some combination.
- ***Challenging the traditional definition of transportation cost:*** Transportation costs have been defined using a traditional concept of cost in terms of the average capital outlay required for travel (including capital and maintenance costs of vehicles), and average cost of vehicle operation. However, other issues include the cost differential (capital cost and operational cost) of different types of vehicles and the cost of time spent en route due to prolonged travel time, congestion, or other factors.
- ***Exploring possible metrics for quantifying household wealth***: For many households, particularly older households, the wealth effect has an important impact on whether housing costs cause economic hardship. Households that have the wealth required to purchase a home with a significant down payment will have a much lower mortgage payment than a household that must finance 80 percent of the cost, which is the assumption made by Metroscope.
- ***Relaxing county- or regionally-based assumptions***. Though the analysis recognizes distinctions in mode-split choices due to consumption patterns, it may not fully recognize the many differences in location-efficiency among the variety of census tracts within Multnomah County. Several transit and walkability indices are available which might be incorporated into Metroscope to refine the model's estimates of mode split.
- ***Development of Case Studies:*** To demonstrate the effect of different housing location decisions on a household's expenditures, the analysis might consider in-depth interviews of specific targeted households, calculating how their spending distribution differs on the basis of their residential location.
- ***Exploration of Policy Tools and Choices:*** With numerous public programs designed to help households spend less than 30 percent of their incomes on

housing, the issue of combined housing and transportation cost burden has given rise to other policy tools to encourage location-efficiency of housing, including Location-Efficient Mortgages, TOD tax-abatement programs, and employer-based incentive programs. Future efforts might explore the availability and efficacy of such policy tools.

These and other efforts to link transportation and housing costs when analyzing affordability can continue to enhance Portland's livability.

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1 INTRODUCTION

The City of Portland is undertaking periodic review of its Comprehensive Plan and wishes to examine the issue of fuel cost volatility and its impact on housing affordability. The need for this effort has been highlighted by recent developments in housing affordability, volatility in fuel costs, and gentrification of close-in neighborhoods which are well-served by transit and commercial services. This effort begins with a review of two studies from the Center for Housing Policy and the Center for Neighborhood Technology which link transportation costs and housing affordability. The intent is to analyze these existing studies and develop a methodology of quantifying housing and transportation costs for Portland subareas. The goal is to better understand the effect of housing location on affordability to inform policy-making, and to use that understanding to guide the City's relevant housing policies and various affordable housing programs.

A key concept of housing affordability in these and other studies is ***cost burden***, which refers ***not to the dollars*** spent on housing, but the ***share of household income*** committed to housing-related costs. The search for affordable housing may send households to far-flung locations as some households attempt to lower their ***housing*** cost burden at the expense of their ***transportation*** cost burden. And in their effort to save money on housing, some working households unintentionally ***increase*** their combined housing and transportation cost burden.

It doesn't have to be that way.

The concept of location efficiency is not new. In the context of housing, location efficiency refers to a dwelling unit's accessibility and affordability, less reliant on automobile dependence with good access to transit and public services and good walking and bicycling conditions. At its core, location efficiency IS good planning.

Like energy efficiency, location efficiency may cost more up front, but the initial investment can result in significant long-term savings and other net benefits.

This analysis can help the city better understand household choices with respect to housing types and housing location, so that city policies address citizens' needs in terms of housing availability and affordability, mobility, and location efficiency.

The purpose of this exploratory study is to synthesize the literature on transportation and housing affordability, identify data sources, and develop a framework for an index of housing and transportation cost burden. This framework will guide the City's efforts toward calculating and refining a combined housing and transportation cost burden.

The report is organized into four main sections:

- Linking Transportation to Housing Affordability;
- Literature Review;
- Analysis of Methods; and
- Recommended Next Steps for Calculating and Refining Housing and Transportation Cost Burden.

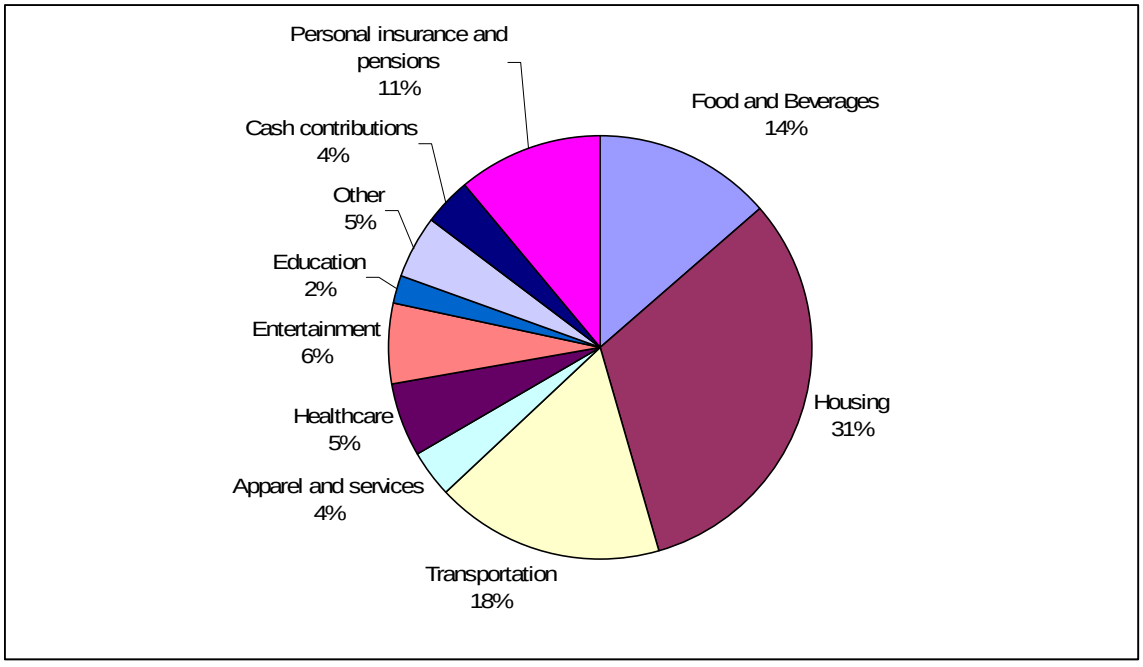
2 LINKING TRANSPORTATION TO HOUSING AFFORDABILITY

Housing affordability has long been an issue of public policy, with public programs to help households spend no more than 30 percent of their incomes on housing. The generally accepted definition of affordability is for a household to pay no more than 30 percent of its annual income on housing. Families who pay more than 30 percent of their income for housing are considered cost burdened and may have difficulty affording other necessities such as food, clothing, transportation and medical care. But the question of the trade-off between transportation and housing has come to the forefront with recent volatility in fuel costs. As noted in one of the studies reviewed, an increase of gas of $1.50 per gallon represents a $1,200 annual increase in an average household, or about 3 percent of median household expenditures.

2.1 Consumer Expenditure Patterns

The question of housing and transportation affordability relates to household expenditure patterns. As noted previously, families who pay more than 30 percent of their income for housing are considered cost burdened and may have difficulty affording other necessities such as food, clothing, transportation and medical care. Data on consumer expenditures in the Portland Metropolitan area reflect this guideline, with average household expenditures in 2004-2005 spending just over 30 percent on housing, as shown in Figure 1 below.

Figure 1
2004-2005 Portland Metropolitan Area Consumer Expenditure Survey



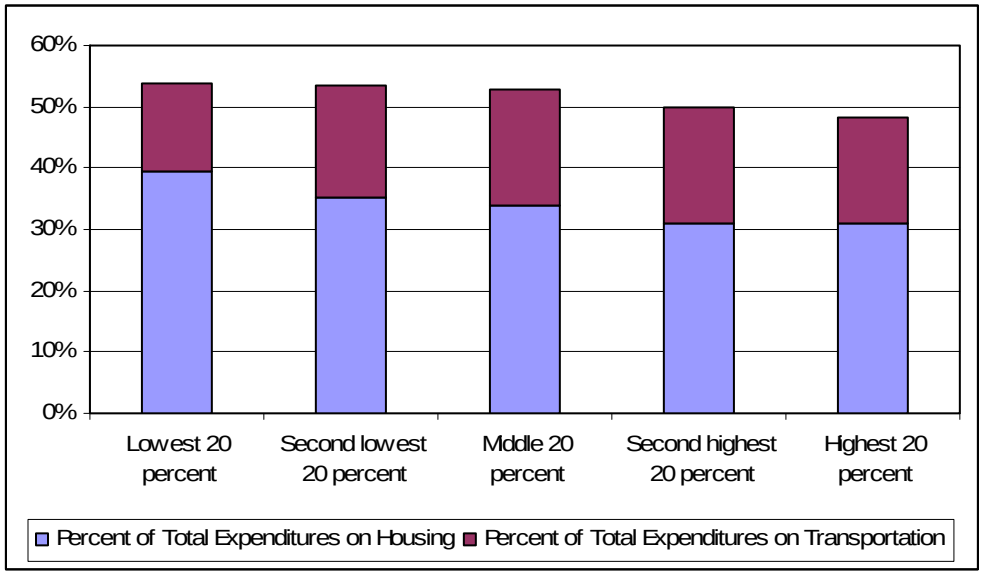
Source: Consumer Expenditure Survey, Bureau of Labor Statistics, U.S. Census Bureau.

As shown by the figure, the largest categories of expenditures are housing and transportation. With housing accounting for just over 30 percent and transportation another 18 percent, these two categories account for just under half of an average household's total expenditures. The historical affordability of housing in Portland has eroded as housing prices increased faster than the area median income; between 1998 and

the year 2008, median housing price in the Portland Metropolitan area increased 58 percent, compared with a median income increase of 36 percent, according to data compiled for the National Association of Homebuilders/Wells Fargo Housing Affordability Index.

In addition, the Consumer Expenditure Survey indicates that the poorest quintile (20 percent) of U.S. households spent 39.4 percent of their total expenditures on housing and 14.3 percent of their expenditures on transportation. In progressively higher income household quintiles, the percentage of expenditures spent on housing falls to 35.2 percent, 33.9 percent, 31.0 percent, and 30.9 percent. But, the corresponding percentage of expenditures on transportation rises to 18.4 percent, 19.0 percent, and 19.3 percent before falling to 17.3 percent for richest 20 percent of households. As a result, the percentage of household expenditures spent on housing and transportation combined is roughly consistent for households in the lower 60 percent of income categories, as shown in Figure 2 below.

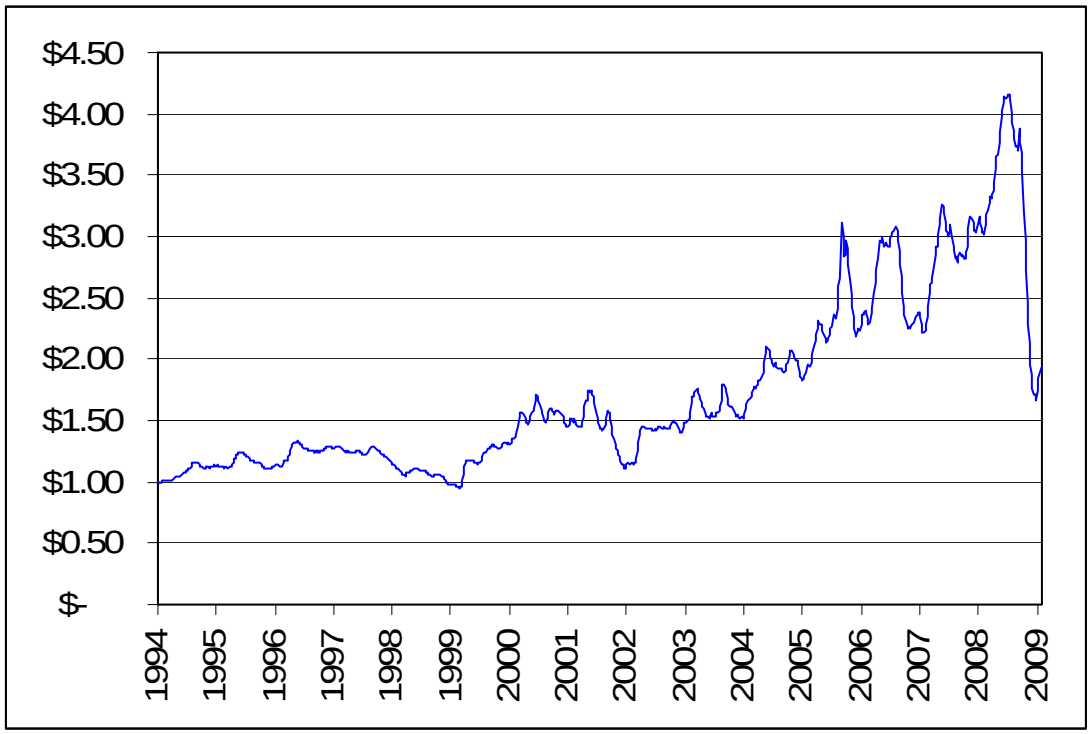
Figure 2
Percent of Total Expenditures on Housing and Transportation,
U.S. Average Expenditures



Source: Consumer Expenditure Survey, Bureau of Labor Statistics, U.S. Census Bureau.

Though 2004-2005 is the latest data available for the Consumer Expenditure Survey for the Portland Metropolitan Area, the cost of fuel has not been stable since that time. In fact, we know that fuel costs increased dramatically in 2007 and 2008, and then declined again, as shown in Figure 3 below.

Figure 3
Fuel Prices, U.S. All Grades All Formulations Retail Gasoline Prices



Source: Department of Energy, Energy Information Administration. Downloaded from http://tonto.eia.doe.gov/dnav/pet/hist/mg_tt_usm.htm in February 2009.

The significant roles of housing and transportation in household expenditures—coupled with the volatility in fuel prices—highlight the importance of considering the costs associated with transportation in conjunction with costs associated directly with housing when considering housing affordability. These data provide the quantitative and historical context to guide the research and analytic efforts described in this report.

2.2 Background

This effort begins with a review of two studies from the Center for Housing Policy and the Center for Neighborhood Technology. These studies were among a preliminary list of studies and websites on the topic of transportation costs and housing affordability compiled and provided by BPS staff. This project reviews the research methods employed by these papers to frame an approach for the City's effort.

The Center for Housing Policy's ***A Heavy Load: The Combined Housing and Transportation Cost Burdens of Working Families*** analyzes the housing and transportation cost burden of working households for 28 metropolitan areas, including Portland. It is based on the data and research of two other studies: ***Housing & Transportation Cost Trade-offs and Burdens of Working Households in 28 Metros***, by Peter M. Haas, Carrie Makarewicz, and Albert Benedict of the Center for Neighborhood Technology and Thomas W. Sanchez, and Casey J. Dawkins of Virginia Tech; and ***Making do: How working families in seven US Metro areas trade off housing costs and commute times***, by Robert Cervero, Karen Chapple, John Landis, and Martin Wachs of UC Berkeley. (Though Portland is included among the 28 metropolitan areas analyzed in

the Haas study and included among the initial 30 cities for the Cervero study, it was ultimately excluded from the seven metropolitan areas used in the Cervero analysis due to small sample size after subdividing by variables of interest.)

These analyses examine the tradeoff many working families face between paying a greater share of their income for housing or enduring long commutes and high transportation costs. According to this research, for every dollar a working family saves on housing it spends an average of 77 cents more on transportation. This effort begins to link two priorities—the need for affordable housing and addressing traffic congestion—in the policymaking process, pointing to the importance of building affordable housing in transportation-efficient locations, provision of high-quality transit to increase accessibility, and policies to promote car-sharing and reduce the costs of car ownership for families for whom public transit is not a viable option.

The Center for Neighborhood Technology also teamed with the Center for Transit Oriented Development and the Brookings Institution to create a brief entitled ***The Affordability Index: A New Tool for Measuring the True Affordability of a Housing Choice***. Its goal is to assist in the development of the housing and transportation affordability index in metropolitan areas across the U.S. It classifies transportation costs into three components: auto ownership, auto use, and public transit use. The model theorizes that each cost component is a function of the local environment of that place and household income and size.

The intent of the aforementioned tool is to mobilize various metropolitan regions to create region-specific indices. These efforts would inform participating regions about the trade-offs between housing and transportation costs, overall costs of living, and a more comprehensive view regarding the cost of providing public services for different locations. From a transportation perspective, it can help quantify the degree to which transit investments can improve the affordability of different communities to households of varying income levels.

Local economist Joe Cortright prepared a study for CEOs for Cities, a cross-sector network of urban leaders. This study, entitled ***Driven to the Brink: How the Gas Price Spike Popped the Housing Bubble and Devalued the Suburbs***, explores the impact of fuel costs on housing prices by location, with an analysis of neighborhood-level data for five cities—Chicago, Los Angeles, Tampa, Pittsburgh and Portland.

This effort analyzed the impact of the 2008 increase in gas prices on housing prices; a key finding was that the relative decline in suburban home prices is likely to persist while the market for higher density and redevelopment in close-in neighborhoods is likely to grow stronger. As has been noted by other efforts, this report noted that the public sector can help households save money by making it easy and convenient to live in mixed-use, close-in neighborhoods served by transit. In addition to reducing household expenditures by reducing vehicle miles traveled, it was noted that households that drive less have more to spend on other things, thus stimulating the local economy.

3 LITERATURE REVIEW

In addition to the studies already mentioned in the background for this project, there is a vast amount of literature dedicated to various relationships relevant to this analysis:

- The concept of a travel-time budget;
- The significance of residential self selection in understanding the impacts of the built environment on travel choices;
- The relationship between land use (and its associated density) and travel behavior;
- The claim that new roadways spur more driving; and
- The impact of transit on adjacent property values.

In many respects, this body of literature is related to the policy questions being addressed here. Though this overview is far from exhaustive, the key elements of this literature are reviewed below.

3.1 The Travel-Time Budget and the "Rational Locator"

According to Tom Vanderbilt's recent book ***Traffic: Why We Drive the Way We Do (And What it Says about us)***, "most people, the world over, spend roughly the same amount of time each day getting to where they need to go. Whether the setting is an African village or an American city, the daily round-trip commute clocks in at about 1.1 hours." In the 1970s, Yacov Zahavi, an Israeli World Bank economist, introduced a theory of a "travel-time budget" suggesting that people are willing to devote a certain part of each day to moving around, across all kinds of different locations. Residents of smaller cities might make more frequent, shorter trips, while residents of larger cities might make fewer, longer trips, but the time spent driving was about the same.

Urban planning researchers David Levinson and Ajay Kumar analyzed data in the Washington DC metropolitan area from the 1950s to the 1980s, and found that average travel times—around thirty-two minutes each way—had remained constant across the decades. What had changed were two other factors: distance and average travel speed had both increased. They suggested that people were acting as ***"rational locators."*** People had moved to more distant suburbs, meaning they had longer distances to drive, but could now travel on faster suburban roads, rather than crowded city streets, to get to their jobs.

This "rational locator" theory has been challenged recently with several studies which note significant variability in the travel-time tolerance among metropolitan areas and among individuals. In particular, original lead author David Levinson compared changes in travel time between the Washington D.C. and the Minneapolis-St. Paul (Twin Cities) metropolitan areas, noting a significant increase in travel times in the Twin Cities between 1990 and 2000 but remain lower than those experienced in Washington DC, which have remained stable. In an international study analyzing data from the U.S., Switzerland, and India, Amlan Banjaree and co-authors noted a considerable inter-person variation in the expected travel time frontiers, particularly in non-commuting trips. While the variation among metropolitan areas may support public investment to improve

location-efficiency of housing, the inter-person variation is more likely a result of residential self-sorting.

3.2 Residential Self-Selection

This phenomenon referred to as ***residential self-selection*** or ***residential sorting*** recognizes that individuals and households locate themselves into neighborhoods that allow them to pursue their activities using modes that are compatible with their income and propensity to pay, attitudes toward auto-use or auto-disinclination, and travel preferences.

In conventional transportation planning, a one-way causal flow is often assumed in which the nature of the land use pattern affects travel behavior. This one-way causal relationship would mean that households and individuals first locate themselves in neighborhoods based on market forces such as housing affordability, crime statistics, and school quality. Their travel behavior would then be shaped by neighborhood characteristics (access to transit or built environment attributes such as connectivity). Such reasoning would imply that changes to land use patterns and neighborhood attributes would shift travel-mode shares. Such a one-way cause-and-effect assumption—which implies a sequential nature of residential location and mode choice decisions (in that order)—does not consider the associative nature of the decisions. In reality, individuals and households may simply be locating in neighborhoods that offer attributes consistent with their intrinsic preferences, attitudes, and values.

Abdul Rawoof Pinjari and co-authors[1] attempt to simultaneously model residential location choice and commute-mode choice and found that while households do indeed self select their residential location based on demographic characteristics (such as auto and bicycle ownership, income, and household size), the built environment attributes—such as accessibility, density, and land use mix—have significant impacts on commute-mode choice even after controlling for residential sorting effects and unobserved taste variations that contribute to such effects.

From a policy perspective, the results suggest that built environment attributes are not truly exogenous in travel choice decisions made by individuals. Households and individuals are locating themselves in metropolitan areas and neighborhoods within those metropolitan areas that are consistent with their lifestyle preferences, attitudes, and values. In other words, households and individuals are making residential location and travel-choice decisions jointly as part of an overall lifestyle package. The findings suggest that modifying the built environment can bring about changes in mode choice behavior as evidenced by the significance of these attributes in the commute mode choice model even after controlling for residential sorting effects.

3.3 Land Use Mix, Density, and Their Impact on Travel Behavior

There is a vast body of literature dedicated to the relationship between land use and travel behavior. One element of this field is related to land use density and its impact on travel behavior. It has been shown that land use density reduces drive-alone traffic, but which land-use strategy yields greater reductions in vehicular travel: improving the proximity of

[1] This paper includes an extensive review of academic literature analyzing land use and travel choices.

jobs to housing or bringing retail and consumer services closer to residential areas? This question is particularly relevant in the context of the ***Transit Orientation Index*** (TOI) which found that 80 percent of transit demand is predicted by three key variables: household density, employment density, and density of retail employment. The TOI and its applicability to this effort are explored later in this document.

A 2006 study by Robert Cervero examines the degree to which job accessibility is associated with reduced work travel and how closely retail and service accessibility is correlated with miles and hours logged getting to shopping destinations. Based on data from the San Francisco Bay Area, it finds that jobs-housing balance reduces travel more than residential adjacency to retail and services, and by a substantial margin.

3.4 Induced Travel

In ***Traffic***, Vanderbilt describes a claim that roadway investments spur new travel: when more land-miles of roads are built, more miles are driven, even more so than might be expected by "natural" increases in demand, like population growth. The new lanes immediately bring relief to those who had been using the highway before, but they will also encourage those same people to use the highway more—they may make those "rational locators" move farther out, for example—and they will bring new drivers onto the highway, because they suddenly find it a better deal.

Another analysis by Robert Cervero, this one from 2003, analyzes the claim that roadway investments spur new travel, known as ***induced demand***, and thus the roadway investments fail to relieve traffic congestion. The analysis confirms the presence of induced travel in both the short and longer run, but notes that estimated elasticities are lower than those of earlier studies. The research also reveals other induced effects, specifically induced growth and induced investment effects; real estate development gravitates to improved freeways, and traffic increases spawn road investments over time, but concludes by acknowledging considerable gaps in knowledge regarding induced travel demand, specifically its variation between urban and suburban settings, by type of facility (e.g., radial highway versus beltway), size of metropolitan area, or level of traffic congestion.

3.5 Impact of Transit on Adjacent Property Values

There is a wide body of literature examining the affect of transit on adjacent property values. While there is evidence that values are enhanced due to increased accessibility provided by the transit service, there is similar evidence that with accessibility comes the negative externalities of pollution, crime, and noise.

One recent analysis indicates a larger positive impact on property values for commercially-designated properties than for residentially-designated properties. It also found that a given area can be made accessible by a number of modes (railways, car, etc.) and that each mode will improve the accessibility of the region independently. So while both highways (freeways) and stations may increase property values, the effect of one is diminished when the other is present, suggesting accessibility improvements in one mode might compensate for lack of accessibility in another mode.

4 ANALYSIS OF METHODS

Metro's Data Resource Center has also been exploring the issue of location-efficiency. Metro's model—***Metroscope***—was developed for land use and transportation policy evaluation for the Portland-Vancouver metropolitan region, including transportation planning and Urban Growth Boundary (UGB) analysis. The geographic level for which the output is generated is in Metro defined regions. The Portland-Vancouver metropolitan area consists of 425 Residential zones ("Rzones"—which match census tracts) and 72 Employment zones ("Ezones"—aggregations of census tracts), and 20 sub-county area districts (Clackamas, Multnomah, and Washington Counties, Oregon and Clark County, Washington). Each district's boundaries follow census tract boundaries and each was designed to represent its fair share of specified population and housing composition in the Portland-Vancouver area.

Metroscope is comprised of four inter-related models:

1. The ***economic model*** forecasts region-wide population and employment;

2. The ***location model*** is comprised of residential and non-residential sub-models and predicts where and how much housing will exist in the future based on predictions of how much and where employment activity will occur, the price of housing (incorporates the costs of development, locational amenities, and depreciation in value), household income and other wealth factors, and the age of householder;

3. The ***travel model*** estimates trip origins and destinations, and measures perceived cost of travel between regions which affects where people work and decide to reside; and

4. The ***GIS/land tools and database*** monitors current residential development and tracks where and how much land (parcels) will be available for development in the future.

All sub-models are interrelated, and they influence and provide inputs for one another.

Metroscope recognizes 4 classes of residential real estate. These are OSFD – owner occupied single family, OMFD – owner occupied multi-family, RSFD – renter occupied single family and RMFD – renter occupied multi-family. Multi-family includes rowhouses, condominiums, and apartments of all types.

Metroscope disaggregates the number of households in the region across a range of dimensions. Each household belongs to one category of household size, one income category, and one category of age of household head. There are over 400 possible combinations of size, income, and age categories and every household is associated with one such combination. In addition, the households are associated to a housing type (single-family, multi-family) and tenure (renter, owner), a specific price level, percent of income spent on housing costs, and household size, and then reorganized into consumption groups. To simplify the analysis, Metroscope aggregates its output based

on household consumption profiles, referred to generally as "bins" or "groups." The distribution of households by group is done by household income, age, household size and the presence of children and a combination of factors determined to drive the household's propensity for various housing types.

- ***Income:*** Income in the Metroscope model is defined by the total household income definition used by the Bureau of Economic Analysis (BEA). It includes wages and salary disbursements, dividends, interest, rent, other labor income, proprietor's income, and transfer payments less social insurance contributions. Income is generally lower for renters than owners for all the consumption groups. For both owners and renters, income increases as we move from one group to the next. Group 1 is comprised generally of the lowest-income owner and renter households, while Group 8 is comprised the most affluent households in both tenure categories.

- ***Age:*** Group 1 includes many elderly, while Group 2 has a much higher concentration of young adults. The average age rises again for Groups 3 and 4 and then falls for Groups 5 and 6, rises slightly for 7, then falls again for Group 8.

- ***Household Size***: Household size is generally higher for the higher number groups. As the presence of school-aged children coincides somewhat with household size; Group 8 renters and owners have both the highest household size and the highest percentage of households with school-aged children.

A summary of the group characteristics is as follows:

- **Group 1: Low-Income Singles.** For both owners and renters, these are the lowest income households. Among renters, these are exclusively single-person households--primarily the elderly. Owners in Group 1 have a more even age and household size distribution.

- **Group 2: Working Class**. These households can be any age, but their income is among the lowest. The income distribution is a bit higher for owners than for renters. They are primarily childless. However, one-third of the renter households in this group have school-aged children, while only about 1 in six of the owners in this group have school-aged children.

- **Group 3: Emerging Singles.** With a bit more income than Group 2 households, these are primarily in the 25-44 age bracket. The renters are mostly single-person households. About half of Group 3 owners are two-person households and one third of the owner households contain school-aged children.

- **Group 4: Established Singles and Couples.** With a broad age distribution and approaching middle income, these households are usually childless, especially among renters. Owner households in Group 4 include more people and about 39 percent include school-aged children.

- **Group 5: Young Middle-income families.** Group 5 households are larger and wealthier. The Renter households in this category are older than the owners, with smaller household sizes. The owners are more likely than not to have children.

- **Group 6: Fast Track Families.** With more income than Group 5 households, almost half of this group is between 25 and 44. Although the majority do not have school-aged children, two- and three-person households are most common, with the owner households larger and more likely to have school-aged children.

- **Group 7: Successful Middle Aged.** Mostly without children, these households include the very high-income couples, especially for owners. Interestingly, the renter households in Group 7 are more likely to have children.

- **Group 8: Movers and Shakers with Kids.** Among owners, most of these households have children; about 60 percent of renter households have children. They are the highest earners in their prime earning years.

The MetroScope model has been used to calculate housing and transportation costs across the region for various transportation and housing needs analyses. Thus far, the housing and transportation cost calculator developed for these efforts have been applied at a regional and sub-area level.

4.1 Housing Needs Study

With the Institute of Portland Metropolitan Studies, Metro used the Metroscope model to prepare the ***Housing Needs Study for the Portland Metropolitan Area***. Released in May 2008, the analysis contained in this report is based on Metroscope's output.

The affordable housing needs study reviewed the use of the Metroscope model and the State of Oregon Housing/Land Needs model ("State Model"), selecting the Metroscope model over the State Model for its more realistic model of housing development, including the impact of household choice, development economics, and commuting preferences, features absent from the state model. According to PSU's preliminary analysis of the two models, the state model was developed as a tool to use in planning for new affordable housing units in a specified area and has been adopted by a number of smaller communities within the state. The State Model forecasts the number of housing units that are needed at different price levels so that that no one in the forecasted population would be paying more than 30 percent of their income on housing costs.

The State Model is comprised of two inter-related components: a housing needs model and a land needs model. New housing is predicted from planned housing by density and zone. The number of affordable units needed by housing costs and tenure is predicted from the forecasted percentage of households by income and age of householder. The gap between the current supply and the future demand of affordable housing units is identified in the results. Land needs in the study area are also predicted based on the current inventory of housing and available buildable land in the area.

The shortcomings of using the state model to model affordable housing needs are also shortcomings when it comes to addressing the combined cost burden of housing and

transportation. In particular, the transportation element is critical. While Metroscope analyzes the metro area by census tract, there is no transportation element in the state model, meaning housing units could be located anywhere within the metropolitan area.

4.2 Refinement of Metroscope Output

For the purposes of the housing and transportation cost burden analysis, the key Metroscope data elements are clearly housing costs, transportation costs, and household income. The housing and transportation cost burden (CB_{H+T}) is represented as follows:

$$CB_{H+T} = (C_H + C_T)/I$$

Where:

C_H = Cost of Housing

C_T = Cost of Transportation

I = Household Income

As noted earlier, Metroscope defines income using the BEA definition of total personal income, including wages and salary disbursements, dividends, interest, rent, other labor income, proprietor's income, and transfers.

Housing costs in the model include rent or mortgage payment (assuming a 20 percent down payment), utilities, property taxes, household operations, and housekeeping supplies.

Transportation costs were estimated using two data components: the travel ***mode split*** and the cost of travel. The four choices in the model for mode choice are as follows:

- Car, truck, or van – drove alone;
- Car, truck, or van – carpooled;
- Public transportation (excluding taxicabs); and
- Walked, biked, or used some other mode.

Travel mode split was estimated using the American Community Survey which reported mode split by demography and housing tenure, allowing distinction in mode-split choices due to consumption patterns suggested by demography and tenure.

The resulting transportation costs (C_T) can be represented as follows:

$$C_T = (C_{DA} * D_{DA}) + (C_{CP} * D_{CP}) + (C_{PT} * D_{PT}) + (C_{OTH} * D_{OTH})$$

Where:

C_{DA} represents the cost per mile of driving alone

D_{DA} represents the estimated distance in miles driven alone

C_{CP} represents the cost per mile of carpooling

D_{CP} represents the estimated distance in miles driven in a carpool

C_{PT} represents the cost per mile of utilizing public transit

D_{PT} represents the estimated distance in miles traveled using public transit

C_{OTH} represents the cost per mile of walking, biking or using some other mode

D_{OTH} represents the estimated distance in miles walked, biked, or using some other mode

Transportation costs in the model are based on an estimated ***cost per mile*** which varies by mode. It is intended to capture average costs involved with purchase, maintenance, and operation of a vehicle, ranging from an estimated $0.65 per mile for driving alone, $0.45 per mile for carpooling, $0.20 per mile using public transportation, and $0.05 per mile for biking, walking, or any other mode.

The cost estimates are based on 260 working days and calibrate to total transportation expenditures. It is noted that within census tracts, commute distances were generally longest for owner-occupied single-family dwelling households, slightly shorter for renter-occupied single-family dwelling households, marginally shorter renter-occupied multi-family dwelling households, and shortest for owner-occupied multi-family dwelling households.

4.3 Preliminary Findings

As noted earlier, Metroscope was used to quantify the housing and transportation cost burden across the region. Averaging across the region, the Transportation Scenarios document summarizes the new household cost of housing and transportation, estimating the average proportion of household income committed to these two expenditure categories. Thankfully, the obfuscation caused by averaging across the region can be eliminated: The model add-on can provide estimates of housing cost, transportation cost, and demographic profiles (including income, age, and presence of children) for each of the household groups, calculating the proportion of income required for the combined housing and transportation cost, by group and by census tract.

Metro staff have run test scenarios of this analysis, testing the ability of the model to focus on the target households of concern—primarily groups 1 and 2 in rental multi-family units. Output has been provided by census tract of the estimated number of households (by group and tenure) and the percentage of household income required to satisfy the estimated housing and transportation costs.

For this preliminary analysis, Metroscope estimated the average yearly housing and transportation expenditure and the estimated average proportion of household income committed to housing and transportation for all housing types and tenures, and for groups 1 and 2 in the rental multi-family category.

For all housing types and tenures and all household groups, Figure 4 shows the average yearly housing expenditure per dwelling unit estimated for 2005. These estimates represent a broad range of housing options: single-family, multi-family, owner- and renter-occupied, ranging from less than $13,000 to over $27,000 per year in annual estimated housing expenditures.

Figure 4
Estimated Average Yearly Housing Expenditure per Dwelling Unit, 2005
All Housing Types and Tenures

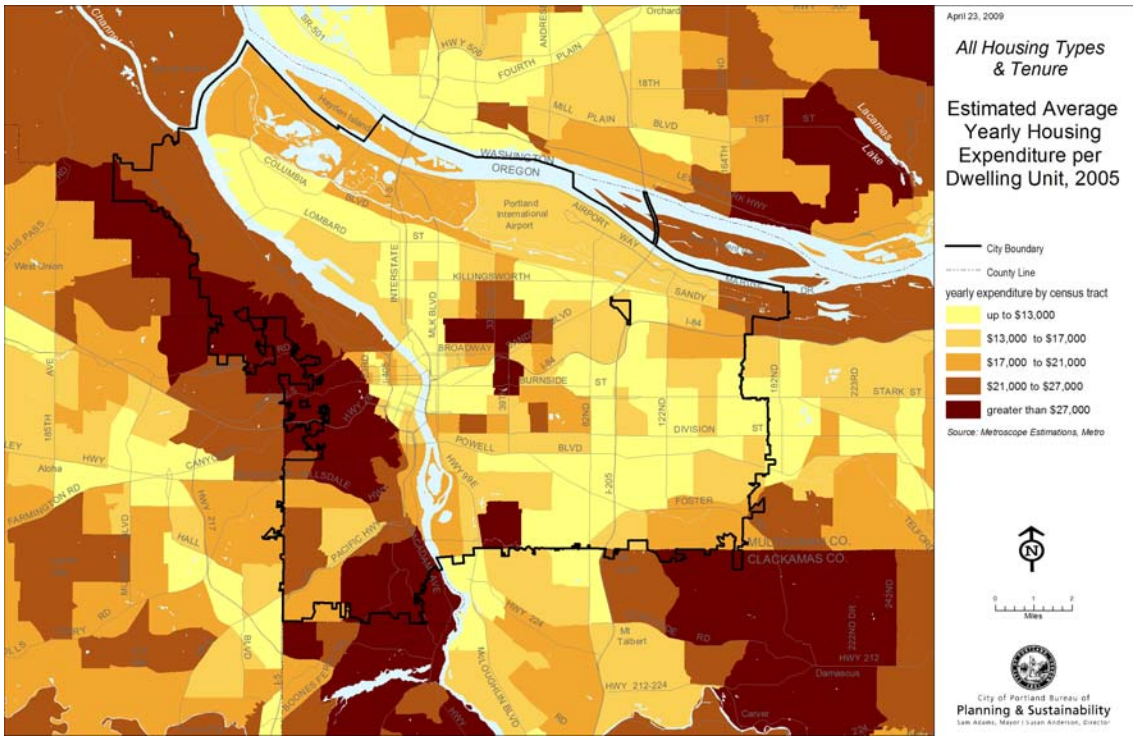
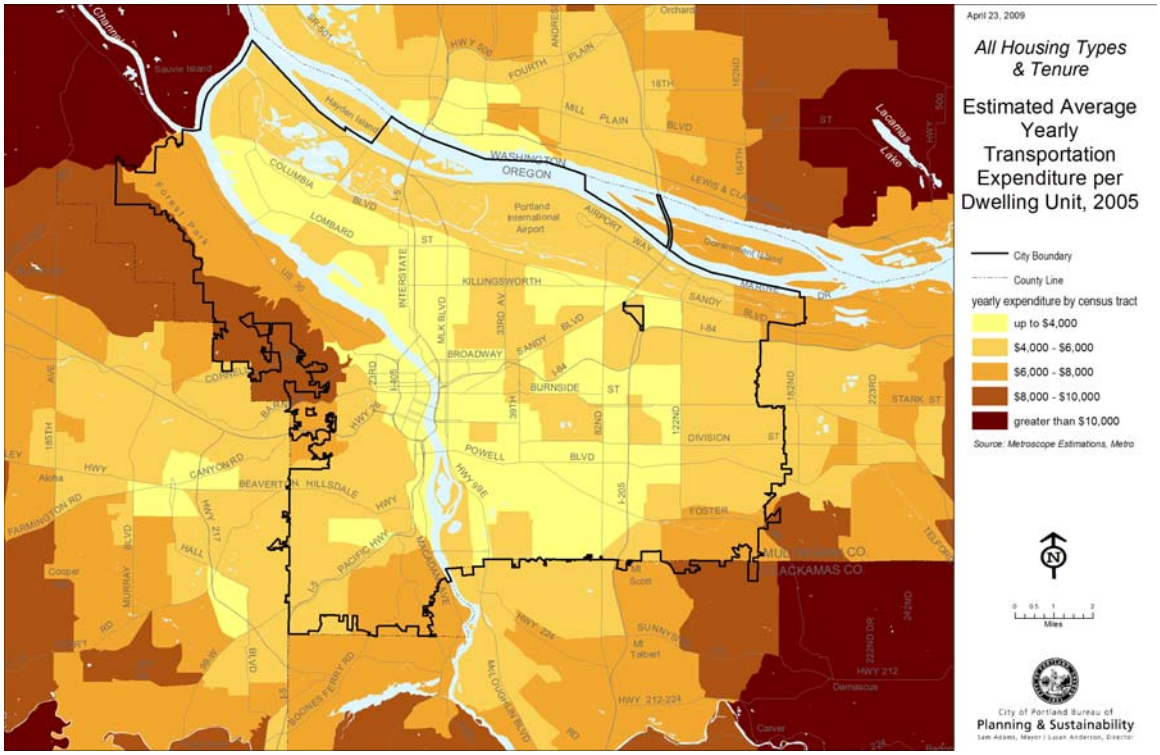


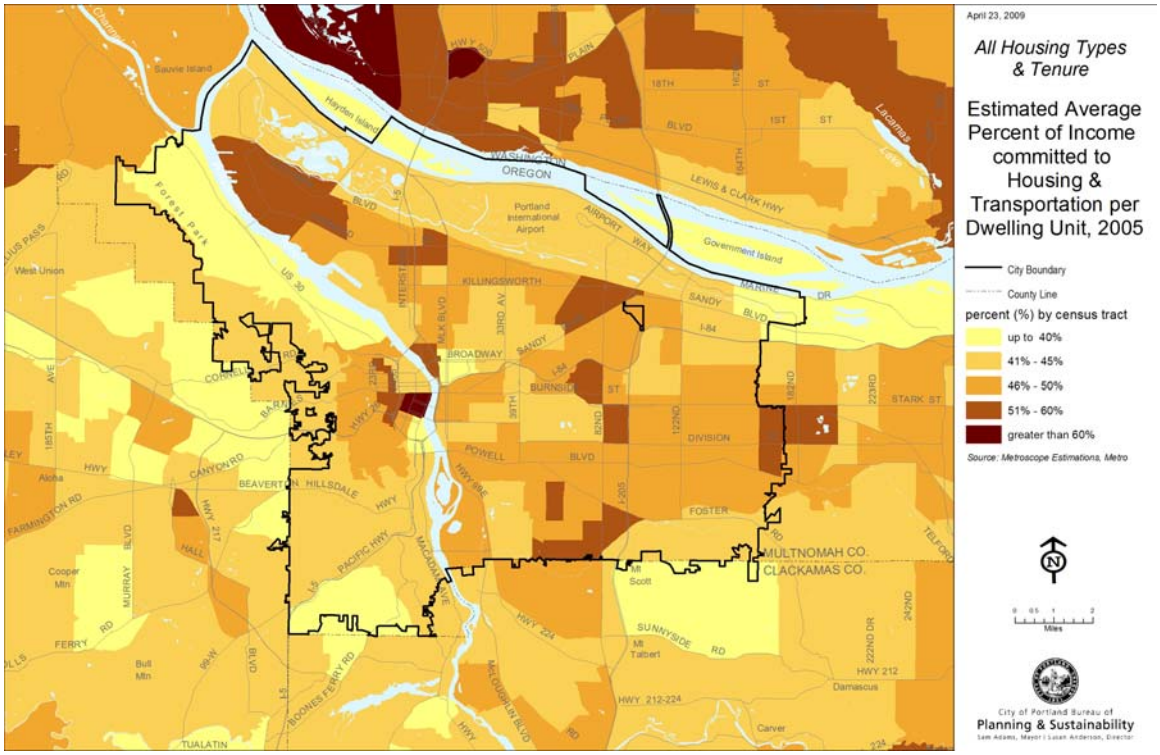
Figure 5 shows the average yearly transportation expenditure per dwelling unit for all housing types and tenures and all household groups, estimated for 2005. Estimated using the American Community Survey data, and disaggregated by Metroscope, the region's households spend from less than $4,000 to over $10,000 for transportation expenditures.

Figure 5
Estimated Average Yearly Transportation Expenditure per Dwelling Unit, 2005
All Housing Types and Tenures



Combining the estimated expenditures for housing and transportation with household income information yields the estimated proportion of household income committed to housing and transportation, as shown in Figure 6.

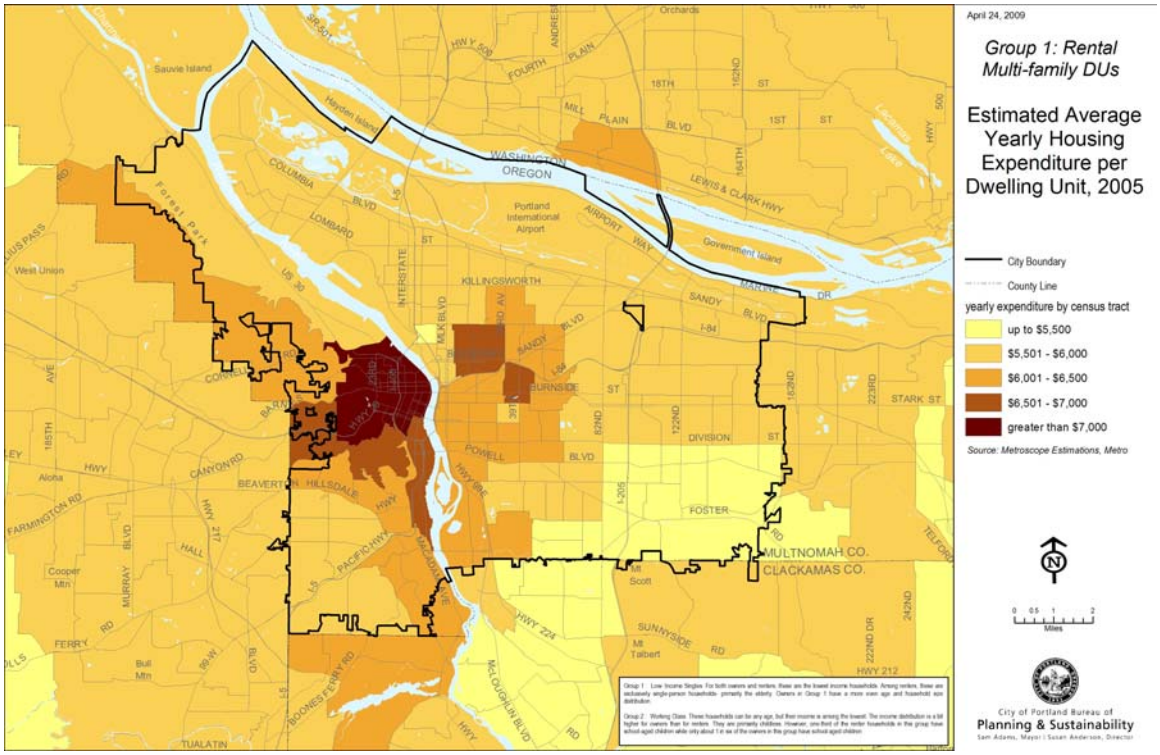
Figure 6
Estimated Average Percent of Income committed to Housing & Transportation Expenditure per Dwelling Unit, 2005, All Housing Types and Tenures



For all housing types and tenures and all household groups, the smallest proportion of household income earmarked for housing and transportation was 31.2 percent, which was calculated in Census Tract 2302 (Rzone 38), which is close-in on the eastside. The next lowest proportion was 32 percent in Census Tract 5700 (Rzone 90), which is the southern part of downtown Portland. There are outer-lying areas with relatively low proportion of household income committed to housing and transportation costs, such as Tract 31608 (Rzone 266--just south of I-26 between 185th and Cornelius Pass Road) and Tract 31402 (Rzone 253--just north of Beaverton Town Center). The relatively lower proportion of income attributed to housing and transportation costs in these outer-lying areas is likely due to availability of transit service in these areas. However, as would be expected, the areas in which a higher proportion of income was committed to housing and transportation were generally outer-lying areas, particularly outer Clackamas and Washington counties.

To see how the combined housing and transportation costs would affect households most likely to be cost burdened, the calculations were run on groups 1 and 2 in rental multi-family units. These are the lowest-income households, and with average household income of only $12,500 for renters, they are the households most likely to be cost burdened. Figure 7 shows the estimated average yearly housing expenditure per dwelling unit for Group 1 renters in multi-family units.

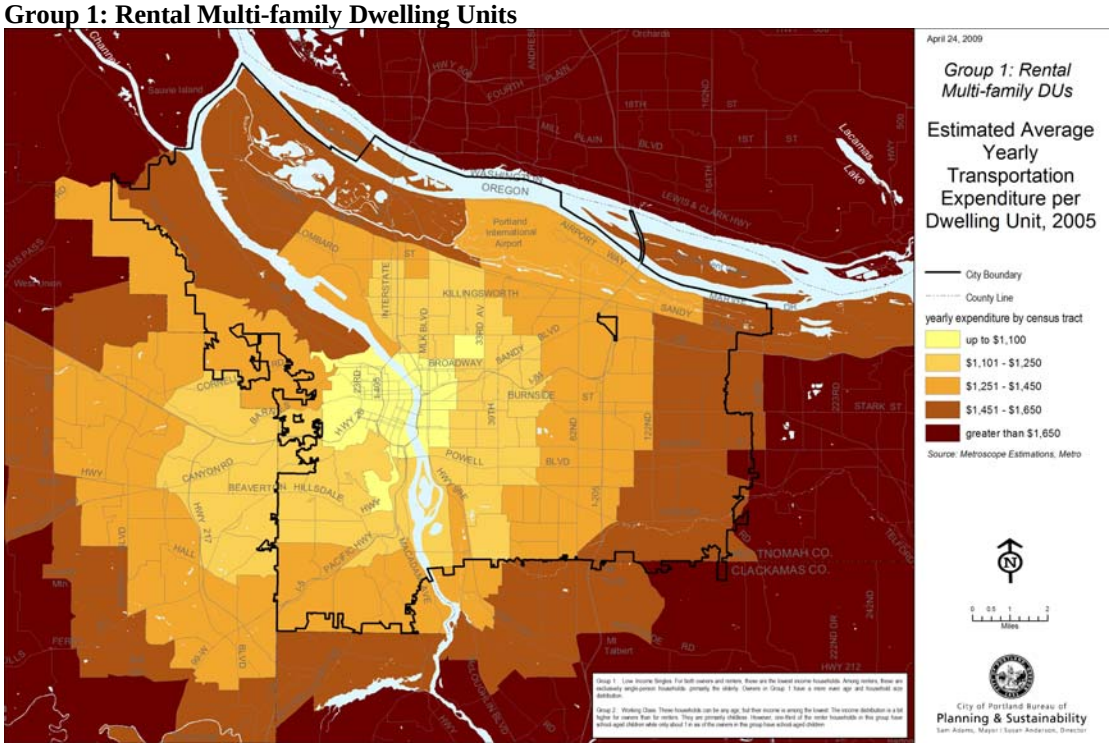
Figure 7
Estimated Average Yearly Housing Expenditure per Dwelling Unit, 2005
Group 1: Rental Multi-family Dwelling Units



Given the limits on this universe (renters in multi-family units in Group 1 households only) it is not surprising that the categories are much more compressed, with the lowest category of "up to $5,500" and the highest category at "greater than $7,000" (compared to the upper limit for all housing units all groups shown in Figure 4 at "greater than $27,000"). The highest categories are clustered in the central city and the Pearl District, possibly reflecting the greater accessibility and proximity to services in these areas.

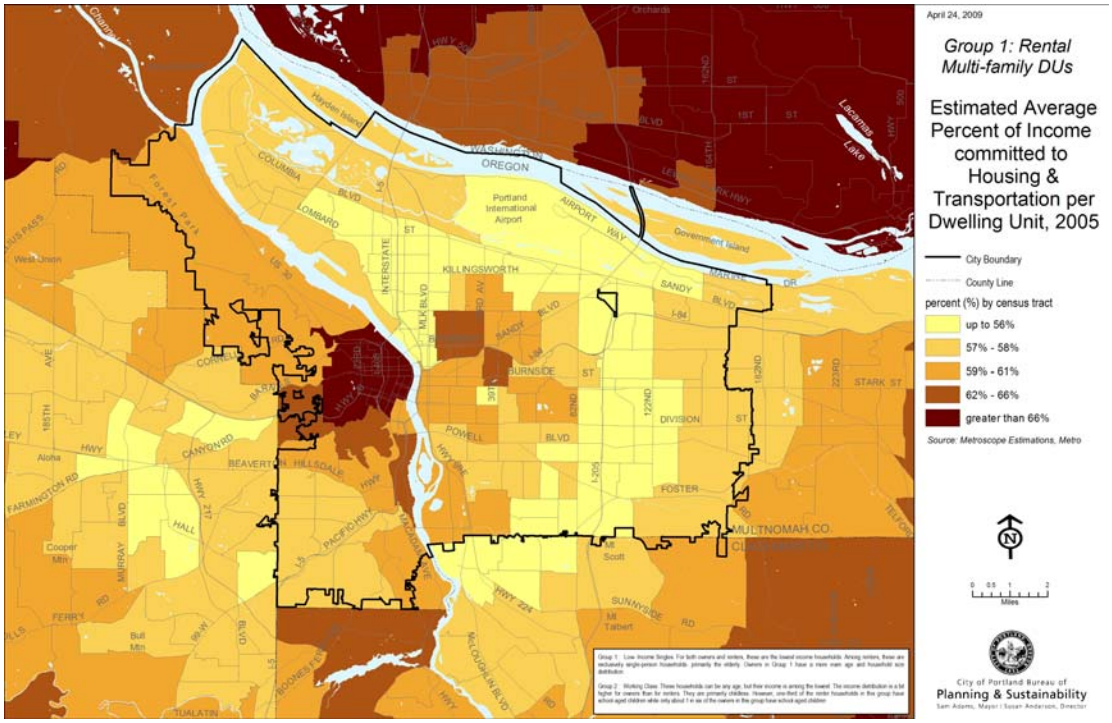
The map of estimated average yearly transportation expenditures for this subset is shown in Figure 8. Again, with its lower limit of "up to $1,100" and upper limit of "greater than $1,650", its compressed scale (compared to the range of "less than $4,000" to "greater than $10,000" for all households) reflects the relative lack of budgetary choices for these households.

Figure 8
Estimated Average Yearly Transportation Expenditure per Dwelling Unit, 2005
Group 1: Rental Multi-family Dwelling Units



The estimated expenditures for housing and transportation are combined with estimated household income information in Figure 9.

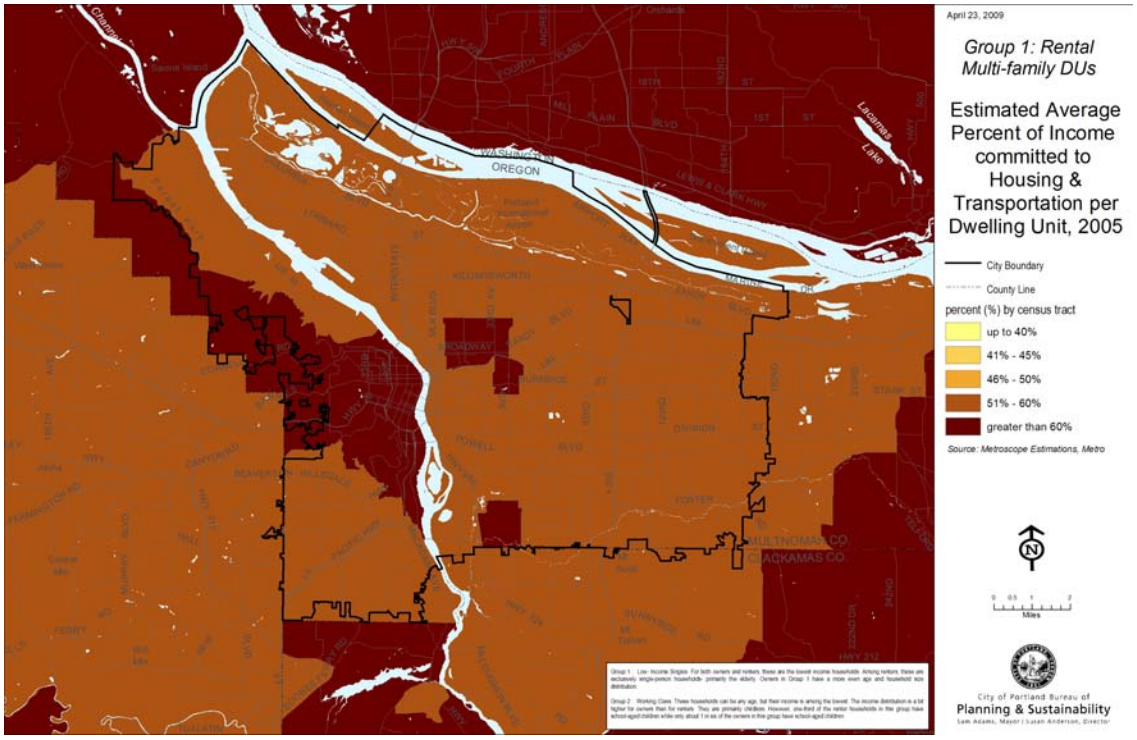
Figure 9
Estimated Average Percent of Income committed to Housing & Transportation Expenditure per Dwelling Unit, 2005, Group 1: Rental Multi-family Dwelling Units



The range of household income earmarked for housing and transportation for both groups was quite large, from a low of 53 percent of household income in Group 1 in Census Tract 2201 (Rzone 35), also close-in eastside to a high over 100 percent of household income for several tracts in outer Washington County.

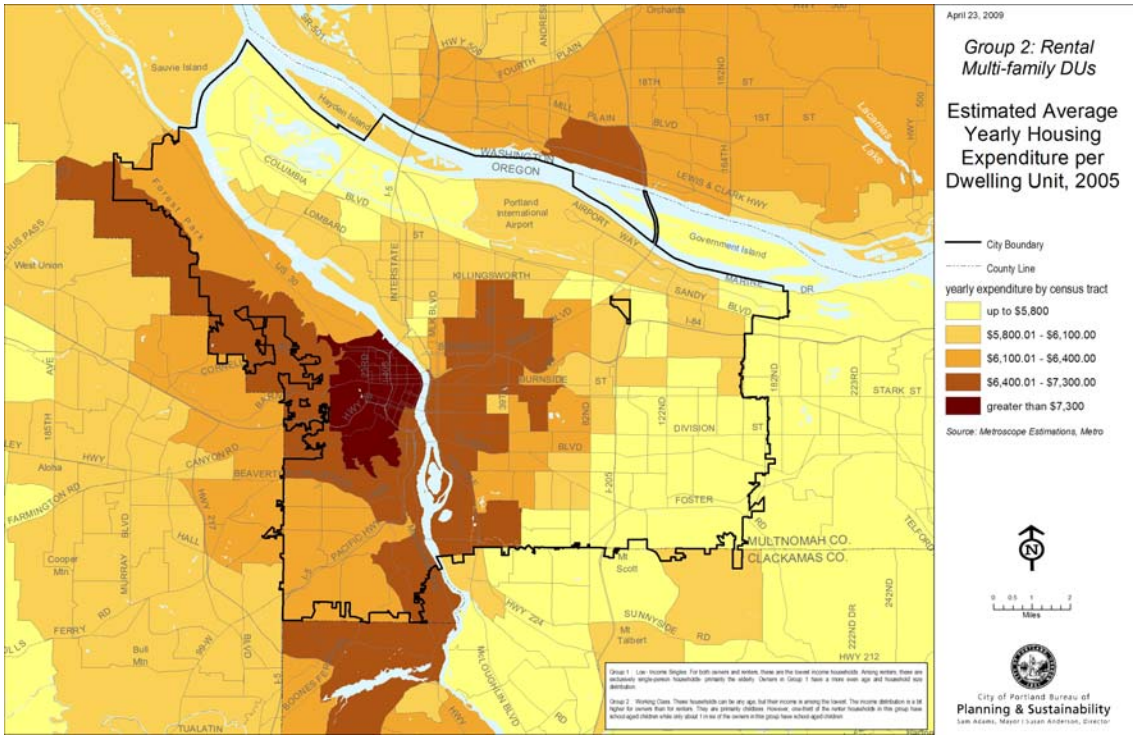
However, these ranges are significantly higher than those for the estimated averages for all housing types/tenures and groups. Re-scaling the categories to those used in Figure 6 shows the relatively high cost burden on this subset, as shown in Figure 10.

Figure 10
Estimated Average Percent of Income committed to Housing & Transportation Expenditure per Dwelling Unit, 2005, Group 1: RMFD, Rescaled to Match All Housing Types Scale



The demographics of Group 2 households create a more delicate balance for transportation expenditures in particular. Again, Group 2 households are working-class households, some with children, compared to the households of Group 1, primarily older singles. Figure 11 shows the estimated average yearly housing expenditure per dwelling unit for Group 2 renters in multi-family units.

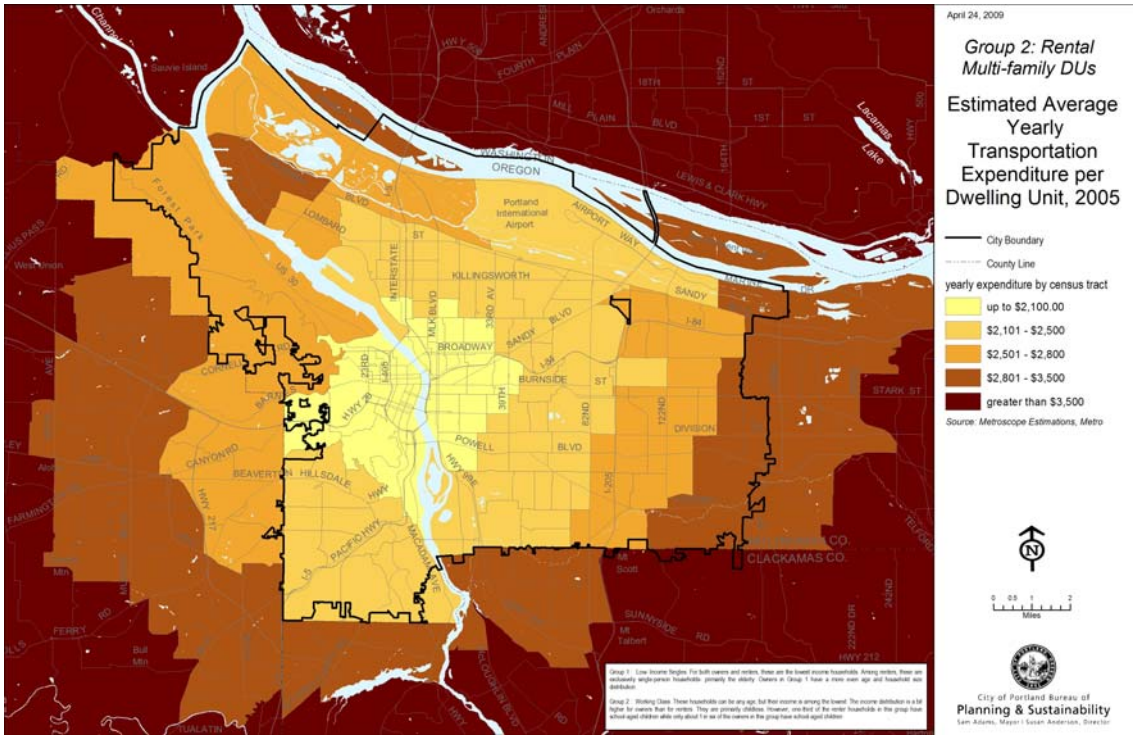
Figure 11
Estimated Average Yearly Housing Expenditure per Dwelling Unit, 2005
Group 2: Rental Multi-family Dwelling Units



Like the corresponding map for Group 1 households, these categories are relatively compressed with the lowest category of "up to $5,800" just slightly higher than the Group 1 lowest category of "up to $5,500" and the highest category at "greater than $7,300" compared to "greater than $7,000" for Group 1. The tracts satisfying the conditions in the highest category the Pearl District and the rest of the Central City.

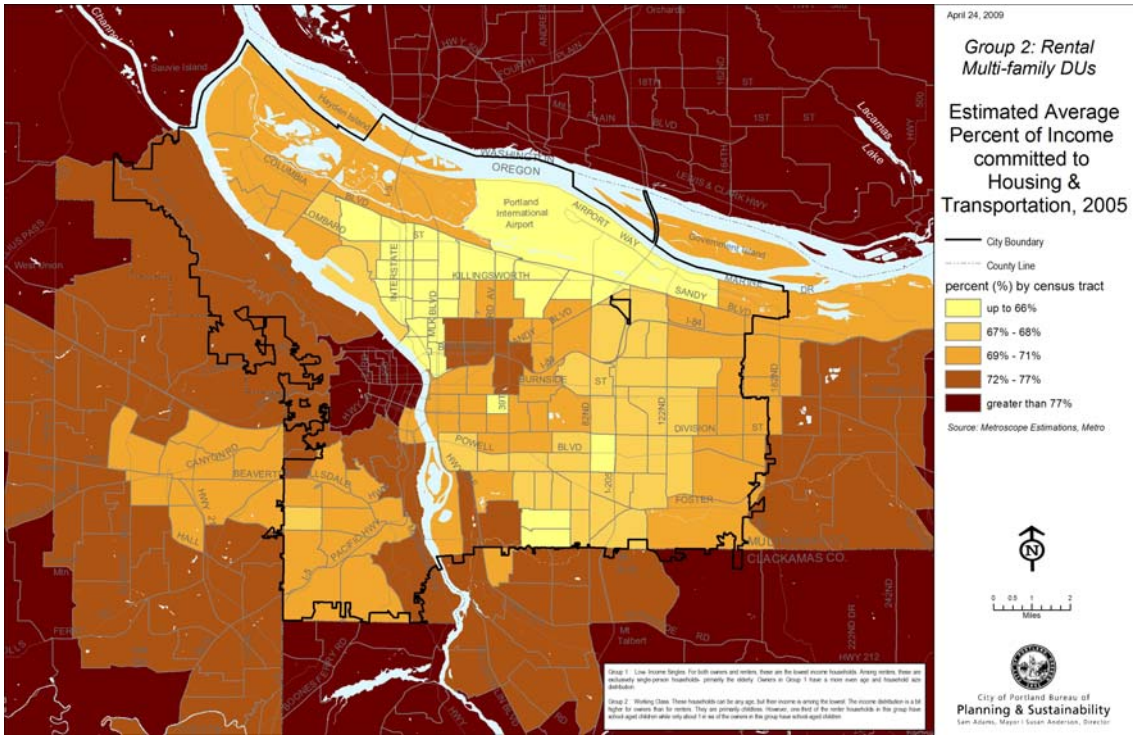
The map of estimated average yearly transportation expenditures for this subset is shown in Figure 12. The categories for this group are higher than those for Group 1, with the lowest category of "up to $2,100" (compared to Group 1's "up to $1,100") and the highest category of "greater than $3,500" (compared to Group 1's "greater than $1,650" reflecting the working-family demographics and lifestyle demands of Group 2 which seem to necessitate auto ownership to a greater degree than households in Group 1.

Figure 12
Estimated Average Yearly Transportation Expenditure per Dwelling Unit, 2005
Group 2 Rental Multi-family Dwelling Units



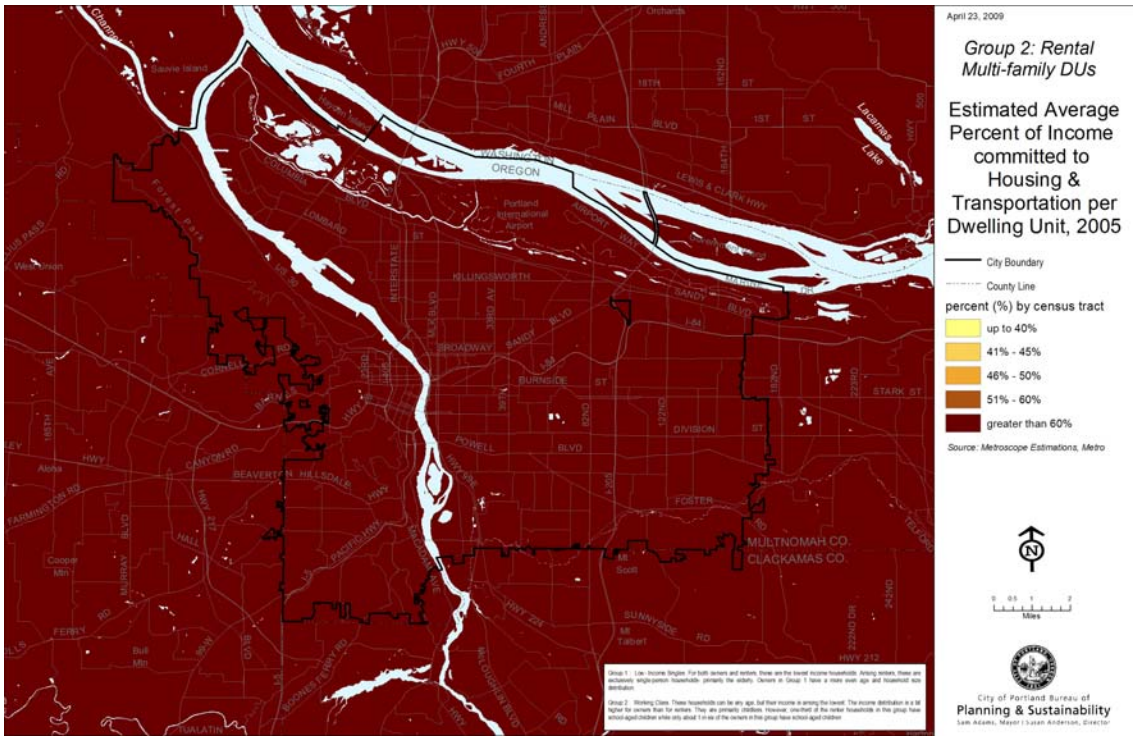
The estimated expenditures for housing and transportation are combined with estimated household income information in Figure 13.

Figure 13
Estimated Average Percent of Income committed to Housing & Transportation Expenditure per Dwelling Unit, 2005, Group 2 Rental Multi-family Dwelling Units



Households classified as Group 2 were even more cost burdened than those in Group 1, with a low of 62 percent of household income in Group 2 earmarked for housing and transportation, again in Census Tract 2201. And again, the model estimates over 100 percent of household income consumed by housing and transportation for numerous tracts in outer Clackamas and Washington counties. As was done with the Group 1 dataset, the categories were re-scaled to the categories used in Figure 6 for all groups and all housing types and tenures, and resulting map is shown below as Figure 14.

Figure 14
Estimated Average Percent of Income committed to Housing & Transportation Expenditure per Dwelling Unit, 2005, Group 2 RMFD, Rescaled to Match All Housing Types Scale



Given these preliminary findings, it seems that location-efficiency of housing can affect the cost burden of housing and transportation on lower-income households, but must be seen as one of many potential tools to increase housing affordability for these very low-income groups. Additional research discussed in the next section can further explore the possibilities of location-efficiency to reduce the cost burden of various household groups.

4.4 Research Questions Considered

Key research questions to be considered by this effort include the following:

- Do lower-income households have higher transportation costs (proportional to their higher-income counterparts)?

- Do lower-income households have a higher combined housing and transportation cost burden?

- Are these lower-income households in location-efficient (or location-inefficient) areas?

- How should location-efficient areas be defined and quantified?

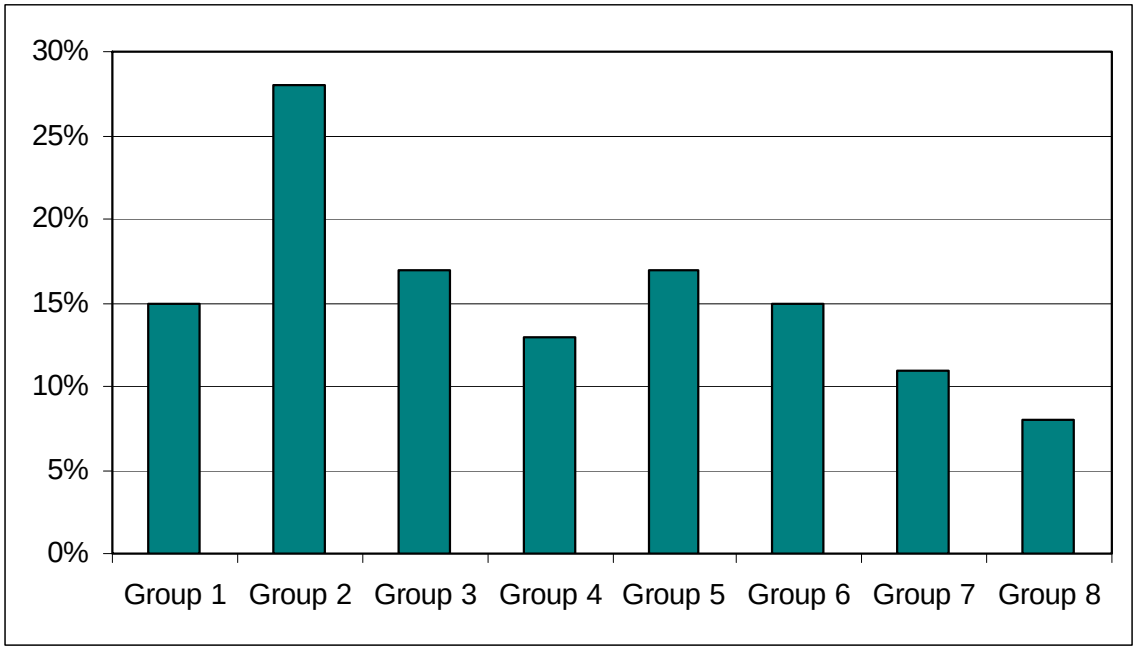
Some of these questions have been answered on a regional and sub-regional level by the Housing Needs Analysis. Others may be answered with some refinement to the Metroscope model and its output.

Do lower-income households have higher transportation costs (proportional to their higher-income counterparts)?

U.S.: According to the Housing Needs Analysis, and its tabulation of Consumer Expenditure Survey data, the poorest 20 percent of U.S. households spend an average of 39.4 percent of their total expenditures on housing and 14.3 percent of their expenditures on transportation. In progressively higher income household quintiles, the percentage of expenditures spent on housing falls to 35.2 percent, 33.9 percent, 31.0 percent, and 30.9 percent. But, the corresponding percentage of expenditures on transportation rises to 18.4 percent, 19.0 percent, and 19.3 percent before falling to 17.3 percent for richest 20 percent of households.

Portland Region: The regional specific proportions were estimated by census tract for the region using Metroscope. Generally, for the household groups defined by Metroscope, lower-income groups in the rental multi-family market tend to spend higher proportions of their income on transportation costs, though the proportion spent on transportation varies somewhat, as shown below:

Figure 15
Average Estimated Proportion of Income Committed to Transportation
Portland Metro Region, Rental Multifamily Households



As noted earlier, Group 1 includes a high proportion of older singles; as such, it is likely that many members of this group forego car ownership, yielding a lower transportation cost burden than their counterparts from Group 2. For renter households, one-third of Group 2 households include school-aged children, which—combined with a very low household income—may partially explain the high cost burden of transportation for this group.

Do lower-income households have a higher combined housing and transportation cost burden?

U.S.: According to the analysis of data from the Consumer Expenditure Survey as reported in the Housing Needs Analysis, the percentage of household expenditures spent on housing and transportation combined is roughly consistent for households in the lower 60 percent of income categories.

Portland Region: The regional specific proportions by census tract were estimated for the region using Metroscope. Generally, for the household groups defined by Metroscope, Group 2 in the rental multi-family market faces the highest combined housing and transportation cost burden, averaging 79 percent region-wide, followed by Group 1, at about 64 percent, with the higher-income groups requiring relatively lower proportions of their household income committed to housing and transportation, as shown below:

- Group 1: 64 percent (ranges from 53 percent to over 100 percent by census tract)
- Group 2: 79 percent (ranges from 62 percent to over 100 percent by census tract)
- Group 3: 56 percent (47 to over 100 percent)

- Group 4: 45 percent (39 to 94 percent)
- Group 5: 49 percent (38 to over 100 percent)
- Group 6: 40 percent (32 to 96 percent)
- Group 7: 32 percent (26 to 74 percent)
- Group 8: 25 percent (20 to 54 percent)

For Group 2, the high proportion of income spent on transportation translates to a high combined housing and transportation cost burden. The ranges reflect the specific tradeoff households make in selecting housing by Census Tract, which are relatively small geographies.

Are these lower-income households in location-efficient (or location-inefficient) areas?

Metroscope estimated the number of households in each of the census tracts in the City for eight consumption categories and the percentage of those households spending more than a defined proportion of its income on housing and transportation, as shown in the preceding section. By quantifying standard metrics for housing and transportation cost burden and location efficient areas (see recommendations in next section), the degree to which cost burdened households are in location-efficient areas can be quantified.

How should location-efficient areas be defined and quantified?

The general definition of a location-efficient area is one that is well-served by transit, and is conducive to biking, walking and other modes of transportation. The empirical definition might be based on the proportion of trips captured by non-driving modes, adjacency to a well-served transit station (light-rail or streetcar station or frequent bus service), proximity to employment, retail and other services, or some combination. Some potential metrics which might be applied to this quantitative standard are described in the discussion on transit and walkability indices in the next section.

5 RECOMMENDED NEXT STEPS

As noted at the outset of this report, the primary goal of this analysis was to develop a framework to guide the City's efforts toward calculating and refining a combined housing and transportation cost burden index. This framework includes recommendations related to the employment of the Metroscope model, potential refinements to the model, suggested inclusions in subsequent work products, and a preliminary exploration of policy tools and choices.

5.1 Metroscope

This preliminary analysis recommends continuing to refine the Metroscope model for the housing and transportation cost burden analysis. With its realistic model of housing development that incorporates the impact of household choice, development economics, and commuting preferences, Metroscope provides a realistic understanding of what housing will be supplied in particular areas given transportation infrastructure investments, land supply restrictions, and household preferences for community and housing costs. Use of the model can be refined in a variety of ways to better satisfy the goals of the housing and transportation cost burden analysis, including:

- Targeting the households for the analysis,
- Challenging the traditional definition of transportation cost;
- Exploring possible metrics for quantifying household wealth; and
- Relaxing county- or regionally-based assumptions.

This section of the report explores each of these possible recommendations in turn.

5.1.1 Targeting the Analytic Universe

This analysis is primarily concerned with the location-efficiency of those housing units occupied by households considered cost burdened. As such, it will be necessarily to define empirical standards for several key metrics: housing and transportation cost burden, and location-efficiency of housing units.

Quantitative standard for combined housing and transportation cost burden: With the generally-accepted definition of cost burden for housing alone at 30 percent of household income, a suitable standard for housing and transportation combined might be in the 45- to 50-percent range. Metro's Housing Needs Analysis uses 50-percent as its standard, and the Center for Neighborhood Technology uses 48-percent as its standard. As the City moves forward with analyzing the housing and transportation cost burden, a first critical step will be defining the level which represents cost burden for a household.

Quantitative standard for location-efficient housing: The general definition of a location-efficient area is one that is well-served by transit, and is conducive to biking, walking and other modes of transportation. The empirical definition might be based on the proportion of trips captured by non-driving modes, adjacency to a well-served transit station (light-rail or streetcar station or frequent bus service), proximity to employment, retail and other services, or some combination. The empirical definition may not be a single standard, but an index to reflect the degrees of location-efficiency across the

region. Some potential metrics which might be applied to this empirical definition are described in the discussion on transit and walkability indices later in this section.

5.1.2 Definition of Transportation Cost

Transportation costs have been defined using a traditional concept of cost in terms of the capital outlay required for travel (including capital and maintenance costs of the vehicle(s) and cost of vehicle operation). Though it may be difficult to quantify, it will be important to consider other issues, such as the cost of time spent en route, due to prolonged travel time, congestion, or other factors.

5.1.3 Quantifying Household Wealth

One challenge is the lack of information on household wealth. The age of household head variable picks up part of the wealth effect, resulting in higher rates of home ownership for lower income, older householders than for younger householders with the same income, but no variable in the model directly quantifies a household's wealth. For many households, particularly older households, the wealth effect has an important impact on whether housing costs cause economic hardship. Households that have the wealth required to purchase an expensive home with a significant down payment will have a much lower mortgage payment than a household that must finance 80 percent of the cost, which is the assumption made by Metroscope. As such, lower-income elderly households paying a significant share of their income on housing may not be cost-burdened in the traditional sense. Future efforts would be well-served to consider data sources and other analytic methods to capture household wealth.

5.1.4 Relaxing Regional Assumptions

This analysis recommends continued collaboration between the City and Metro to explore some of the assumptions which are county- or regionally-based. For example, the cost of travel is held constant by mode for all households in the region without regard to household income (which would affect the age and type of vehicle, which could have profound cost impacts). Another example is mode split, which is determined by the county of residence. Though the analysis recognizes distinctions in mode-split choices due to consumption patterns, it may not fully recognize the many differences in location-efficiency among the variety of census tracts within Multnomah County. Some locally-available indices which might prove useful in refining the mode split estimation are discussed in the next section.

5.2 Transit and Walkability Indices

There are several transit-related and walkability efforts in place which could be applied to the effort to quantify location-efficiency or refine the mode split analysis: a transit-availability indicator, TriMet's Transit Orientation Index, PDOT's Primary Transit Index, and the walkscore algorithm.

Transit-Availability Index: The first is a simple indicator of transit availability, a binary which indicates whether a parcel is within a certain distance of a bus stop, streetcar station, or light-rail station. The distances currently in use are one-fifth of a mile for bus stops and streetcar stations and one-half mile for light-rail stations, recognizing the stronger draw of light rail.

The ***Transit Orientation Index*** (TOI) was developed for TriMet using a detailed regression analysis to evaluate the effectiveness of different land use and demographic variables in predicting transit use. The analysis found that 80 percent of transit demand is predicted by three key variables: household density, employment density, and density of retail employment. Other factors—such as income, vehicle ownership, and age—are not statistically significant predictors of transit demand.

The ***Primary Transit Index*** (PTI) was developed in 2007 by PDOT using the TOI score and the availability of regional "anchors." It is this concept of anchors which allows strong ridership for the entirety of a transit line. Without anchors, ridership would be expected to peak in the middle of the line and taper toward the ends.

Using the ***walkscore algorithm***, the city's GIS staff may be able to create a dataset by running a database of parcels through the algorithm to create a new layer of information about services in close proximity to specific parcels. This effort would serve to incorporate additional information on the built environment.

These or other indices might be incorporated into Metroscope to refine the model's estimates of mode split.

5.3 Development of Case Studies

To demonstrate the effect of different housing location decisions on a household's expenditures, the analysis might consider in-depth interviews of specific targeted households, calculating how their spending distribution differs on the basis of their residential location.

5.4 Policy Tools and Choices

As noted at the outset of this report, the primary goal of this analysis is to better understand the effect of the combined housing and transportation cost burden to inform policy making. There are numerous public programs designed to help households spend less than 30 percent of their incomes on housing, from (Federal) Section 8 vouchers to Low-Income Housing Tax Credits. The issue of combined housing and transportation cost burden has given rise to other policy tools to encourage location-efficiency of housing, including Location-Efficient Mortgages, TOD tax-abatement programs, and employer-based incentive programs.

5.4.1 Location-Efficient Mortgages

The role of transportation costs in household expenses can be taken into consideration when making decisions on location and financing. One way of linking these issues is the location-efficient mortgage (LEM), which considers household savings in transportation costs associated with living near public transit. By including these savings in calculating housing affordability, LEMs enable potential homebuyers to qualify for higher mortgages, making more housing affordable.

Despite wide-spread interest, the LEM is currently available only in Chicago, Seattle, San Francisco, and Los Angeles. At one point, Metro staff prepared a spreadsheet model that uses household information to estimate the number of vehicles and vehicle-miles traveled. Combined with standard mortgage inputs, the model estimates the location-

efficient benefit (in dollars) of residential units by TAZ. It is believed that the region is not pursuing development of LEM standards for the Portland metro region at this time.

5.4.2 TOD Tax Abatement

The City of Portland adopted the Transit Supportive Residential or Mixed Use Development (TOD) tax exemption program in 1996 to provide an incentive for the construction of new multifamily and mixed-use development to provide support for the light rail system and other public transit. The TOD program allows a limited property tax exemption of up to ten years on the improvement value of transit-oriented residential and mixed-use projects though land is not subject to the exemption. The program is available in MAX light-rail station areas along the east-west MAX line outside the Central City, the Hollywood and Lents Town Centers, the Gateway Regional Center, and a portion of Northwest Portland. The program was recently modified to include station areas along the MAX Interstate Corridor light rail line, station areas along the future I-205 light rail line, and other transit-oriented areas (including several main street areas with frequent bus service).

These existing tax abatements can target specific areas thereby increasing the incentive for households to select housing in location-efficient areas.

5.4.3 Employer-Based Incentive Programs

There is a range of employer-based programs to encourage employees to use public transportation. In recognition that motor vehicles are one of the largest sources of air pollution in the Portland region, the Department of Environmental Quality (DEQ) established the Employee Commute Options (ECO) program. Under this program, employers with more than 100 employees are required to provide commute alternatives to employees. The goal of this program is to reduce the number of cars driven to work in the Portland metro area. Employee commute option programs include a range of incentives such as:

(1) Promoting carpool and vanpool programs;
(2) Offering transit subsidies;
(3) Establishing telecommuting opportunities;
(4) Offering compressed work week schedules;
(5) Providing an emergency ride home program;
(6) Sponsoring shuttle buses to and from transit terminals and/or during lunch hours for errands;
(7) Improving facilities to promote bicycle use;
(8) Establishing on-site amenities to decrease employees' need for a car at the work site;
(9) Discontinuing parking subsidies and charging all employees for parking.

These employer based incentive programs can be expanded to include small businesses as well so that more households can reap the benefits.

5.5 Conclusion

The City of Portland's approach to planning has helped make our region one of the most livable in the world. Even so, the city is not immune to the impacts of economic instability, population growth, changing demographic characteristics, and global climate change. As it

undergoes periodic review, the City is trying to find new ways to address these global issues. Recent volatility in fuel prices has led to a renewed interest in minimizing vehicle miles traveled. And incorporating the cost of transportation along with the cost of housing will be critical when examining housing affordability.

After reviewing the relevant literature on the impacts of housing and transportation costs on affordability and conducting preliminary analysis of Metroscope data on selected household types, this report concludes that inclusion of a transportation cost component is imperative in assessing housing affordability and policy making. Further, the report offers recommendations related to the employment of the Metroscope model, potential refinements of the model, suggested inclusions in subsequent work efforts, and an exploration of policy tools and choices.

6 APPENDIX

The MetroScope model has been used to calculate housing and transportation costs across the region for various transportation and housing needs analyses. Key findings from these related analyses are described in this appendix.

6.1 Transportation Scenarios Analysis

As part of the Transportation Scenarios Analysis, Metroscope was used to quantify the housing and transportation cost burden across the region. The draft document summarizes the average new household cost of housing and transportation and estimates the average portion of household income spent on these two expenditure categories for five different planning scenarios:

- ***A reference scenario:*** A projection of how the region would grow if current local government transportation and land-use plans are followed through to 2035;

- ***The connectivity scenario:*** Aggressive implementation of RTP policies to increase the number of street connections throughout the region;

- ***The high-capacity transit scenario:*** A bold expansion and improvement of the HCT system beyond current RTP policies;

- ***Two throughway scenarios:*** A) A bold expansion of the region's highway and freeway system to address growing congestion and delay, and B) A second transportation model run was conducted to test high-occupancy toll (HOT) lanes on capacity added to I-5, I-205, I-405, I-84, OR 217 and US 26; and

- ***The management scenario:*** Aggressive system management to optimize capital investments in the reference scenario and address growing congestion and delay.

For each of these scenarios, estimates of key indicators are summarized for the five scenarios. These indicators include the proportion of new households in centers and corridors, the acres of land developed in future UGB expansion areas, average commute distance, total infrastructure cost, residential source greenhouse gas emissions, transportation system capital cost, carbon monoxide emission, transit ridership, walk and bike trips, VMT, system delay and resulting costs for freight. Several of these indicators were also calculated on an annual average household cost basis, including average annual new household cost of housing and transportation and average portion of household income spent on housing and transportation.

The application of averages in this case has obscured the cost burdens of housing and transportation costs: The numbers for the scenarios vary only by $100 for average new household cost of housing and transportation (between $27,400 and $27,500) and 0.2 percent for the average portion of household income spent on housing and transportation (between 47.3 percent and 47.5 percent), suggesting little change in household cost burdens among the scenarios. Unfortunately, the lack of variation among the scenarios may be largely due to the averaging of the costs across the entire region, which for the

MetroScope model extends beyond Metro's jurisdictional boundary and includes all of Washington, Multnomah, Clackamas, Columbia and Clark counties; most of Yamhill County; and a small portion of Marion County.

The underlying model and data are remarkably robust. For four housing type/tenure combinations (Owner and Renter Single- and Multi-family housing), the cost calculator estimates average housing and transportation expense for eight household types (using an aggregation of Metroscope's 400 Household Income and Age classes), using assumptions for mode split, housing size, and various other analytic inputs.

6.2 Findings from the Housing Analysis

The housing analysis acknowledges the trade-off households make between transportation and housing costs. The study determined that the percentage of household expenditures spent on housing and transportation combined is roughly constant for households in the lower 60 percent of income categories. This finding confirms the initial concern that while households may move away from high-cost central locations to reduce their housing cost burden, they experience increased transportation costs that offset the savings. The housing analysis notes that "Simply adding affordable housing in parts of the region that are not accessible to efficient public transportation may not reduce combined housing and transportation costs for households that find jobs and services farther away."

Other key findings relating to housing and transportation cost burden include the following:

- The metro region's percentage of households paying 30 percent or more of their income on housing will rise from 44.1 percent in 2005 to 49.2 percent in 2035. These percentages are highest for renters, rising from 51.4 percent in 2005 to 56.9 percent in 2035. The demographic groups occupying Groups 1 and 2 (low-income singles and working class) are most likely to struggle with housing costs, and this struggle is expected to increase in the future. Based upon the number of units and reflecting the composition of income levels for groups 1, 2 and 3, rental multi-family units will pose the greatest housing hardship.

- This increasing cost burden will be felt region-wide, but the households most affected will be young and old (under 25 and 65 and over), small (a large majority living alone), with household income below $25,000 (many households under $15,000). In addition, single-parent households with children will comprise the most cost-burdened households, especially those in rental single-family households.

- While median family income in the metropolitan region is expected to remain about the same between 2005 and 2035, housing costs are expected to increase, resulting in a larger percentage of income consumed by housing costs. With rental single-family housing becoming less available over time, the households which rely on this housing type (generally poor families with children) will need affordable alternatives. One possible solution will be appropriate alternatives in

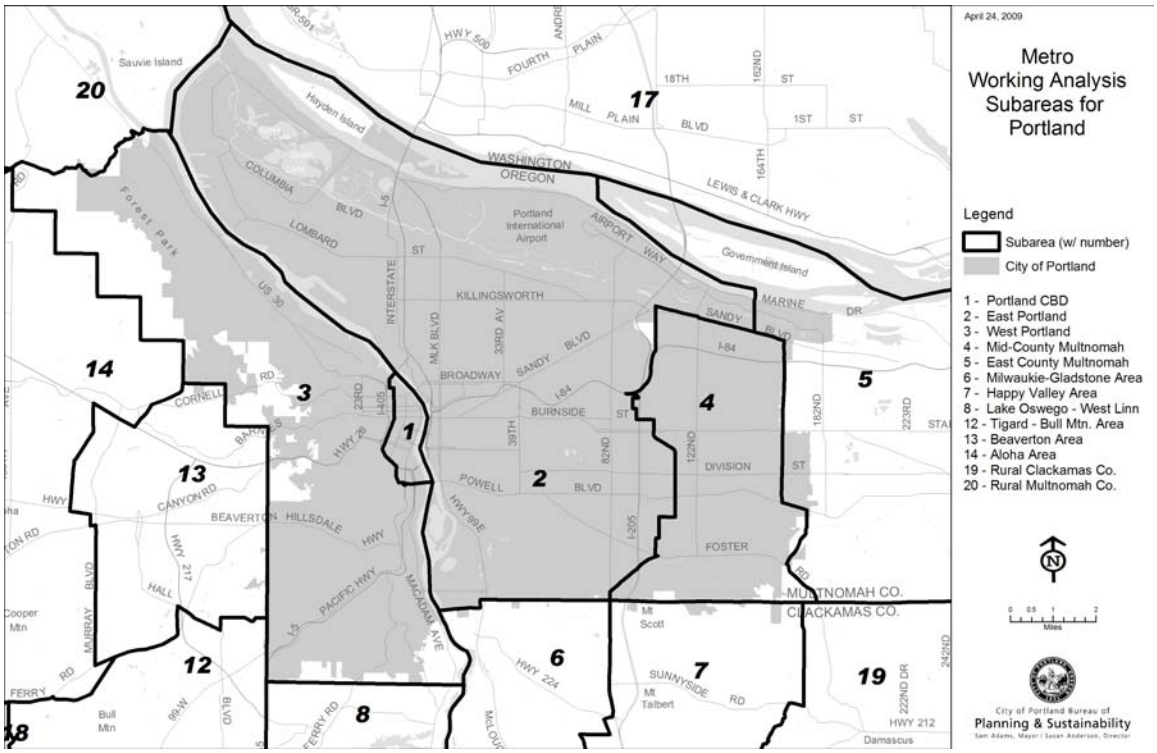
the rental multifamily housing market, which typically offers smaller living quarters.

- The overwhelming majority of families with children choose owner single-family housing; yet those families purchasing single-family units, many of which occupy Groups 3 and 5, are becoming more cost burdened themselves. By 2035, 90 percent of Group 3 and 30 percent of Group 5 owners will be expected to be paying more than 30 percent of their income on housing; the largest jump occurs in Group 5 households. Almost ten percent of Group 3 and Group 5 families will pay more than 50 percent of their income for housing by 2035.

- Although cost burden is rising for both owners and renters, this burden is felt more by renters than owners, as owners are able to build equity in their homes as housing values rise, while renters experience higher rent with no corresponding increase in wealth.

The housing analysis also considers the housing cost burden by subarea shown as Figure 16. The subareas that will have a higher than average rate of cost-burdened households include subareas 1 through 6, 12, 13, 15, 16, and 17. The only subareas in which the percentage of cost-burdened households falls are Subareas 8 and 10.

Figure 16
Metro Working Subareas



- The subarea with the highest percentage of households paying 30 percent or more of their income on housing in 2005 is Subarea 1 (Downtown Portland), with 61.7; by 2035 it will still have the highest percentage with 81.4 percent. Its share of

these households will double so that in 2035 its share will be 3.4 percent, compared with its 2.0 percent share of total households.

- Subarea 2 (North and Northeast Portland) has a large percentage of the region's total households (18.4 percent in 2005). It will experience an increase in cost-burdened households between 2005 and 2035. But its share of the total will fall from 24.4 percent in 2005 to 18.9 percent in 2035. This is about 35 percent higher than its share of total units in 2035 (14 percent).

- Subarea 3 (west Portland) increases its percentage of households paying 30 percent or more of their income on housing from 41.1 percent in 2005 to 57.5 percent in 2035. The share of cost-burdened households increases from 6.5 percent to 8.5 percent, as does its share of total households (6.9 percent to 7.3 percent).

- Subarea 16 (far west) will continue to struggle with affordability but its share of cost-burdened households will not increase. In this subarea, the percentage of households paying 30 percent or more on housing will rise from 55 percent in 2005 to 64.1 percent in 2035. However, its share of these cost-burdened households is expected to remain constant at 1.8 percent.

- Subarea 17 (Clark County) will experience a small increase in the percentage of households paying 50 percent or more of their income for housing (49.2 percent to 51.6 percent). While the subrarea's share of total households grows from 18.2 percent to 20.4 percent, its share of cost burdened households will rise from 20.3 percent to 21.4 percent.

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