APPENDIX 8 – Housing Needs Analysis (HNA)

Background

Detailed household characteristics are needed to forecast housing affordability, the willingness (or ability) of different households to acquire housing, and the tenure and type of housing that each kind of household might consider as a viable housing alternative. The material presented in this appendix offers a high-level overview of the methodology behind the housing needs analysis, including a supportive narrative describing key elements of the regional household forecast. Additional socioeconomic profiles of households are used in this HNA methodology and for the estimation of housing demand required by recent changes in housing statutes. New analytics have been incorporated into the 2024-44 Urban Growth Report (UGR) to meet the new regulatory requirements.

Additional information which specifies the forecasted number of households by household size (i.e., the number of persons in a household); income bracket of the household; and age bracket of the householder (i.e., the age of the head of household as defined by the US Census) are used in formulating the housing demand outlooks for this HNA. Typically, this data is commonly referred to as the Metro HIA forecast, where "H" stands for household size, "I" for income, and "A" for age. The HIA forecast are a series of three-way contingency tables that consist of a cross-classification of the three categorical variables.

We estimate a 2024 base-year of households by HIA, a forecast horizon-year of 2044 and every five years beginning with 2030 through 2050. There are three housing demand outlooks based on the details of the HIA.

The HIA forecast is a product derived from the Metro MSA 2024-44 regional forecast, representing a life-cycle evolution of existing householders as well as the addition of new householders to the region. US Census American Community Survey (ACS) annual regional demographic estimates and ACS Public Use Microsample (PUMS) 2020 5-year estimates of the MSA region are primary sources that inform the details to the socio-economic relationships of members of the households. Metro has been routinely producing the HIA forecast since 1995 for the Regional Transportation Plan (RTP) and travel demand modeling but has only recently in this UGR deployed this information for housing needs analysis.

What's New?

- Oregon HB 2003 (adopted in 2019) – Relevant to Metro's HNA, this bill adds specificity for the household income groups that should be considered when assessing needed housing. It also adds "middle housing" to the list of needed housing types.
- Oregon HB 2001 (adopted in 2019) –This bill fundamentally shifts Oregon's approach to housing planning by requiring cities and counties to allow "missing middle" housing in zones that allow detached single-unit housing.) [This HNA therefore considers an array of possible scenarios that will fundamentally shift the Metro region's mix of future housing.] This bill also requires that Metro estimate existing and future housing. Assessment of existing housing needs (historic underproduction and housing for people experiencing houselessness) is a new provision and is described in more detailed in Appendix 8A.
- The 2024 UGR adds middle housing as another residential archetype in the HNA. The three housing types are 1-unit structures (i.e., single-family detached housing), middle housing (e.g., duplexes, triplexes, quadplexes, townhouses/rowhouses, accessory dwelling units (ADU), and

cottage clusters) (see RLIS meta data for more definitions of each archetypes: https://www.arcgis.com/sharing/rest/content/items/819b261a943b4e5a9a2e60a4be4c19f1/info/metadata/metadata.xml?format=default&output=html)

- Housing Demand: the Metro HIA forecast is used to inform and relate the demand for future housing by rent and price ranges for 5 different household segments based on HUD (Housing and Urban Development) categories of area median income (AMI), i.e., 30% AMI, 30-50% AMI, 50-80% AMI, 80-120% AMI, and over 120% AMI. Demand profiles for affordability and a willingness to pay stem from Metro's HIA forecast by relating selected HIA categories of households by size and income to the 3 housing archetypes in this HNA.

- Housing Supply: the Metro estimate of housing supply (derived from Metro's Buildable Land Inventory – BLI) has been revamped to use a pro forma real estate model to project single family, middle housing, and multifamily housing options (see BLI Appendix for additional details). The pro forma model estimates the highest and best use (HBU) possible for every vacant buildable tax lot and each existing site eligible for redevelopment. Residential types now include middle housing as a development option. Outdated redevelopment assumptions are replaced with the real estate pro forma model and a stabilized set of economic assumptions, evaluating feasible market alternatives and choosing the HBU on only the viable sites. This HNA incorporates this newer data into the capacity estimates to calculate need (i.e., a surplus or deficit).

- Housing Supply Range: this HNA considers alternating development density assumptions and possible end uses in the residential BLI to create a range on the supply-side which can be used in creating a range for the residential gap analysis. A mix of the three housing types is considered which creates a range of housing supply alternatives in addition to other variables.

- New information from Metro's Land Development Monitoring System (LDMS) informs these fundamental shifts in density assumptions from the change in future mixes of shares of housing archetypes. (see Residential Development Indicators Appendix for historical details).

- Housing Demand Range: past UGR's have created a range by assessing the housing demand using roughly 1 (and up to 2) standard deviation(s) from the baseline forecast. The HNA in this 2024 UGR assumes a slightly narrower range – an error band of +/- 20 percent from the baseline forecast of housing demand. Additional forecast range is instilled into the housing demand forecast by varying the housing preferences/choices of future households (i.e., changing the mix/share of single-family detached, middle housing, and multifamily which in itself creates a range of housing need scenarios).

Development of the HIA forecast (methodology overview)

The MSA forecast sets the expectation for the total number of people and households projected in the twenty-year forecast. This is derived as regular output of Metro's regional economic model. More specifically, the derivation of the regional household forecast is a product of a projection of age-specific household headship rates and a population forecast by age cohorts. (For more information about the regional forecast, please see the Regional Economic Forecast appendix.)

Additional information from the Census is folded into the regional MSA forecast to compute the necessary HIA forecast data. There are two main inputs and several key components in each which feed into the generation of the 20-year HIA forecast:

1. Metro MSA forecast:

a. Population forecast by age
        b. Household forecast by age of householder
        c. Personal income forecast for the region
   2. Census ACS data:
        a. H: ACS 1-year, Table B1101 (Households Type by Householder Size)
        b. I: ACS 1-year, Table B19001 (Household Income in the past 12 months, nominal dollars)
        c. A: ACS 1-year, Table B25007 (Tenure by Age of Householder)
        d. IA: ACS 1-year, Table B19037 (Age of Householder by Household Income)
        e. HIA: ACS 2020 PUMS 5-year Table

The HIA forecast is a statistical tabulation which describes future changes in characteristics of households which are key to impacting the taste and preferences of future housing demand. This is shown in a three-variable contingency table or cross-tabulation matrix for the base year (Census year 2020) and future years in 5-year increments. 2024 and 2044 are needed interpolated years for the UGR. These three variables in the contingency table are (H) household size, (I) household income bracket and (A) householder age, hence the name HIA forecast. These variables are known to be highly correlated with housing affordability, willingness/ ability to pay for different forms of shelter, tenure (i.e., own or rent), and structure type size (e.g., single family domiciles or multifamily rental units), as well as other attributes that form individual housing preferences for every subgroup of households.

Current and historical estimates of HIA data can be tabulated from Census PUMS survey data for the Portland MSA, but projections or forecasts are unavailable. However, combining the Metro forecast and current year household characteristics available from the Census allows us to produce the necessary forecast information. The methodology for producing future year HIA contingency tables, i.e. the HIA forecasts, begins with Census HIA data which then extrapolate summary level characteristics of each variable into future years using a statistical technique called "iterative proportional fitting" (IPF) or "matrix scaling." The IPF procedure adjusts (or forecasts) a known distribution from one data set (in our case the HIA base year data given by ACS PUMS) using (sub)totals reported in another data set (in our case it is the Metro regional forecast).

A table nearby illustrates the categories for household size, income and age. The reader should note that these are not the HIA tables. They are merely summary tabulations of the more complex statistical tables.

Household Size Categories
(excludes pop in GQ)

	1 person	2-person	3-person	4-person	5 or more		average HH size
2020	27.2%	36.0%	15.4%	12.9%	8.5%	100.0%	2.52
2030	30.1%	35.8%	16.5%	12.5%	5.1%	100.0%	2.32
2040	31.3%	35.6%	16.9%	12.4%	3.9%	100.0%	2.25
2050	32.0%	35.5%	17.1%	12.2%	3.1%	100.0%	2.21

Household Income Brackets

	under $15,000	$15,000 - $24,999	$25,000 - $34,999	$35,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 - $149,999	$150,000 and over	
2020	7.5%	5.9%	6.6%	10.3%	16.8%	13.8%	19.1%	20.0%	100.0%
2030	8.3%	6.9%	7.5%	11.5%	16.1%	12.7%	18.1%	19.0%	100.0%
2040	8.6%	7.4%	7.9%	12.1%	15.9%	12.2%	17.7%	18.4%	100.0%
2050	8.8%	7.6%	8.1%	12.4%	15.7%	11.9%	17.4%	18.1%	100.0%

Household Age Brackets (Head of Household)

	under 25	25 to 34	35 to 44	45 to 54	55 to 64	65 to 74	75 to 84	85 & over	
2020	3.3%	16.9%	19.9%	17.9%	17.8%	15.0%	6.6%	2.6%	100.0%
2030	3.3%	14.1%	18.5%	18.2%	16.7%	14.8%	10.2%	4.4%	100.0%
2040	3.4%	13.3%	16.6%	17.6%	17.3%	15.0%	10.9%	6.0%	100.0%
2050	3.3%	12.6%	15.5%	16.6%	17.3%	15.8%	11.8%	7.3%	100.0%

Figure 1: Truncated summary tables of the three variables contained in the HIA forecast for the Portland MSA (note: not HIA contingency tables)

The table set, above, tabulate the subtotals reported from the Metro HIA forecast. The standard HIA forecast includes 5-year forecast increments, beginning in 2020. HIA data are interpolated for the base year and the twenty-year forecast (i.e., 2024 and 2044) for this UGR. The tables are expressed as percentages of total households so the reader may see how the marginal distributions of each data concept changes over time. (The figures may be reverted to the original set of numbers by multiplying the share in each by the number of total households in each year.)

A household consists of related or unrelated individuals residing in the same domicile. In general, the average household size in the MSA is expected to lower incrementally each year in the forecast, declining from a regional average of 2.5 persons per household in 2020 to 2.2 persons per household in 2050. This is consistent with our expectation of fewer births and a rising number of families delaying child rearing until they are older. Most households are made up of a single person or a couple, with a plurality being a two-person household. It is also notable that the MSA forecast anticipates a much steeper drop off in larger families (i.e., households of 5 or more people).

The nearby table also shows income brackets of households delineated per US Census categories. The Census data differ from HUD income brackets as HUD (Housing and Urban Development) shows data for family income brackets as percentile of area median income statistics by persons in a family, a somewhat different measurement than what is provided by Census data for the region. The Census household income brackets can be raked up or down to approximate the area median income limits prescribed by HUD. (This is done in a later step in the methodology.) Census delineation fit with our methodology for forecasting households and income brackets. The IPF approach is the chosen method we use to forecast future HIA data for the region.

The HIA forecast of real income (set at year 2020 purchasing power) for households making less than $50,000 shows the number of households in the 4 lowest income brackets, rising in this forecast, with the share of households in 2020 at 30.3% and creeping higher to 36.9% by 2050. The average household income of the richest income bracket (i.e., $150,000 and over) is calculated at $870,300 and rising to $1.3 million by 2050. Please note that this is an average for just the highest Census income bracket and since it is an average is distorted by very high earners; a median value for this bracket would be more representative, but we are unable to calculate that statistic because of the confidential nature imposed on Census information. Without being accused of being too pedantic, we note that since the share of lower income households is on the rise, then the share of higher income households is necessarily on the decline and to the degree to which some in this subset are very high earners it does indeed distort the perception of average wealth for the highest income earners in the highest bracket.

It has been widely noted that population growth is slowing and that the median age of people residing in the MSA is on the rise. Reflective of this aging demographic trend, the share of householders in the MSA in retirement and post-retirement age cohorts is on the rise too. In 2020, fewer than 1 in 4 households were in these two retirement-age cohorts. By 2050, the share of older householders is expected to grow to over 1 in 3, more than a 10-percentage point swing higher.

The full HIA contingency tables are much too large and complex to be shown in a printed appendix. Instead, we offer a stylized illustration of what an HIA forecast might look like. In this illustration, it represents a table of households for 8 income bracket and 5 household sizes and for 5 different household age cohorts.

Figure 2: Truncated illustration of the HIA contingency table for a single forecast year.

Projecting Housing Demand from the HIA forecast (methodology overview)

Census data is the foundation by which Metro projects the HIA forecast and housing demand. Some definitional adjustments in the Census data are required to harmonize with state regulations which rely on HUD income limits to prescribe needed housing. Initial projections of housing demand are based on households assumed to spend a certain percent of their income on shelter costs using current trend information. Scenarios or alternative growth projections on housing demand will assume to alter these current trends.

Forecast steps of projecting household HIA brackets into initial housing demand:

1. Collect the HIA brackets of household size and age into household life stages
2. Divide the number of households in the region into the separate life stages (from step 1) and estimate the likely tenure of each (i.e., rent or own)
3. Split and combine the real household income bracket projections (Census definitions) to HUD's AMI limits
4. Reconcile the life stages and household income brackets with HUD AMI limits (from step 2 and 3)
5. Summarize the historical affinity of renters to affordable housing choices (i.e., market rate housing vs. subsidized housing final demand forecast) (from step 4)
6. Summarize the historical affinity of owners to affordable housing choices (i.e., market rate vs. subsidized housing choices final demand forecast) (from step 4)
7. Assign historic structure type preferences by tenure, life cycle and HUD AMI income groups (initial baseline derivation from historic final demand data) (from step 5 and 6)
8. Alter future preferences (create alternate scenarios of housing available) subject to current and expected regulatory production limits (i.e., availability of buildable supply, type of housing entitlements, i.e., zoning codes, and state/ Metro land use regulations). This step alters the historic structure type preferences (in step 7) to meet anticipated entitlement regulations, the state's Metropolitan housing rule (i.e., at least 50% multifamily or attached housing), and state housing regulations requiring allowances for middle housing.

Household Life Stage Assumptions

The HIA forecast underlies the tabulation of households into separate life cycle stages. The HIA data is a tabular array of 5 household size brackets (1-person to 5 or more person households), 8 income brackets (constant 2020 dollar purchasing power), and 5 age brackets. The cross-tabulation of these household characteristics creates a data array of 320 unique household types (320 = 5 x 8 x 5). Each of the 320 household types will have varying degrees of affinity to tenure and structure type, which we call preferences. The majority preference type for each individual housing type, though unique, are not so different that they can't be simplified and summarized by life cycle. The methodology exploits our understanding of the usual aging process of households and the adjacency of HIA categories that share nearly the same degree of and life cycle characteristics in order to streamline both the concept and the actual computational load of estimating and forecasting housing preferences.

HIA household characteristics

household sizes	income brackets	age brackets
1-person	under $15,000	under 25 years old
2-person	$15,000 - $24,999	25 to 44 years old
3-person	$25,000 - $34,999	45 to 54 years old
4-person	$35,000 - $49,999	55 to 64 years old
5 or more	$50,000 - $74,999	65 years or older
	$75,000 - $99,999	
	$100,000 - $149,999	
	$150,000 and over	

Figure 3: Definition of the HIA household and individual attribute levels

The close affinities of some household types and the historic majority preferences of these similar household types are streamlined (i.e., collapsing of categories) by household size, age and other life cycle considerations into just seven life cycle cohorts. Naming of the seven life cycle cohorts are shown in a nearby table. Interpolation of the HIA income brackets is then computed, splitting and rearranging the Census derived income brackets to better match to latter calculation of households by HUD AMI limits. Conceptually, the HIA household forecast reveals the aging of households and the alterations we anticipate happening to them as they age through the various life stages. We show the Metro MSA changes to these life cycles in a nearby table which has households as percentage shares of the entire region.

Base year, 2024 Life Cycle of Households in the MSA

2024: MSA estimate = 1,073,400 total households

Income Category	Young Households, under 25 years old	Adults 25-44 without kids	Families 25-44 with kids	Single adults, 45-64	Adults 45-64 in 2+ person household	Older (65+) single adult household	Older (65+) couples and multigenerational households	Total
< $20K	0.6%	1.5%	1.0%	2.3%	1.2%	3.7%	0.8%	**11.2%**
$20K to $39K	0.7%	1.9%	1.9%	1.8%	1.9%	4.1%	1.9%	**14.2%**
$40K to $59K	0.7%	2.6%	2.2%	1.6%	2.6%	2.1%	2.6%	**14.4%**
$60K to $99K	0.7%	4.8%	4.1%	1.8%	5.2%	1.8%	4.1%	**22.5%**
$100K to $149K	0.3%	3.7%	3.8%	0.9%	6.2%	0.7%	2.9%	**18.4%**
$150K to $199K	0.03%	1.6%	2.0%	0.4%	3.6%	0.2%	1.3%	**9.2%**
≥ $200K	0.05%	1.2%	2.4%	0.3%	4.6%	0.3%	1.2%	**10.1%**
Total	**3.2%**	**17.2%**	**17.4%**	**9.1%**	**25.4%**	**12.8%**	**14.8%**	100%

Figure 4: Tabulation of 2024 MSA HIA estimate by life cycle

Forecast, 2044 Life Cycle of Households in the MSA

2044: MSA forecast = 1,276,900 total households

Income Category	Young Households , under 25 years old	Adults 25-44 without kids	Families 25-44 with kids	Single adults, 45-64	Adults 45-64 in 2+ person household	Older (65+) single adult household	Older (65+) couples and multigener ational households	Total
< $20K	0.7%	1.3%	0.9%	2.5%	1.3%	4.7%	1.0%	**12.4%**
$20K to $39K	0.8%	1.7%	1.7%	1.8%	2.1%	5.2%	2.5%	**15.7%**
$40K to $59K	0.8%	2.3%	1.9%	1.7%	2.7%	2.6%	3.2%	**15.1%**
$60K to $99K	0.7%	3.8%	3.3%	1.7%	5.0%	2.0%	4.6%	**21.0%**
$100K to $149K	0.3%	3.1%	3.1%	0.8%	6.1%	0.8%	3.4%	**17.6%**
$150K to $199K	0.03%	1.3%	1.7%	0.4%	3.6%	0.2%	1.5%	**8.7%**
≥ $200K	0.04%	1.0%	2.0%	0.3%	4.5%	0.3%	1.4%	**9.5%**
Total	**3.3%**	**14.5%**	**14.4%**	**9.1%**	**25.2%**	**15.9%**	**17.5%**	100%

Figure 5: Tabulation of 2044 MSA forecast by HIA households by life cycle.

The two tables succinctly illustrate the distributional changes we anticipate in the composition and types of households between 2024 and 2044. As a household's age, income, and the number of dependents changes for a household, the household moves from one phase into another. The housing affinity, that is the preference to own or rent and the type and size of a structure, is determined by these characteristics and then altered as events in a household adjust to new additions or subtractions within the household. As households age, these changes could be brought about by having more/less income, more/fewer individuals add/subtracted to/from the household, and the inevitable aging of the household. Through different life stages, we can approximate the housing preferences of the region, at least an initial baseline determined by historical data and observed final demand statistics.

Tenure calculations and assumptions

A projected shift in tenure is thus produced by the underlying HIA forecast. The tenure rate assumption for households residing in the MSA in 2024 is estimated at 61% owners and 39% renters. These rates are projected to change in 2044 to be 62% owners and 38% renters. This is a relatively small change in projected tenure and will likely induce only a small shift in future housing preferences, other things being equal. The alteration in tenure splits is due primarily to the underlying shift implied by the demographics and socioeconomic projections embedded in the HIA forecast. However, this mild conclusion is before housing regulations and the availability of housing supplies are considered. The shift in the final demand of housing preference will likely be altered considerably when preferences are balanced against available housing supply and prevailing housing regulations.

Among renters we see a greater proportion that are in the lower income brackets. Those earning below $60,000 dollars in 2024 represent 57% of households that rent. In 2044, that share edges higher to 60.7% of renters. Nearly half of all renters in 2024 are between the ages of 25 and 44, with or without kids. In 2044, the share of renters between the ages of 25 and 44 slips lower to 41.6% from 47.9% of all renters.

Base year (2024) and Forecast (2044): Households by Life Cycle and HUD AMI limits

Renters, 2024

Income Category	Renters							
	Young Households, under 25 years old	Adults 25-44 without kids	Families 25-44 with kids	Single adults, 45-64	Adults 45-64 in 2+ person household	Older (65+) single adult household	Older (65+) couples & multigenerational households	Total, renters in 2024
< $20K	1.6%	3.2%	2.1%	4.1%	1.7%	5.3%	0.6%	18.6%
$20K to $39K	1.8%	4.0%	4.0%	2.8%	2.3%	4.4%	0.9%	20.3%
$40K to $59K	1.8%	5.4%	3.5%	1.9%	2.5%	1.9%	1.0%	18.0%
$60K to $99K	1.7%	8.6%	4.9%	1.7%	3.9%	1.4%	1.1%	23.3%
$100K to $149K	0.7%	5.0%	3.0%	0.6%	3.0%	0.5%	0.5%	13.3%
$150K to $199K	0.04%	1.9%	0.7%	0.2%	0.7%	0.0%	0.2%	3.8%
≥ $200K	0.1%	1.1%	0.5%	0.2%	0.5%	0.2%	0.2%	2.7%
Total	**7.6%**	**29.2%**	**18.7%**	**11.6%**	**14.7%**	**13.7%**	**4.5%**	**100.0%**
						% all renters in 2024:		39%

Renters, 2044

Income Category	Renters							
	Young Households, under 25 years old	Adults 25-44 without kids	Families 25-44 with kids	Single adults, 45-64	Adults 45-64 in 2+ person household	Older (65+) single adult household	Older (65+) couples & multigenerational households	Total, renters in 2044
< $20K	1.7%	2.9%	1.9%	4.5%	1.8%	6.9%	0.8%	20.6%
$20K to $39K	2.0%	3.8%	3.6%	2.8%	2.6%	5.8%	1.2%	21.8%
$40K to $59K	1.9%	4.9%	3.1%	2.1%	2.6%	2.4%	1.3%	18.3%
$60K to $99K	1.7%	7.1%	4.0%	1.6%	3.8%	1.6%	1.3%	21.0%
$100K to $149K	0.7%	4.3%	2.6%	0.6%	3.0%	0.5%	0.6%	12.3%
$150K to $199K	0.04%	1.6%	0.6%	0.2%	0.7%	0.0%	0.2%	3.5%
≥ $200K	0.1%	0.9%	0.4%	0.1%	0.5%	0.2%	0.2%	2.5%
Total	**8.1%**	**25.4%**	**16.1%**	**12.0%**	**15.2%**	**17.5%**	**5.6%**	**100.0%**
						% all renters in 2044:		38%

Figure 6: renter households in 2024 and 2044

Owners, 2024

Income Category	Owners							
	Young Households, under 25 years old	Adults 25-44 without kids	Families 25-44 with kids	Single adults, 45-64	Adults 45-64 in 2+ person household	Older (65+) single adult household	Older (65+) couples & multigenerational households	Total, owners in 2024
< $20K	0.1%	0.4%	0.3%	1.1%	0.9%	2.7%	0.9%	6.4%
$20K to $39K	0.1%	0.5%	0.5%	1.2%	1.6%	3.9%	2.6%	10.3%
$40K to $59K	0.1%	0.7%	1.3%	1.4%	2.6%	2.2%	3.6%	12.0%
$60K to $99K	0.1%	2.3%	3.6%	1.9%	6.1%	2.0%	6.0%	22.0%
$100K to $149K	0.1%	2.9%	4.2%	1.0%	8.3%	0.8%	4.4%	21.7%
$150K to $199K	0.02%	1.4%	2.9%	0.5%	5.5%	0.3%	2.0%	12.6%
≥ $200K	0.04%	1.3%	3.7%	0.5%	7.3%	0.4%	1.8%	14.9%
Total	**0.4%**	**9.5%**	**16.6%**	**7.5%**	**32.4%**	**12.3%**	**21.4%**	**100%**
						% all owners in 2024:		61%

Owners, 2044

Income Category	Owners							
	Young Households, under 25 years old	Adults 25-44 without kids	Families 25-44 with kids	Single adults, 45-64	Adults 45-64 in 2+ person household	Older (65+) single adult household	Older (65+) couples & multigenerational households	Total, owners in 2044
< $20K	0.1%	0.3%	0.3%	1.2%	0.9%	3.3%	1.1%	7.3%
$20K to $39K	0.1%	0.5%	0.4%	1.1%	1.7%	4.9%	3.3%	12.0%
$40K to $59K	0.1%	0.6%	1.1%	1.4%	2.7%	2.7%	4.4%	13.1%
$60K to $99K	0.1%	1.8%	2.8%	1.7%	5.7%	2.2%	6.7%	21.0%
$100K to $149K	0.1%	2.3%	3.4%	1.0%	8.0%	0.9%	5.1%	20.8%
$150K to $199K	0.02%	1.2%	2.3%	0.4%	5.4%	0.3%	2.3%	12.0%
≥ $200K	0.04%	1.0%	2.9%	0.4%	7.0%	0.4%	2.1%	13.9%
Total	**0.4%**	**7.7%**	**13.3%**	**7.3%**	**31.4%**	**14.9%**	**24.9%**	**100%**
						% all owners in 2044:		62%

Figure 7: owner households in 2024 and 2044

Of the 6 in 10 households that choose to own, those having income below $60,000 represent 28.7% of households that own their own home in 2024. This share in 2044 edges a bit higher to 32.3% of owners

in the future. Young adult households (below 45 years of age) have a lower propensity to own, which is understandable because housing prices are very high relative to their generally lower earning potential. As householders exceed 45 years old, the propensity to own is considerably higher. Older households are more likely to include more people in them (i.e., more dependents), have greater earning potential, more accumulated wealth and thus have a greater affinity to own.

Income and Housing Affordability

Housing is essential and everyone should have a place to live, but housing is also a scarce resource. Supply and demand determine the price of housing. Those with more income generally buy more housing than those with less. Households who can't afford to buy tend to rent. This is borne out in Census data which was discussed in a previous section.

There is also a phenomenon that wealthier households generally spend less of their income on housing. This is true with other goods too. The logic behind this becomes clear when one considers that households, despite having more income, will limit their housing expenditure when their need for housing becomes sated. Regardless of wealth, a household can only consume a limited amount of housing before the marginal propensity to consume more housing soon hits its limit and encounters diminishing returns/ benefits.

The percent of income spent on housing varies by tenure, household income, and life cycle (a combination of age and household size). Generally, renters spend proportionally more than owners. Younger households also spend proportionally more than older households. Lower income households generally spend a proportionally more on housing. The Census data finds each data axis highly correlated in some fashion with housing expenditure and housing choice. The tables nearby detail the summary relationships between income spent and household income; note the details of these percentages differ slightly when broken out by life cycle (i.e., household age and family size composition).

Percent Income Spent on Housing, All household tenures

	[0%, 15%)	[15%, 20%)	[20%, 25%)	[25%, 30%)	[30%, 35%)	[35%, 40%)	[40%, 45%)	[45%, 50%)	[50%, 100%]
< $20K	6%	3%	3%	6%	3%	2%	3%	2%	71%
$20K to $39K	16%	4%	3%	4%	6%	7%	8%	9%	43%
$40K to $59K	19%	3%	8%	12%	16%	13%	9%	6%	13%
$60K to $99K	24%	12%	21%	18%	10%	6%	4%	2%	3%
$100K to $149K	32%	28%	22%	11%	4%	2%	1%	1%	0%
$150K to $199K	51%	28%	14%	4%	2%	1%	0%	0%	0%
≥ $200K	77%	15%	5%	2%	1%	0%	0%	0%	0%
Total	**32%**	**14%**	**13%**	**10%**	**6%**	**5%**	**3%**	**3%**	**14%**

Figure 8

Percent Income Spent on Housing, Renter households

	[0%, 15%)	[15%, 20%)	[20%, 25%)	[25%, 30%)	[30%, 35%)	[35%, 40%)	[40%, 45%)	[45%, 50%)	[50%, 100%]
< $20K	1%	2%	3%	7%	2%	2%	2%	2%	80%
$20K to $39K	1%	2%	3%	5%	8%	10%	10%	12%	50%
$40K to $59K	2%	3%	11%	18%	22%	18%	11%	6%	9%
$60K to $99K	6%	18%	32%	23%	11%	5%	3%	1%	2%
$100K to $149K	27%	40%	23%	8%	2%	0%	0%	0%	0%
$150K to $199K	57%	32%	8%	3%	1%	0%	0%	0%	0%
≥ $200K	86%	10%	3%	0%	0%	0%	0%	0%	0%
Total	12%	13%	14%	12%	9%	7%	5%	4%	24%

Figure 9

Percent Income Spent on Housing, Owner households

	[0%, 15%)	[15%, 20%)	[20%, 25%)	[25%, 30%)	[30%, 35%)	[35%, 40%)	[40%, 45%)	[45%, 50%)	[50%, 100%]
< $20K	16%	6%	5%	6%	4%	2%	3%	2%	55%
$20K to $39K	37%	6%	5%	4%	3%	4%	5%	4%	32%
$40K to $59K	38%	4%	5%	6%	9%	8%	7%	6%	17%
$60K to $99K	36%	8%	14%	15%	10%	7%	4%	2%	3%
$100K to $149K	35%	22%	22%	12%	5%	2%	1%	1%	1%
$150K to $199K	50%	27%	15%	5%	2%	1%	0%	0%	0%
≥ $200K	76%	16%	6%	2%	1%	0%	0%	0%	0%
Total	45%	15%	12%	8%	5%	3%	2%	2%	8%

Figure 10

The tables above summarize what economist denote as "willingness to pay". It factors in what is observed in the current trends of real estate markets in the MSA region.

Reconciling HUD income limits, household income and age brackets

Harmonizing Census household income, age and size brackets with HUD income limits required extensive interpolation of various categories. Many of the Census income brackets spanned across the AMI limits for HUD, see nearby table for a brief definition of these limits. The results of interpolating Census income brackets with HUD AMI limits are shown in the body of the following illustration, where extremely low income (ELI) (<30% AMI), very low income (VLI) (30-50% AMI), low income (LI) (50-80% AMI), moderate income (80-120% AMI), and above moderate (>120% AMI).

	1 person	2 person	3 person	4 person	5+ person
Less than $10,000	ELI	ELI	ELI	ELI	ELI
$10,000 to $14,999	ELI	ELI	ELI	ELI	ELI
$15,000 to $19,999	ELI	ELI	ELI	ELI	ELI
$20,000 to $24,999	ELI / VLI	ELI	ELI	ELI	ELI
$25,000 to $29,999	VLI	ELI / VLI	ELI	ELI	ELI
$30,000 to $34,999	VLI	VLI	ELI / VLI	ELI / VLI	ELI
$35,000 to $39,999	VLI / LI	VLI	VLI	VLI	ELI
$40,000 to $44,999	LI	VLI	VLI	VLI	ELI / VLI
$45,000 to $49,999	LI	VLI / LI	VLI	VLI	VLI
$50,000 to $59,999	LI	LI	VLI / LI	VLI / LI	VLI
$60,000 to $74,999	LI/Mod	LI/Mod	LI	LI	VLI / LI
$75,000 to $99,999	Mod / Above Mod	Mod	LI/Mod	LI/Mod	LI
$100,000 to $124,999	Above Mod	Mod / Above Mod	Mod / Above Mod	Mod	LI/Mod
$125,000 to $149,999	Above Mod	Above Mod	Above Mod	Mod / Above Mod	Mod
$150,000 to $199,999	Above Mod	Above Mod	Above Mod	Above Mod	Mod / Above Mod
$200,000 or more	Above Mod	Above Mod	Above Mod	Above Mod	Above Mod

Figure 11

Housing demand and household characteristics from the HIA forecast

Housing demand projections, though computationally sophisticated, are conceptually fairly straight forward as a verbal explanation. Household fall into observable stages in a household life cycle. In each

category we understand how old a householder will be, the projected incomes of these households, and include a forecast of future household sizes. Applying what we observe of typical households in each life cycle category, their income and their willingness to pay, it is straight forward to extrapolate housing preferences from current house trends, that is 1) ownership/ rental, 2) percentage afforded – rent levels or home price, and structure type – single family, middle housing or multifamily.

Assume renter households spending historically observed percent of their income
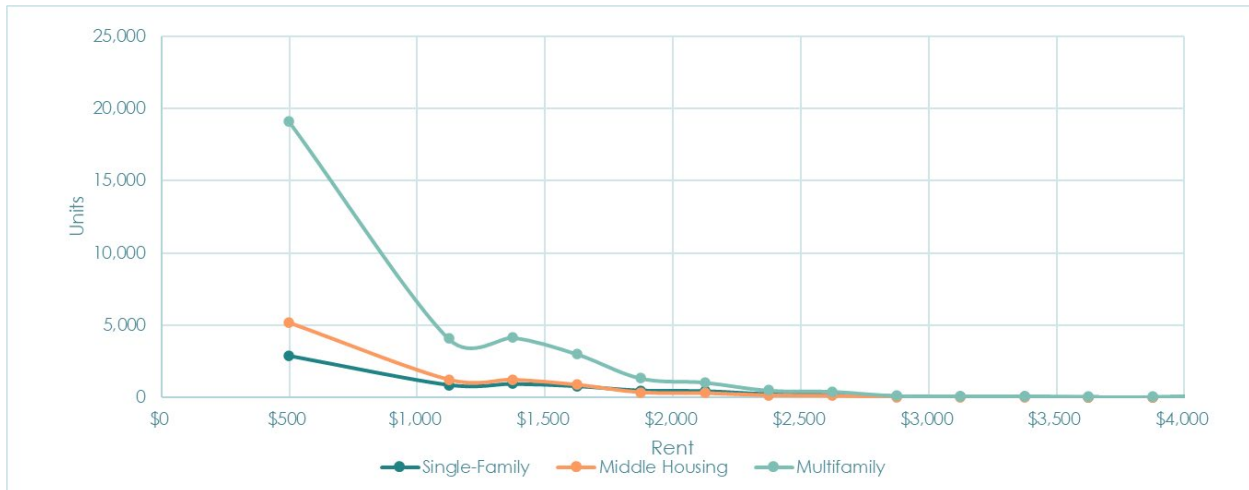
Figure 12

The chart above shows the 2024-44 forecast of renter household's greatest shelter choice is predominantly multifamily – a structure that has 5 or more units. This is followed by a middle housing choice that is a hybrid structure that is seen as generally more affordable than a 1-unit detached structure. The middle housing option is a cross-between a single-family structure and an apartment due to the fact that it is often constructed as a structure with attached units which share walls with another tenant. It said to include duplexes, triplexes, quadplexes, rowhouses and townhouses, and cottage clusters. There are considerably fewer single-family homes for rent as most are generally not purpose-built solely as rental units. The renters forecast has 14% of households in single-family rental choices, 19% in middle housing options, and 67% falling into multi-family units.

An examination of the rental market from a renting cost perspective and taking into account willingness to pay, in particular, reveals a housing market that is likely to yield significant economic dislocations, other things being equal. Over half of this market in the future can only afford housing below $1000 per month based on current conditions. It's unlikely that a future market might improve, so this estimate is likely to look worse.
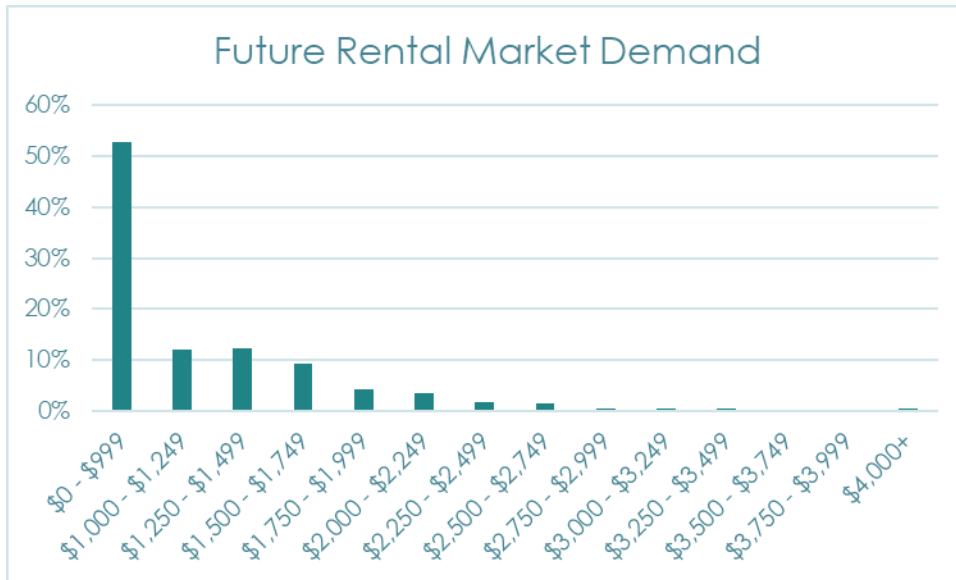
Figure 13

The next chart illustrates the baseline forecast of owner housing choices. In the owner market, 88% of households choose single-family homes, 8% in middle housing alternatives, and 5% in multi-family housing (i.e., condos).

Assume owner households spending historically observed percent of their income

Figure 14

Future households will be financially challenged or unable to purchase homes with current median sales price at roughly today's $550,000. 81% of future households will find it difficult to afford to own such a median house, based on demand calculations seen here. The implication is that future housing tenure choices are not likely to match the past.

Figure 15

Demand is characterized by tenure and structure type. This is further summarized to only structure type, collapsing renters and owners together because the supply-side housing analytics is unable to reasonably quantify tenure. That's because we don't have sufficient data from zoning or other entitlement information to discern whether construction will lead to rental units or ownership. Residential analysis of a gap in supply and demand is not forthcoming from the limited information on hand for a sound housing supply forecast that includes tenure. The forecast of housing demand is rolled up into three categories: single family housing, middle housing options, and multifamily housing.

HNA Results of Renters and Owners by Life Cycle and rent / home price

Renter Demand by Rent Level | 2024-2044
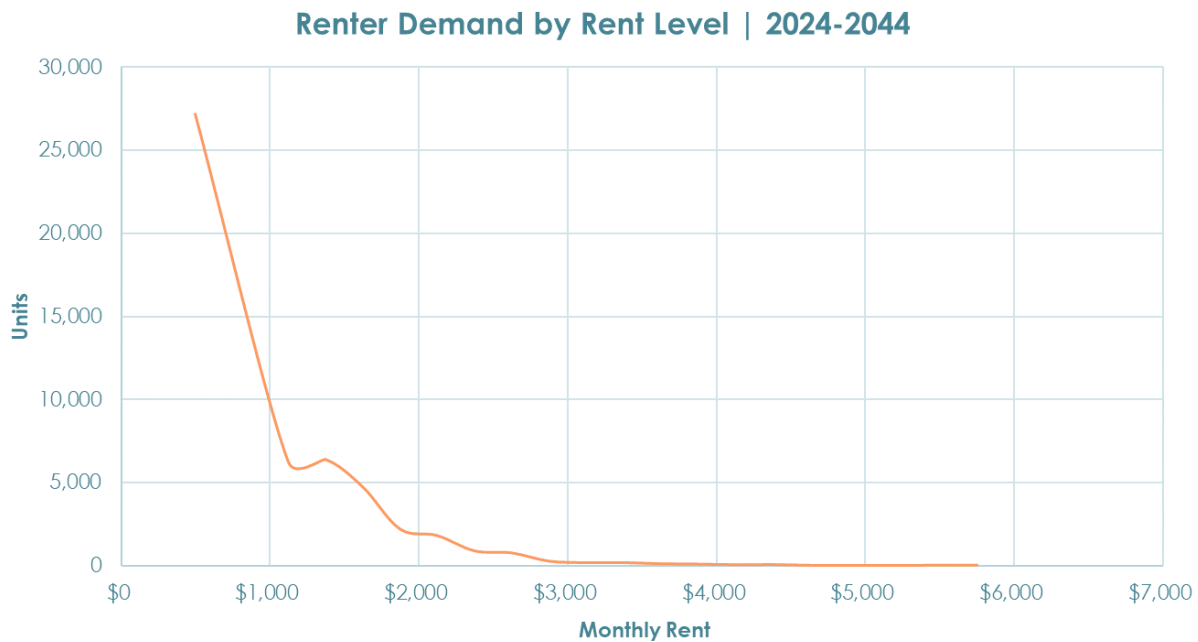
Figure 16: Assumes households spend a percentage of their income on housing based on current trends

The chart above shows the forecast of renters by life cycle and expected rent levels, if households spend a percentage of their income on housing based on current trends. This means that households, particularly lower-income households, will likely spend over the 30% threshold of household income that is commonly used as a metric of affordability. Assuming that this is the case in the future, young householders, single adults and older residents are more likely to be renters and have lower household earning potential and therefore fall into the lower rent need spectrum in which many will need some form of government assisted housing (i.e., rent subsidy). Of renters, the forecast under these assumed conditions is quite stark, projecting fewer than 10% of renters in future years (2024-44) will have the financial ability to afford market-rate rents given their household income. (Note: this analysis may somewhat overstate willingness to pay due to limitations on not being able to account for the accumulation of wealth, particularly retirees who may be on fixed incomes but have amassed a lifetime of savings for their retirement. Affordability in these cases based on annual earnings and income may be supplemented by other assets to pay for monthly shelter expenditures.)

The chart below shows the forecast of owners by life cycle and expected home purchase prices, if households spend a percentage of their income on housing based on current trends. The majority of future market-rate housing demand will likely fall to a generation of more mature residents according to extrapolation of current trends. Older adult households (greater than 45 years old) make up nearly all market-rate home demand between 2024 and 2044, but over half are expected to need some form of housing subsidy unless personal savings or other financial resources are brought or a sizable down payment is made available. Still it makes sense that the vast majority of home buyers in the future are older households that have the financial wherewithal to make up the ownership market for homes.

It's unsurprising that young adult households and households in their "root-setting" years will experience home buying affordability problems. The home demand projections for these younger

household life cycle cohorts suggest very few will be in the home buying market. There are several reasons for this: 1) younger households generally earn less; 2) are unable to qualify for mortgages; 3) don't have enough saved up for a down payment; 4) and the demographics in the future lean toward proportionally fewer younger households in the region as there will be fewer due to declining birth rates and thus lower household formation rates.
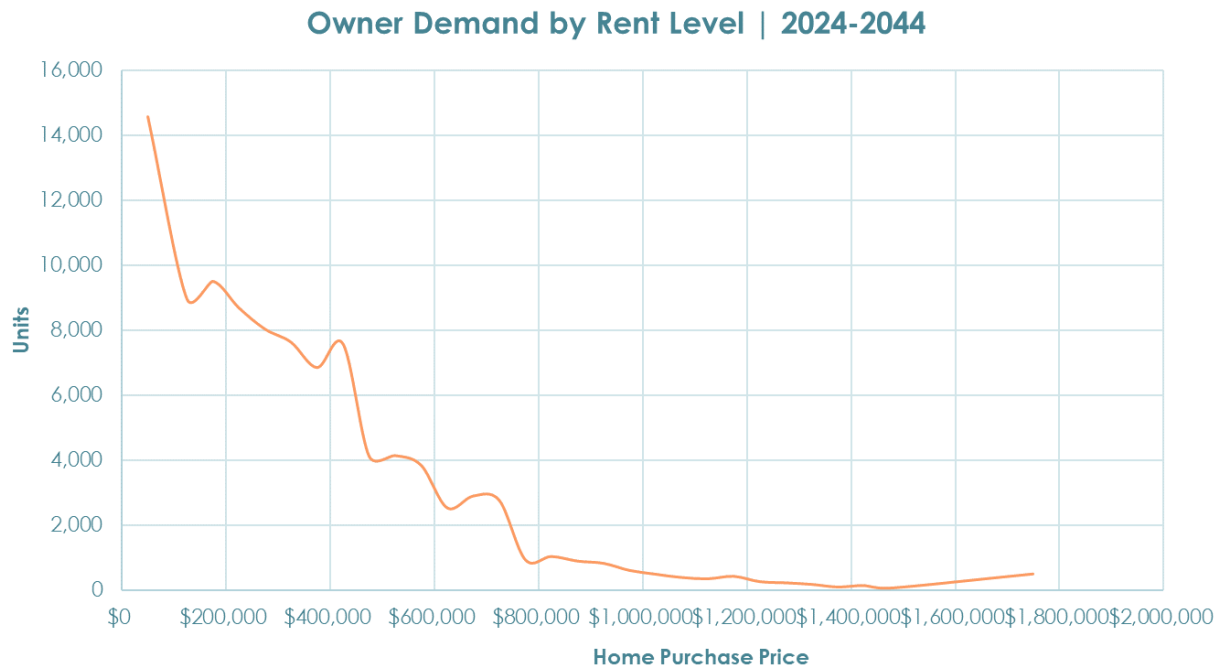
Owner Demand by Rent Level | 2024-2044

Figure 17: Assumes households spend a percentage of their income on housing based on current trends

In summary, both charts derive from Metro's HIA forecast and rely on further calculations employing HUD's AMI limits and Census housing characteristics are computed into the HIA forecast. Current housing conditions underly the renter and ownership projections in the last two charts. Recent Census ACS data are applied to the tenure splits to modify the HIA forecast into owner and renter projections for the twenty-year forecast. The seven life cycles are tabulated from the more detailed breakdown of HIA households. Then HUD income limits are interpolated from the income brackets to modify the HIA forecast of household by life cycle and tenure. The next to final step is computing the willingness to pay of renters and owners to estimate affordability of the three structure types.

Residential Gap Analysis: Analyzing (3) housing demand scenarios by structure type and (4) housing supply scenarios by structure type

The HNA considers three housing archetypes in this gap analysis: 1) single-family detached housing; 2) middle housing alternatives; 3) multi-family units. This analysis of residential demand includes a range of plausible housing demand scenarios, which are based on the range population forecast for which high, baseline and low growth alternatives are produced. The supply-side includes plausible alternatives to future capacity that are linked to the scenario for demand. Additional assumptions of redevelopment capacity, alternative entitlement assumptions, and the degree to which middle housing is an acceptable

substitute for single family housing offers more flexibility in estimating a range for residential capacity going forward.

Final demand, which is the expression of market need after consumers have weighed their supply and demand options, is dependent on the supply of goods (and in this case it is housing) available, relative prices of those goods as well as the income and characteristics of the household to want the good. Supplies of needed housing are thus dependent on demand because producers don't build housing unless there are willing buyers. Price and rent signals tell the supplier how much more/less to build and those same price signals inform households what they can afford to buy or in others how much rents shall be. Determination of final demand or need is thus the market interaction through price signals that inform how much housing of each is consumed and how much supply to build of each archetype.

A housing forecast based on structure type demand assuming current housing trend proportions was completed and subsequently rejected from consideration as a plausible gap scenario. This was because recent statutes enacted by the state are expected to alter the historic production rates of single and multifamily units. Middle housing offers a third archetype. The metropolitan housing rule already regulates the share of single-family entitlement, below the historic proportion to produce single-family units.

Going forward, both real and nominal home prices are expected to outpace growth in household incomes, making home purchases potentially less affordable and less accessible to the median home buyer. Recent state regulations have spurred the market and local entitlements to provide smaller and denser housing alternatives that are nominally less expensive to own. The new state rule thus offers middle housing as a hybrid housing product that might serve as a substitute for traditional detached single-family structures while at the same time meeting higher density requirements of existing and new building regulations closer to multifamily entitlements. Bottom line: the addition of middle housing as an allowedarchetype going forward deters the use and assumption of current housing trends as a useful baseline scenario for forecasting regional housing supply (and demand).

We pivot and consider 4 alternate residential growth scenarios, based on a mix of 3 possible housing demand options and 4 outlooks of what housing supply alternatives are possible. The four residential capacity scenarios are informed by whether growth is slower or faster. In a future of faster demographic growth rates, with the concomitant assumption that more growth will torque prices higher and faster, this demand scenario prompts a supply response to build less expensive, smaller and denser units . In a slower growth scenario, the demand for housing is eased and this outlook assumes tastes and preferences are likely to resemble historic patterns of housing consumption (though not identical because of a rapidly aging population and shifts in demography). The two baseline capacity scenarios bracket an unknown market uptake for middle housing. Although some type of middle housing production (e.g., duplexes and townhouses) has existed for a long while, it is a hybrid housing product that straddles aspects of multifamily housing with its inherent higher carrying capacity while on the consumer end, middle housing offers features in the unit that resemble characteristics inherent of a single-family structure. Because housing costs are expected to continue rising even in real dollar terms, there is uncertainty whether middle housing will become a viable archetype, gaining widespread consumer acceptance. Hence, we have a pair of baseline scenarios that bookend a low vs. a high uptake of middle housing.

The following descriptions provide a brief insight to the four scenarios considered in this HNA.

Residential demand scenarios:
1. (Low growth forecast) – Metro UGB low regional household growth formation & generally following in the footsteps of previous generations' housing preferences and willingness to pay.
2. (Baseline growth forecast) – Metro UGB baseline regional household growth forecast & adjusted for the addition of middle housing entitlements.
3. (High growth forecast) – Metro UGB high regional household growth formation & fundamental shift in housing preferences due to a combination of regulation, entitlements, affordability and demographic shift in market tastes and preferences.

Residential supply scenarios:
1. Weak growth/ weak market conditions
2. Baseline housing supply outlook w/ greater market penetration of middle housing products
3. Baseline housing supply w/ marginally greater detached single-family housing
4. Stronger growth outlook & demand for higher density

Residential components for each residential supply scenario:

Vacant land	Redevelopment	Concept Plans of UGB adds	Other Redevelopment	Office to Residential Conversion	ADU & middle housing conversion
Baseline	Baseline	Baseline	Baseline	Baseline	Baseline
SFR Heavy	Market Recovery			Low	Low
Pro forma	Market Erosion			High	High

Figure 18: Residential gap scenarios.

In total, we analyze 4 scenario combinations. Different combinations of the elements of the mix of 6 supply components make up an individual residential supply scenario. The supply scenario is then matched up against the appropriate demand scenario (low to low, baseline to baseline, high to high). Demand scenarios include estimates of existing housing needs, which are described in more detail in Appendix 8A.

At the final capacity gap calculation stage, middle housing and single-unit detached housing capacity surpluses or deficits are combined because both are allowed in the same residential zones. It will be the market, not Metro's UGR calculations, that determine what mix of middle housing and single-unit detached housing gets build on those residentially zoned lands. Importantly, Metro has no recourse for specifically addressing a single-unit detached housing deficit since any UGB expansion area would have to also allow middle housing and multifamily housing in order that the city can remain in compliance with HB 2001 and the Metropolitan Housing Rule.

Scenario Low: Slow demographic growth / easing residential market

		Supply / Capacity			
		Single unit detached (SFR)	Middle housing (MH)	Multifamily (MFR)	Total Units
Vacant land	SFR Heavy	34,944	13,228	42,970	91,142
Redevelopment	Market erosion	8,978	6,360	13,950	29,288
Concept Plans of UGB adds	Baseline	9,096	6,662	4,138	19,896
Other Redevelopment	Baseline	135	172	9,830	10,137
Office-to-Residential	Low	-	-	250	250
ADUs & middle housing conv.	Low	-	4,955	-	4,955
Total		**53,153**	**31,377**	**71,138**	**155,668**
		34%	20%	46%	100%

		Demand / Housing preferences			
		Single unit detached (SFR)	Middle housing (MH)	Multifamily (MFR)	Total Units
Future growth	Low growth	57,539	16,000	46,136	119,675
Vac. homes		1,072	1,769	443	3,285
Underproduction		726	2,089	12,160	14,975
Homeless		-	40	8,653	8,693
Total		**59,337**	**19,898**	**67,392**	**146,628**
		40%	14%	46%	100%
Surplus/(Deficit)		(6,184)	11,479	3,746	9,041
Surplus/(Deficit) with SFR and MH combined			5,295	3,746	9,041

Scenario Notes:

"Low growth" – a forecast scenario that assumes a lower amount of population than the baseline.

"SFR Heavy" – more SFR detached units are produced than middle housing options. In low growth forecast scenario, there is less pressure to build higher density and the taste and preference of the single-family market is assumed to be more easily met in this scenario.

"Market erosion redevelopment" – assumes a modest erosion of market-rate redevelopment (pro forma) in residential redevelopment estimate; assumes residential pricing is 5% lower across all parcels because of a low population growth scenario (lower demand equates to lower prices)

"Baseline Concept Plans" – density and capacity yield as given by local jurisdictions' concept plans for the vacant tax lots in recent UGB expansions.

"Baseline other redevelopment" – post-BLI override of pro forma real estate redevelopment calculations, approved redevelopment capacity derived from development plans or local input.

"Low office to residential conversion" – assumes fewer units are converted from office buildings.

"Low ADU's & middle housing conversions" – based on a period of "below average" ADU and middle housing conversions during the last 10 years.

Scenario Baseline "A": Baseline population forecast & higher-end market penetration of middle housing

		Supply / Capacity			
		Single unit detached (SFR)	Middle housing (MH)	Multifamily (MFR)	Total Units
Vacant land	Expected Density	26,197	33,486	39,621	99,304
Redevelopment	Baseline	12,292	11,727	24,382	48,400
Concept Plans of UGB adds	Baseline	9,096	6,662	4,138	19,896
Other Redevelopment	Baseline	135	172	9,830	10,137
Office-to-Residential	Baseline	-	-	1,000	1,000
ADUs & middle housing conv.	Baseline	-	8,692	-	8,692
Total		**47,719**	**60,738**	**78,971**	**187,429**
		25%	32%	42%	100%

		Demand / Housing preferences			
		Single unit detached (SFR)	Middle housing (MH)	Multifamily (MFR)	Total Units
Future growth	Baseline	56,846	32,911	59,838	149,594
Vac. homes		1,072	1,769	443	3,285
Underproduction		726	2,089	12,160	14,975
Homeless		-	40	8,653	8,693
Total		**58,644**	**36,809**	**81,093**	**176,546**
		33%	21%	46%	100%
Surplus/(Deficit)		(10,925)	23,930	(2,122)	10,882
Surplus/(Deficit) with SFR and MH combined			13,005	(2,122)	10,882

Scenario Notes:

"Baseline growth" – most likely population growth trend; a new normal in housing preferences reinforced by allowances for middle housing.

"Expected Density" – generally asserts a future development density in cities closer to the top-end of what current entitlement regulations permit.

"Baseline redevelopment" – a baseline scenario of market-rate redevelopment (pro forma)

"Baseline Concept Plans" – density and capacity yield as given by local jurisdictions' concept plans for the vacant tax lots in recent UGB expansions.

"Baseline other redevelopment" – post-BLI override of pro forma real estate redevelopment calculations, approved redevelopment capacity derived from development plans or local input.

"Baseline office to residential conversion" – assumes a couple office high-rises or a few mid-rise office buildings convert to residential apartment uses.

"ADU's & middle housing conversions" – based on a period of "average" ADU and middle housing conversions in the last 10 years.

Scenario Baseline "B": Baseline population forecast & lower-end penetration of middle housing

		Supply / Capacity			
		Single unit detached (SFR)	Middle housing (MH)	Multifamily (MFR)	Total Units
Vacant land	SFR heavy	34,944	13,228	42,970	91,142
Redevelopment	Baseline	12,292	11,727	24,382	48,400
Concept Plans of UGB adds	Baseline	9,096	6,662	4,138	19,896
Other Redevelopment	Baseline	135	172	9,830	10,137
Office-to-Residential	Baseline	-	-	1,000	1,000
ADUs & middle housing conv.	Baseline	-	4,955	-	4,955
Total		**56,466**	**36,744**	**82,320**	**175,530**
		32%	21%	47%	100%

		Demand / Housing preferences			
		Single unit detached (SFR)	Middle housing (MH)	Multifamily (MFR)	Total Units
Future growth	Baseline	56,846	32,911	59,838	149,594
Vac. homes		1,072	1,769	443	3,285
Underproduction		726	2,089	12,160	14,975
Homeless		-	40	8,653	8,693
Total		**58,644**	**36,809**	**81,093**	**176,546**
		33%	21%	46%	100%
Surplus/(Deficit)		(2,178)	(65)	1,227	(1,017)
Surplus/(Deficit) with SFR and MH combined			(2,243)	1,227	(1,017)

Scenario Notes:
"Baseline growth" – most likely population growth trend; a new normal in housing preferences reinforced by allowances for middle housing.
"SFR Heavy" – more SFR detached units are produced than middle housing options. A step-down in market acceptance of middle housing options, w/ SFR still prevailing.
"Baseline redevelopment" – a baseline scenario of market-rate redevelopment (pro forma)
"Baseline Concept Plans" – density and capacity yield as given by local jurisdictions' concept plans for the vacant tax lots in recent UGB expansions.
"Baseline other redevelopment" – post-BLI override of pro forma real estate redevelopment calculations, approved redevelopment capacity derived from development plans or local input.

"Baseline office to residential conversion" – assumes a couple office high-rises or a few mid-rise office buildings are converted to residential apartment uses.

"ADU's & middle housing conversions" – based on a period of "average" ADU and middle housing conversions in the last 10 years.

Scenario High: Higher growth population forecast

		Supply / Capacity			
		Single unit detached (SFR)	Middle housing (MH)	Multifamily (MFR)	Total Units
Vacant land	Expected Density	26,197	33,486	39,621	99,304
Redevelopment	Market Recovery	16,175	18,951	37,397	72,522
Concept Plans of UGB adds	Baseline	9,096	6,662	4,138	19,896
Other Redevelopment	Baseline	135	172	9,830	10,137
Office-to-Residential	High	-	-	1,500	1,500
ADUs & middle housing conv.	High	-	11,716	-	11,716
Total		**51,602**	**70,986**	**92,487**	**215,075**
		24%	33%	43%	100%

		Demand / Housing preferences			
		Single unit detached (SFR)	Middle housing (MH)	Multifamily (MFR)	Total Units
Future growth	High Growth	44,878	39,493	95,142	179,513
Vac. homes		1,072	1,769	443	3,285
Underproduction		726	2,089	12,160	14,975
Homeless		-	40	8,653	8,693
Total		**46,677**	**43,391**	**116,398**	**206,465**
		23%	21%	56%	100%
Surplus/(Deficit)		4,926	27,595	(23,911)	8,610
Surplus/(Deficit) with SFR and MH combined			32,521	(23,911)	8,610

Scenario Notes:
"High growth" – a forecast scenario that assumes a greater amount of population than the baseline.
"Expected Density" – generally asserts a future development density in cities closer to the top-end of what current entitlement regulations permit.
"Market-recovery Redevelopment" – assumes a modest improvement in market-rate redevelopment (pro forma) in residential redevelopment; assumes residential pricing is 5% higher across all parcels because of higher population growth (higher demand equates to higher prices)
"Baseline Concept Plans" – density and capacity yield as given by local jurisdictions' concept plans for the vacant tax lots in recent UGB expansions.
"Baseline other redevelopment" – post-BLI override of pro forma real estate redevelopment calculations, approved redevelopment capacity derived from development plans or local input.
"High office to residential conversion" – assumes a couple office high-rises or a few mid-rise office buildings convert to residential apartment uses.

"ADU's & middle housing conversions" – based on a period of "above-average" ADU and middle housing conversions in the last 10 years.

Scenario Discussion

Population range forecast – The baseline population forecast represents the most likely growth outlook and population outcome for this region. The population forecast is then translated into households, using headship rates. Headship rates are observed statistical rates at which populations (by age cohort) form into household units. These headship rates are extrapolated for future years, assuming that household sizes on average in the future will see further decreases as birth rates fall and child rearing is delayed to older age cohorts.

A 5% vacancy rate is included in the high, baseline and low growth household scenarios to factor up to a projected demand for housing.

A household range forecast is based on + / - 20% from the baseline household forecast, forming "bookends" that describe the high-end and low-end household growth forecast in the set of HNA scenarios. This equates roughly to a standard z-score of about 0.5 standard deviation from the mean in a range forecast assumed to be normally distributed.

Note: the population range forecast assumed an error range of 2 standard deviations, which encompasses roughly 95% of the probability, chance of that growth will fall between the lines of the high or lower population projections. Staff, with consultant advice, deemed that 2 standard deviations was too wide an error band, encompassing portions of the high-end and low-end of the household forecast range that was too unlikely to consider for reasonable policy evaluations.

Vacant Land Supply / Capacity – For additional information, please see the BLI appendix for methods and additional details.

Note: the HNA scenarios do not utilize the "pro forma" approach of estimating the capacity of vacant land supply inside the UGB.

HNA scenarios contemplate two capacity alternatives for the vacant land supply calculations. Both alternatives rely on the "expected density" method of computing vacant land capacity in the existing UGB. A second version of the expected density approach asserts more of the supply of vacant tax lots will turn to production of detached single family units.

Redevelopment Capacity – For additional information, please see the BLI appendix for methods and additional details.

The HNA scenarios consider 3 residential redevelopment capacity estimates. The baseline redevelopment alternative is derived from the Metro real estate pro forma model. There are two other alternatives to redevelopment capacity – "market erosion" and "market recovery" scenarios. The each pivot from the baseline redevelopment scenario. The main difference in the three scenarios are as follows:
- Baseline redevelopment is derived from a "stabilized" home price surface based on updated home prices and a "stabilized" rent surface for the region, also updated.
- Market erosion assumes a 5% across the region decrease in home and rent price surfaces. The basis for this assumption is linked to the low growth scenario in which there are fewer

consumers chasing market-rate housing and thus price/ rent is shifted lower, other things being equal.

- Market recovery assumes the opposite – 5% increase across the region.

Concept Plan Areas & Other Planned Development (Vacant) – Residential densities and subsequent total yield on capacity is either given by local jurisdictions or available from published concept plans that illustrate the long-term development capability of vacant lands included in recent UGB expansions. Typically, these are areas added to the UGB since 2018.

Other Planned Development (Redevelopment) – These are corrections to the BLI. The capacity changes represent amendments to the existing BLI and pro forma capacity calculations. They generally came about because post-BLI review and further input from local jurisdictions made it clear that development was already substantially underway and/ or the estimated redevelopment rate was incorrectly applied to these tax lots.

Office-to-Residential conversion – see Appendix 2.

ADUs & middle housing conversion – see Appendix 2.