Attachment 6~~5~~ (Staff Report to Ordinance no. 12-1292A)

Technical Documentation

Regional Forecast Distribution

Methodology & Assumptions

Population and Employment

2010-40 TAZ Forecast Distribution "gamma scenario"

Metro

Research Center and Planning and Development Department

November 2012

Technical Document:
2010-2040 TAZ Forecast Distribution

(This report highlights major assumptions assumed by the TAZ forecast distribution.)

Forecast Mandate

A coordinated population forecast is mandated under state law[1]. Oregon regulations require Metro, as the coordinating body for the Portland metropolitan area[2], to allocate population (and employment) forecasts to local area cities within the Metro urban growth boundary. A coordinated forecast is needed to facilitate periodic use planning. To carry out this role, Metro develops Traffic Analysis Zone[3] growth distributions for cities and counties in the region. The Traffic Analysis Zone (TAZ) is a joint forecast effort with cooperation of local governments[4] and serves the state requirement of having coordinated forecasts.

Metro also serves as the metropolitan planning organization[5] (MPO) designated under federal authority to plan for transportation needs for the Oregon portion of the Portland-Vancouver-Hillsboro, OR-WA urbanized area. Metro is required to conduct continuing, comprehensive and collaborative transportation planning that facilitates the efficient, economic movement of people and goods in the metropolitan area.[6] At minimum, the coordination of land use forecasting and transportation planning requires that the well-being of a region assess and evaluate the impact of land use decisions to access goods, services, resources and other opportunities. Coordinating (or integrating) land use and transportation is "smart growth"[7]. The Metro charter gives the agency the responsibility for regional

[1] ORS 195.036 (Area population forecast)
[2] ORS 195.025 (Regional coordination of planning activities)
[3] Traffic Analysis Zones (TAZ for short) are travel / commuter sheds that represent areas of concentration of resident locations or commuter work locations. A TAZ is the unit of geography commonly used in Metro's transportation planning models. Zone sizes vary and the number of zones is periodically updated to account for changes in development densities. The current Metro TAZ system has a total of 2162 zones in its urban, suburban and ex-urban setting. 2147 zones belong in the four-county metropolitan area and the remaining zones account for rural counties adjacent to the region. Typically ex-urban areas have larger zone sizes, while central business districts and densely populated residential areas have much smaller zones. Zones are created from census block information. Typically, these blocks provide the socio-economic data used in Metro's transportation demand models. They are generally the size of census block groups, but have boundaries not related to census tracts or block group delineations nor do they generally coincide with streets or city limits. Metro's TAZ boundaries are unique geographies designed around transportation "cut lines".
[4] ORS 195.020 (Special district planning responsibilities)
[5] Metropolitan Planning Organizations are responsible for planning, programming and coordination of federal highway and transit investments in urbanized areas.
http://www.bts.gov/external_links/government/metropolitan_planning_organizations.html
[6] http://www.fhwa.dot.gov/planning/processes/statewide/
[7] http://www.fhwa.dot.gov/planning/processes/land_use/

land use planning, and long-range transportation planning. The TAZ growth distribution forecast fulfills the call for an integrated land use and transportation planning effort required by federal regulations and Metro charter's land use planning provisions.

Metro's TAZ forecast process efficiently delivers a comprehensive and collaborative regional growth distribution that uses appropriate modeling and forecasting tools. Under MPO planning rules, Metro is required to maintain state of the art transportation and land use forecasting models and growth projections that are consistent with regulatory authorities. Metro operates a regional travel demand model based on a traditional 4-step model approach[8], and a land use model we call MetroScope[9]. These represent state of the art transportation and land use forecasting methods – operating at TAZ level population and employment estimates. Federal and state transportation authorities annually assess and review the efficacy of Metro's forecasting and modeling, data and statistical methods[10]. Metro's regional forecasts and growth distributions are prepared under scrutiny of federal requirements that meet high levels of forecasting integrity and accuracy. The models incorporate the latest set of policy assumptions available at the time of the forecast. The TAZ forecast distribution process broadly supports the goal of providing reasonably accurate and reliable small area growth projections for land use and transportation studies and planning goals. The regional forecast and growth distribution process is transparent and collaborative, frequently consulting with Metro area local governments and stakeholders.

How often are Metro forecasts and growth distributions updated?

About every 5 years, the Metro Research Center prepares employment and population forecast distributions by TAZ. The growth distribution update is the last step in Metro's periodic review process. The forecast distribution analyzes Metro's adopted regional forecast for population and employment and then geographically distributes the projected regional growth totals into smaller geographic subunits denoted by TAZ. The cycle of preparing a regional forecast occurs in concert with the state law requiring Metro to assess every 5-year its capacity to accommodate urban growth in the boundary[11]. A

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[8] Metro is in the middle of a development cycle to upgrade to a new activity-based transportation model (i.e., DASH) and dynamic traffic assignment models (i.e., Dynameq and DYNUST).

[9] MetroScope is an integrated land use-transportation modeling tool developed by Metro's Research Center. It is a very detailed representation of an urban land market, complete with methods to estimate supply, demand and equilibrium prices and to allocate development trends to specific locations throughout the greater Portland region. Both households and employment locations are allocated by the MetroScope model. The model is an economic simulation tool capable of assessing the economic well-being and potential policy impacts for various demographic groups and subareas of the region given alternative land use and transportation assumptions.

[10] A Unified Planning Work Program (UPWP) is developed annually by Metro. It is a federally-required document and includes a process known as self-certification to demonstrate that the Portland MPO (Metro) planning process is being conducted in accordance with all applicable federal planning requirements.

[11] ORS 197.296(3) and (1997) HB 2493 require Metro to complete 1) an inventory of the supply of buildable lands in the UGB; 2) performance measures including actual density and housing mix during the past 5 years; 3) an analysis of a 20-year housing need projection.

new TAZ forecast ensures that growth projections incorporate the latest policy assumptions endorsed by the Metro Council.

The regional forecast was the socio-economic basis for studies concerning land use and transportation, including this growth distribution. Recently, the regional forecast supported the 2010 Urban Reserves, 2010 Urban Growth Capacity decisions, and 2035 Regional Transportation Plan (RTP) update. Forecast-wise, the Metro Council selected a point inside the 2010-2060 regional range forecast for evaluating urban growth needs the last Urban Growth Report. Regional decision makers used forecast information to shape public policy and to plan for infrastructure investments the region needs in order to encourage economic vitality and to accommodate future land use and transportation needs of residents.

The precise role of the forecast was to project the level of economic and demographic growth expected of the region for the next 20 to 50 years. The regional forecast included a range and a baseline projection of how population and employment is expected to change over time. Growth distributions ensure that land management and transportation planning policies are incorporated into small area forecast distributions. In turn, the growth forecast distributions are completed in advance of so that the next 2040 Regional Transportation Plan (RTP) update integrates the latest growth management policy assumptions. The growth distributions then provide the socio-economic assumptions for travel demand planning. They also provide information that then informs the next cycle of regional forecasts, UGR and UGB decision. This cycle repeats itself beginning in 2014.

MetroScope - preparing a coordinated growth distribution

The TAZ forecast distribution extends from 2010 to 2040[12]. The growth distribution relies on information from:

- An adopted regional forecast
- Land supply estimates and capacity assumptions
- Enacted land use policy regulations, and
- Transportation policy assumptions.

The MetroScope land use model was used to simulate and assess the socio-economic growth trends emerging from these assumptions. MetroScope produces a consistent, complete and comprehensive analysis of regional growth impacts.

The TAZ distribution is a joint forecast produced by Metro in cooperation with local government planning partners. The TAZ distribution is a forecast product derived for a 7-county region[13]. The

[12] The forecast distribution can optionally be extended an additional 5 years to the year 2045. This extension has not been completed at this time.

[13] The Metro regional forecast is developed from a regional macro-econometric model. Projections from this model include population by age, householders by age, employment by industry (NAICS), wages and income. The regional forecast is an aggregate trend projection for the Portland-Vancouver-Hillsboro, OR-WA metropolitan

regional forecast gets spatially disaggregated to transportation analysis zones using Metro's integrated land use and transportation demand model – MetroScope. The preliminary MetroScope TAZ forecast distribution is reviewed and fine tuned by local government land use experts before Metro Council accepts the growth distributions. Local governments may then adopt the growth distributions for their city, for example, as they update their own comprehensive plans or transportation system plans (TSP).

What is MetroScope?

MetroScope is a land use allocation model. It is capable of forecasting over time the spatial distribution of employment and population. MetroScope is an urban econometric model based on applied real estate and mainstream economic theories. This means that it is a mathematical model patterned after behavior seen in real-world real estate markets; it has a supply, a demand and finds an equilibrium price that matches the two. The real estate supply market includes vacant buildable land, market-rate redevelopment and infill, and incentivized redevelopment capacity for the greater Portland area. Demand is characterized by household attributes and industry-detailed employment composition. MetroScope provides a complete and consistent assessment of regional real estate trends.

Demand for residential real estate depends on location factors, demographic characteristics of households, and economic trend projections. Construction costs and prices that businesses are willing to pay for commercial and industrial real estate are also factored into location choices. MetroScope is an equilibrium model, meaning it estimates prices for the cost of real estate construction and the price households are willing to pay for housing. It finds where people and businesses are willing to live and work at a stable equilibrium price in which supply and demand exactly match.

MetroScope projects where residents will want to live, at what density and by housing type. The model is capable of projecting residential and employment growth in centers, corridors and other locations. The result is an expectation of where in the region and what type of business and residential locations are most attractive given that there is a regional forecast, transportation and land use regulatory factors that shape future growth trends. MetroScope also capably allocates population and employment at market clearing prices for different development forms in different locations throughout the region according to given policy assumptions.

Census and other economic data from state and federal statistical sources provide base year land use, demographic and economic information that can influence the spatial growth trends in future years. Historical trend data are factors that add into future growth patterns. The amount of household (or employment) spatial change is formulated as behavioral expressions and as such respond to expected changes in:

- land use regulations (e.g., zoning, urban reserves, concept plans etc.),

statistical area (MSA). The MSA includes 5 Oregon counties (Clackamas, Columbia, Multnomah, Washington and Yamhill) and 2 Washington counties (Clark and Skamania). The MetroScope model is later used to spatially disaggregate regionwide growth estimates to TAZ level estimates.

- development incentives (e.g., urban renewal)
- transportation policies (e.g., regional access to opportunities)
- demography (e.g., population growth, aging population, income, and migration)
- employment trends (e.g., less manufacturing and more services).

Spatial preferences need not be fixed. Sub-regional growth rates are expected to vary because the growth distributions will respond to regional growth projections that include anticipated shifts in the economic make up of the region (e.g., proportionally less manufacturing growth expected) and shifts in demographic structure (e.g., aging populations, migration and income bracket shifts). As these elements are accounted for in the forecast, we should see faster (or slower) growth across some residential areas depending upon how well capacity fits the innate residential housing demand.

The region is expected to add between 40 to 50% more residents by the year 2040. The median population age is expected to grow older. The composition of the population should grow more diverse, with a proportionally higher concentration of Latino and Asian residents. Economic disparity among residents is expected to be more unequal as the ranks of the middle class become proportionally thinner.

As the composition of the economy changes, industries will rise and fall. The emergence of new competitors and technological improvements will drive industrial change. High-technology industries are expected to gain ground while resource based industries such as forest products and metals are likely to diminish. The non-manufacturing sector will grow proportionally faster in the region, with health and business services ringing up robust growth.

MetroScope is also capable of assessing the economic impact of public policies. The region's land use and transportation policy developments leave very little slack capacity in the economy. Some of these policy assumptions provide ceilings for how much growth can be accommodated (e.g., zoning and growth concept plans). With residential capacity expected to be fairly tight, spatial growth distributions will pattern themselves based on wherever supplies permit. Other policies try to influence the market clearing prices (e.g., urban renewal assumptions) for residential development in centers and corridors. Still others will impact access to opportunities (e.g., RTP) that will affect the location choices of business and residents.

In summary, the TAZ forecast distribution that comes out of MetroScope represents a consistent and complete evaluation tool of both economic growth potential and the possible economic impact of how public land use and transportation policies might affect regional growth trends and regional outcomes. Using an economic equilibrium assessment model as we have for the TAZ forecast, further economic assessment of housing need information can identify which demographic segments in the region benefit most from land use and transportation policies enacted today and which segments suffer the greatest disutility from these same public policies. MetroScope can inform more than simple population coordination information. It can provide an assessment of economic outcomes of public policy actions.

Regional Forecast Overview

Economy in Review

Three years after the announced end of the Great Recession, economic growth remains torpid and choppy. The Great Recession slammed into the U.S. in December 2007 and curtailed U.S. economic activity, according to research published by the National Bureau of Economic Research[14]. During this period, nearly 8 million Americans became jobless. Economic growth stalled as it became apparent that financial strapped banking institutions could not meet financial obligations, thus causing a cascade of economic difficulties across all sectors of the U.S. economy. Especially hard hit were the construction, finance and real estate sectors. The contagion spread quickly and no part of the U.S. was immune. U.S. Gross Domestic Product – a measure of total economic growth and output – fell 6 straight quarters while trimming away in excess of $625 billion (inflation adjusted) of U.S. GDP (peak to trough). Slumping growth induced the U.S. unemployment rate to soar above 10% and it still remains stubbornly high (June 2012, 8.4%).

Regional employment began slowing at the onset of the U.S. recession, but didn't actually go negative until half a year later. The first industries in the region to hit the skids were finance and real estate firms, durable manufacturers and resource producers. The economic malaise eventually spread to the Portland region, carrying with it widespread workforce reductions and slower growth in every industry save health care. But even the health care industry has recently seen year-over-year job growth diminish to nearly zero. The region's overall unemployment rate topped 11 percent at its economic trough, but has been stuck near 8%, down from 9% a year ago. Tepid regional economic growth persists and employment growth remains mired well below full employment while cautious employers remain sidelined worried that economic conditions could quickly sour again.

2010 to 2040 Forecast Summary

The initial regional forecast was prepared in late 2007 – just before the onset of the Great Recession. The adopted regional forecast totals for population and employment are in the *20 and 50 Year Regional Population and Employment Range Forecasts*[15]." This included a medium growth baseline and a companion set of high and low growth scenarios. This growth band was developed as two standard deviation margin of error around the medium growth baseline. Subsequently, a one standard deviation interval was prepared for Metro Council deliberation – the so-called "middle-third" growth scenario

[14] National Bureau of Economic Research, http://www.nber.org/cycles.html, Founded in 1920, the National Bureau of Economic Research is a private, nonprofit, nonpartisan research organization dedicated to promoting a greater understanding of how the economy works. The NBER is committed to undertaking and disseminating unbiased economic research among public policymakers, business professionals, and the academic community. The Bureau concentrates on 4 types of empirical research: 1) developing new statistical measurements, 2) estimating quantitative models of economic behavior, 3) assessing the effects of public policies, and 4) projecting the effects of alternative policy proposals.

[15] Metro Ordinance No. 11-1264B

alternatives[16]. The Metro Council – realizing regional growth rates would be subdued – adopted a "lower middle-third" point in the forecast range.

However, more recent economic data suggests growth will be slower than previously anticipated. The adopted regional forecast is now almost 3 years old. Regional conditions have fallen short and in fact are worse than expected at this stage of the recovery. U.S. macro-economic conditions have yet to recover to pre-recession levels. This includes a much slower rebound in employment across all sectors, which has dampened population and employment prospects regionally. Monetary (i.e., lower interest rates and quantitative easing measures) and fiscal policies (e.g., industry bailouts and "cash for clunkers") have been largely ineffective in spurring a stronger economic rebound. The economy instead has been stuck in low gear since the end of the recession.

Consequently, a minor technical adjustment has been made to the adopted lower middle-third regional totals in order to reflect the sluggish recovery and a plodding recovery for the foreseeable near term. Regional growth totals have been revised down for employment and population. Details for each have been proportionally ratcheted down in keeping with the revised regional totals. This is merely a technical correction to realign the Metro Council adopted forecast decree with the best available information nowadays. Data for this correction were from the Census Bureau and Portland State University intercensal population estimates, and Bureau of Labor Statistics and Oregon employment department monthly employment estimates.

The Metro Council, in fact, only adopts regional control totals for employment and population. Forecast details, such as the:

- industry employment forecast (by NAICS)
- household demographics (including population age and household size)
- income brackets of households.

These are technical details left to Metro research center staff to determine[17]. A regional econometric model produces the forecast details needed for transportation and land use forecast model analysis. An HIA model disaggregates population data into a joint distribution of households differentiated by household size, income bracket and householder age. The regional forecast details are post-processed and proportionally rescaled to sum up to the adjusted "lower middle-third" forecast values. Rescaled model input details (i.e., HIA and industry employment forecasts) are available in the report Appendix 1. The rescaled values represent the regional forecast assumptions going into this growth distribution.

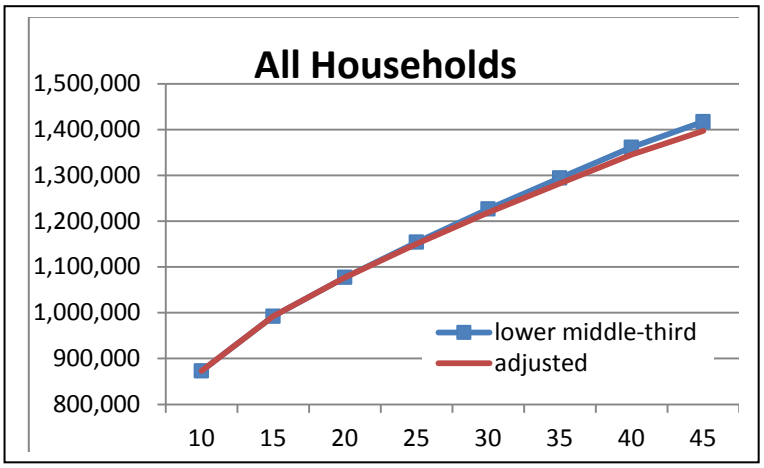
TAZ gamma growth distribution regional control totals

The adopted lower middle-third regional forecast totals are compared to the adjusted value, which reflect a downgrade in growth expectations in the long-run.

[16] The "lower middle-third" was designated at minus 1 standard deviation from the medium growth baseline, while the "upper middle-third" represented a plus 1 standard deviation from the baseline.
[17] Metro, "20 and 50 year Regional Population and Employment Range Forecast", http://www.oregonmetro.gov/index.cfm/go/by.web/id=29836, Oct. 4, 2012

Total Households: 2010 -2045 Regional Forecast (7-county MSA)

	Lower middle-third	adjusted
2010		873,052
2015	992,400	992,400
2020	1,077,500	1,077,500
2025	1,154,400	1,154,400
2030	1,226,900	1,221,900
2035	1,294,600	1,284,600
2040	1,361,600	1,346,600
2045	1,417,500	1,397,500



Total Employment: 2010 -2045 Regional Forecast (7-county MSA)

	Lower middle-third	adjusted
2010		968,800
2015	1,106,600	1,107,000
2020	1,205,400	1,205,400
2025	1,297,900	1,293,400
2030	1,396,000	1,386,900
2035	1,502,700	1,488,800
2040	1,611,900	1,593,000
2045	1,678,600	1,654,900

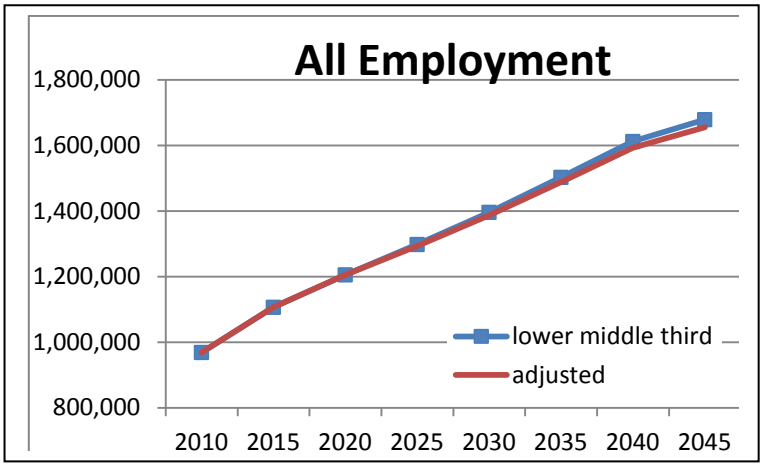


Figure 1: 2010-40 Regional Growth Distribution Forecast Totals (7-county MSA)

The adjusted regional forecast projects over 473,000 more households and growth of 686,100 jobs adding to the MSA region between 2010 and 2040.

Growth Distribution Overview

The regional forecast totals were first distributed to TAZ's using the MetroScope land use model. Second, local jurisdictions scrutinized and revised the TAZ household and employment forecasts. Third, Metro took the revisions and where necessary rebalanced the forecast to preserve the regional forecast totals. Each jurisdictions was given instructions during the review to be mindful of its given city forecast totals. They were to maintain the city totals if they wanted to revise the TAZ distributions. In the rare instance where cities wanted to reduce or increase the given city total (either for households or employment), the county and Metro stepped-in to broker re-allocation amounts between jurisdictions.

In the final analysis, local revisions sharpened the accuracy of TAZ growth forecasts and Metro and the counties were able to successfully coordinate population.

But before undertaking the forecast distribution, there needed to be general agreement concerning the assumptions making up the regional supply. The supply data or buildable land inventory for the region had to be reviewed, cleaned and accepted by local area planning directors.

Recapping Regionwide Supply / Capacity Assumptions

This section highlights the major supply assumptions and capacity declarations relating to the 2010-2040 TAZ "gamma" growth distribution forecast. Supply is divided into parts by major geographic divisions. Where and how much capacity exists in the region depended on actual counts, survey data, and statistical estimation techniques. Since the regional supply was partly derived from iffier assumptions, some parts were judged to be more accurate than other items in the supply data.[18] To improve the accuracy of the supply data, a lengthy review process cleaned up major estimation and counting errors. A margin of error for this is unknown, but the regional supply was finalized and a general consensus of its suitability was settled before any data was used for the forecast distribution.

The regional supply has been variously described to accommodate up to 50 years. This syncs up with planning studies that have a need for long-term forecasts up to 2040[19]. The supply information therefore has to have capacity up to 2060 (or 50 years). This is in keeping with realistically trying to model development trends with ORS 197.296(3) and (1997) HB 2493 requiring Metro to maintain a 20-year housing need by type. The purpose of the 20 year supply was to provide the urban land market with sufficient flexibility to accommodate market choices. State law has required periodic update of the Metro UGB inventory every 5 years. Hence, as a practical matter of forecasting, the supply data for the model maintains an estimate of residential inventory that accommodates growth up to 2060 for a 2040 forecast end year.

The details of the growth distribution rely on several essential ingredients related to a buildable land inventory that meets rules set forth by state law and growth management planning directives:

1. Land supply (or capacity) information[20]
    a. Current zoning, comprehensive plans or concept plans (with zoning trumping comp plans trumping concept plans or hypothetical zone designations depending data availability)

[18] Although a general consensus was achieved, there remained lingering doubts concerning the residential redevelopment assumptions and the parameter estimates for residential preferences. Suburban jurisdictions feared that redevelopment assumptions were too robust in urban areas and may thus skew residential location choices causing biased residential location choice in the distribution. A second concern focused on specified model parameters estimates that were said to fix future preferences on the past, perhaps implying the need for replacing parameters with ones based on stated preference data.

[19] An upcoming RTP update sets the forecast horizon to be2010 to 2040. The forecast distribution can optionally be extended an additional 5 years to the year 2045. This extension has not been completed at this time.

[20] To read more about Metro's capacity ordinance, see:
http://www.oregonmetro.gov/index.cfm/go/by.web/id=34527

    b. Buildable land inventory (including Metro UGB, Clark county, rural areas and neighbor cities and adjacent counties)
2. Growth management policy assumptions
    a. Transportation policies
    b. New urban areas (i.e., assign hypothetical zoning if still rurally zoned)
    c. Other economic development policies
    d. Urban reserves (i.e., assign hypothetical zoning to supersede rural zoning at time each is added as prospective UGB adds)
    e. Subsidized redevelopment (i.e., estimate economic impact of urban renewal district)

The growth allocation integrated land supply details that include capacity information for multiple geographies in the region. Capacity is calculated from current zoning or current comprehensive plan data (and sometimes concept plans when there isn't any urban zoning or comp plan in place). The buildable land inventory (i.e., the BLI includes vacant, infill and redevelopment expectations) for the Metro UGB and Clark and its cities are based on a 2008 vacant land survey data that was subsequently revised to represent 2010 capacity. Also added to the BLI analysis are rough capacity estimates for rural areas, neighboring counties and cities. Estimates of additional residential capacity from public development subsidies (e.g., urban renewal districts) were also tallied into the regional land supply. Supply data is very important in the modeling process as it provides information on regulatory densities and details on the whereabouts future development may be accommodated. Capacity data in the modeling process is not endogenous, but is fixed information that's needed for land development forecasting.

Growth management policy assumptions impact growth. As such, they too are integrated into the forecast distribution. Access to job opportunities and the locations of existing housing are variables considered in projecting residential and employment location. Transportation behaviors are factored into the forecast distribution. Economic development policies – in the form of urban renewal initiatives – are factored into the land supply / capacity assumptions. Land use policies – notably urban reserve designations – represent growth policy assumptions are also included in the distribution. There are other policy assumptions including regional and municipal land use concept plans, environmental measures for wildlife and water quality protection, and parks and open space provisions that put development off limits and thus impose development constraints that prohibit growth distributions applied to these places. Growth distributions are more accurate in places where land use details are more specifically detailed out. The modeling process factors in a host of growth management policies and weighs the potential impact on the distribution of employment and household growth across the region.

Key Steps of the Population and Forecast Coordination Effort:

1. Prepare a 7-county Regional Forecast with employment, economics and population details (medium growth scenario) – (2007)
2. Estimate a Range Forecast for total population / households and total employment – (2008)
3. Estimate a narrower Range Forecast – so called "middle third" – (2009)

4. Regional Forecast and "middle-third" forecast used in determining policy objectives in the Urban Growth Report – (2009)
5. Metro Council selects the "lower middle-third" of the range forecast as its "point forecast" in which land use and transportation policies will hinge on in subsequent policy decisions, including the UGB decision and RTP Forecast. – (2010)
    a. Subsequently regional forecast totals adjusted lower due to slower than expected regional recovery. – (2012)
6. Agree with local governments on growth distribution methodology – (2011-12)
    a. Prepare preliminary model inputs and assumptions for local review
    b. Review local zoning to regional zone class crosswalk
    c. Revise to TAZ 2162 system
    d. Review Buildable Land Inventory and verify assumptions with local governments
        i. Metro UGB vacant BLI capacity assumptions
        ii. Metro UGB redevelopment (and infill) BLI capacity assumptions
        iii. Subsidized redevelopment assumptions (i.e., urban renewal)
        iv. New urban area urbanization assumptions (i.e., post-1997 expansion areas)
        v. Urban reserve urbanization assumptions
        vi. Clark county BLI / capacity assumptions
        vii. Ex-urban area neighbor capacity assumptions (e.g., Banks, Canby and Sandy, Columbia, Marion and Yamhill counties)
        viii. Residential development from Measure-49 claims
        ix. Residential development capacity from rural unincorporated areas in the tri-county, but outside the Metro UGB
7. Run in 5-year increments MetroScope TAZ scenario with full transportation demand model – (2012)
8. Review TAZ forecast distributions for years 2025, 2035, 2040 with local governments – (2012)
9. Conduct detailed city and county engagement to amend TAZ distributions for total households and employment by retail, service and other (2012)
10. Finalize and Adopt TAZ growth forecast distribution (2012)
    a. mandated population coordination with local governments
    b. RTP and other corridor transportation projects

MetroScope Model update: none (deployed MetroScope Generation 3 version)

MetroScope Socio-economic Data updates:

- Base year population updated to 2010 Census[21] consistent with TAZ 2162 geographies
- Base year 2010 employment estimates from the Bureau of Labor Statistics (BLS) and the state Quarterly Census of Employment and Wages (QCEW) consistent with TAZ 2162
- Updated other economic and demographic forecast drivers and variables per Census, BLS, BEA (Bureau of Economic Analysis), various state data sources

[21] Demographic data updated to 2010 Census, but MetroScope zone system still at 2000 Census residential zones.

- 2010 calibration of model (i.e., real estate prices)
- Revised hedonic neighborhood scores as needed
- Transportation network updated to a 2010 base year consistent with new TAZ 2162

Local Review Regional Density Assumptions help to verify BLI capacity estimates.

Local jurisdictions fine tuned the following land supply assumptions:

- Regional zone classes (an updating of the crosswalk table that translates local zoning ordinances to standardized regional zone categories without materially changing allowed zone densities)
- TAZ 2162 (an updating of the traffic analysis zones to 2,162 polygons – 2,147 are inside the Metro UGB and Clark county)
- Buildable Land Inventory – vacant, part vacant, and redevelopment assumptions (a review and acceptance of both residential and employment supply assumptions – confirms residential acres and dwelling unit capacity in Metro UGB, employment supply acres by industrial and commercial districts)
- Clark County Buildable Land Inventory[22]
- Subsidized Residential Redevelopment Assumption[23]
- New Urban Area Assumption (post-1997 UGB amendments)
- Urban Reserve urbanization assumptions (i.e., buildable land inventory measures, timing of UGB expansions and urban density assumptions)
- Ex-urban residential and non-residential capacity assumptions

Over 600 local zoning districts exist in the region. However, zoning districts generally share common themes, permit only types of development and have common allowable development densities. These common zoning traits allow normalization and each one to be classified into 1 of 48 regional zone class designations. Residential zoning districts are matched up with an appropriate regional zone class designation based on the maximum dwelling unit density allowed and per zone district by the dominant single family, multi-family or mixed use residential entitlement. The commercial and industrial crosswalks were more simply based on the entitlement description for each zoning district. In all, zoning districts were cross-walked for all 25 cities and counties in the Metro UGB and including Clark county and ex-urban rural cities.

The Metro Research Center each quarter updates the data layer in its Regional Land Information System GIS database when new zone districts are created (or amended). Additionally, the entire RLIS zone class data layer went through a careful jurisdiction by jurisdiction review with each participating city and county in the region to verify the accurate crosswalk of local zoning districts to the proper RLIS regional zone class designation. Corrections from city planners were incorporated into the final supply dataset.

[22] Only Clark County and City of Vancouver participated in the review and subsequent revision of BLI capacity assumptions. The RTC participated but made no recommendations to change capacity assumptions.
[23] There is no comparable assumption for non-residential growth distributions. MetroScope modeling and forecasting does not assert any subsidies for employment lands.

To see the list of standardized regional zone classes, please see Appendix 2. Detailed zone class maps may be downloaded from Metro's FTP server:
ftp://ftp.oregonmetro.gov/dist/gm/TazAlloc2010/July22_meeting/

ZoningClackCo_map.pdf
ZoningMultCo_map.pdf
ZoningWashCo_map.pdf
ZoningRegional_map.pdf

Refining Transportation Analysis Zones: TAZ 2162 to meet new planning challenges.

At the same time that supply and capacity assumptions were being reviewed and refined, Metro's Transportation Research and Modeling staff (TRMS) underwent a parallel process of reviewing and splitting TAZ boundaries as needed to meet individual municipal transportation planning needs. This task was completed and what emerged is the new TAZ 2162 system. The system has 2,147 zones inside the four-county metropolitan region (the coverage includes the full geographic extent of Clackamas, Multnomah and Washington counties in Oregon and Clark County, WA). The remaining zones represent external (or halo) zones not usually associated with Metro's travel demand model. However, some transportation and land use applications may reserve the need to study the travel distance behaviors and economic impacts of long distance commuters into adjacent zones in Columbia, Marion and Yamhill.

For an illustration of the TAZ 2162, please see Appendix 3. A printable map can be downloaded from Metro's FTP server: ftp://ftp.oregonmetro.gov/dist/gm/TazAlloc2010/July22_meeting/

MetroScope_zones_taz2162.pdf.

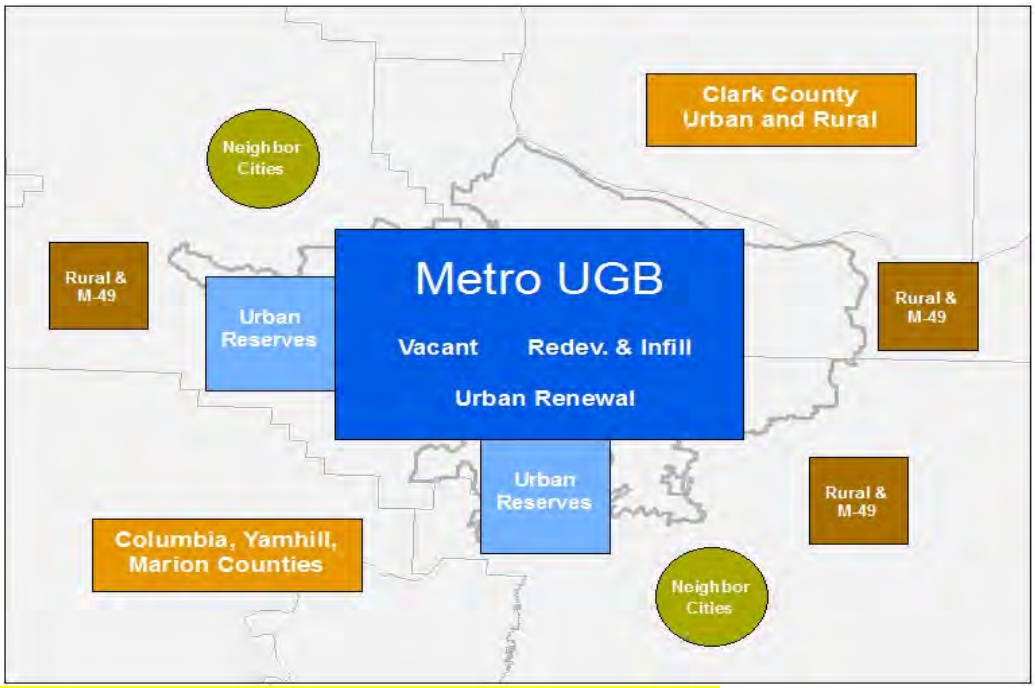


Figure 1: Supply Data – MetroScope Capacity Concept areas

Residential Capacity Estimates derive from many sources.

Regional supply assumptions stretch across multiple counties. This information is necessary to include in the modeling process because regional residents have the choice to reside anywhere in the greater metropolitan area. There are no borders that restrict where people can live, nor where businesses can set up shop. The opportunity to live or work outside the Metro UGB is a practical alternative for some population segments. MetroScope is capable of projecting residential location choice based on behavioral characteristics unique to household of varying life cycle and income bracket. In order to assess the rational economic choices of households, the analysis of where to live and where to work has to encompass the socio-economic influence area of the region as a whole. Clark county, rural unincorporated areas adjacent to the Metro UGB, rural cities and counties are included in the forecast distribution with that of the Metro UGB. The illustration in Figure 1 depicts the major sources of residential (and employment) capacity available for modeling and forecasting future development in the region.

	Dwelling Unit Capacity
SF Vacant - UGB	45,200
SF Infill - UGB	53,800
MF Vacant - UGB	53,500
MF Redev - UGB	219,200
Urban Reserves	155,600
Clark County	103,200
Rural TriCounty	33,800
Ex-urban Counties	57,200
Regional Total	721,500

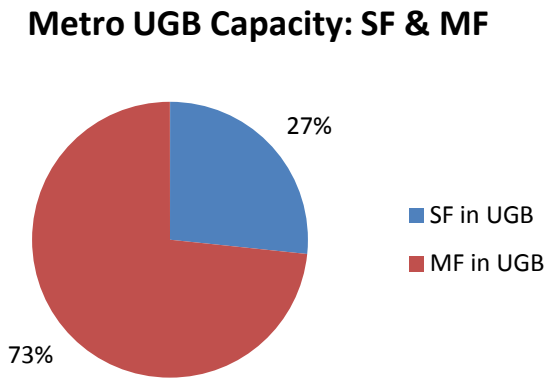


Table 1: Residential Dwelling Unit Capacity (Supply) – 7 county MSA

The overall regional capacity for the 7-county area summed to 721,500 units. Residential capacity – measured in dwelling units – in the Metro UGB totaled 371,700 units. Multifamily redevelopment represents the largest single source of potential development capacity during the forecast period. Urban Reserves accounts for over one-fifth of residential capacity going forward, but is subject to change when actual zoning densities and closer assessment of buildable land inventories are conducted. Current assumptions on urban reserve capacities are derived from a conjectural set of density assumptions centered on achieving 15 DU / net acre. These capacity estimates represent a best approximation of future development capacity through at least 2045 and up to year 2060 when urban reserves are folded into the total. The forecast distribution assigned future households to the residential capacity outlined in table 1.

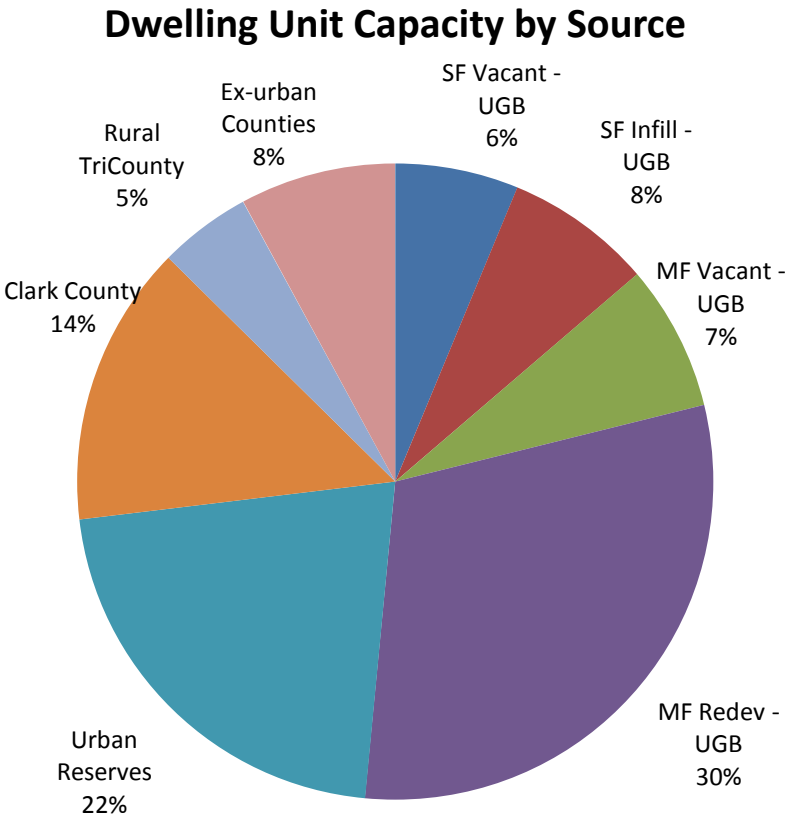


Figure 2: Supply Data – Residential Capacity all Sources (7 county MSA)

There was a major shift in the makeup of residential capacity. Future development trends are expected to conform to the shift. Capacity estimates going forward from today for the region indicate a regulatory mandated change in direction that reverses the post-World War II development trend. Specifically, the residential composition is changing by location, by development form and by vacant vs. redevelopment. The bulk of residential capacity is no longer in the suburbs but in close-in more urban settings. Allowable development forms (i.e., building type) is expected to flip-flop, going from mostly single family to apartments and development of multifamily products. In the post modern era, government incentives promoted single family housing development in suburbs at the rate of about 70% SF vs. 30% MF. More recently, the Metropolitan Housing Rule and Metro's 2040 Growth Concept Plan and Regional Framework have bolstered multifamily development. The ratio of development since 1995 has shifted to 60% SF and 40% MF – a trend consistent with the region's growth management edicts. Future ratio of SF and MF development is expected to reverse from historical patterns to where the ratio becomes 40% SF and 60% MF. At the very end of the forecast in 2040, the ratio becomes 10% SF and 90% MF, reflecting the eventual absorption of nearly all available SF capacity inside the Metro UGB.

Redevelopment will mark a major shift in residential capacity. Redevelopment is defined as the net increase in development density, meaning that an older dwelling unit is torn down and a newer structure replaces it with more housing units. Infill is the addition of more dwelling units to a site that already has an existing home or development. Infill capacity is measured from indentifying how many

over-sized tax lots (relative to minimum lot size regulations on current zoning) and how many additional unit(s) could physically fit on the undeveloped portion of the site. The capacity estimates going forward will rely heavily on demolishing older depreciated home sites and redeveloping them at higher densities.

Estimates of residential capacity for just the existing Metro UGB (excluding urban reserves which will be discussed in another section) show three-fourths of the real estate supply will derive from potential redevelopment and infill. The supply data indicate the shift in capacity favoring more multifamily, i.e., apartments, mixed use residential condos and for rent apartments, and higher density attached development forms generally greater than 20 units per net acre. The table below documents this marginal change expected in residential capacity.

Dwelling Unit Capacity in Metro UGB		
SF Vacant	45,200	12%
MF Vacant	14,800	4%
MUR Vacant	38,700	10%
SF Infill	53,800	14%
MF Redev	33,900	9%
MUR Redev	185,300	50%
Total in UGB	**371,700**	**100%**
Single Family	99,000	27%
Multifamily	272,700	73%
Total in UGB	**371,700**	**100%**
Vacant Capacity	98,700	27%
Redev + Infill Cap.	273,000	73%
Total in UGB	**371,700**	**100%**

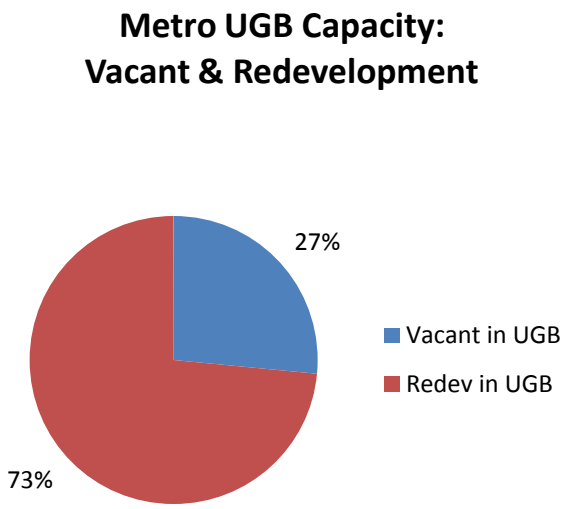


Table 2: Residential Dwelling Unit Capacity (Supply) – Metro UGB (no urban reserves

From a growth capacity standpoint, the growth distribution increases marginal (i.e., 2010 to 2040) development densities in keeping with growing up and not out. Roughly 40% more residents are accommodated in under 10% expansion of the UGB. Consistent with raising marginal densities, redevelopment rates reach almost 75%. This matches closely with the ratio of 27% vacant capacity and 73% redevelopment and infill.

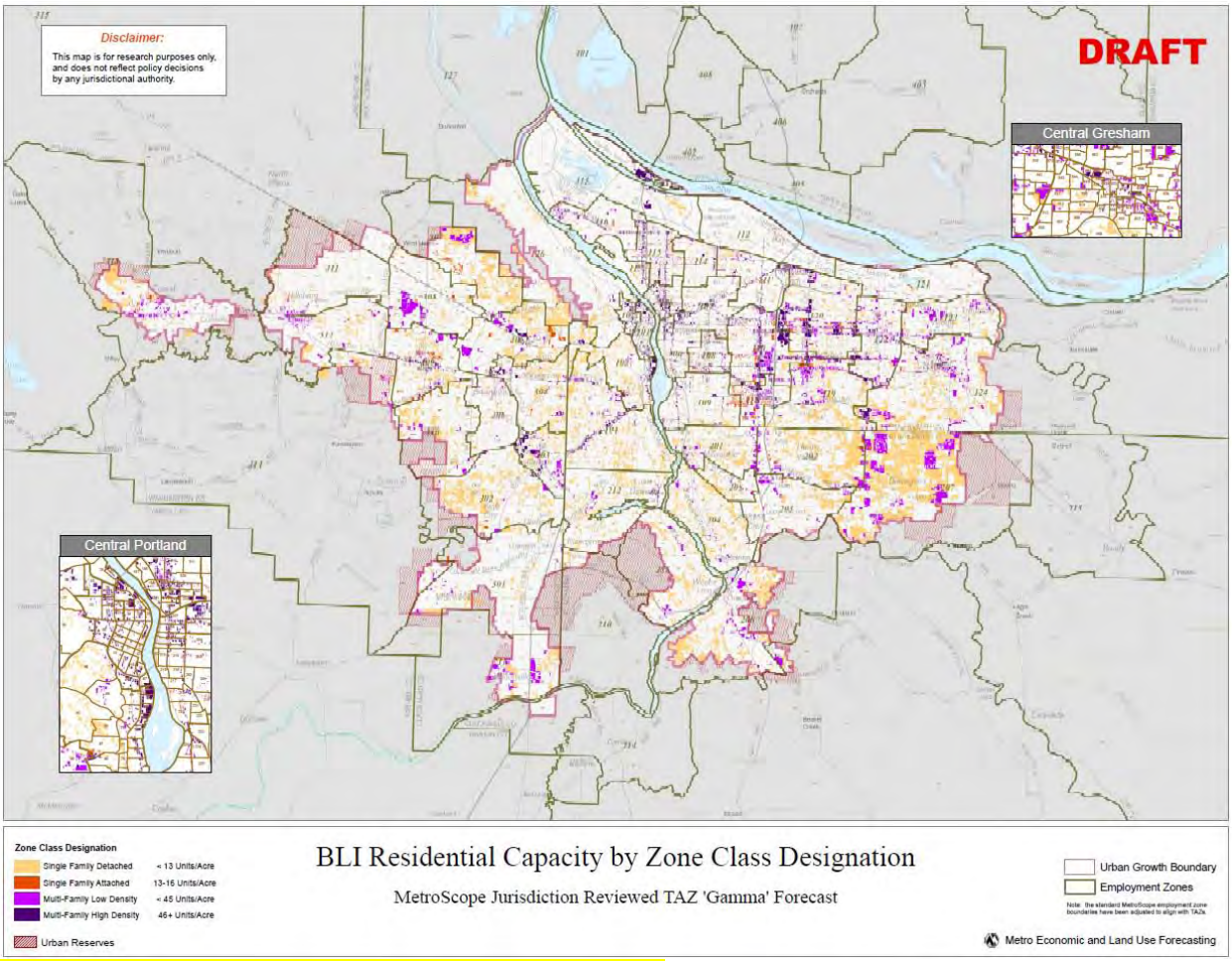
In summary, the supply data, independent of the forecast and growth distribution, indicate the Metro UGB capacity shifting sharply between SF and MF densities. The ratio between single and multifamily capacity for the entire MSA region is estimated to be 40% SF and 60% MF. In contrast, since World War II, development splits between SF and MF were about 70% / 30%. More recently, the Metro region has seen development splits closer to 60% / 40%. As a result, the region should see a significant shift in

regional development patterns. The growth pattern for this forecast distribution represents the most consistent treatment and outcome of the 2040 Growth Concept Plan.

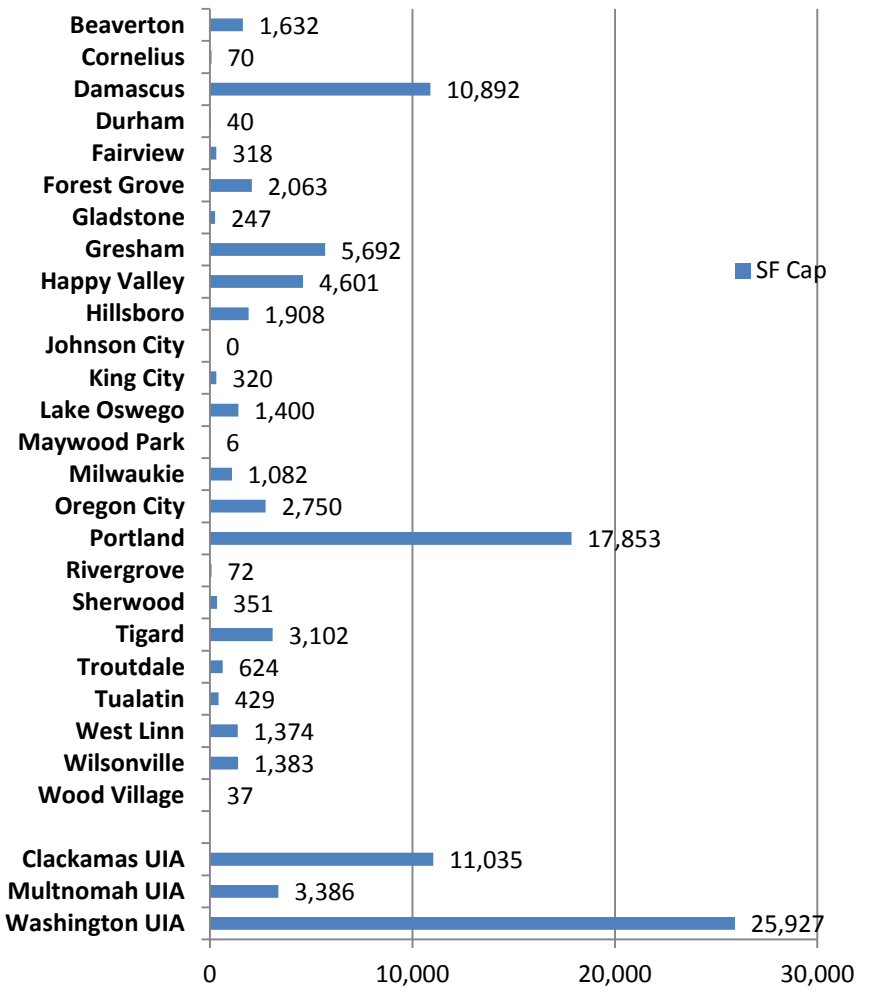
	Post WWII	1995 to present	2010 to 2040	2040
Single Family %	70%	60%	40%	10%
Mult-family %	30%	40%	60%	90%

Table 3: Illustration of Historical Development Trends and Future Capacity Estimates

From a subregional standpoint, the city of Portland represents the lion's share of residential capacity for the Metro UGB. The vast majority of the region's redevelopment capacity is expected to be delivered in the city of Portland. The city's estimated redevelopment capacity is about 137,000 units (7% SF infill and 93% MF redevelopment units – not including an additional 47,200 units from urban renewal). Portland capacity from all sources totals to about 199,000 dwelling units (with urban renewal). This capacity is largely located in the city's designated centers, corridors and main streets. Portland city redevelopment accounts for about two-thirds of the potential residential redevelopment supply estimated for the Metro UGB. Subsequent tables list out single family and multifamily residential capacity for each city inside the Metro UGB.



Map 1: Supply Data – Residential Capacity (Metro UGB)



	% of UGB SF Capacity
Beaverton	1.7%
Cornelius	0.1%
Damascus	11.0%
Durham	0.0%
Fairview	0.3%
Forest Grove	2.1%
Gladstone	0.3%
Gresham	5.8%
Happy Valley	4.7%
Hillsboro	1.9%
Johnson City	0.0%
King City	0.3%
Lake Oswego	1.4%
Maywood Park	0.0%
Milwaukie	1.1%
Oregon City	2.8%
Portland	18.1%
Rivergrove	0.1%
Sherwood	0.4%
Tigard	3.1%
Troutdale	0.6%
Tualatin	0.4%
West Linn	1.4%
Wilsonville	1.4%
Wood Village	0.0%
Clackamas UIA	11.2%
Multnomah UIA	3.4%
Washington UIA	26.3%
UGB Total	100.0%

Table 4: SF Residential Capacity in the Metro UGB (tabulated by city boundary – not TAZ)

Unincorporated Washington County represents the largest single jurisdiction for single family residential capacity in the Metro UGB, followed by city of Portland and unincorporated Clackamas County and the city Damascus. These SF and MF estimates are based on GIS data derived by tabulating up capacity for each local jurisdiction's city limits (no urban service areas used in calculating capacity totals) as of year 2010. In other tabulations, capacity estimates by city may differ due to an alternative accounting system based on summing together TAZ's that have been assigned to approximate the city or jurisdictional boundaries. Note TAZ delineations are unique and boundaries do not necessarily reflect recognized political boundaries, streets, or census geographies.

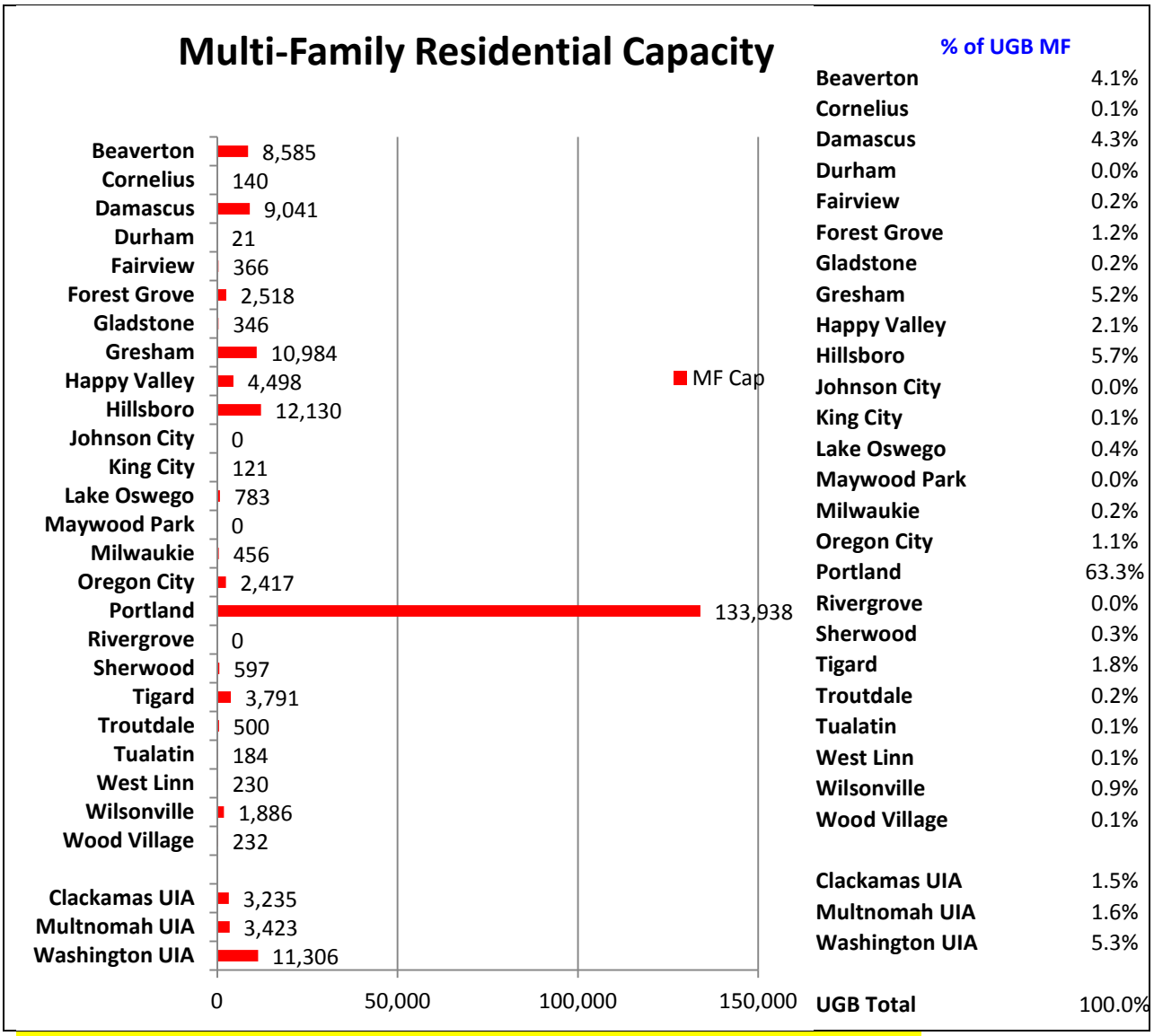


Table 5: MF (includes mixed use residential) Residential Capacity in the Metro UGB (tabulated by city boundary – not TAZ)

In the case of Damascus, capacity estimates are more subject to variance than other jurisdictions for the mere fact that the city has yet to adopt zoning or comprehensive plans for urbanization. Instead, the best available data on hand from a year ago was the city's proposed concept plan. Metro staff with help from city planning officials estimated the residential and employment capacity using the concept plan and Metro's own buildable land inventory of the city. A greater variance may exist for Damascus as the city strives to refine its own BLI estimate and adopts official urban zoning regulations.

It should be noted that during the capacity review phase of the distribution process, several jurisdictions raised these concerns:

1. The amount / proportion of residential redevelopment supply assumed for the forecast distribution

2. Equity concerns arising from housing affordability after 2025
3. Residential location preferences assumed in the model
4. Ability of the model to forecast shifting preferences for building types – vis-à-vis aging demographics for example
5. The significant proportional shift in overall SF and MF capacity for the region
6. Urban renewal subsidy amounts
7. Rural development capacity / density assumptions

These issues will be dealt with as research items going into the next UGR. Two principle research objectives have been identified by planning directors:

1. Review of the BLI for next UGR – in particular the redevelopment assumption
2. Undertake a stated preference residential location choice study.

The first research item will verify BLI data for the region, including redevelopment supplies in the UGB, residential subsidy assumptions, supply of single and multifamily units and rural density assumptions. The second item will depend largely on funding needed to properly carry out a scientifically valid survey and research.

For a more detailed discussion of the current BLI methods and capacity calculation approach for the Metro UGB single and multifamily capacity estimates, please reference Metro's "Methodology for Computing Res. & Empl. Capcity report".
ftp://ftp.oregonmetro.gov/dist/gm/TazAlloc2010/July22_meeting/

New Urban Areas…delaying the start of urban development until 2020.

Metro amended its UGB in 1997 to add Pleasant Valley and Bethany areas, and Damascus in 2002. It still remains unclear when urban development will actually begin, however. Governance of these areas has seemed to mostly been resolved. The city of Damascus was incorporated in 2004 to oversee planning for the new area with Happy Valley plans contributing to the west end. Gresham had taken the lead in planning with other adjacent municipalities to direct planning for Pleasant Valley. Beaverton and Washington County share in planning for Bethany. Still impeding urban development in Bethany and Pleasant Valley has been the lack of public funds to carry out infrastructure construction. Also large parts of the Pleasant Valley are still zoned rural residential and not ready for urbanization. Damascus has had setbacks that have stalled progress in enacting comprehensive plans. Urbanization plans for the new urban areas have been held up by planning disagreements and infrastructure funding questions.

It will only be a matter of time before these areas become ripe to receive urban densities. For modeling and forecasting purposes, we expect the new urban areas will eventually become urbanizable within the next 25 to 30 years, with build-out taking longer. As a matter of practical supposition, the forecast distribution anticipates urban development will be forestalled until 2020 – assuming a 10 year delay before these areas are able to overcome initial development barriers. At 2020, the assumption is to hypothetically up-zone rural new urban areas to 10 dwelling units per net buildable acre.

Industrial and Commercial Employment Capacity appears sufficient for the 2010 to 2040 horizon

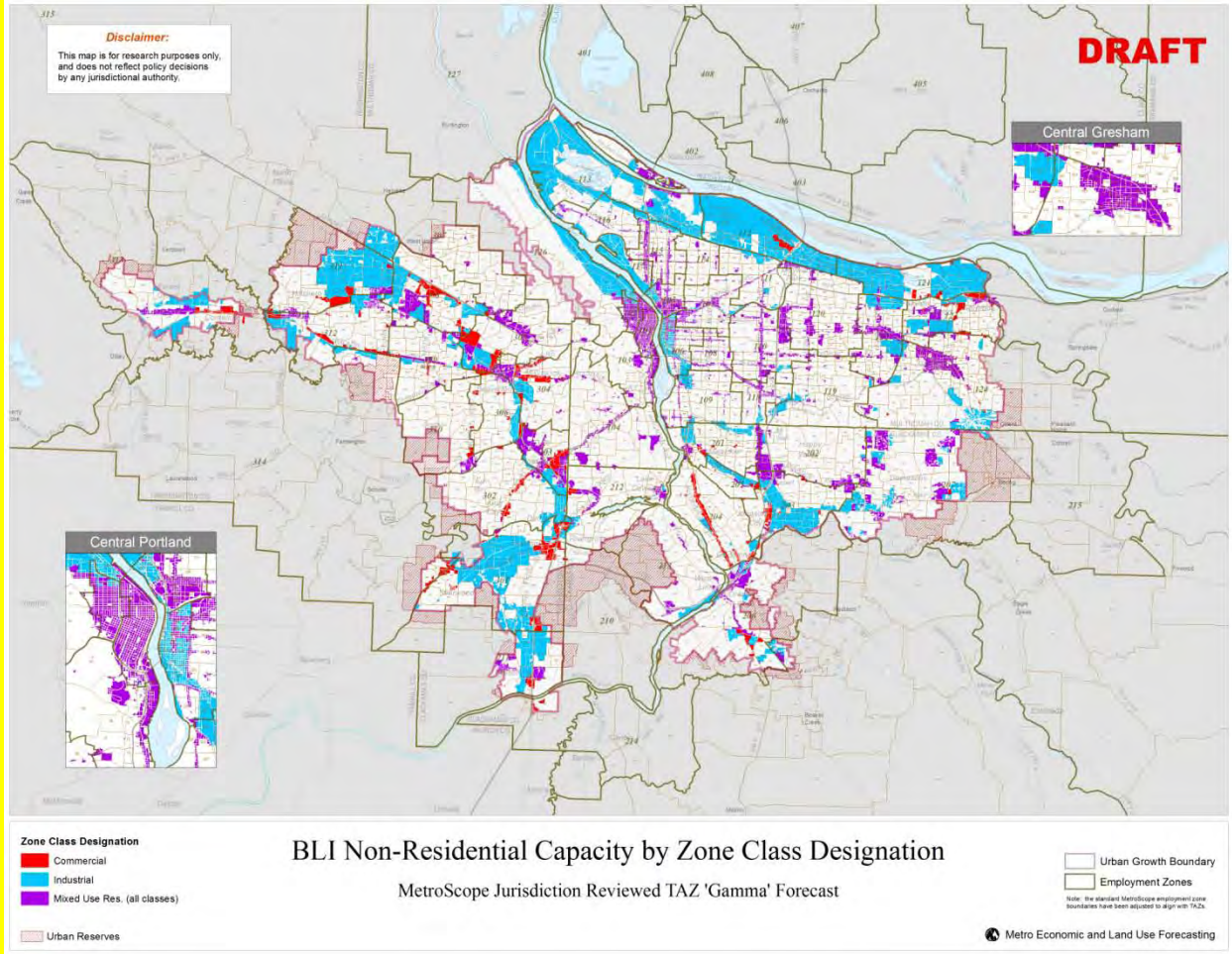
In aggregate, employment capacity includes vacant and redevelopment as shown in Table 5. Like the residential BLI, the non-residential supplies are represented in a GIS data base and stored as net buildable acres. Potentially redevelopable employment sites are tabulated with vacant buildable sites in the overall inventory. The redevelopment supplies also include brownfields, but it is uncertain that the brownfield estimates are 100% accurate. Unbuildable sites and areas such as resource lands, environmentally protected zones and public right of ways are excluded from buildable lands much in the same way as for residential supplies.

Statistical estimation methods were employed to estimate the amount of nonresidential redevelopment supply. As such there exists a margin of error on this redevelopment capacity that is unknown. Undoubtedly, the margin of error found in the redevelopment estimates is going to be larger than the vacant tabulations. Before the redevelopment (and vacant) capacity was accepted into the modeling and forecasting, all non-residential capacity underwent a review by local jurisdictions. The initial estimate for the redevelopment supply was determined from a set of redevelopment filters based on zoning, site size, value of the lot and improvement. The values were given by recent county assessment information and lot size by Metro's RLIS tax lot layer file.

	Industrial	Commercial
Clackamas	3,819	2,255
Multnomah	3,662	1,605
Washington	6,748	2,159
Clark	3,237	1,785
Total	17,466	7,804

Table 6: Supply Data –Employment Capacity (in net acres)

Additional information concerning employment capacity, the redevelopment filters, assumptions and other capacity assumptions are included in the report "Methodology for Computing Res. & Empl. Capcity report". ftp://ftp.oregonmetro.gov/dist/gm/TazAlloc2010/July22_meeting/.



Map 2: Supply Data – Employment Capacity (Metro UGB)

Subsidized Redevelopment (i.e., urban renewal assumptions) – a policy assumption adding to the Regional Residential Capacity.

The subsidized residential redevelopment capacity assumptions represent specific areas in which local governments are attempting to revitalize with urban renewal. These modeling and forecasting assumptions are an attempt to model the potential impact of implementing the Region 2040 framework plan and the resulting economic influences of local government interventions in the private real estate market. The subsidies are applied only to areas in the region defined with an operating urban renewal as of July 2011.

The nature of the subsidy for modeling and forecasting purposes is to make the units more affordable for development and homeowners (or renters). Many of the subsidized redevelopment areas are in the central city, regional centers, town centers, and corridors that carry higher residential price tags. The impact of the subsidy is such that prospective homeowners (or renters) are more likely to locate in the urban renewal area – other things being equal – because rents should be lower with the housing subsidy than otherwise.

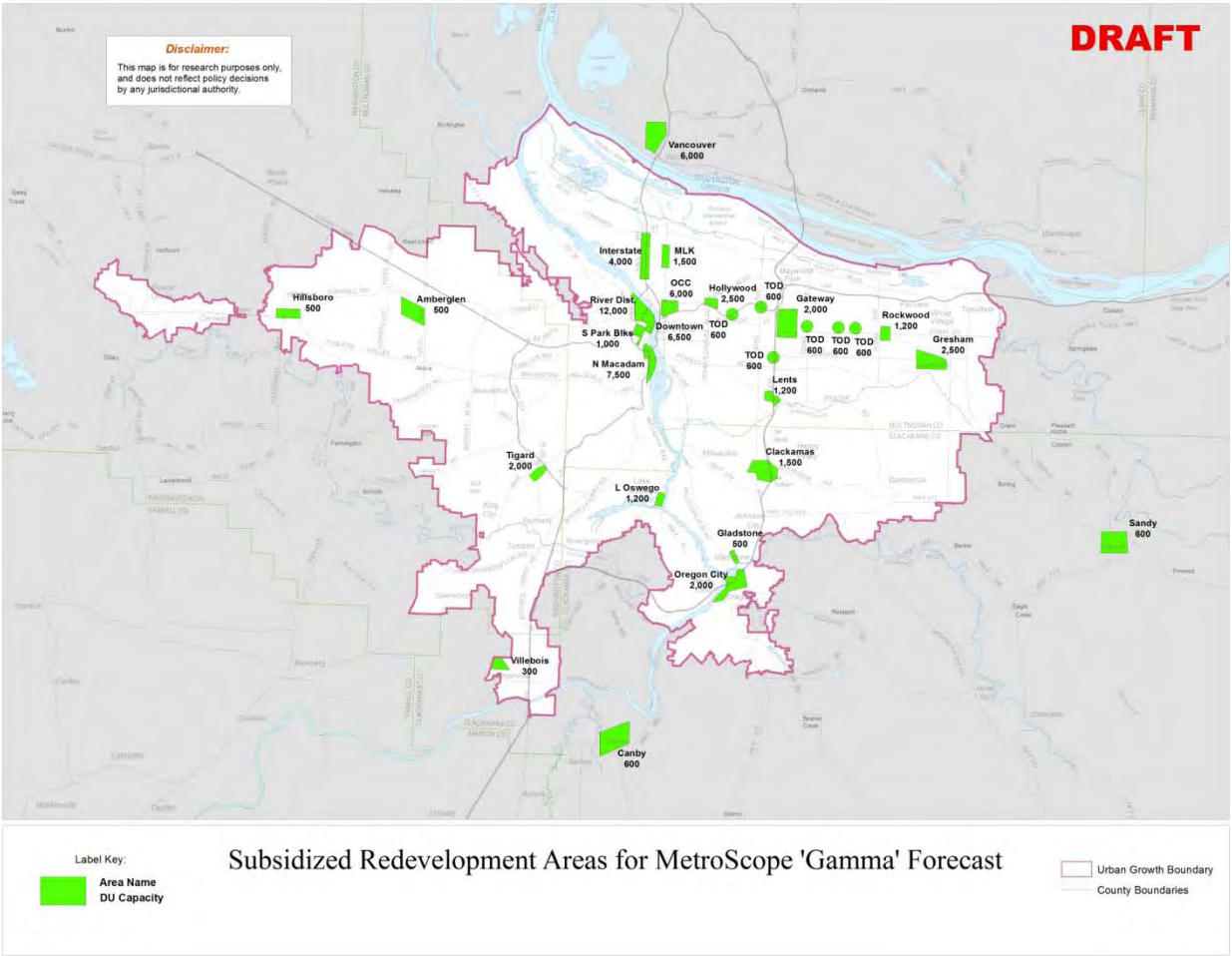
On the other hand, the forecast distribution anticipates that "other things are not equal" because neighborhood amenities from place to place are not the same. Differences in travel time/distance to work, recreation, shopping and entertainment opportunities will override subsidy preferences. Although residential subsidies tend give an advantage to these units, they still must compete with other residential real estate products. In many cases, the subsidies are still enough to tip the scales of development. Development factors in other areas (and outside the region too) still maintain an edge over the subsidized units. Sometimes the differences come down to price advantages, but many other times it's differences in amenities and the tradeoffs that households have to make in balancing work location, transit availability, proximity to parks, schools and stores that decide where residents choose to live.

The old adage in real estate sales "location, location, location" holds true in the modeling and forecasting of residential location choice. Location very much matters, so urban renewal areas compete against all other residential opportunities. Moreover, characteristics of one household to another vary and the number of households with willingness to pay for residential location in highly dense and urban locations is not unlimited. Residential preferences have to also respond to a household's actual income bracket, life-style and life-cycle. In many cases, the innate residential preferences will outweigh the attraction of subsidized units. Competitive forces will drive some households to locate in subsidized areas, but for a large segment of regional residents other residential locations are preferable. Therefore, given limited demand and many competing real estate markets, MetroScope predicts about 89% of subsidized residential capacity consumed during the next 25 to 30 years. This works out to roughly 50,000 households (from a total of 250,000) that is expected to find the subsidized residential units to be an attractive option.

- 25 subsidized locations (each area corresponds to an identified urban renewal area as confirmed by local jurisdictions as of July 2011)
- Number of subsidized units vary (number of units subsidized varies according to the size of the urban renewal and the designated 2040 area type; number of subsidized units does not exceed allowed zoning or comp plan densities)
- Density assumption of redevelopment units (for determining variable cost of construction) varys with downtown Portland locations set at MUR 9 (100 to 125 DU/ acre) densities and suburban locations set at MUR 4 (25 to 30 DU/ acre) densities
- Value of subsidy amount vary between $10,000 per dwelling unit up to $50,000 per unit (central city locations assume the higher amount while ex-urban and suburban locations assume the lower amount, a $25,000 amount is assumed mainly in regional centers and few town centers)
- Subsidy amounts are metered in between 2015 and 2045 in 5 year increments (the actual assumptions are listed in an appendix table) so as not to "flood the market" with unrealistic subsidies whose beneficial economic impacts are generally not felt immediately and do tend to be phased in over time

Exhibit 1: Urban Renewal Capacity Capacity Assumptions

The subsidies are applied to new development in 25 identified areas. The total amount of initial subsidized redevelopment capacity assumed in this forecast distribution calls for a total of 69,300 dwelling units (60,000 dwelling units are in places designated inside the Metro UGB) and a monetized value totaling $2.5 billion over 35 years. For a list of these areas and the detailed tabular forecast assumptions, please reference the subsidized redevelopment portion of the appendix in this report. A map nearby illustrates where these residential locations are assumed for modeling and forecasting purposes. The number adjacent to each site indicates the additional redevelopment capacity added to total residential capacity[24].



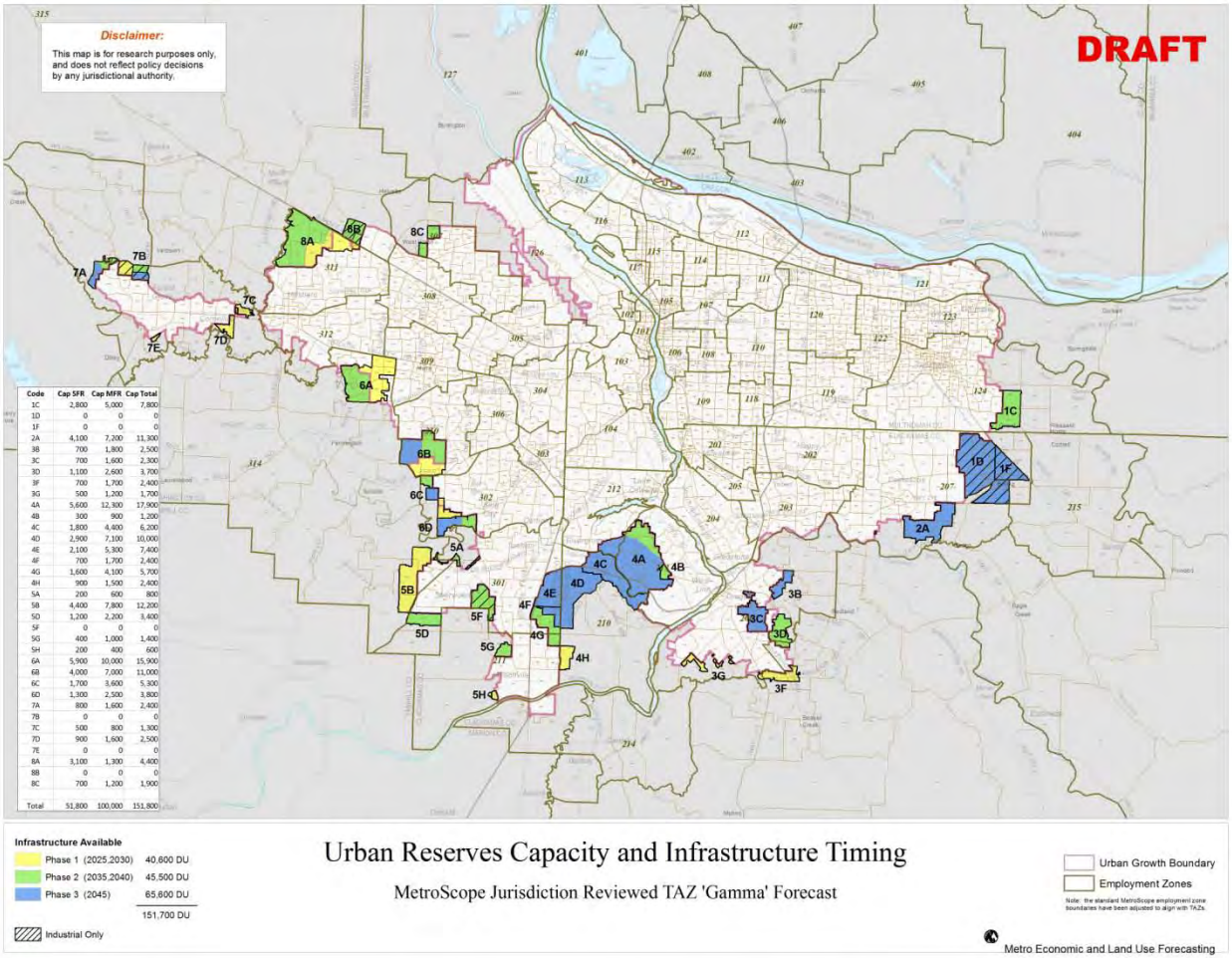
Map 2: Residential Urban Renewal Subsidy Assumption

Metro Urban Reserves Capacity – additional capacity to accommodate regional growth 20 or more years into the future

For modeling and forecasting purposes only – i.e., this assumption is not included in any Urban Growth Report of Metro Capacity Ordinance – the TAZ forecast distribution incorporates an assumption for

[24] The subsidy only applies to residential. There are no promotional development subsidies assumed for employment. There are a number of economic development initiatives underway in the region, but MetroScope is at this time unable to characterize the locational subsidies that would incentivize development.

residential capacity that implements local government efforts to promote 2040 Growth Concept development forms in centers, corridors and light rail station areas.



Map 3: Metro Urban Reserves and Capacity Assumptions

The forecast incorporates prospective Metro UGB expansions into the growth distribution. The reason for this is to reduce the projected growth distortions to internal TAZ's and designated centers that are adjacent to an urban reserve site. Over time, we would expect reserves to be added to the UGB. It is our thought that a rolling 5-year forecast with periodic UGB adds would be more accurate in the long-run for the region as a whole. Otherwise, without future adds, the internal TAZ's would not be adequately represented in the growth distributions. Since there are no policy mandates from the Metro Council as a guide for when urban reserves will be added to the Metro UGB, the forecast assumption is strictly a technical assumption left to forecasters.

Maximizing the information on hand, the forecast knows these as givens:

- Location of urban reserve sites
- Designation of which sites will be industrial
- A crude estimate of each site's buildable land acreage

- A crude estimate of environmental resource land acreage
- Directed to assume 15 DU / net acre

This still leaves out some important information needed for future forecasts. The map above illustrates embodies the actual assumptions made concerning governance, financing and infrastructure development. These assumptions are modeled into the forecast in terms of:

- Timing of reserves (when it enters the UGB and when we can expect urbanization to start)
- Residential capacity (expected supply of SF and MF dwelling units)
- Industrial capacity (expected number of net acres)
- Commercial employment capacity (expected number of net acres)

Local governments were consulted and their comments folded into the governance assumptions and infrastructure financing and urbanization timing of each urban reserve. Here's the basics:

1. Urban reserves were divided into 3 phases by local governments. These phases represent the most likely ability of the nearest local government to provide infrastructure financing and governance in terms of spelling zoning and other urbanization factors
2. Each phase was subdivided roughly in half to coincide with the 5 year growth forecast increments
3. A 10 year delay was assumed before an urban reserve site would begin to have urban densities assigned. This represents a crude approximation of the infrastructure delay or about the time expected to make the site development ready.
4. Sites that were designated in the urban reserve process as industrial remained wholly industrial for modeling purposes unless the nearby city proposed concept plans which offered more precise reckoning of future zoning districts
5. Other sites were designated as residential and neighborhood commercial. These sites were given a crude capacity concept based on 15 DU / net acre. 70% of the BLI in each site was given to single family densities; 24% to multifamily density and 6% of the BLI for neighborhood commercial development. SF densities were either set at SFR5, SFR6 or SFR7 depending on existing single family zoning in nearby TAZ inside the UGB. The MF density was set to whatever density would allow the urban reserve site to average the required 15 DU / net acre.
6. Otherwise, if local jurisdictions had on hand their own concept plans for an urban reserve, the TAZ forecast replaced the crude Metro assumptions with the local concept plan.

Exhibit 2: Urban Reserve Density Assumptions.

The urban reserve capacities are hypothetical assumptions deriving from recommendations provided to the Metro Research Center by local government officials. They are technical assumptions and should not be construed as plans for future decisions by the current or any future Metro Council. The urban reserve assumptions are non-binding and intended for research purposes only. They merely represent a subset of capacity assumptions included among a broader set of other technical assumptions necessary for simulating future population and employment growth patterns. The urban reserve assumptions are

solely the responsibility of the Metro Research Center and intended for informational and technical research purposes.

In the context of distributing the regional forecast to specific neighborhoods and locations in the region, urban reserves represent additional areas that can be provisionally added to the Metro UGB in later forecast years. As population and employment in the region grows, residents and businesses need room to grow. A portion of this growth may be accommodated within the existing UGB and others may spill out to Clark county, rural areas in the region, or counties adjacent to Metro. Metro urban reserves provide an identified reservoir of development capacity that can be drawn on in future years to augment the capacity of the Metro UGB to accommodate future growth pressures. Urban reserves provide planning certainty and are intended to help maintain a compact urban form while protecting and sustaining valuable agricultural resources adjacent to the UGB.

As on-going economic development and residential need is absorbed into the Metro UGB, every 5 years Metro is required to take stock of its capacity and replenish the amount of capacity absorbed such that there will be enough capacity on hand for the next 20 years. Urban reserves represent an available choice in which future markets are likely to see growth happen and future Metro Councils will likely decide expansion of the Metro UGB into all or parts of designated urban reserves as a possible solution to meet growth demands.

In order to simulate this cycle of 5 year capacity review and replenishment of the Metro UGB capacity, the Metro Research Center in consultation with local governments has devised a hypothetical schedule for metering in the expansion of the Metro UGB into designated urban reserve locations. Reserves are a fact. Ignoring the likelihood that urban reserves would go untouched in the foreseeable 25 to 60 year time horizon would significantly skew growth distribution results in the Metro UGB. Ignoring periodic inclusion of urban reserves would hamper the growth distribution forecast and severely skew results. The better forecast alternative is to assume a hypothetical schedule of UGB amendments equal to a hypothetical replenishment rate. Even if the timing, location and capacity assumption are less accurate, the inclusion of urban reserves into the forecast distribution limits forecast biases and geographic distribution errors to the urban reserves areas and immediate adjacent zones.

The only piece of information we have about urban reserves are its geographic boundaries. In order to make use of urban reserves, the Metro Research Center has had to impute certain attributes for each designated urban reserve area. Synthetic land use information had to be constructed in order to approximate urban densities, land use capacity to accommodate residential, industrial or commercial development for each urban reserve area.

1. UGB / urban reserve timing: There is – as a point of fact – no schedule for adding urban reserve areas to the Metro UGB. The regional forecast distribution does not actually make any assumptions concerning when any individual or set of urban reserve areas are to be added to the Metro UGB. We skirt this issue of UGB expansion timing instead by assuming when infrastructure might be brought into the area at some future date.

2. Infrastructure timing: A timing-delay function is assumed into the growth distribution to represent when each urban reserve area can start to receive residential (or employment) growth allocations. We have seen abundant evidence from post-1997 Metro UGB expansions that dictate growth will not happen until questions about governance, financing, and infrastructure development actually get resolved. Urban-style growth densities and development are not likely to materialize in any designated urban reserve until these concerns are addressed. We assume a timing delay for modeling and forecasting purposes for each urban reserve area that ranks each by its likelihood toward development readiness.

   Reserves are divided into 3 phases and then assigned a 5-year period in which urban development densities and growth may begin. The delay function starts with reserves identified in the phase 1 and assigning new growth in either 2025 or 2030. Phases 2 and 3 stretch out development in the reserves through year 2045. A reserve area is not likely to reach build-out during its initial phase of inclusion to the UGB; it takes several development cycles for that to occur. How quickly a reserve may reach its development build-out depends on a number of demand factors, competing supply choices and real estate prices. A specific reserve area is more likely to see more growth allocated to it if it was added to the UGB capacity in an earlier year.

Buildable land inventory: Development in the reserves can only occur on buildable land[25]. The buildable land inventory is defined by Metro's vacant land inventory and "modeled" Title 3 and Title 13 environmental data layers. Since the buildable land inventory was derived from modeled data instead of actual surveys and measurements, it is conceivable that later refinements to this data may vary widely from the Metro Research Center BLI estimates in this report. After the mid-term review, Beaverton and Hillsboro provided more detailed capacity estimates (i.e., residential and employment) for the Northern Hillsboro, Southern Hillsboro and Cooper Mountain urban reserve sites. These revisions were incorporated into subsequent growth years. A table listing the Urban Reserve BLI estimates is shown in the appendix.

3. Zoning and residential density: Urban-style density assumptions were not given as part of the urban reserve decision. The only guidance given was a recommendation by Metro Council that each piece of urban reserve should plan for a minimum density of 15 dwelling units per net acre. Therefore, the Metro Research Center devised hypothetical density concept assumptions for each designated urban reserve area[26]. Formulation of the dwelling unit capacity assumption in each urban reserve area follows this basic approach:
   a. Single family dwelling unit capacity = 70% of BLI * SFR units/acre, where the SFR density is determined based on observed single family zoning densities in nearby zoning

[25] The reserve areas are expected to be sparsely developed and any redevelopment potential is assumed to be minimal and therefore will not add material capacity. All development capacity is assumed to derive from vacant buildable sources.

[26] Cities of Beaverton and Hillsboro provided more detailed estimates of buildable capacity in urban reserve areas likely to be annexed by the cities. Planning data concerning the residential development capacities for northern Hillsboro (NOHI) and southern Hillsboro (SOHI) and Cooper Mountain urban reserves were substituted in lieu of Metro's standardized capacity estimates.

districts. This seemed to be a reasonable assertion given that very few urban reserves had detailed site plans or capacity concept plans in place. The forecast assumed a 70% rate of SF development largely in keeping with the development mix that has been the case over the last couple decades. For modeling and forecasting, it seemed prudent to generally duplicate similar development mix of adjacent residential subdivisions.

b. Multifamily dwelling unit capacity = 24% of BLI * MFR units/acre, where the MFR density is determined based on the density needed to achieve approximately 15 dwelling units per acre after considering the density assumed for single family. In order to achieve 15 units an acre, there would have to be a significant MF component. Generally the density required to meet the target density was between 45 and 65 units per net acre.
c. Commercial capacity = 6% of BLI. Commercial capacity was aside to accommodate a mix of neighborhood retail and low-scale office employment to meet the needs of area residents. This capacity is not for industrial uses per se.
d. Industrial capacity = 100% of BLI but only in urban reserve areas designated for industrial development. Industrial capacity is not assumed in non-designated industrial reserves.

Future concept planning and comprehensive plan reviews may yield different assumptions, but in so far as urban reserve areas are devoid of urban density assumptions, this is the density assumption template imposed for each designated urban reserve area.

The only salient disagreement over the urban reserve timing assumptions is the Stafford area site. The cities making up the Stafford triangle have stated clearly that urbanization should be delayed until after 2040. This is what is assumed in the modeling and forecasting. On the other hand, Clackamas county has suggested that the Stafford area should come into the UGB sooner.

Capacity Assumptions beyond the Metro jurisdiction.

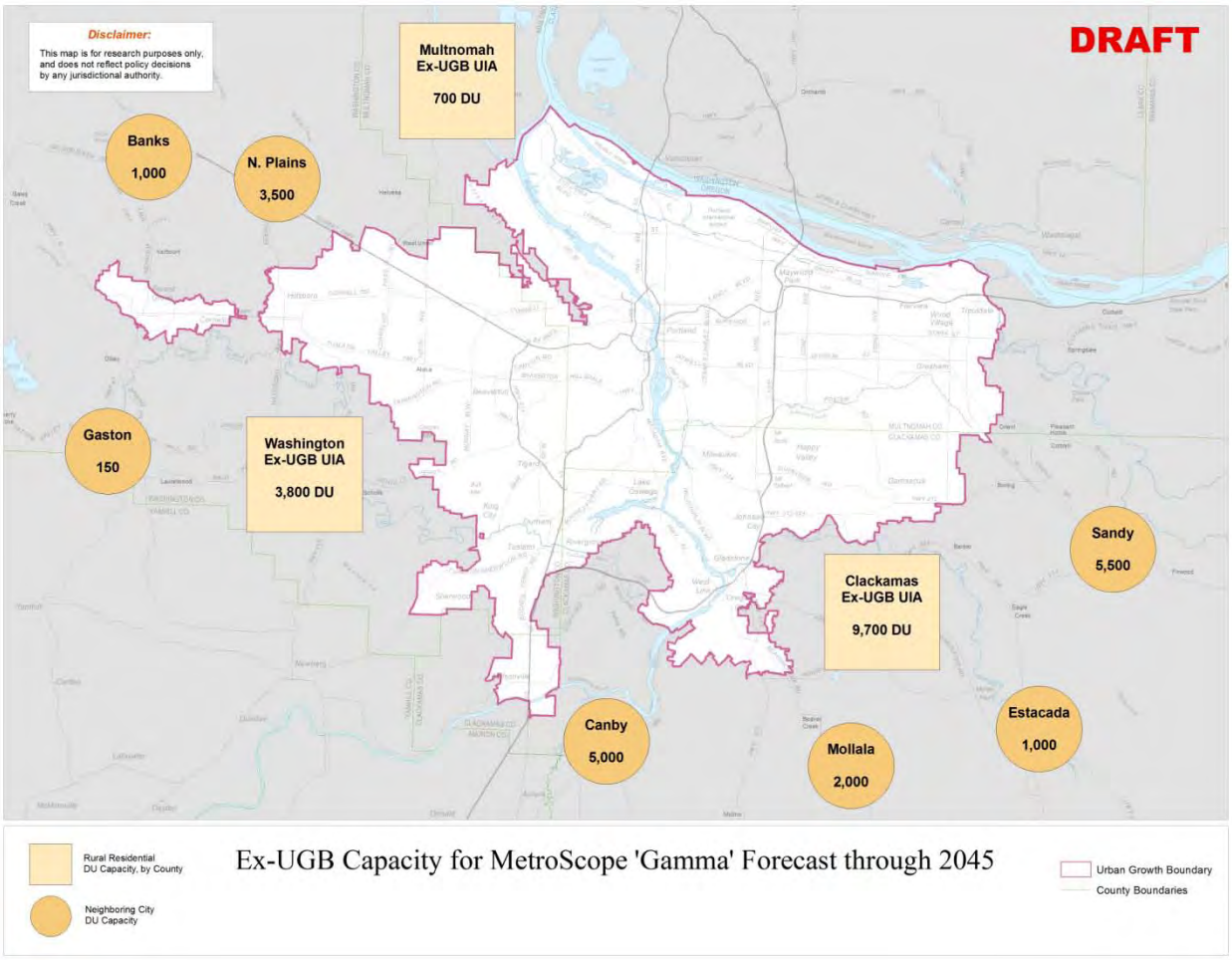
Let's now turn to capacity that's outside the Metro boundary. For complete and consistent accounting of regional development, the modeling and forecasting of land use futures requires estimates of residential and employment capacity in outlying areas that fall in the shadow of the Portland socio-economic influence. These areas are

- the rural county unincorporated areas outside the Metro UGB
- neighboring cities in Clackamas County
- neighboring cities in Washington County
- Clark county (in its entirety).

Generally, capacity estimates for these areas are significantly coarser and may not actually reflect capacity estimates of local governments. Neighboring cities were invited to participate in the forecast distribution and capacity reviews. North Plains and Sandy provided some residential capacity information, but the modeling efforts were ultimately unable to secure capacity estimates that would be compatible with the forecast for the other rural cities. Consequently, Metro staff assumed that future rural city capacities (as noted in the map below) would mimic similar development trends as seen

historically. Manual capacity estimates were eyeballed from 2000 Census data that assumed each neighbor city might practicably double its size during the next 20 to 30 year time horizon.

The residential capacity in the rural tri-county area approximated the combined capacity of Measure-49 claims and a hypothetical estimate of potential farmhouse development. Measure 49 data came from the state. The growth distribution forecast assumed the right to build 3 houses per claim.



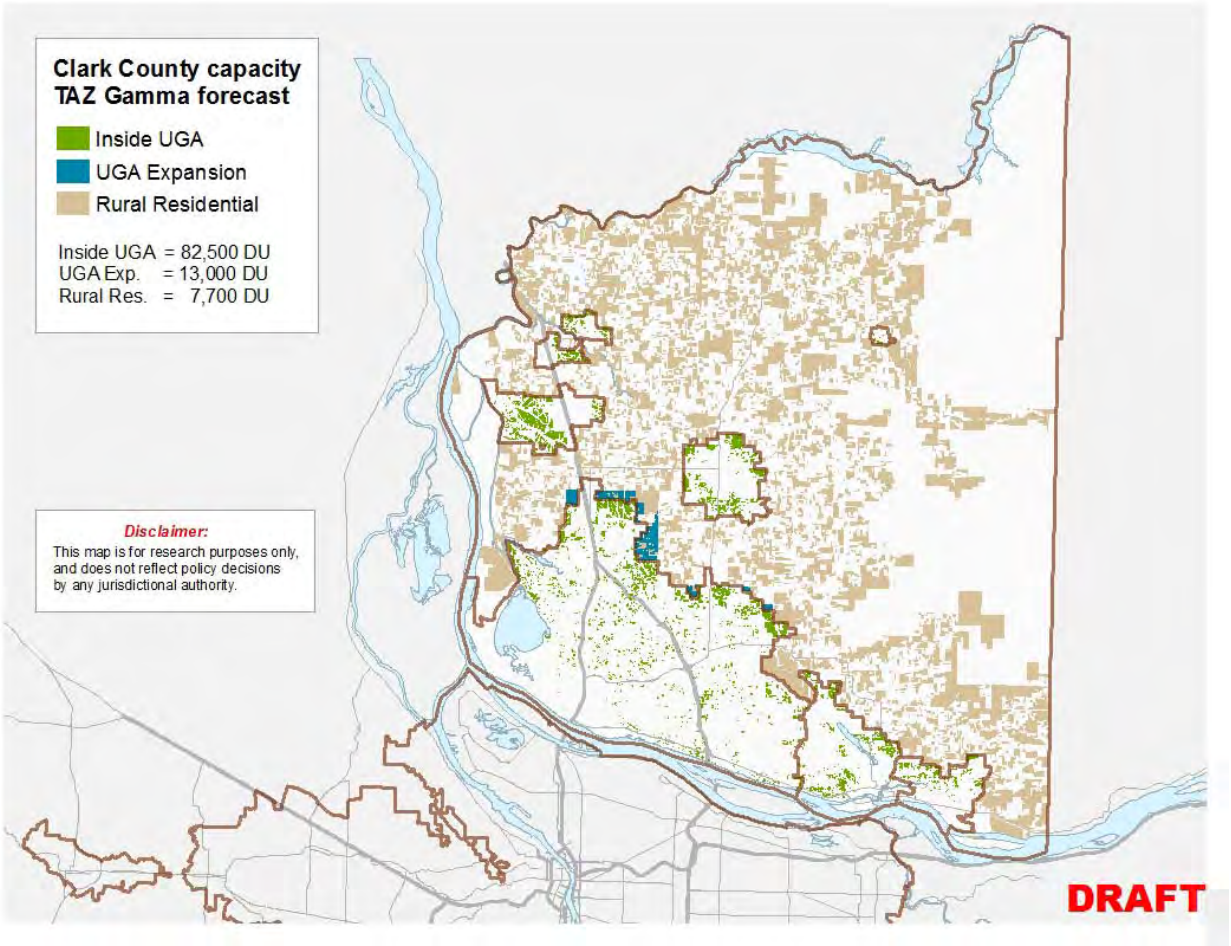
Map 4: Residential Capacity estimates for the rural tri-county area, neighboring cities and rural counties

Additional rural development capacity was computed from exception land information. For all 3 counties, Metro generated an initial rural residential capacity estimate. The initial estimates in each county relied on assuming 4 dwelling units per 5 acres of exception land. This proved inaccurate and later revised. Each county during the capacity review phase overrode and reduced the amount of rural development capacity according to local knowledge and data trends spotted in recent years. MetroScope was designed with the intent of providing a complete analysis of regional growth which includes economic, transportation and land use interactions with adjacent counties. These adjacent areas are often called economic halo regions because there exists significant cross border commuting, economic trade between adjacent counties, and thriving social interactions among the urban counties, suburban counties and ex-urban counties. These socio-economic ties are difficult to disentangle and as a

consequence any exclusions of these counties would severely distort econometric models designed to analyze, forecast and assess the economic conditions of the Portland economic region.

From a Metro-centric perspective, the halo areas in this region include Clark County, Washington, Columbia, Marion and Yamhill counties in Oregon. Additionally, ex-urban areas outside the Metro UGB including neighboring cities (Barlow, Canby, Estacada, Molalla, Sandy in Clackamas County and Banks, Gaston and North Plains in Washington County) and rural unincorporated county areas outside the Metro UGB in Clackamas, Multnomah and Washington counties are included as halo areas.

Because of the close proximity of halo area economies, they provide a pressure release for development both in the model and in reality to excess demand that may form in the Metro UGB. For example, as growth pressures tighten the supply or capacity inside the Metro UGB for residential (or employment) need, the halo areas may provide alternative housing options for residents and businesses in the future. As a market equilibrium model, MetroScope mimics economic choices and conditions. A choice for some residents (and businesses / employees) may be to live in single family housing beyond the UGB if price and availability make it unaffordable. This choice necessarily includes the choice to locate either inside the UGB or outside the UGB. Of course having supply (or capacity) is necessary but not sufficient if there is not the sufficient market demand to want to choose to locate outside the UGB. Where the growth distribution lands depends on many critical factors, one of which is the amount of residential (and employment) capacity available to accommodate regional growth.

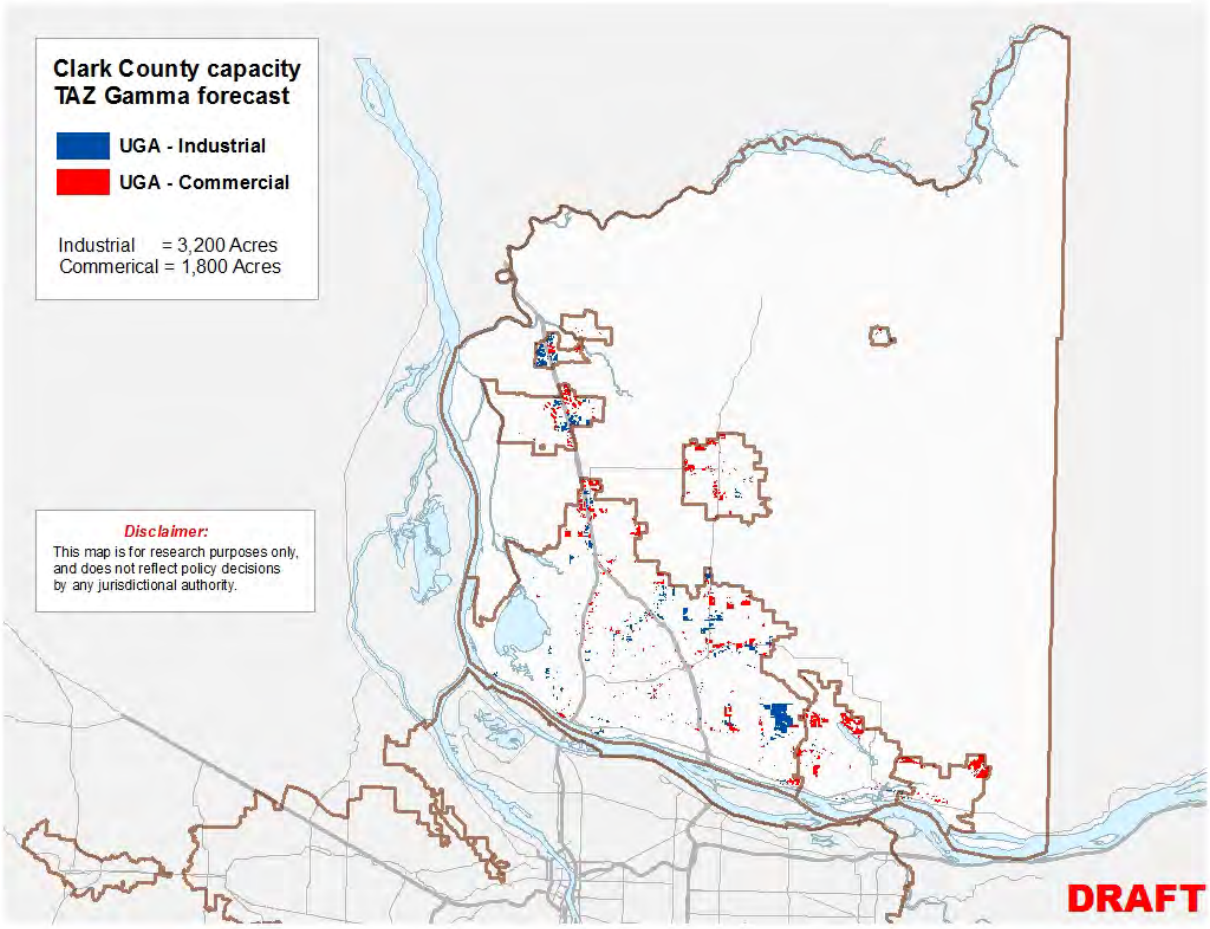


Map 5: Cities and Clark County Residential Capacity

Clark county BLI

The buildable land inventory for Clark County and its cities were given by the county's Vacant Buildable Land Model. Responsibility for this inventory is the county's own GIS and Assessment Department. The BLI includes both vacant and redevelopment supply estimates. The capacity includes data for both residential and non-residential sources. Non-residential capacity was divided into commercial and industrial sources according to zoning. The residential capacity was sorted into same categories of single family, multifamily and mixed used residential sources based on a cross-walk of city and county zoning ordinances to Metro's own standardized zone classification.

The capacity estimates for Clark County and its cities was essentially unchanged and directly inserted into the overall regional growth distribution forecast.



Map 6: Illustration of Cities and Clark County Employment Capacity

Other policy and infrastructure assumptions

In order to accurately assess future development patterns for employment and residential need, the TAZ forecast incorporates detailed Regional Transportation Plan (RTP) assumptions into the final forecast distribution. This includes travel time forecast information from zone pairs, auto occupancy assumptions, existing network assumptions and future network infrastructure investments.

There are 4 separate RTP assumptions used in preparing the final 2010 to 2040 TAZ forecast distributions. Since MetroScope is time path dependent and operates in 5-year growth increments, but the travel demand model has only 4 different networks corresponding to the MetroScope growth forecast years.

MetroScope Growth Forecast Year	Transportation Network
2010 and 2015	Existing 2010 base year
2020 and 2025	2017 Air Quality Conformity
2030 and 2035	2035 Financially Constrained (Federal network)
2040 and 2045	2035 Strategic (State network)

A map of the projects included in the 2035 State and Federal transportation networks is included in the appendix of this report.

- Federal and state regulations require that the region assess the air quality consequences of proposed transportation improvements. Current laws mean that the region must assess the carbon monoxide emissions from surface transportation sources to meet the Clean Air Act. Metro has prepared an air quality conformity transportation network as part of its determination for the federal component of the 2035 RTP and 2010-13 Metropolitan Transportation Improvement Program as required by state and federal law. For further information concerning the description and technical details of the 2017 air quality conformity network assumptions, please refer to the official air quality conformity determination documents.
- The federal component of the 2035 RTP represents a step toward improved implementation of the 2040 Growth Concept, the region's long-range plan for addressing expected growth while preserving our region's livability. The federal RTP meets federal timelines, fiscal requirements, and new requirements in the Safe, Accountable, Flexible and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). This was approved by the U.S. Department of Transportation on Feb. 29, 2008. For further information concerning the Metro ordinance, amendments, technical appendix, system management and operation plans, freight plan, transit plans, and final project list, please follow this link: http://www.oregonmetro.gov/index.cfm/go/by.web/id=25038.
- The state component of the 2035 RTP was a second step toward fulfilling the vision of Metro's 2040 Growth Concept. The second step has produced a final RTP that meets regional and state as well as federal planning requirements. The final RTP includes:
    - the first high-capacity transit plan since the early 1980s, which outlines priorities for future investments in an expanded light-rail network, bus rapid transit and other high-capacity transit corridors
    - a regional freight plan that looks at how freight can move more efficiently through the region's transportation system
    - the first comprehensive plan for transportation systems management and operations to make the most of investments already made in the transportation network
    - the first climate change action plan to address how an integrated set of transportation investments, land use policies and other strategies can most effectively reduce greenhouse gases
    - performance measures to link transportation investments to reducing the region's carbon footprint, job creation, protecting the urban growth boundary and enhancing travel options for everyone.

  Additional details and file documents can be found at this link: http://www.oregonmetro.gov/index.cfm/go/by.web/id=25038

Growth Forecast Distribution Summary Guide

Appendix 8 of this report summarizes the primary demand and supply assumptions utilized in the "gamma" growth forecast distribution. The gamma forecast represents a third refinement of the growth distribution. There were earlier versions – alpha and beta – generated on an as needed temporary basis. Both alpha and beta were interim forecasts which are now superseded by the gamma forecast. The alpha distribution was rejected outright and improved beta versions were developed for use in

- GHG modeling and forecast development (beta 1 version)
- Southwest corridor project analysis (beta 1 version)
- East Metro corridor planning (beta 1 version)
- City of Portland Plan (beta 2 version)

Neither alpha nor beta versions are to be used going forward.

Appendix 1: Adjusted "lower middle-third" forecast details (7-county totals)

Household Forecast by Income Bracket

Household Forecast by Age Bracket

Household Forecast by Persons per Household

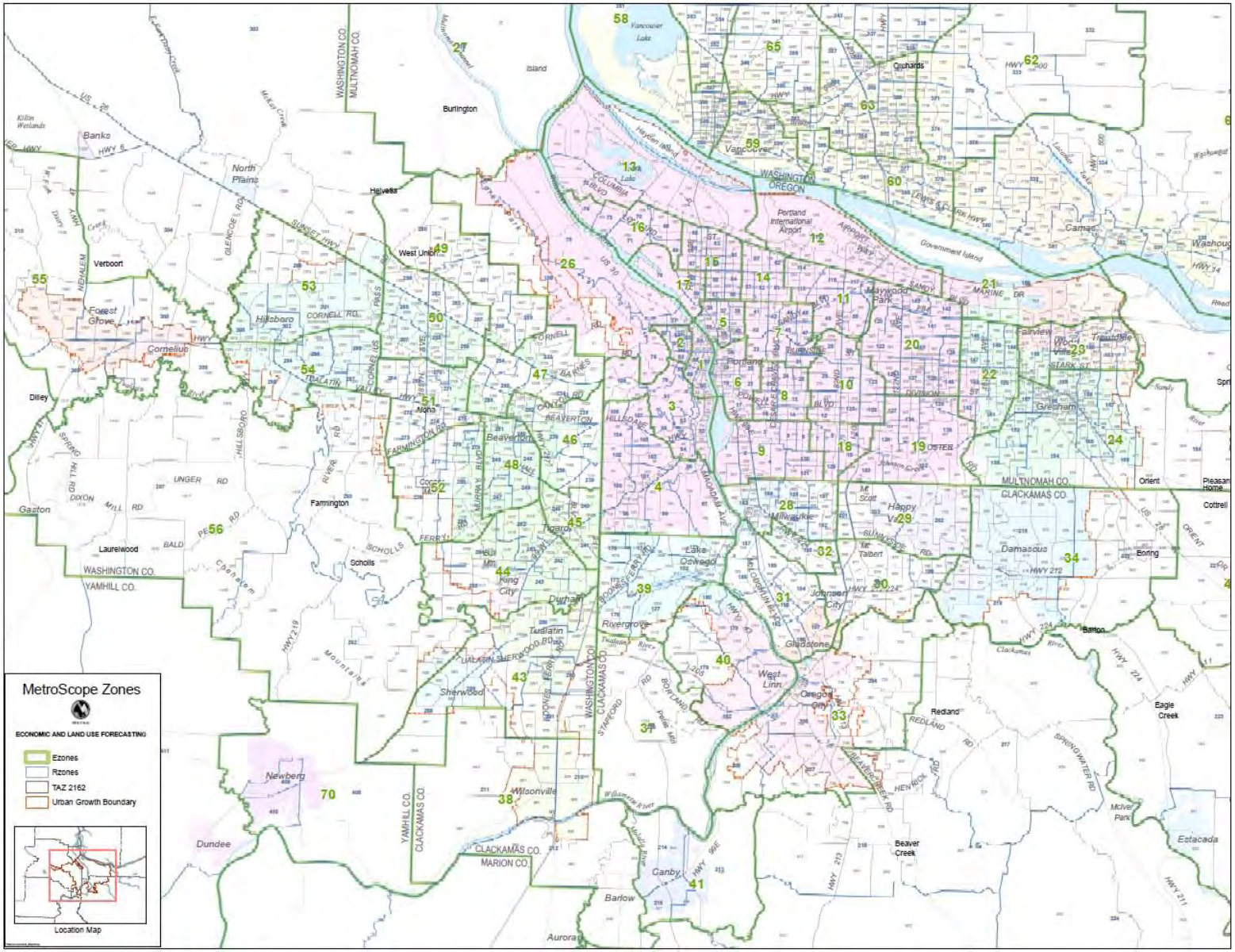
Industry Employment Forecast

Appendix 2: RLIS Standardized Regional Zone Class and Dwelling Unit Density Crosswalk Table

#	Standardized Regional Zones	Zone Class	Residential Lot Size		Maximum Units Allowed (Dwelling Units / Net Acre)			Zone Class
			Min	Max	Min	Max	Avg. Range Density	
1	Single Family 1 acre tax lot	SFR1	35,000	43,560	0	1	1	SFR1
2	Single Family 1/2 acre tax lot	SFR2	15,000	35,000	1.1	2	2	SFR2
3	Single Family 10,000 sq. ft. lot	SFR3	10,000	15,000	2.1	3	3	SFR3
4	Single Family 9,000 sq. ft. lot	SFR4	9,000	10,000	3.1	4	4	SFR4
5	Single Family 7,000 sq. ft. lot	SFR5	7,000	9,000	4.1	5	5	SFR5
6	Single Family 6,000 sq. ft. lot	SFR6	6,000	7,000	5.1	6	6	SFR6
7	Single Family 5,000 sq. ft. lot	SFR7	5,000	6,000	6.1	7	7	SFR7
8	Single Family 4,500 sq. ft. lot	SFR8	4,500	5,000	7.1	8	8	SFR8
9	Single Family 4,000 sq. ft. lot	SFR9	4,000	4,500	8.1	9	9	SFR9
10	Single Family 3,500 sq. ft. lot	SFR10	3,500	4,000	9.1	10	10	SFR10
11	Single Family 3,000 sq. ft. lot	SFR11	3,000	3,500	10.1	11	11	SFR11
12	Single Family 2,900 sq. ft. lot	SFR12	2,900	3,000	11.1	12	12	SFR12
13	Single Family 2,700 sq. ft. lot	SFR13	2,700	2,900	12.1	13	13	SFR13
14	Single Family 2,500 sq. ft. lot	SFR14	2,500	2,700	13.1	14	14	SFR14
15	Single Family 2,300 sq. ft. lot	SFR15	2,300	2,500	14.1	15	15	SFR15
16	Single Family 2,000 sq. ft. lot	SFR16	2,000	2,300	15.1	16	16	SFR16
17	Multi-family-Very Low Density	MFR1	Approx. FAR = 0.4		4	15	12.3	MFR1
18	Multi-family-Low Density	MFR2	Approx. FAR = 0.5		16	20	17.8	MFR2
19	Multi-family-Moderate Density	MFR3	Approx. FAR = 0.7		21	25	23.3	MFR3
20	Multi-family-Medium Density	MFR4	Approx. FAR = 0.8		26	30	29.4	MFR4
21	Multi-family-Med. High Density	MFR5	Approx. FAR = 1		31	35	33.4	MFR5
22	Multi-family-High Density	MFR6	Approx. FAR = 1.1		36	45	40.0	MFR6
23	Multi-family-Very High Density	MFR7	Approx. FAR = 2.1		46	85	73.1	MFR7
24	Mixed-Use Comm. & Res.	MUR1	Approx. FAR = 0.3		4	15	11.2	MUR1
25	Mixed-Use Comm. & Res.	MUR2	Approx. FAR = 0.5		16	20	18.2	MUR2
26	Mixed-Use Comm. & Res.	MUR3	Approx. FAR = 0.7		21	25	23.1	MUR3
27	Mixed-Use Comm. & Res.	MUR4	Approx. FAR = 0.8		26	30	29.1	MUR4
28	Mixed-Use Comm. & Res.	MUR5	Approx. FAR = 1		31	35	34.6	MUR5
29	Mixed-Use Comm. & Res.	MUR6	Approx. FAR = 1.1		36	45	40.1	MUR6
30	Mixed-Use Comm. & Res.	MUR7	Approx. FAR = 1.6		46	65	54.6	MUR7
31	Mixed-Use Comm. & Res.	MUR8	Approx. FAR = 2.2		66	100	75.5	MUR8
32	Mixed-Use Comm. & Res.	MUR9	Approx. FAR = 3.2		101	125	110.5	MUR9
33	Mixed-Use Comm. & Res.	MUR10	Approx. FAR = 6.4		126	700	222.5	MUR10
34	Future Urban Development	FUD					10	FUD
	Standardized Regional Zones	**Zoning**						**Zoning**
35	Commercial - Central	CC						CC
36	Commercial - General	CG						CG
37	Commercial - Neighborhood	CN						CN
38	Commercial - Office	CO						CO
39	Public & semi-public Uses	PF						PF
40	Industrial Campus	IC						IC
41	Industrial Office	IO						IO
42	Industrial - Light	IL						IL
43	Industrial - Heavy	IH						IH
44	Parks & Open Space	POS						POS
45	Exclusive Farm Use	EFU						EFU
46	Rural Residential	RRFU						RRFU
47	Rural Commercial	RC						RC
48	Rural Industrial	RI						RI

http://rlismetadata.oregonmetro.gov/display_rl.cfm?Meta_layer_id=416&Db_type=rlislite

Appendix 3: MetroScope_zones_taz2162.pdf



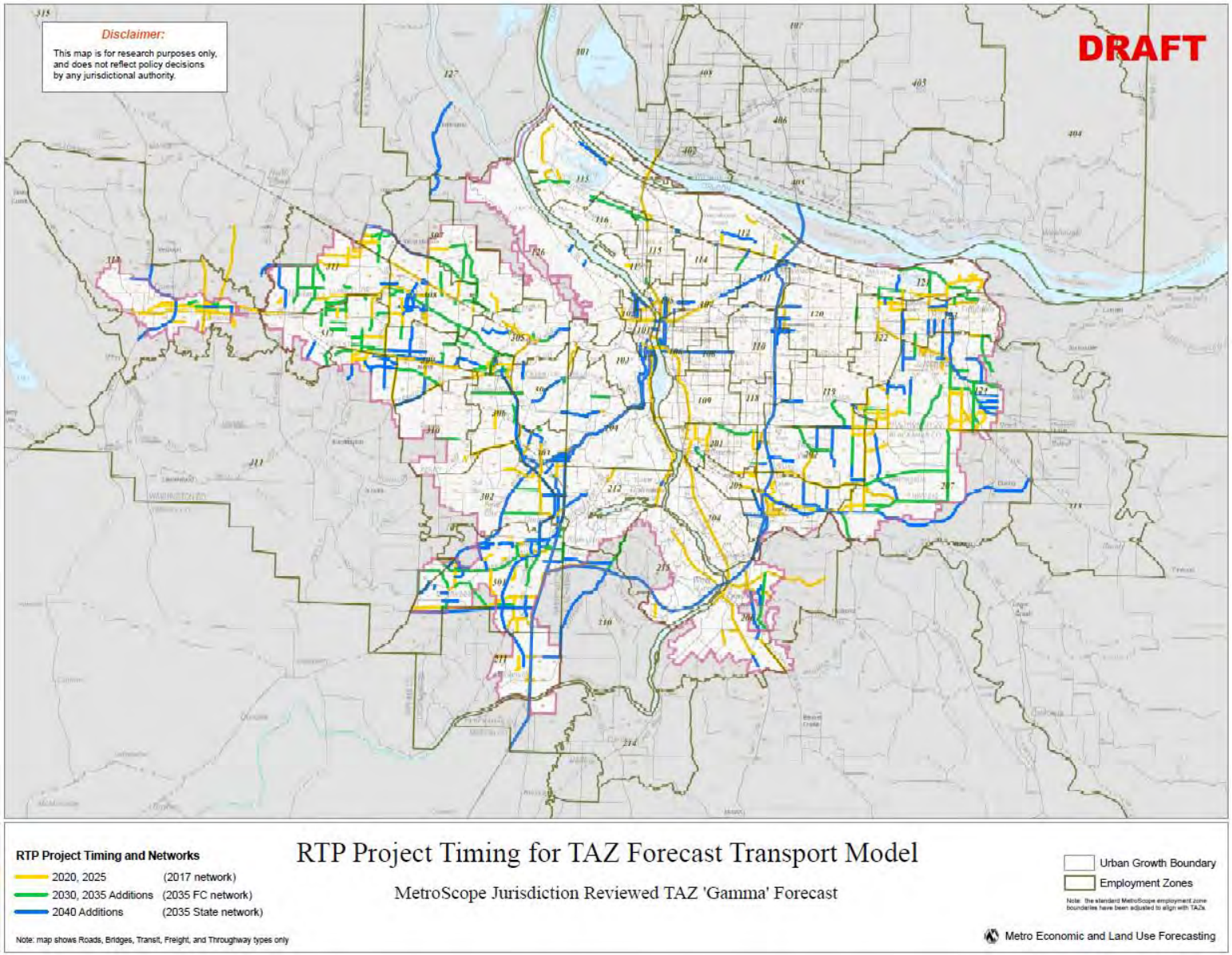
ftp://ftp.oregonmetro.gov/dist/gm/TazAlloc2010/July22_meeting/

Appendix 4: Metro UGB Residential Capacity Assumption – Jurisdiction Reviewed (DRAFT: 9/19/2012)

											Jurisciction Capacity		Percent of Jurisdiction Capacity by Building Type					
				Low Density		High Density				Urban	by Building Type		Percent of Total Capacity					
		Single Family (SF)		Multi-family (MF)		Multi-family (MF)		New Urban		Renewal							Vacant	Redev.
Local Government	TOTAL	Vacant	Infill	Vacant	Redev.	Vacant	Redev.	SF	MF	Areas	SF	MF	%SF	%MF	%Lo-MF	%Hi-MF	%Hi-MF	%Hi-MF
Clackamas Total	**63,228**	**5,578**	**11,906**	**2,241**	**6,020**	**23**	**489**	**17,353**	**14,117**		**34,837**	**22,891**	**55%**	**45%**	**13.1%**	**0.8%**	**0.0%**	**0.8%**
Damascus	**19,932**	0	0	0	0	0	0	10,892	9,041	0	10,892	9,041	55%	45%				
Gladstone	**1,093**	38	210	34	312	0	0	0	0	500	247	346	23%	77%	31.6%			
Happy Valley	**9,099**	1,184	1,403	690	147	0	0	2,013	3,662	0	4,601	4,498	51%	49%	9.2%			
Johnson City	**0**	0	0	0	0	0	0	0	0	0	0	0						
Lake Oswego	**3,383**	275	1,125	94	280	22	387	0	0	1,200	1,400	783	41%	59%	11.0%	12.1%	0.7%	11.4%
Milwaukie	**1,538**	185	897	128	225	1	102	0	0		1,082	456	70%	30%	22.9%	6.7%	0.1%	6.7%
Oregon City	**7,167**	846	1,726	471	1,488	0	0	178	457	2,000	2,750	2,417	38%	62%	27.3%			
Rivergrove	**72**	48	25	0	0	0	0	0	0		72	0	100%					
West Linn	**1,603**	607	766	44	185	0	0	0	0		1,374	230	86%	14%	14.3%			
Wilsonville	**3,570**	377	614	337	1,064	0	0	392	485	300	1,383	1,886	39%	61%	39.3%			
Clackamas UIA	**15,770**	2,017	5,141	443	2,319	0	0	3,878	473	1,500	11,035	3,235	70%	30%	17.5%			
Multnomah Total	**228,859**	**7,174**	**18,063**	**4,509**	**32,844**	**8,289**	**99,000**	**2,679**	**4,801**		**27,916**	**149,443**	**12%**	**88%**	**16.3%**	**46.9%**	**3.6%**	**43.3%**
Fairview	**684**	104	214	103	263	0	0	0	0		318	366	46%	54%	53.5%			
Gresham	**20,976**	1,242	3,463	1,087	6,821	269	1,429	987	1,378	4,300	5,692	10,984	27%	73%	37.7%	8.1%	1.3%	6.8%
Maywood Park	**6**	5	1	0	0	0	0	0	0		6	0	100%					
Portland	**198,991**	5,256	12,597	3,228	25,119	8,020	97,571	0	0	47,200	17,853	133,938	9%	91%	14.2%	53.1%	4.0%	49.0%
Troutdale	**1,124**	98	527	80	420	0	0	0	0		624	500	56%	44%	44.4%			
Wood Village	**270**	17	20	11	222	0	0	0	0		37	232	14%	86%	86.2%			
Multnomah UIA	**6,808**	453	1,240	0	0	0	0	1,693	3,423		3,386	3,423	50%	50%				
Washington Total	**78,236**	**6,600**	**23,786**	**9,579**	**20,373**	**981**	**4,215**	**5,456**	**4,245**		**35,843**	**39,393**	**46%**	**54%**	**38.3%**	**6.6%**	**1.3%**	**5.4%**
Beaverton	**10,217**	296	1,300	2,077	5,480	303	725	36	0		1,632	8,585	16%	84%	74.0%	10.1%	3.0%	7.1%
Cornelius	**209**	22	47	17	122	0	0	0	0		70	140	33%	67%	66.8%			
Durham	**61**	15	25	0	21	0	0	0	0		40	21	66%	34%	34.0%			
Forest Grove	**4,581**	879	1,184	545	1,973	0	0	0	0		2,063	2,518	45%	55%	55.0%			
Hillsboro	**15,038**	910	984	4,816	7,283	27	3	14	0	1,000	1,908	12,130	13%	87%	80.5%	0.2%	0.2%	0.0%
King City	**442**	231	90	110	11	0	0	0	0		320	121	73%	27%	27.4%			
Sherwood	**949**	50	248	111	317	0	0	53	169		351	597	37%	63%	45.1%			
Tigard	**8,893**	640	2,461	1,270	1,811	3	707	0	0	2,000	3,102	3,791	35%	65%	34.7%	8.0%	0.0%	7.9%
Tualatin	**613**	84	345	86	98	0	0	0	0		429	184	70%	30%	30.1%			
Washington UIA	**37,233**	3,473	17,101	546	3,256	648	2,780	5,353	4,076		25,927	11,306	70%	30%	10.2%	9.2%	1.7%	7.5%
UGB TOTAL	**370,324**	**19,352**	**53,755**	**16,329**	**59,237**	**9,294**	**103,704**	**25,489**	**23,163**	**60,000**	**98,596**	**211,728**	**27%**	**73%**	**20.4%**	**30.5%**	**2.5%**	**28.0%**

MF cateogory includes capacity in MFR and MUR zone classes
UIA = unincorporated county areas inside Metro UGB
New Urban = post-1997 UGB amendments
Cities are defined by 2010 RLIS boundaries
Low density MF < 75 units per acre
High density MF > 75 units per acre

Appendix 5: Illustration of the Timing of Transportation Projects and Investments



ftp://ftp.oregonmetro.gov/dist/gm/TazAlloc2010/FINAL_2035-2040_TAZforecast/

Appendix 7: Subsidized Redevelopment Supply Assumptions (8/24/2011)

Location	2040 Design Type	Subsidized Capacity DU	Mscope Zone Class	DU per net acre	Subsidy per Unit	Estimated Subsidy Assumption	Percent of dwelling units with incentive available (timing) 2015	2020	2025	2030	2035	2040	2045	Total
Downtown	CC	6,500	MUR9	125	$50,000	$325,000,000	20%	40%	40%					100%
North Macadam	CC	7,500	MUR9	125	$50,000	$375,000,000	33%	33%	33%					100%
Oregon Conv. Center	CC	6,000	MUR9	125	$50,000	$300,000,000	33%	33%	33%					100%
River District	CC	12,000	MUR9	125	$50,000	$600,000,000	25%	25%	25%	25%				100%
South Park Blocks	CC	1,000	MUR9	125	$50,000	$50,000,000	25%	25%	25%	25%				100%
Amberglen/Tanasbourne	Reg. Ctr.	500	MUR4	30	$25,000	$12,500,000	25%	25%	25%	25%				100%
Clackamas Town Center	Reg. Ctr.	1,500	MUR4	30	$25,000	$37,500,000	25%	25%	25%	25%				100%
Gateway	Reg. Ctr.	2,000	MUR4	30	$25,000	$50,000,000	25%	25%	25%	25%				100%
Gresham	Reg. Ctr.	2,500	MUR4	30	$25,000	$62,500,000	33%	33%	33%					100%
Hillsboro	Reg. Ctr.	500	MUR4	30	$25,000	$12,500,000		20%	20%	20%	20%	20%		100%
Oregon City	Reg. Ctr.	2,000	MUR4	30	$10,000	$20,000,000	33%	33%	33%					100%
Vancouver	Reg. Ctr.	6,000	MUR4	30	$25,000	$150,000,000	20%	20%	20%	20%	20%			100%
Gladstone	Town Ctr.	500	MUR4	30	$10,000	$5,000,000	20%	20%	20%	20%	20%			100%
Hollywood	Town Ctr.	2,500	MUR4	30	$10,000	$25,000,000	25%	25%	25%	25%				100%
Lake Oswego	Town Ctr.	1,200	MUR4	30	$25,000	$30,000,000		20%	20%	20%	20%	20%		100%
Lents	Town Ctr.	1,200	MUR4	30	$25,000	$30,000,000		20%	20%	20%	20%	20%		100%
Rockwood (Gresham)	Town Ctr.	1,200	MUR4	30	$25,000	$30,000,000	20%	20%	20%	20%	20%			100%
Tigard	Town Ctr.	2,000	MUR4	30	$10,000	$20,000,000		20%	20%	20%	20%	20%		100%
Interstate	Non-Ctr. UR	4,000	MUR4	30	$50,000	$200,000,000	25%	25%	25%	25%				100%
MLK	Non-Ctr. UR	1,500	MUR4	30	$50,000	$75,000,000	20%	20%	20%	20%	20%			100%
Villebois (Wilsonville)	Non-Ctr UR	300	MUR4	30	$10,000	$3,000,000	33%	33%	33%					100%
NE 60th Ave MAX Station	Portland TOD*	600	MUR4	30	$10,000	$6,000,000	25%	25%	25%	25%				100%
NE 82nd Ave MAX Station	Portland TOD*	600	MUR4	30	$10,000	$6,000,000	25%	25%	25%	25%				100%
E 148th Ave MAX Station	Portland TOD*	600	MUR4	30	$10,000	$6,000,000	25%	25%	25%	25%				100%
E 162nd Ave MAX Station	Gresham TOD*	600	MUR4	30	$10,000	$6,000,000	25%	25%	25%	25%				100%
E 122nd Ave MAX Station	Portland TOD*	600	MUR4	30	$10,000	$6,000,000	25%	25%	25%	25%				100%
SE Division St.	Portland TOD*	600	MUR4	30	$10,000	$6,000,000	25%	25%	25%	25%				100%
Canby	rural City	600	MUR4	30	$10,000	$6,000,000			20%	20%	20%	20%	20%	100%
Sandy	rural City	600	MUR4	30	$10,000	$6,000,000			20%	20%	20%	20%	20%	100%

REGION TOTAL:	67,200	units
Metro UGB Total:	60,000	units
Portland subtotal:	47,200	units

*** 1/4 mile radius around MAX stations at NE 60th, NE 82nd, 122nd, 148th, SE Division, Portland portion of 162nd**

Note: updated from 7/27/11

Appendix 7: Urban Reserve Capacity Assumptions

Urban Reserve Name	Code	Subarea	Year Avail.	SF acres	MF acres	SF Cap	MF Cap	Total Cap	IND acres	COM acres
Gresham East	1C		2040	323	111	2,815	4,986	7,801	0	28
Boring	1D		2045	0	0	0	0	0	1,159	0
Boring	1F		2045	0	0	0	0	0	492	0
Damascus	2A		2045	466	160	4,064	7,197	11,261	0	40
Holcomb	3B		2045	115	39	713	1,767	2,479	0	10
Holly Ln/Newell Ck Canyon	3C		2045	106	36	658	1,631	2,289	0	9
Maplelane	3D		2035	169	58	1,052	2,608	3,661	0	14
Henrici	3F		2030	110	38	685	1,699	2,384	0	9
Beaver Creek Bluffs	3G		2030	77	26	479	1,187	1,666	0	7
Stafford	4A									
		4A-N	2040	208	71	1,293	3,205	4,497	0	18
		4A-S	2045	590	202	4,282	9,099	13,381	0	51
Rosemont	4B		2040	55	19	343	851	1,195	0	5
Borland	4C		2045	288	99	1,790	4,439	6,229	0	25
Norwood	4D		2045	460	158	2,863	7,098	9,960	0	39
I-5 East – Washington Co	4E		2045	343	117	2,132	5,285	7,417	0	29
I-5 East – Washington Co	4F		2045	112	38	694	1,720	2,414	0	10
I-5 East – Washington Co	4G		2040	264	91	1,643	4,073	5,716	0	23
Advance	4H		2025	98	34	949	1,513	2,462	0	8
Sherwood North	5A		2035	40	14	247	612	859	0	3
Sherwood West	5B		2030	506	173	4,405	7,801	12,206	0	43
Sherwood South	5D		2035	140	48	1,223	2,165	3,388	0	12
Tonquin	5F		2035	0	0	0	0	0	257	0
Grahams Ferry	5G		2035	65	22	403	998	1,401	0	6
Wilsonville Southwest	5H		2030	25	8	239	381	620	0	2
South Hillsboro	6A									
		6A-E	2025	403	138	3,509	6,214	9,723	0	60
		6A-W	2035	245	84	2,369	3,776	6,145	0	21
South Cooper Mountain	6B									
		6B-i	2025	225	77	1,455	2,554	4,009	0	19
		6B-ii	2035	212	73	1,371	2,406	3,777	0	18
		6B-iii	2035	92	31	593	1,041	1,634	0	8
		6B-iv	2045	92	32	597	1,048	1,645	0	8
Roy Rogers West	6C									
		6C-i	2030	117	40	852	1,811	2,662	0	10
		6C-ii	2035	60	20	433	921	1,354	0	5
		6C-iii	2045	59	20	429	913	1,342	0	5
Beef Bend South	6D									
		6D-E	2035	51	18	445	788	1,233	0	4
		6D-W	2045	112	38	815	1,732	2,547	0	10
David Hill	7A									
		7A-i	2040	43	15	309	657	966	0	4
		7A-ii	2045	63	22	456	970	1,426	0	5
Forest Grove North	7B									
		7B-i	2025	0	0	0	0	0	189	0
		7B-ii	2035	0	0	0	0	0	84	0
		7B-iii	2045	0	0	0	0	0	146	0
Cornelius East	7C		2025	53	18	462	819	1,281	0	5
Cornelius South	7D		2025	101	35	878	1,555	2,432	0	9
Forest Grove South	7E		2025	0	0	0	0	0	36	0
North Hillsboro	8A									
		8A-E	2025	168	0	1,120	0	1,120	629	0
		8A-W	2035	339	29	1,933	1,301	3,234	893	172
Shute Road Interchange	8B									
		8B-i	2035	0	0	0	0	0	61	0
		8B-ii	2035	0	0	0	0	0	304	0
Bethany West	8C		2035	76	26	663	1,174	1,837	0	7
Urban Reserves Total				**7,068**	**2,278**	**51,662**	**99,995**	**151,657**	**4,250**	**760**

	SF acres	MF acres	SF Cap	MF Cap	Total Cap	IND acres	COM acres
2025 Total	1,048	302	8,374	12,654	21,028	854	101
2030 Total	835	286	6,660	12,879	19,539	0	72
2035 Total	1,488	423	10,732	17,790	28,522	1,599	270
2040 Total	893	306	6,403	13,772	20,176	0	77
2045	2,805	962	19,493	42,900	62,393	1,797	240

Total							
	7,068	**2,278**	**51,662**	**99,995**	**151,657**	**4,250**	**760**

Appendix 8: 2010-40 TAZ Forecast: MetroScope "Gamma" version land use scenario assumptions

November 2012 Metro Research Center

Theme	Major category	Subcategory	Scenario Assumption
DEMAND	Forecast control totals Portland-Hillsboro-Vancouver, OR-WA, PMSA (7 counties) Source: middle-thrid.xls	Household	Use 2010-35 adjusted lower middle-third forecast 2010: 873,100 (Census 2010) 2040: 1,346,600 2010-35: 473,500 %APR: 1.45%
		Employment	Use 2010-40 adjusted lower middle-third forecast 2010: 968,800 (BLS 2010 estimate) 2040: 1,593,000 2010-35: 624,200 %APR: 1.67%
SUPPLY (CAPACITY)	Metro UGB capacity	Zoned capacity	Tri-county (Clackamas, Multnomah, Washington): updated 2010 zone class
		Vacant land	2008 vacant land based on aerial photography, permit data, and assessor records and amended by local review
		Buildable land	2008 inventory (less environmental constraints based on latest 2010 data, also deduct major known utility easements)
		Redev. capacity	Reviewed by local jurisdictions (see: Metro Research Center capacity white paper)
		Prospective UGB expansions	See separate map (expansion locations based on designated Urban Reserves; expansion timing assumptions informed by local jurisdiction review)
		Recent UGB expansions	Urban zoning assumptions for new urban areas (i.e., post-1997 expansions)and future urban reserves are delayed to account for lags in infrastructure development
	Clark County capacity	Zoning	2010 zoning
		Vacant, buildable land	2010 VBLM - provided by Clark County, using Clark County methodology (i.e. different than Metro's methodology for vacant / buildable)
		Redev. capacity	2010 VBLM
		Urban Growth Area expansions	Clark Co. urban reserve areas in effect in 2009 (incorporates latest court decision that added in ~19 sq. miles) metered in roughly equal proportions [reflects court overturning selected areas] Zoning is based on latest comp plans
	Neighbor city capacity	Zoning	Zoned capacity is assumed equal to twice year 2000 Census number of households
		UGB expansions	Implicitly calculated from zoned capacity amount
	Tri-county rural residential capacity	M-49 and RRFU capacity	Assume 3 dwelling units per Measure 37 claims
	Ex-urban rural county capacity	Columbia, Yamhill & Marion (part)	Zoned capacity is assumed equal to twice year 2000 Census number of households
Other forecast variables	Construction costs	SDC	Assume added $25,000 per new dwelling unit in all locations to per unit construction costs
	exogenous Consumer preference assumptions	Residential subsidized redevelopment	Refer to separate schedule of investments (3 tiers of subsidies: $50,000, $25,000, $10,000 per new redev. unit); e.g., reflects either active urban renewal or other incentive such as a vertical housing tax credit.
		Neighborhood score	Neighborhood score is an input that describes the relative (historic) desirability of different neighborhoods (based on a statistical analysis of historic residential sales data that controls for residence size, lot size, 3 of bedrooms, etc.)
	Accessibility	Transportation Travel times	Use 3 network years: 2010, 2017 and 2035 2010 network of existing conditions (2010-15 forecast years) 2017 network (2020-25 forecast years) 2035 network of federal financially constrained RTP assumptions (2020-25 forecast years) 2035 network state RTP assumptions (2040 and 2045 forecast years)

Appendix 9: Ordinance No. 12-1292 Exhibits A

2035 Reviewed Household Forecast Distribution by Jurisdiction
MetroScope Gamma TAZ Forecast

Final Draft 9/19/2012

Notes: Jurisdiction geographies are approximate, and based on TAZs. Urban Reserves are considered to be outside the UGB.

	2010 Reviewed HH			2035 Reviewed HH			2010-2035 Change		
Inside UGB:	**SF**	**MF**	**Total**	**SF**	**MF**	**Total**	**SF**	**MF**	**Total**
Beaverton	18,128	21,953	40,081	20,038	30,479	50,517	1,910	8,526	10,436
Cornelius	2,467	1,051	3,518	3,428	2,085	5,513	961	1,034	1,995
Damascus	3,322	205	3,527	11,700	217	11,916	8,378	12	8,389
Durham	350	8	358	410	26	436	60	18	78
Fairview	1,677	1,954	3,631	1,927	2,076	4,003	250	122	372
Forest Grove	4,775	2,717	7,492	6,999	3,380	10,379	2,224	663	2,887
Gladstone	2,831	1,356	4,187	3,097	1,779	4,876	266	423	689
Gresham	19,781	18,243	38,024	25,394	25,656	51,051	5,613	7,413	13,027
Happy Valley	4,162	273	4,435	9,898	512	10,410	5,736	239	5,975
Hillsboro	18,575	14,251	32,826	21,762	23,211	44,973	3,187	8,960	12,147
King City	572	383	955	590	379	969	18	-4	14
Lake Oswego	10,887	5,180	16,067	12,307	6,984	19,291	1,420	1,804	3,224
Milwaukie	5,934	2,307	8,241	7,166	2,574	9,740	1,232	267	1,499
Oregon City	8,463	3,511	11,974	12,186	4,861	17,047	3,723	1,350	5,073
Portland	143,801	104,915	248,716	165,636	204,068	369,704	21,835	99,153	120,988
Sherwood	4,971	1,505	6,476	5,553	1,716	7,269	582	211	793
Tigard	12,035	6,632	18,667	15,120	10,877	25,997	3,085	4,245	7,330
Troutdale	3,981	1,806	5,787	4,506	2,126	6,632	525	320	845
Tualatin	5,391	4,847	10,238	5,980	5,190	11,170	589	343	932
West Linn	7,670	2,582	10,252	9,237	2,751	11,988	1,567	169	1,736
Wilsonville	3,471	4,509	7,980	5,625	5,883	11,508	2,154	1,374	3,528
Wood Village	458	1,081	1,539	488	1,121	1,609	30	40	70
Uninc. Clackamas Co.	21,497	13,559	35,056	28,816	16,650	45,466	7,319	3,091	10,410
Uninc. Multnomah Co.	1,715	314	2,029	3,260	847	4,107	1,545	533	2,078
Uninc. Washington Co.	50,176	21,204	71,380	71,698	28,778	100,476	21,522	7,574	29,096
Inside UGB Total	357,090	236,346	593,436	452,823	384,225	837,048	95,733	147,879	243,612
Outside UGB:									
Clackamas County	40,749	4,202	44,951	60,792	5,600	66,392	20,043	1,398	21,441
Multnomah County	3,776	97	3,873	4,243	122	4,365	467	25	492
Washington County	11,259	101	11,360	27,369	5,401	32,770	16,110	5,300	21,410
Clark County	114,638	114,638	158,110	164,207	64,185	228,392	49,569	20,713	70,282
Outside UGB Total	170,422	119,038	218,294	256,610	75,309	331,919	86,188	27,437	113,625
Four-County Total	527,512	284,218	811,730	709,433	459,534	1,168,967	181,921	175,316	357,237

Appendix 8: Ordinance No. 12-1292 Exhibits B

2035 Reviewed Employment Forecast Distribution by Jurisdiction
MetroScope Gamma TAZ Forecast

Final Draft 9/19/2012

Notes: Jurisdiction geographies are approximate, and based on TAZs. Urban Reserves are considered to be outside the UGB.

	2010 Employment Geocode				2035 Jurisdiction Review				2010 - 2035 Change			
Inside UGB:	**Retail**	**Service**	**Other**	**Total**	**Retail**	**Service**	**Other**	**Total**	**Retail**	**Service**	**Other**	**Total**
Beaverton	11,041	19,261	21,539	51,841	14,254	33,282	27,822	75,358	3,213	14,021	6,283	23,517
Cornelius	693	711	1,680	3,084	1,611	1,880	4,440	7,931	918	1,169	2,760	4,847
Damascus	260	357	908	1,525	902	1,613	1,894	4,409	642	1,256	986	2,884
Durham	1	213	318	532	1	307	458	766	0	94	140	234
Fairview	236	497	1,878	2,611	558	3,293	3,724	7,575	322	2,796	1,846	4,964
Forest Grove	882	2,018	2,617	5,517	1,747	3,455	5,343	10,545	865	1,437	2,726	5,028
Gladstone	702	546	883	2,131	903	1,040	1,092	3,035	201	494	209	904
Gresham	7,353	8,871	16,408	32,632	12,334	20,154	26,079	58,567	4,981	11,283	9,671	25,935
Happy Valley	241	256	621	1,118	789	1,842	1,616	4,247	548	1,586	995	3,129
Hillsboro	9,584	14,449	34,227	58,260	12,152	25,518	55,733	93,403	2,568	11,069	21,506	35,143
King City	137	269	64	470	173	511	137	821	36	242	73	351
Lake Oswego	2,553	7,024	8,670	18,247	2,323	11,584	8,879	22,786	-230	4,560	209	4,539
Milwaukie	1,403	3,527	6,658	11,588	1,944	5,751	7,712	15,407	541	2,224	1,054	3,819
Oregon City	3,081	3,727	7,580	14,388	5,418	6,990	10,077	22,485	2,337	3,263	2,497	8,097
Portland	65,150	139,116	170,076	374,342	76,134	218,147	214,199	508,482	10,984	79,031	44,123	134,140
Sherwood	1,103	1,206	1,907	4,216	1,643	2,604	5,005	9,252	540	1,398	3,098	5,036
Tigard	9,072	11,901	16,196	37,169	10,764	23,818	19,650	54,232	1,692	11,917	3,454	17,063
Troutdale	1,272	493	2,361	4,126	2,039	2,357	5,615	10,011	767	1,864	3,254	5,885
Tualatin	4,372	6,140	12,460	22,972	5,066	8,868	21,305	35,239	694	2,728	8,845	12,267
West Linn	966	1,593	1,693	4,252	1,517	2,683	2,331	6,531	551	1,090	638	2,279
Wilsonville	2,480	4,839	9,754	17,073	3,536	9,733	14,150	27,419	1,056	4,894	4,396	10,346
Wood Village	1,261	242	531	2,034	1,783	1,158	1,489	4,430	522	916	958	2,396
Uninc. Clackamas Co.	11,506	13,302	20,344	45,152	15,519	26,628	25,775	67,922	4,013	13,326	5,431	22,770
Uninc. Multnomah Co.	109	377	396	882	749	1,658	2,367	4,774	640	1,281	1,971	3,892
Uninc. Washington Co.	5,929	13,844	17,097	36,870	8,659	23,012	31,142	62,813	2,730	9,168	14,045	25,943
Inside UGB Total	141,387	254,779	356,866	753,032	182,518	437,886	498,034	1,118,440	41,131	183,107	141,168	365,408

2010 Employment Geocode	2035 Jurisdiction Review	2010 - 2035 Change

Outside UGB:	Retail	Service	Other	Total	Retail	Service	Other	Total	Retail	Service	Other	Total
Clackamas County	4,803	5,218	15,348	25,369	8,182	11,295	22,359	41,836	3,379	6,077	7,011	16,467
Multnomah County	361	479	1,513	2,353	384	876	1,945	3,205	23	397	432	852
Washington County	854	1,640	5,881	8,375	2,363	6,659	18,084	27,106	1,509	5,019	12,203	18,731
Clark County	25,375	42,061	59,831	127,267	40,864	80,963	100,193	222,020	15,489	38,902	40,362	94,753
Outside UGB Total	31,393	49,398	82,573	163,364	51,793	99,793	142,581	294,167	20,400	50,395	60,008	130,803
Four-County Total	172,780	304,177	439,439	916,396	234,311	537,679	640,615	1,412,607	61,531	233,502	201,176	496,211

ftp://ftp.oregonmetro.gov/dist/gm/TazAlloc2010/FINAL_2035-2040_TAZforecast/2035 Reviewed Forecast Distribution by Jurisdiction.xlsx

Appendix 9: 2010, 2025, 2035, 2040 TAZ Growth Distribution

(forthcoming)