



**MILWAUKIE CLIMATE FRIENDLY AREA
MODELING CASE STUDY**

**ODOT TRANSPORTATION PLANNING RULE MODELING AND
ANALYSIS GUIDELINES UPDATE PROJECT**

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EXECUTIVE SUMMARY

The TPR Modeling and Analysis Guides Update (the “Project”) provides modeling and transportation analysis procedural guidance to address recent changes to the Oregon Administrative Rules (OAR) sections 660-012 and 660-044 related to the Climate-Friendly and Equitable Community (CFEC) program. To help develop modeling guidance, the Project includes two sample case studies, one using activity-based travel demand models (Ashland) and the other using trip-based travel demand models (Milwaukie). The purpose of this case study in Milwaukie is to serve as a “sample problem” of trip-based travel demand models to:

- Test and refine new modeling procedures related to CFEC requirements, and
- Demonstrate technical approaches in alignment with the Transportation Planning Rules (TPR).

The case study is not intended to make any technical findings specific to the jurisdiction and is not intended to suggest planned land use or transportation actions. Rather, the intent of this case study analysis is to include a reasonable range of potential “actions” (investments, programs, or policies that could be placed into Transportation System Plans) that cities could contemplate implementing as part of addressing CFEC requirements. The intent of the case study is to provide a reasonable example that demonstrates the methodology, data needs, and potential results that can be used as technical guidance and as a future reference to inform upcoming TSPs.

The following report is organized around the steps listed in *Technical Memorandum #5: CFA Framework*. Table 1 below summarizes the key steps and outcomes from the case study for each step that may influence future analysis guidance.

TABLE 1. KEY ANALYSIS CHECKLIST STEPS AND SUMMARY OF CASE STUDY OUTCOMES

STEP	KEY OUTCOME
STEP 1: REFERENCE INPUTS	The 2015 base year and 2040 future year regional travel demand model (RTDM) was used for the case study analysis along with the 2018 RTP (Regional Transportation Plan) Financially Constrained Network. In the RTDM, there are 42 TAZs wholly or partially within the City of Milwaukie.
STEP 2: LAND USE STEPS	Downtown Milwaukie’s designation as a Town Center within the Metro 2040 Growth Concept serves as its CFA. There are 11 TAZs wholly or partially within the CFA boundary. Demographic assumptions within the RTDM were adjusted to fit more closely with those expected to be exhibited within a CFA. These adjustments were primarily made via analytical means but would ideally include coordination and review by local agency staff.
STEP 3: OTHER ZONAL DATA	Parking, transit coverage, and intersection density were reviewed in the model but were not modified for the CFA scenario. A sensitivity test was conducted that explored adjusting the ped/bike connector lengths to approximate connectivity improvements for the multimodal system.

STEP	KEY OUTCOME
STEP 4: NETWORK EDITS	Transportation improvements planned within the CFA were reviewed and were found to be already included in the RTDM.
STEP 5: MODEL RUN	Metro staff conducted full RTDM runs that included changes to land use and other zonal data and the zonal connector lengths. Metro staff provided output data to the analysis team for review and evaluation.
STEP 6: MODEL OUTPUT – VMT PER CAPITA	Household-based light-vehicle VMT per capita was evaluated in alignment with the OAR 660-012-0005(64) definition. The various components of VMT within the model area and external to the model area were calculated using the RTDM and SWIM outputs. The VMT per capita calculations indicated that while the 2040 “Base” (RTP) model would have approximately a 6.5 percent reduction from year 2015, the 2040 CFA scenario would have a 9.3 percent reduction.

BACKGROUND

THE RULEMAKING

The Land Conservation and Development Commission initiated the 2023 rulemaking for the Climate-Friendly and Equitable Communities (CFEC) program on April 20, 2023, and finalized it on November 2, 2023. The 2023 rulemaking process updated the previously adopted 2022 rules. Through the 2022 rulemaking, OAR 660-012-0310 describes out the creation and designation of Climate Friendly Areas (CFA). Areas designated as Town Centers within the Metro 2040 Growth Concept serve as CFAs in the Portland metropolitan area.

A CFA supports development that is consistent with high-density residential uses, a high concentration of employment opportunities, and is served by high-quality pedestrian, bicycle, and transit services. The concept of Climate Friendly Areas was developed to help meet Oregon’s climate pollution reduction and equity goals by facilitating the development of urban areas in which residents are less dependent on single occupancy vehicles. This supports jurisdictions meet the requirement (OAR 660-012-0160) that their TSP achieve a future household-based VMT per capita reduction that is no higher than the base year level. Similarly, regional transportation plans must meet the full target VMT per capita reduction as described in OAR 660-012-0020.

Note the use of the term VMT per capita and the calculation of such is defined in OAR 660-012-0005(64) which defines Vehicle Miles Traveled as all jurisdictional household-based light vehicle travel regardless of where the travel occurs.

CITY OF MILWAUKIE

The City of Milwaukie was an area chosen to perform a case study to advance understanding of the effect of the TPR on future transportation modeling procedures in part because it is located within the Portland Metro Regional Transportation Model (RTDM). It was also chosen because an update of

the City’s Transportation System Plan is currently underway as of 2023. **The case study is not intended to make any technical findings specific to Milwaukie. It is not intended to suggest planned land use or transportation actions but is instead intended to demonstrate a “sample problem” to implementing modeling analysis and procedures.**

Due to market considerations and other factors, forecasted total housing units within a CFA will ultimately be determined through implementation of aspects of Milwaukie’s most recently adopted Housing Needs Assessment; total jurisdiction population is forecast through PSU Population Resource Center.

STEP 1. REFERENCE INPUTS

Figure 1 shows Milwaukie’s boundaries within the Portland Metro Regional Travel Demand Model (RTDM). There are 42 different Transportation Analysis Zones (TAZ) within the RTDM that are entirely or partially within Milwaukie’s boundaries.

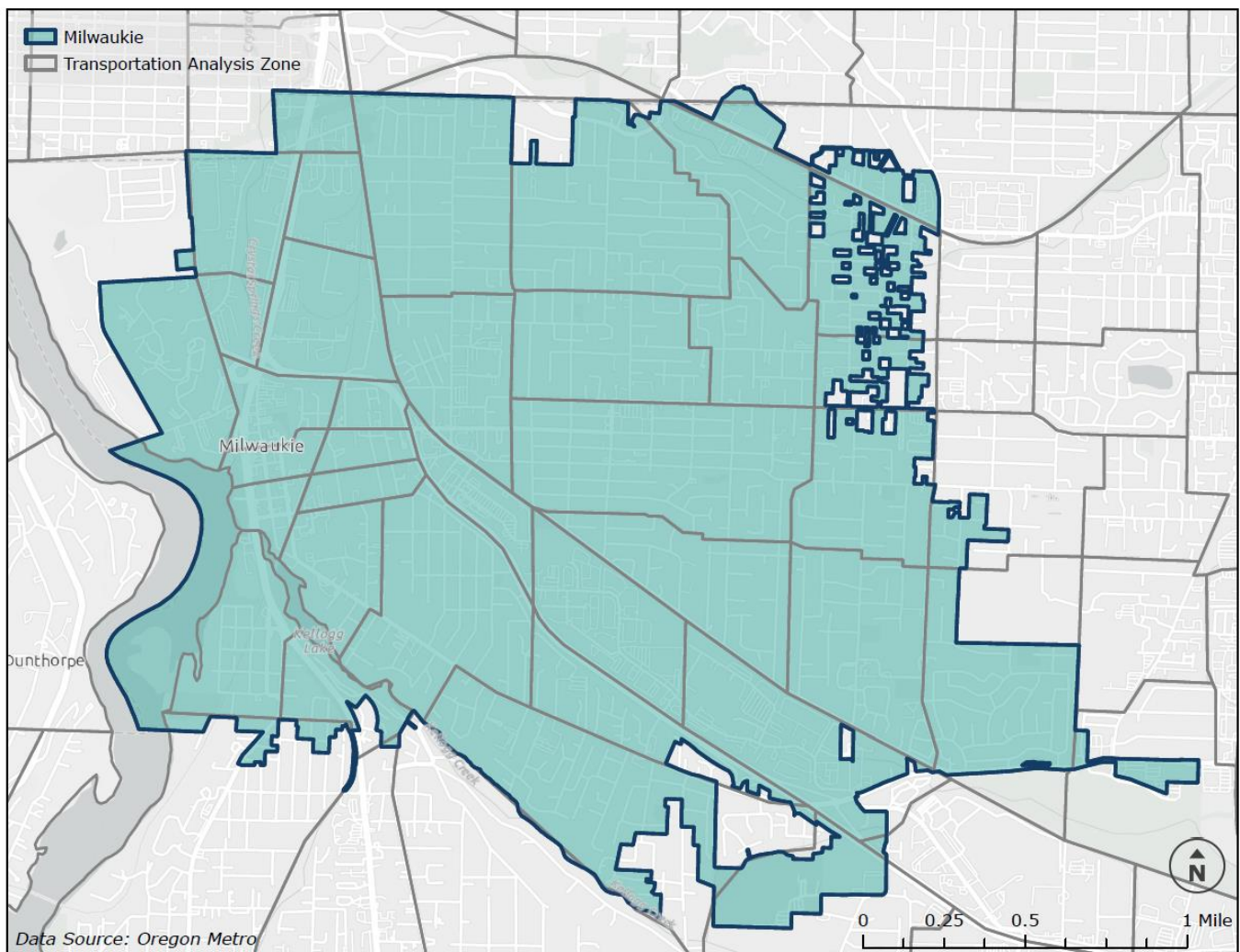


FIGURE 1. CITY OF MILWAUKIE TRANSPORTATION ANALYSIS ZONES

Table 2 lists key reference inputs from the RTDM used for this analysis. Note that the 2018 Regional Transportation Plan (RTP) model was used for this case study as the modeling for the 2023 RTP update was still underway at the time this case study analysis began.

TABLE 2. REFERENCE INPUTS

REFERENCE INPUTS	NOTES
MODEL BASE AND FUTURE YEAR	2015 base year; 2040 future year
STARTING NETWORK ASSUMPTIONS	2018 RTP Model Financially Constrained Network
FUTURE (2040) POPULATION TOTALS	23,149
AUTO OPERATING COSTS	Auto operating costs consist of fuel, oil, tires and general maintenance costs on a per mile basis. This cost is modeled as \$0.21 per mile in 2010 dollars, as derived from information from AAA. For future year forecasts, the model assumes that this operating cost per mile will rise with inflation. Upcoming Analysis Procedures Manual (APM) guidance is being developed that will recommend an Oregon auto operating costs forecast that better reflects fleet electrification and other changes.
INFLATION ADJUSTED INPUTS	Auto operating costs, parking factors (1.5% above the inflation annual growth rate) follow Metro assumptions.
INCOME GROWTH	Not investigated for purposes of this case study (future exploration needed).
VALUE OF TIME	Not investigated for purposes of this case study (future exploration needed).

STEP 2. LAND USE STEPS

This step helps to provide context as to whether parameters in current modeling processes need to be updated to better account for travel changes with Milwaukie’s downtown CFA. The goal of this step is to better understand current and future land use for the study area to better inform the model. Specifically, how might land use and demographic assumptions change proposed housing densities with the CFA, and how would this impact performance measures such as VMT per capita, Step 2 includes the following:

- Identify Representative TAZs
- Gather Planning Information
- Review Existing Model Land Use Assumptions
- Propose Updated Model Land Use Assumptions

IDENTIFY REPRESENTATIVE TAZS

As previously identified, there are 42 TAZs within the boundaries of the City of Milwaukie. Areas within the Portland Metro Urban Growth Boundary (UGB) designated as Town Centers or Regional Centers in the 2040 Growth concept¹ are defined as CFAs in the TPR. The 2040 Growth Concept is a long-range plan adopted by the Metro Council in 1995. Policies in the 2040 Growth Concept encourage compact development, protection of natural resources, a balance of transportation systems, and housing for people of all incomes. Ten urban design components, including the Town Center designation, were identified in the plan as the focal points for growth. According to the Metro website, the following are the goals of a Town Center:

- To provide services to tens of thousands of people within a two-to three-mile radius.
- To have one-to three-story buildings for employment and housing.
- To have a strong sense of community identity.
- To be well served by transit.

Within this case study, the Milwaukie Town Center is the designated CFA for the city and is shown in Figure 2.

Figure 3 shows the CFA boundary for the Milwaukie Town Center, Milwaukie's city boundary and all corresponding TAZs (also listed in Table 3).

¹ OAR 660-012-0325 Transportation Review in Climate-Friendly Areas and Centers

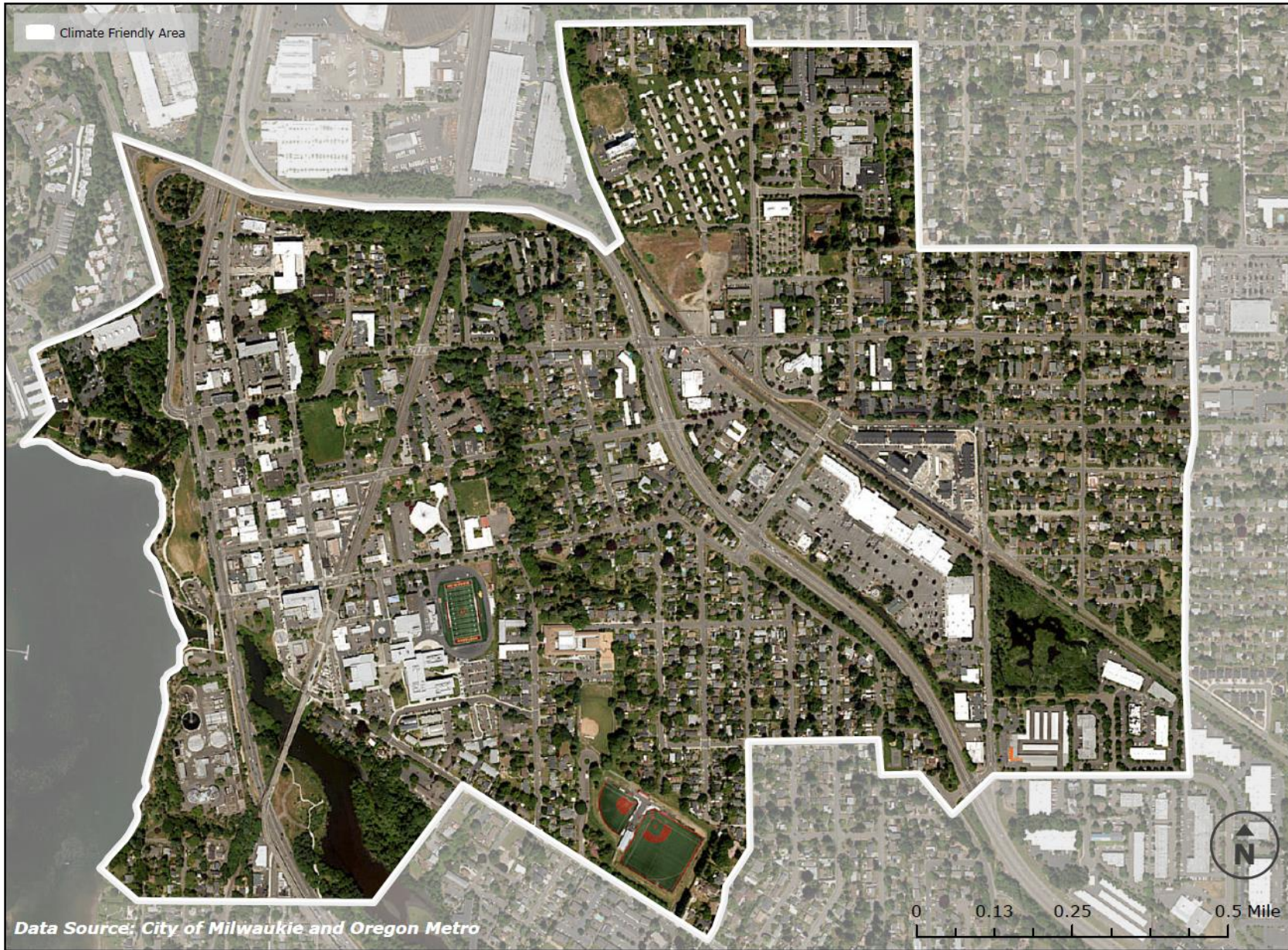


FIGURE 2. MILWAUKIE TOWN CENTER (ASSUMED CFA FOR THIS CASE STUDY)

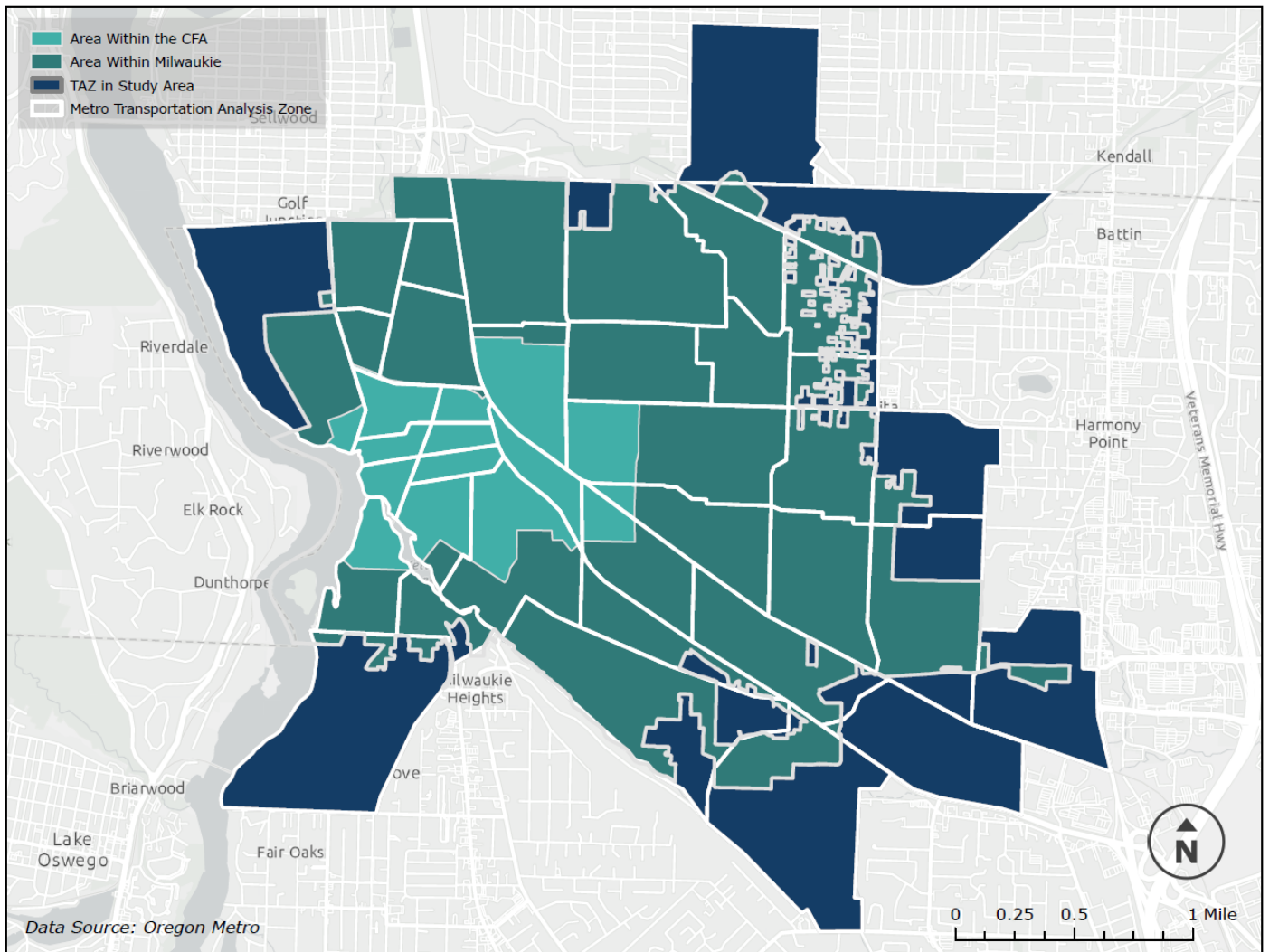


FIGURE 3. MILWAUKIE CITY BOUNDARY

The TAZs, Milwaukie, and the CFA have different boundaries. The percentage of land within each of the different boundaries is documented in Table 3 below. TAZs that don't have most of their area within the CFA are highlighted in blue. For the analysis a TAZ with at least 50% of its area within CFA boundary is considered a part of the CFA. A TAZ between 25% and 50% in the boundary is determined on a case-by-case basis. A TAZ that has less than 25% of its area overlapping within the CFA was considered to not be part of the CFA.

For example, TAZ 675 is 37% within the CFA boundary as shown in Figure 4. Aerial imagery for the TAZ was examined to identify what is currently located within the portion of the TAZ that was within the CFA. Most of the land in TAZ 675 within the CFA is currently occupied by the Kellogg Creek Wastewater Treatment Plant and Kellogg Creek Park. The rest of the area contains some single-family homes and service businesses. Because most of the land that overlapped between the CFA and the TAZ was occupied by the wastewater treatment plant (which is a land use which is unlikely to change during the analysis timeframe) and there were no undeveloped parcels, the TAZ was considered to not be part of the CFA.

Similarly, Minthorn North Natural Area takes up most of the land within TAZ 694 that overlaps with the CFA boundary as shown in Figure 4. In addition to the natural area, there is a public

TABLE 3: APPLICABLE TAZS

LIST OF APPLICABLE TAZS FOR ANALYSIS	IN CFA?	PERCENTAGE WITHIN CFA	PERCENTAGE WITHIN CITY LIMITS
236	No	0%	1%
662	No	4%	37%
663	No	0%	100%
664	No	0%	100%
665	No	0%	100%
666	No	3%	100%
667	No	2%	100%
668	Yes	100%	100%
669	Yes	95%	100%
670	Yes	100%	100%
671	Yes	100%	100%
672	Yes	100%	100%
673	Yes	83%	100%
674	Yes	100%	100%
675	No	37%	100%
676	No	0%	85%
677	Yes	44%	100%
678	Yes	99%	100%
679	Yes	84%	100%
680	No	0%	100%
681	No	0%	89%
682	No	0%	98%
683	No	0%	17%
684	No	0%	71%
685	No	0%	62%
686	No	0%	100%
687	No	1%	100%
688	Yes	30%	100%
689	No	0%	93%
690	No	0%	15%
691	No	0%	59%
692	No	0%	100%
693	No	8%	100%
694	No	24%	100%
695	No	0%	87%
696	No	0%	87%
697	No	0%	69%
698	No	0%	22%
699	No	0%	1%
700	No	0%	9%
706	No	0%	7%

GATHER RELEVANT PLANNING INFORMATION

The following documents were reviewed to provide a broader understanding of housing and jobs within the City of Milwaukie as well as the CFA:

- Milwaukie Housing Capacity Analysis² (2023)
- Economic Opportunities Analysis³ (2016)
- Current Zoning
- Current Employment
- Current Housing Condition
- Current RTDM Assumptions

CURRENT ZONING AND LAND USE

There are currently ten types of zoning within the downtown CFA, as shown in Table 4 and Figure 5:

- Downtown Mixed Use (DMU)
- Residential High Density (R-HD)
- Residential Middle Density (R-MD)
- General Mixed Use (GMU)
- Community Shopping Commercial (C-CS)
- Neighborhood Commercial (C-N)
- Neighborhood Mixed Use (NMU)
- General Commercial (C-G)
- Business Industrial (BI)
- Open Space (OS)

Much of the zoning in the area is either R-HD or R-MD.

TABLE 4. ZONING AND LAND USE BY CFA TAZ

CFA TAZ	PREDOMINANT ZONING	PERCENTAGE OF CFA HH	PERCENTAGE OF CFA EMPLOYMENT
668	DMU	13%	11%
669	R-HD	6%	0%
670	DMU/R-HD	3%	6%
671	R-HD	6%	5%
672	DMU	4%	10%

²ECONorthwest. 2023. "City of Milwaukie 2023-2043 Housing Capacity Analysis." May. http://www.milwaukieoregon.gov/sites/default/files/fileattachments/housing_affordability/page/108601/milwaukie_hca_may_2023_final.pdf.

³Milwaukie, City of. 2016. "Economic Opportunities Analysis." October. Accessed 13, 2024. https://www.milwaukieoregon.gov/sites/default/files/fileattachments/planning/page/75331/milwaukie_eoa_consolidated_draft.pdf.

CFA TAZ	PREDOMINANT ZONING	PERCENTAGE OF CFA HH	PERCENTAGE OF CFA EMPLOYMENT
673	R-HD	9%	7%
674	R-HD	3%	2%
677	R-MD	9%	0%
678	C-CS	1%	21%
679	GMU/R-HD	31%	18%
688	R-MD	9%	2%
694*	BI	0%	15%

*TAZ 694 is not a CFA TAZ for residential purposes, but does contain a significant portion of the CFA jobs

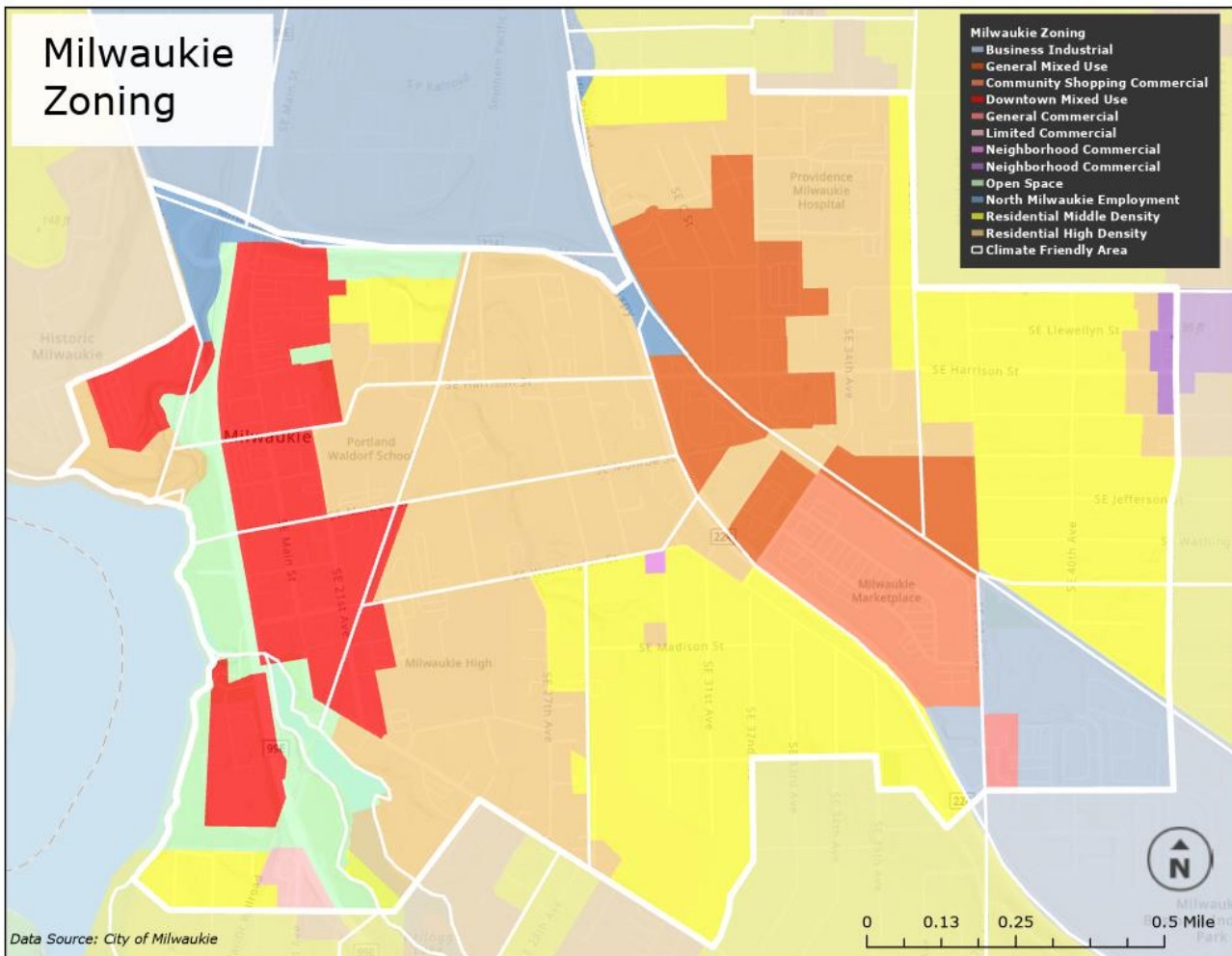


FIGURE 5. ZONING MAP OF MILWAUKIE CFA

CURRENT EMPLOYMENT

According to data from the U.S. Census Bureau's OnTheMap tool, in 2021 there were 13,726 jobs within Milwaukie as shown in Figure 6. Most employees arrive from outside the City of Milwaukie to work in the city, and most of those who live in Milwaukie leave city to go to their workplace. Between 2019 and 2021, there was approximately a 10% decrease in employment within the city.



FIGURE 6. MILWAUKIE EMPLOYMENT INFLOW AND OUTFLOW⁴

⁴ U.S. Census Bureau. (2021). LEHD Origin-Destination Employment Statistics (2002-2021) [computer file]. Washington, DC: U.S. Census Bureau, Longitudinal-Employer Household Dynamics Program [distributor], accessed on 12/20/2023 at <https://onthemap.ces.census.gov>. LODS 8.1 [version]

Figure 7 shows where jobs are located within Milwaukie. Most jobs are in the southeast corner of the city in the Milwaukie business and industrial area. There is also a substantial concentration of jobs within the boundaries of the CFA.

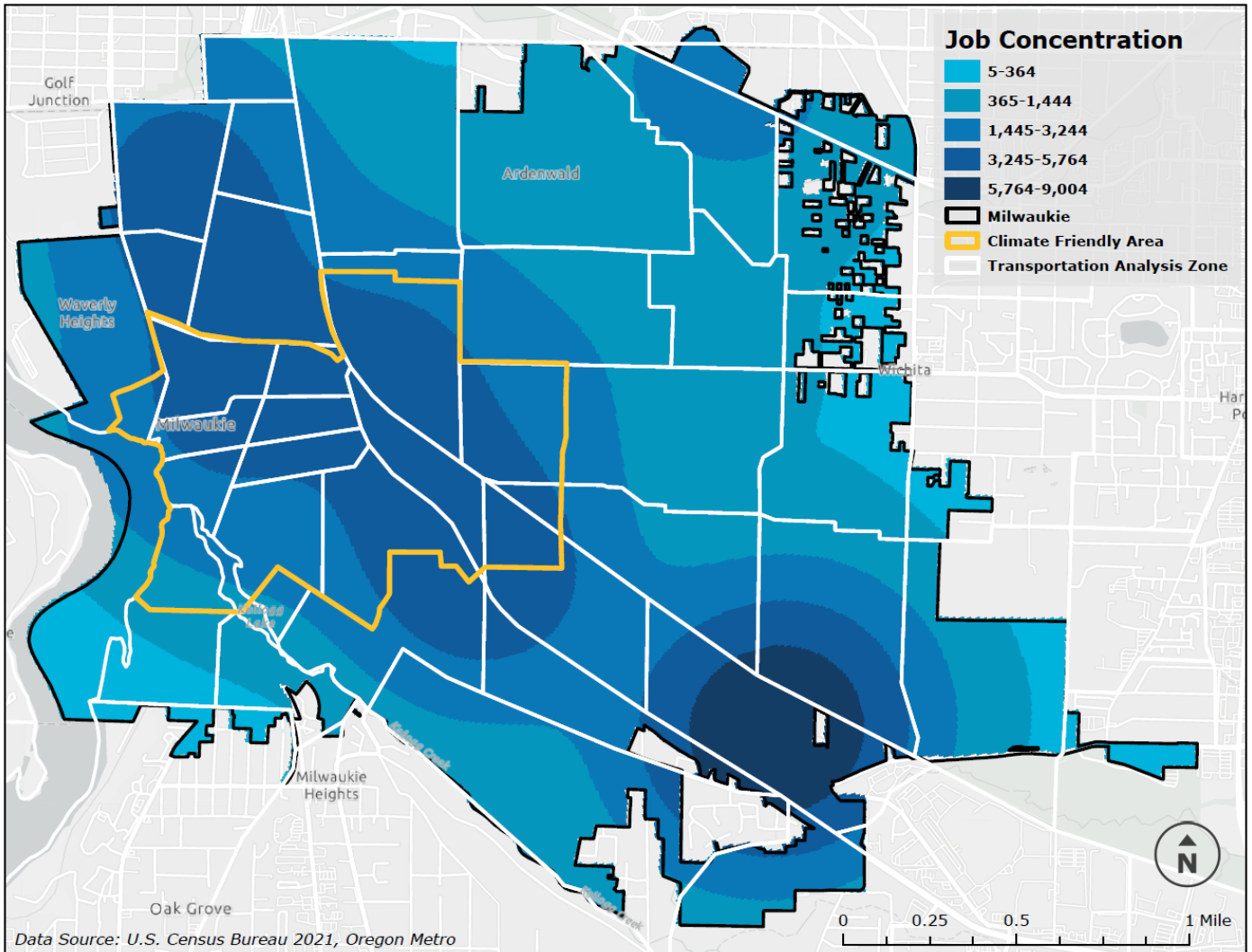


FIGURE 7. EMPLOYMENT CONCENTRATION

Figure 8 indicates employment concentration within the CFA boundary. Approximately 3,500 people are employed within the CFA according to data from the U.S. Census Bureau. Of those jobs approximately 57% (1,980) work in the retail and service industries. Approximately 2% of employees who work within the CFA also live within the CFA. Currently, the highest density of jobs is in the northern portion of the CFA. Overall, approximately 37% of people employed in this area currently work in health care and social assistance, 14% work in finance and insurance, and 7% work in retail.

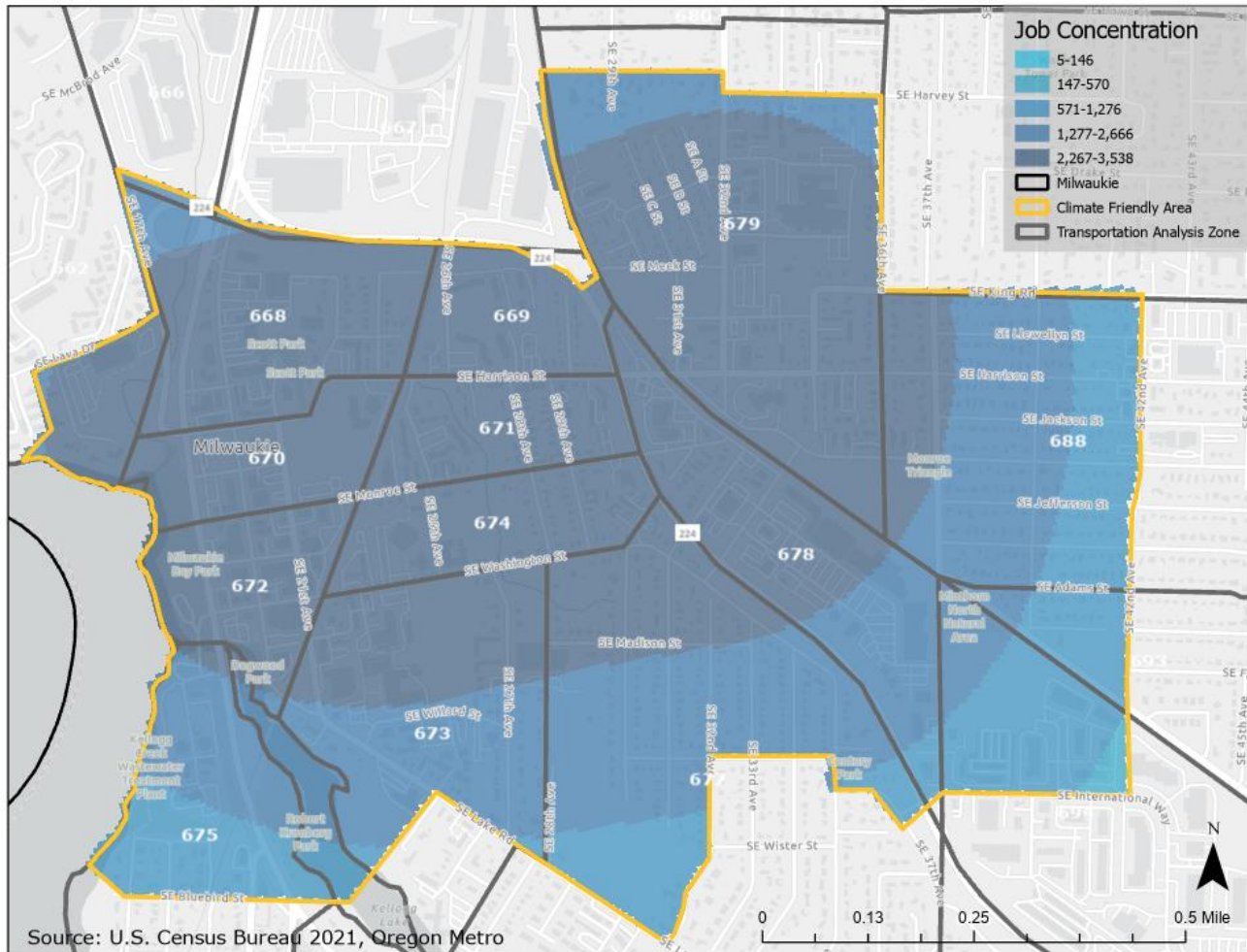


FIGURE 8. EMPLOYMENT CONCENTRATION IN MILWAUKIE CFA

CURRENT HOUSING

Based on data compiled by Metro, Figure 9 shows locations of multifamily housing within the CFA.

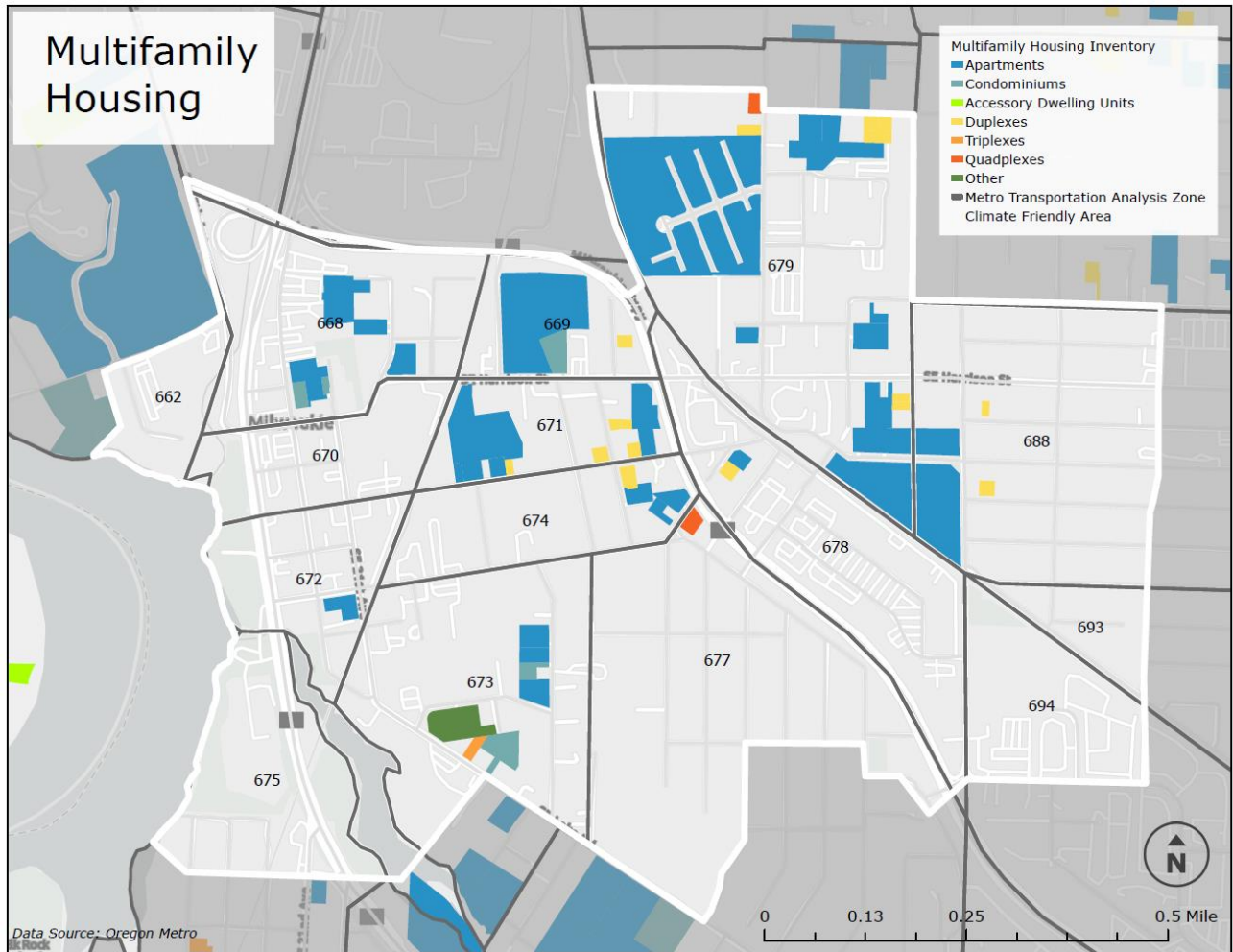


FIGURE 9. MULTIFAMILY HOUSING IN CFA

There currently are, or plan to be, affordable housing developments in three TAZs within the CFA. Information about these developments is shown in Table 5 and visually in Figure 10. TAZ 679 has two affordable housing developments. The Hillside Manor projects included the redevelopment of affordable housing that already existed on the site. The Hillside Park development will include the replacement of the existing 100 affordable housing units plus the additional construction of 400 new units.

TABLE 5. AFFORDABLE HOUSING DEVELOPMENTS

CFA TAZ	AFFORDABLE HOUSING DEVELOPMENT	YEAR BUILT	NUMBER OF UNITS
668	North Main Apartments	2006	64
673	Walsh Commons	2019	28

CFA TAZ	AFFORDABLE HOUSING DEVELOPMENT	YEAR BUILT	NUMBER OF UNITS
673	Annie Ross House Shelter	2019	8
679	Hillside Manor	2019	100
679	Hillside Park	2025	100

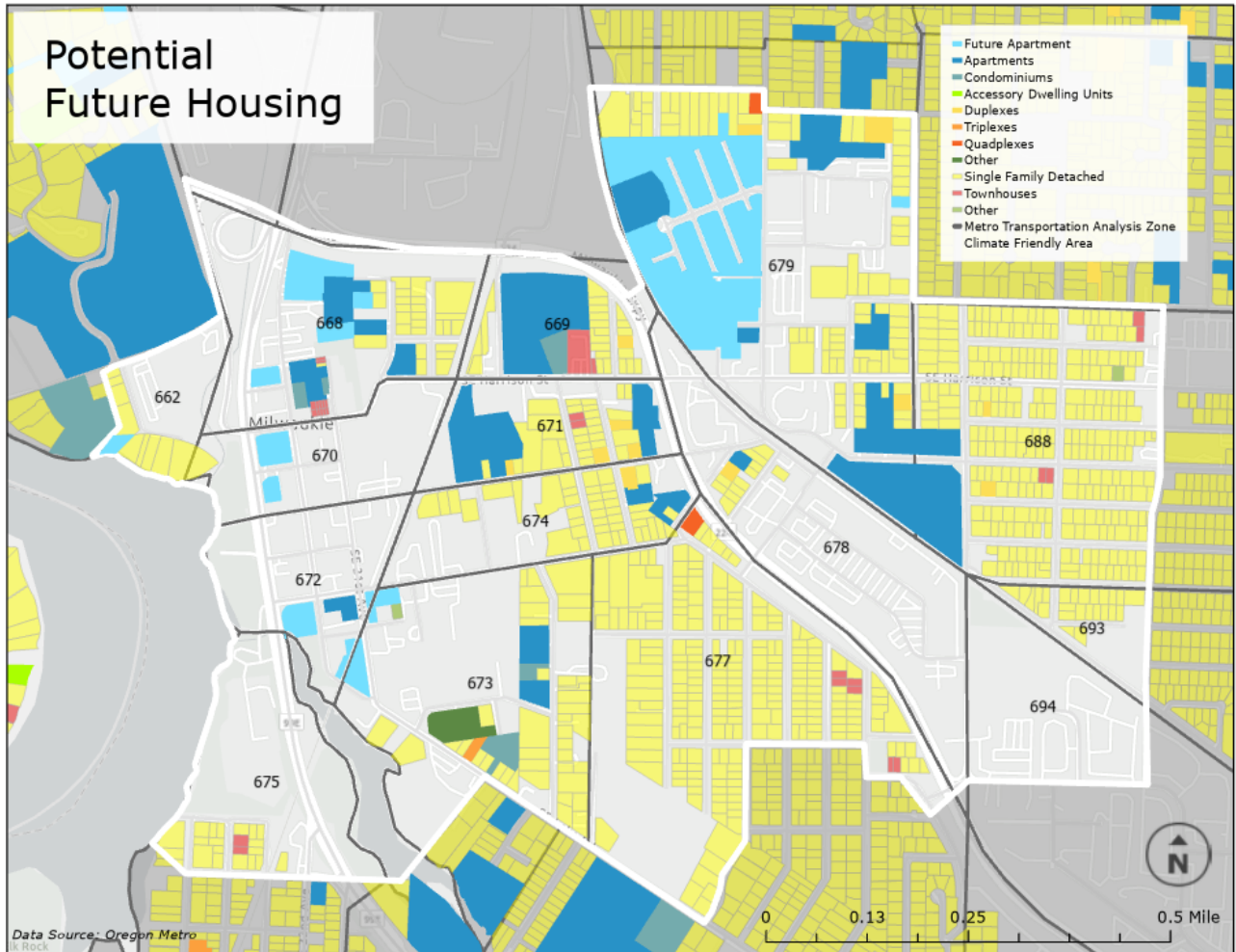


FIGURE 10. POTENTIAL FUTURE CFA HOUSING

EXISTING MODEL LAND USE ASSUMPTION REVIEW

The following section documents current household and employment assumptions that were part of the 2018 RTP process and in current regional planning efforts that affect CFAs. Table 6 shows the existing RTDM data and future assumptions for total households and employment in the CFA and City of Milwaukie.

TABLE 6. 2015 VS 2040 RTDM INPUTS^A

AREA	HH 2015	HH 2040	JOB 2015	JOB 2040	R/S ^B JOBS 2015	R/S ^B JOBS 2040
CFA	1,855	2,430	3,740	5,315	2,840	3,935
MILWAUKIE	8,530	9,905	12,860	16,730	6,525	9,040

A. Total jobs and households were determined based on the percentage of land within TAZ borders and within City boundaries.

B. Retail/service jobs

Oregon law requires that at least every six years Metro must forecast the population and employment growth for the Portland region for the following 20-year period. The law requires that Metro must then coordinate its regional forecasts with governments within the urban growth boundary. These growth forecast distributions are used to update land use and transportation plans, regulations and related policies. The information from the 2017 forecast for Milwaukie is shown in Table 7, and indicates some variations from the TAZ-level data contained in the 2015 base year for the RTDM. For example, the RTDM contains 8,530 households in Milwaukie for the year 2015, and Metro’s data indicates a total of 8,677 (+147 households).

Additional forecasts data about households can be found in the Milwaukie Housing Needs Assessment, which estimates that there would be 10,980 households in the year 2040. This estimate is larger than the data in the RTDM or in the Metro forecast. Similarly, the Milwaukie Economic Opportunity Analysis estimated between 17,900 and 19,520 jobs in 2035; extrapolated to 2040 would be between 23,000 and 25,000 jobs. Current year 2040 RTDM estimates (16,730) and the Metro forecast (17,387) for employment are lower than the Economic Opportunity Analysis forecast.

TABLE 7. METRO 2040 DISTRIBUTED FORECAST FOR MILWAUKIE

METRIC	2015	2040
POPULATION	20,505	23,149
HOUSEHOLDS	8,677	10,151
JOBS	12,764	17,376

Source: <https://www.oregonmetro.gov/sites/default/files/2017/03/08/2040-regional-population-housing-forecast-by-city-county.pdf>

EMPLOYMENT ASSUMPTIONS

Figure 11 shows the 2018 RTDM assumptions for employment growth in Milwaukie between 2015 and 2040. During that time period there are two TAZ within the CFA which are expected to have substantial job growth. The rest of job growth in the CFA is expected to occur in the TAZs that are located between SE Railroad Ave and the Milwaukie Expressway (OR-224). The economic sector with the most growth is projected to be in agriculture, mining, and forestry. Government employment is expected to add the largest total numbers of jobs. Retail and service jobs were projected to increase 38% (3,060).

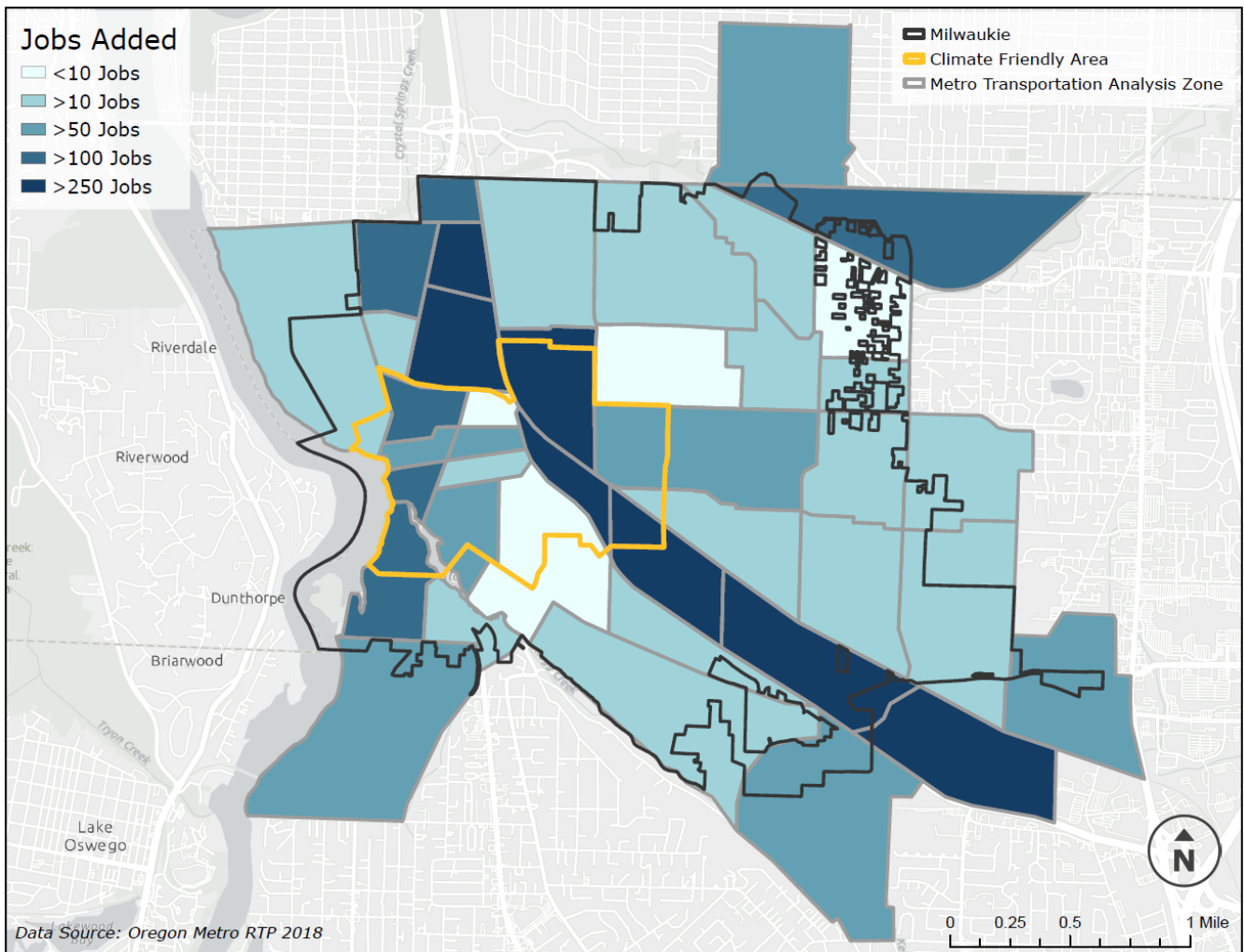


FIGURE 11. 2015-2040 EMPLOYMENT GROWTH

Figure 12 shows the forecast employment density within Milwaukie in 2040 based on the 2018 RTDM assumptions. 20 percent (3/15) of TAZs within the CFA are expected to have job densities less than one job per acre. Areas with high employment density include the northwest and northeast portions of the CFA.

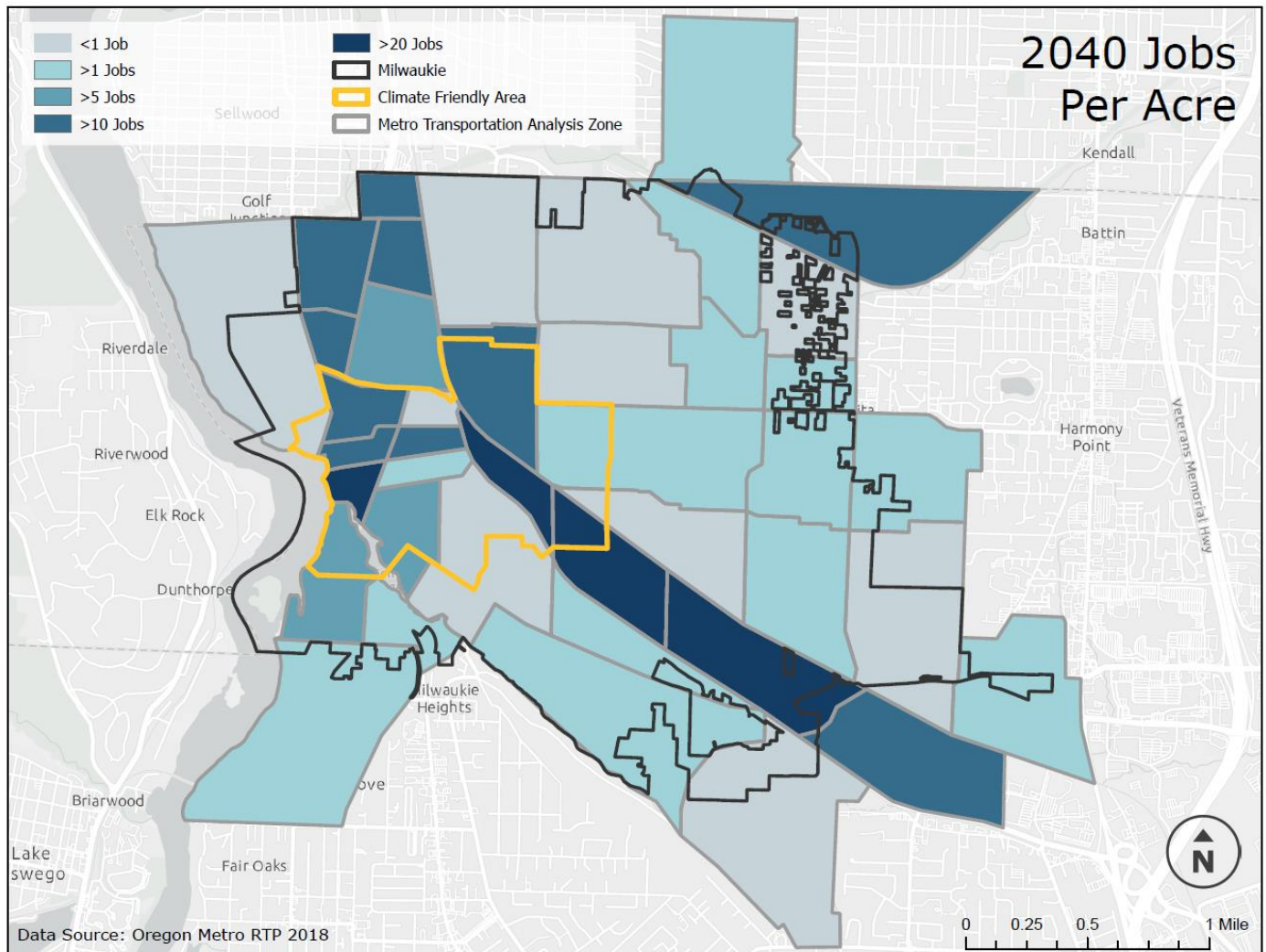


FIGURE 12. EXPECTED 2040 EMPLOYMENT DENSITY

HOUSEHOLD ASSUMPTIONS

Figure 13 shows the assumptions in household changes documented in the 2018 RTDM. In total there were approximately 2,400 households added to TAZs in Milwaukie. Most of the growth was expected to occur around the edges of the city, particularly in the southwest and southeast areas.

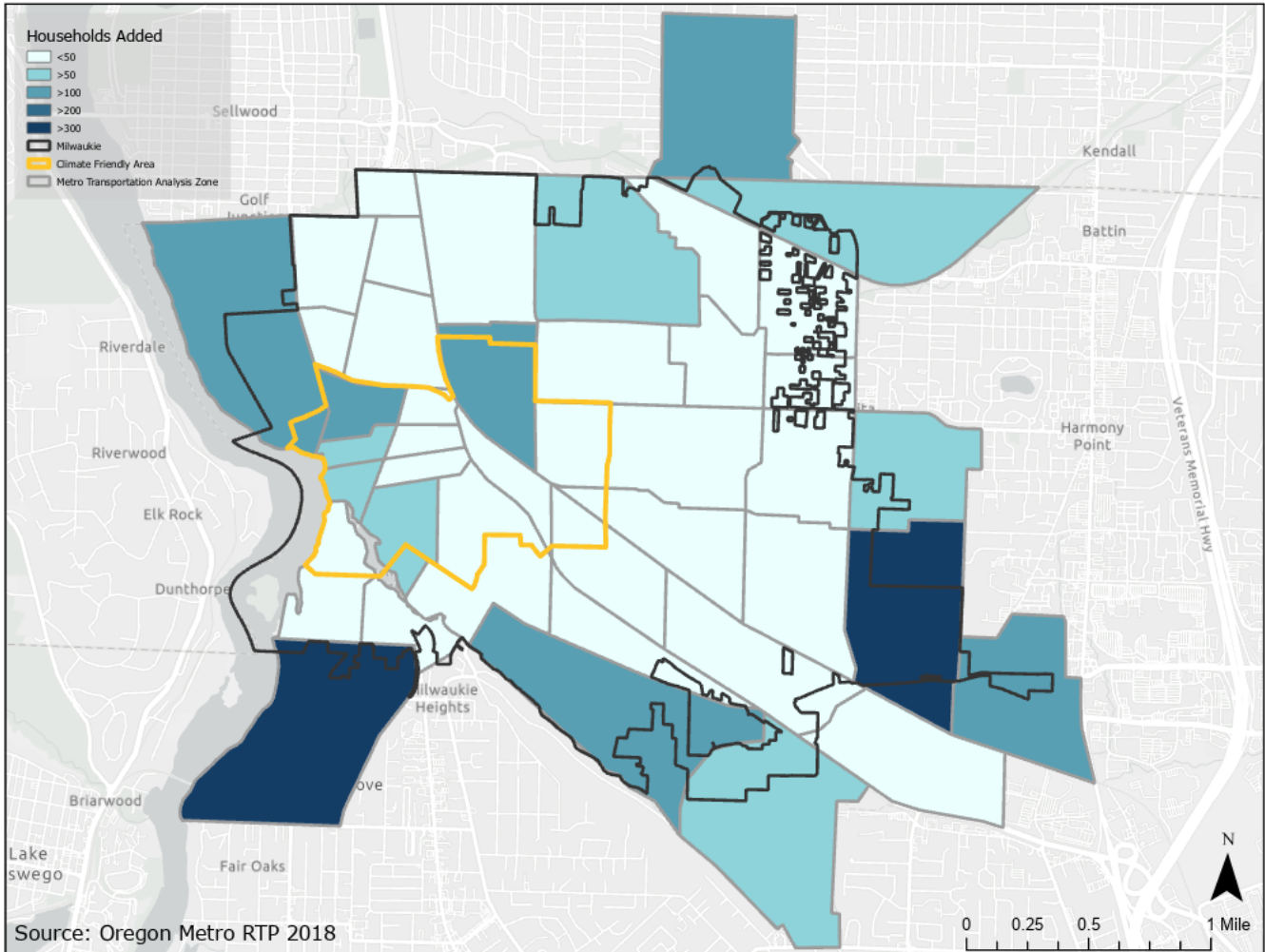


FIGURE 13. CHANGE IN NUMBER OF HOUSEHOLDS BY TAZ

Figure 14 shows the expected household density by TAZ in the year 2040 based on the 2018 RTDM. With the addition of the new households, the densest areas in Milwaukie are expected to be within the boundaries of the CFA. The highest density in the CFA was expected to be in two TAZs between OR-224, the MAX Orange line, and SE Monroe Street.

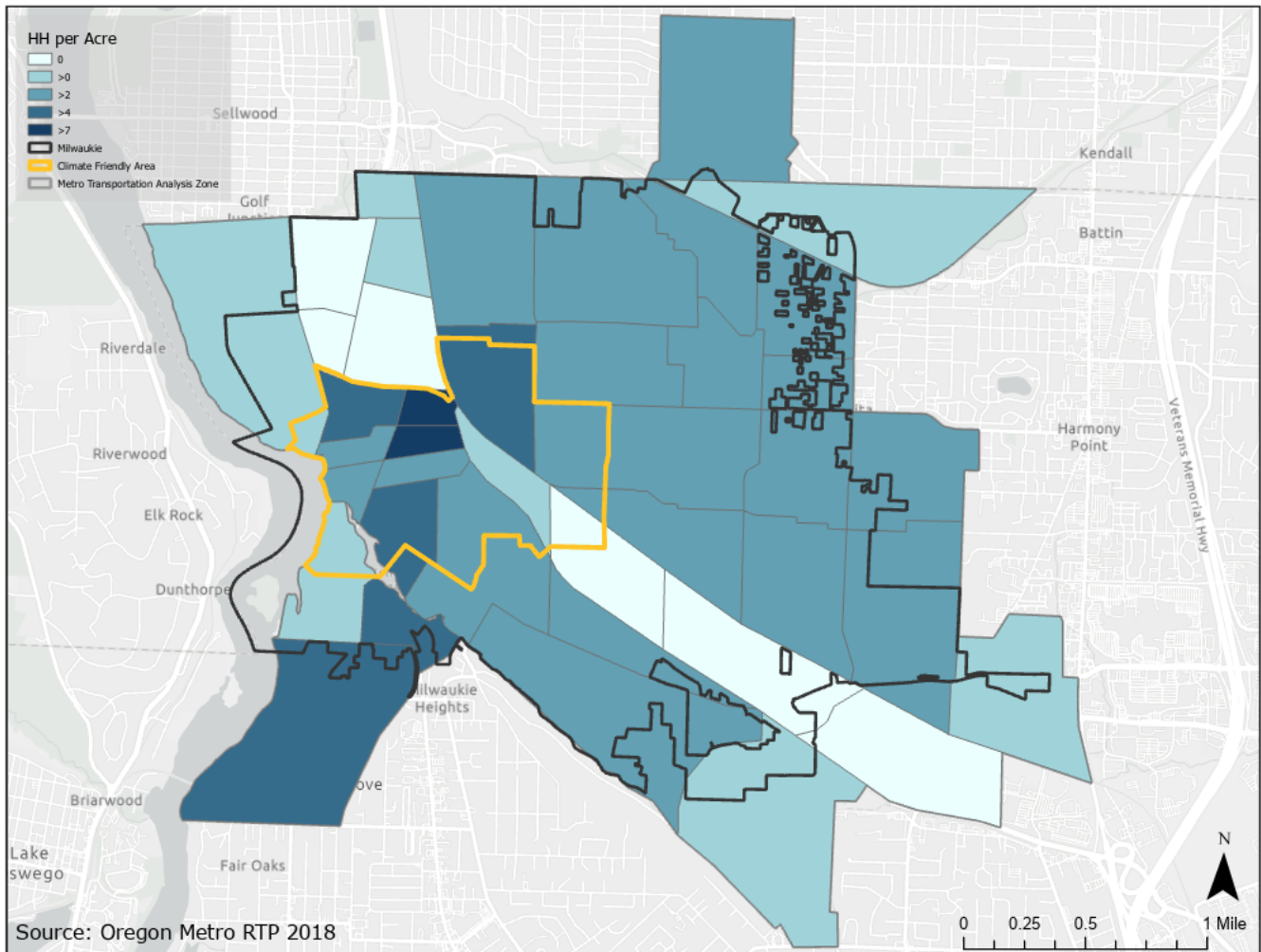


FIGURE 14. EXPECTED 2040 HH DENSITY

CURRENT PLANNING EFFORTS

The Metro 2023 RTP was adopted on November 30, 2023. The base year for the new update has been changed from 2015 to 2020, and the horizon year was changed updated from 2040 to 2045. Between the years 2040 and 2045, the highest estimated household growth would occur within the CFA, and the edges of the city would be expected to see slower growth in the number of households. Further analysis can be seen within Section 1 of the Appendix.

DEMOGRAPHICS ASSUMPTIONS

The RTDM has inputs that divide households based on three factors: income, head of household age, and household size as seen in Table 8.

TABLE 8. RTDM DEMOGRAPHIC DISTRIBUTION

CATEGORY	1	2	3	4
INCOME (1995\$)	<\$15K	\$15-30K	\$30-60K	\$60K+
HEAD OF HOUSEHOLD AGE	15-24	25-54	55-64	65+
HOUSEHOLD SIZE	1	2	3	4+

The RTDM demographic assumptions for the CFA assume that most households contain two people or fewer. The RTDM does not directly include single/multi-family split as part of the direct model inputs. In the RTDM, the income ranges are evenly distributed amongst Income categories 1, 2, and 3, and there are fewer households in Age categories 2 and 4. Additional demographic data can be found in Section 2 of the Appendix.

CURRENT ASSUMPTIONS IN RESPECT TO THE TPR

Today, Milwaukie’s CFA has a higher housing density compared to the rest of the city, based on its designation as the Milwaukie Town Center in 1995. In addition, there are a few high-density housing redevelopment projects already in the works in the CFA (Hillside Manor, Henley Place, Dogwood Station, Coho Point, and Monroe Apartments). Based on 2018 RTP, the CFA is expected to contain 23.3% of Milwaukie’s housing in the year 2040. The amount of future growth is currently limited by market conditions and the need to maintain population control totals in the planning horizon. While the prior housing analysis indicated that there is a need for affordable housing types, the central areas are generally built out with single family homes that would need to be redeveloped to situate higher density housing units in these areas.

Employment within the City of Milwaukie is predominantly located outside of the CFA boundaries in the designated business and industrial areas. Approximately 60% of the land within the CFA boundaries is zoned for residential use only or dedicated as open space for the Willamette Greenway. As shown at the bottom of Table 9, the estimated job density in the CFA is expected to be at approximately 9.0 jobs/acre in the year 2040.

TABLE 9. SUMMARY OF 2040 RTP CONDITIONS

CFA TAZ	HOUSING (PERCENT OF TOTAL)	TOTAL JOB DENSITY (JOBS/ACRE)	TOTAL RETAIL/SERVICE JOBS
668	2.9%	13.7	475
669	1.8%	0.5	10
670	0.8%	14.0	125
671	2.0%	12.3	240

CFA TAZ	HOUSING (PERCENT OF TOTAL)	TOTAL JOB DENSITY (JOBS/ACRE)	TOTAL RETAIL/SERVICE JOBS
672	0.8%	22.2	440
673	2.5%	6.6	125
674	0.8%	4.0	35
677	2.9%	0.3	10
678	0.4%	24.6	970
679	5.9%	10.1	775
688	2.5%	1.8	90
CFA TOTAL	23.3%	9.0	3,295

PROPOSED CFA MODEL LAND USE ASSUMPTIONS

EMPLOYMENT ANALYSIS

Though the Economic Opportunity Analysis forecasted more jobs within the City of Milwaukie than what is represented in the RTDM, the number of jobs within the city boundaries and model was kept constant. This was done to limit the number of variables affecting the analysis and remove the need to rebalance jobs outside of Milwaukie city limits. However, this is a worthwhile refinement for other analyses.

Jobs within Milwaukie were adjusted to meet a 15-jobs per-acre density within the CFA. This density was chosen based on ODOT Place Type definitions for areas with high density.

The goal of a CFA is to be an area where residents, workers, and visitors can meet most of their daily needs without having to drive. Though there are no mandates within the ruling for employment density, the mixed-use nature of a CFA is expected to concentrate more jobs within its boundaries over time. The ODOT Place Type guide describes retail and service jobs as ones that are particularly important for high-density areas.

Table 10 shows the employment breakdown within the RTDM as well as how the category of jobs was adjusted to simulate an employment distribution supported by CFA rules.

TABLE 10. RTDM EMPLOYMENT CODES

EMPLOYMENT CODE	DESCRIPTION	ADJUSTMENT
AER	Arts, Entertainment, and Recreation	Increase
AMF	Agriculture, Mining & Forestry	Decrease
CON	Construction	No Change
EDU	Education	No Change
FSD	Food Services and Drinking Places	Increase
GOV	Government	No Change

EMPLOYMENT CODE	DESCRIPTION	ADJUSTMENT
HSS	Health and Social Services	Increase
MFG	Manufacturing (except high tech)	Decrease
MHT	Manufacturing High Tech	Decrease
OSV	Other Services	No Change
PBS	Professional and Business Services	Increase
RCS	Retail and Consumer Services	Increase
TWU	Transportation, Warehousing, and Utilities	Decrease
WT	Wholesale Trade	Decrease

Job growth between 2019 and 2045 was removed for job types classified as “Increase” in Table 10 for areas outside of the CFA. Those jobs were then reallocated into the CFA proportional to total jobs already within the CFA TAZs. This process resulted in TAZs that were high employment areas being given additional jobs as opposed to adding jobs to places where there is little employment. This work was completed using a spreadsheet tool that compared land use growth and distributed it proportionally. If there was not enough growth outside of the CFA to move in certain jobs, those jobs classified as “Decrease” were removed and converted into retail and service jobs within the CFA to maintain overall total employment. In total, 423 jobs were moved into TAZs located within the CFA.

HOUSING ANALYSIS

Metro forecasts that there will be 10,150 households in Milwaukie in the year 2040 (and zoned to accommodate more). Current RTDM assumptions forecast approximately 2,595 (25.5%) households within the CFA boundary in the year 2040, and some additional adjustments in the case study were made to increase the number of households within CFA boundaries.

The total number of households within the Milwaukie city limits was kept constant throughout the reallocation. Households that were added to the CFA were proportionally removed from areas outside the CFA. This process also ensured that no TAZ would have fewer households in 2040 than it did in 2015. At the end of the reallocation process, 3,045 (30.0%) households, an increase of 450 households from the RTDM forecast, would be located within the CFA boundary. This reallocation was conducted using a spreadsheet tool that compared attributes among the TAZs.

Note: The case study focused on analytical methods and adjustment processes to expedite the development of procedures. Along with these analytical and modeling methods, it is important to integrate local planning expertise to ensure that local assumptions are reasonable. The coordination with local planning staff was limited during this case study but should be included in future applications.

DEMOGRAPHIC ANALYSIS

Once total households for each TAZ were determined they were then redistributed by the current Housing Income and Age (HIA) assumptions that existed within the RTDM. Changes to these HIA assumptions are explained in the following section.

The RTDM divides households into 64 separate categories due to variations in household size, age of the head of household, and income of the head of household. These three categories are then each further divided into four subcategories and combined to create 64 (4³) bins for the HIA distribution.

To create a HIA distribution for TAZ within the boundary of the CFA an analysis was performed on all TAZs in the RTDM and their characteristics as they were input within the 2015 model iteration. TAZs were run through a series of metrics to determine a best match of the characteristics in either the MPO Mixed Use (MU) designation or MPO Transit Oriented Development (TOD) Place Type used by ODOT and DLCD.

Both the MPO Mixed Use and the TOD Place Types are characterized as having medium to high densities of jobs and housing as well as a high diversity of land use mix. TAZs were scored based on their density of housing and density of jobs. If a TAZ met the characteristics listed within the High column shown in Table 11 and located within a quarter-mile from a TriMet MAX stop, it was designated a TOD Place Type. If the TAZ was not within a quarter-mile, it was categorized as the Mixed-Use Place Type. TAZs with a housing density greater than 30 households per acre were not included as they do not match the current housing market in Milwaukie. For other analysis of other jurisdictions, the need to include all TAZs should be evaluated.

TABLE 11. PLACE TYPE CHARACTERISTICS

	HIGH	MEDIUM
DENSITY	15 or more Jobs & Households per Acre	5-15 or more Jobs & Households per Acre
DIVERSITY	1:2-2:1 Jobs to Household Ratio	1:2-1:4 or 2:1-4:1 Jobs to Household Ratio
	1:4 to 10:1 Retail/Service Jobs to Household	1:4-1:8 or 10:1-20:1 Retail/Service Jobs to Household

After performing the analysis, three TAZs were chosen for each condition (Mixed-Use or TOD) to be used to create two new CFA specific HIA distributions. TAZs 865, 32, and 302 (aerial imagery can be seen in Figure 15 and Figure 16) were used for the TOD Place Type and TAZs 261, 509, and 294 were used for the Mixed-Use Place Type. These TAZs were chosen as the “optimal” TAZ for the distribution creation based on their ability to meet the Place Type characteristics related to housing and job density. Summaries of the TAZs are shown within Table 12.

TAZ 865 is located close to the Clackamas Town Center Transit Center which is the terminus of the MAX Green Line. TAZ 32 is in the NW sextant of Portland close to Providence Park, which also contains MAX Blue and Red line stations. TAZ 302 is near Lloyd Center and contains stations for the MAX Red, Blue and Green Lines. These TAZs are good examples of TOD TAZ because of their proximity to the MAX as well as pre-existing high density land use such as apartment buildings, multi-family homes, and high employment densities. The other three TAZs selected have similar land uses as the TOD TAZ, but do not have a nearby MAX station.

CFA TAZs that were within a quarter-mile of a MAX line were classified as a TOD TAZ and those not within a quarter-mile were classified as Mixed-Use TAZ. New household distributions were applied based on these characteristics to the total number of households previously determined to be within the TAZ.

TABLE 12. EXAMPLE TAZ FROM THE RTDM

TAZ	LOCATION	CATEGORY	WITHIN ¼ MILE OF MAX	RETAIL/ SERVICE JOBS	HH DENSITY	JOB: HH
865	Happy Valley	TOD	Yes	590	16.8	0.72
32	Portland	TOD	Yes	2,420	24.5	1.98
302	Portland	TOD	Yes	470	14.4	1.47
261	Portland	MU	No	445	7.2	1.06
509	Gresham	MU	No	580	7.9	1.09
294	Portland	MU	No	593	12.7	0.91



FIGURE 15. AERIAL VIEW OF TAZ 865

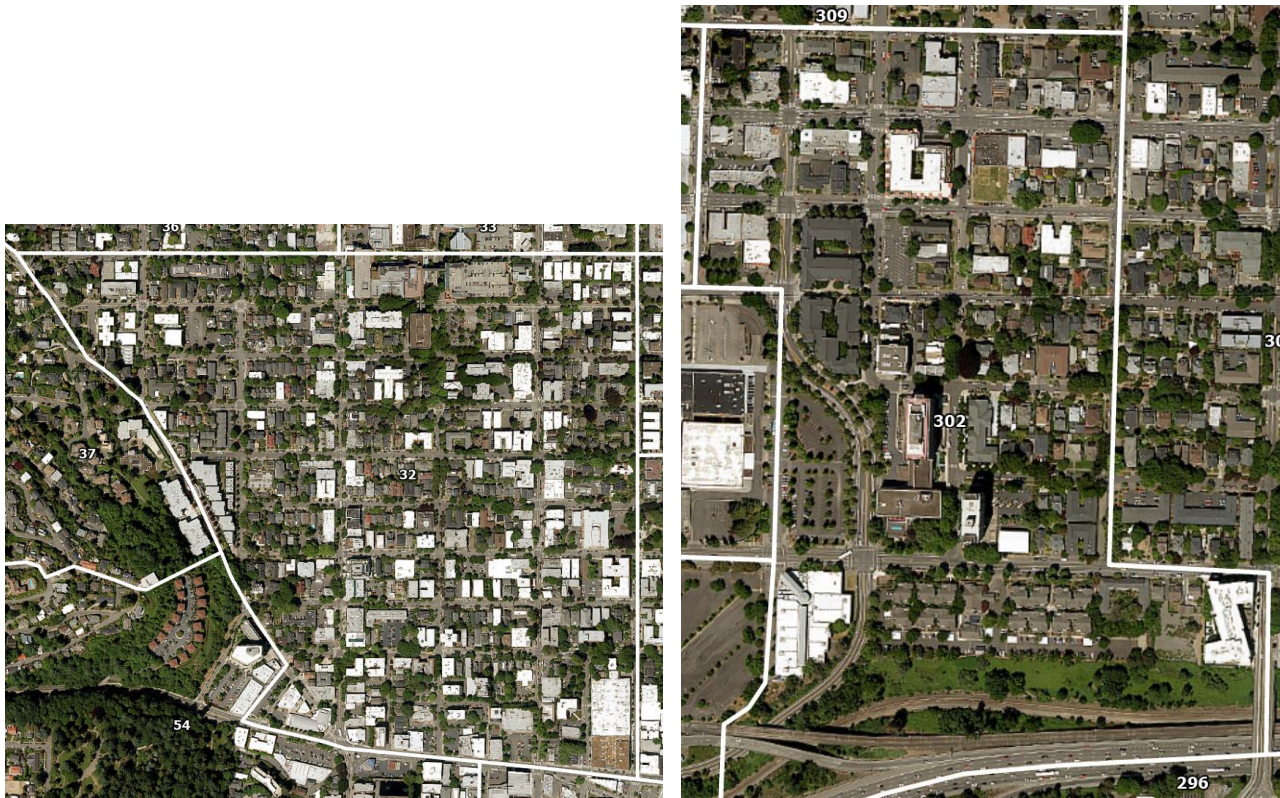


FIGURE 16. AERIAL VIEW OF TAZ 32 (LEFT) AND TAZ 302 (RIGHT)

Balancing

Once the total number of households was balanced and the CFA TAZ had their new HIA distribution, all Milwaukie TAZs were rebalanced to maintain the same age and income distributions as the original RTDM 2040 assumptions. Unlike age and income demographics, the overall number of households within the city could change because of the growth of multi-family and smaller households within the CFA boundary. Based on this modification, a constant household size distribution was not maintained.

HIA characteristics for non-CFA TAZs were adjusted proportionally to each other to maintain similar demographics for the City within the new year 2040 conditions.

SINGLE FAMILY PERCENTAGE

Figure 18 in the Appendix shows an analysis done by ECONorthwest of potential redevelopment in downtown Milwaukie and adjacent areas. The analysis done in 2022 identified potential projects and estimated the construction of approximately 1,870 housing units in the area through both greenfield development and redevelopment. Using the same assumptions as the previous housing analysis (74.5 dwelling units per acre) for potential projects, revised estimates indicate capacity to construct 1,970 units in the area. All identified projects would be within the CFA boundary except for the Birnam Oaks development which opened in 2023. Given this updated information, 1,870 units could be developed within the CFA as shown in Table 13. Some of these projects include the Hillside Manor development, the Henley Place development, and the Monroe Apartments development.

TABLE 13. PROPOSED LAND USE ASSUMPTIONS

CFA TAZ	DOWNTOWN REDEVELOPMENT UNITS
668	364
669	0
670	72
671	0
672	195
673	55
674	0
677	0
678	0
679	1,067
688	117
CFA TOTAL	1,870

It was assumed that no additional single-family housing would be constructed within CFA boundaries unless development was already in progress. A spatial analysis of existing housing based on Metro RLIS multifamily housing inventory was conducted to determine the current number of single-family homes located within each CFA TAZ. This number was then divided by the total number of households previously determined to be within the TAZ to obtain the new single-family percentages.

STEP 3. OTHER ZONAL DATA

Other inputs within the RTDM include:

- Parking
- Transit coverage
- Intersection density

Parking data is the input for the average cost to park within a TAZ. It is a useful tool for causing mode shift due to the increase in cost of the vehicle trip. Parking costs were not adjusted, and there are no parking projects currently in progress in the City of Milwaukie. The City of Milwaukie eliminated parking minimums in May 2024.

Transit coverage is not anticipated to substantially change beyond what is already captured in the regional travel demand model. Beyond their regular long-term capital planning, TriMet conducts annual on-going operational adjustments to address service needs, but those generally occur at a regional scale. Additional assumptions about specific route modifications and other service adjustments are not local actions and were therefore not adjusted in the context of this analysis.

Intersection density was reviewed but was not adjusted because the subject TAZs already meet or exceed the requirements for the TAZ based on the Metro Place Type definitions. The full list of inputs can be found in Section 2 of the Appendix.

STEP 4. NETWORK EDITS

The most current RTP was reviewed for transportation projects that might affect travel behavior within the CFA. It was determined that there were no additional motor vehicle, transit, pedestrian, or bicycle projects that would cause substantial changes to how the network is currently coded within the RTDM.

The only edits that were made to the network (for the second model run, see below) involved the locations and quantities of connectors. The RTDM network tends to favor vehicle trips and does not provide the most accurate representation of other modes of transport. Adding more connectors to the model is a way to simulate improved walking and biking conditions and encourage mode shifts within the model.

STEP 5. MODEL RUN

The consultant team provided updated model input files to Metro for the year 2040 scenarios:

- 2040 - CFA land use and demographic adjustments
- 2040 – CFA land use and demographic adjustments + centroid connector adjustments to improve access for active transportation

Metro conducted model runs and provided the resulting data banks and other information to the consultant team for calculations as part of Step 6, below. Metro also provided data banks and associated files for the 2015 and 2040 reference (RTP) models for comparison purposes.

No initial off-model adjustments were made to the results of the model run. However, future adjustments could be carefully considered based on outcomes of other case studies, variations in geographies, and the different demographics of other jurisdictions.

STEP 6. MODEL OUTPUT – VMT PER CAPITA

CALCULATION METHODOLOGY

The Metro RTDM was used for the VMT per capita evaluation in the Milwaukie case study and the trip assignment component from the completed full four-step model runs for the 2015 and 2040 scenarios was used to extract VMT data. As a reminder, the methodology to calculate vehicle miles traveled (VMT) aligns with OAR5 definition and includes all jurisdictional household-based light vehicle travel, regardless of where the travel occurs.

The following four factors were considered in the evaluation:

⁵ OAR 660-012-0005(64)

1. Traffic demand, in this case hourly trip by vehicle class for 24 hours.
2. Average trip length, obtained through model assignment as stated.
3. Trips by type information to determine home-based (HB) and non-home-based (NHB) trip purposes.
4. Population to calculated for VMT per capita.

There are four types of VMT to capture for the VMT evaluation:

1. Household-based light vehicle trips that start in Milwaukie (these trips can end in Milwaukie or anywhere else within the model boundary).
2. Intrazonal trips in Milwaukie.
3. NHB trips that occur anywhere in the model but originated within Milwaukie.
4. Household-based light vehicle trips that originated within Milwaukie and leave the model area (referred to “external” in subsequent sections).

Note: The external (to the model boundaries) trip distance and calculations are included in the following sections but are intended for future implementation. These steps would account for VMT outside of the regional model area by using the Statewide Integrated Model (SWIM) to estimate inter-regional trip distribution and travel distances. **Initial testing has identified that other procedural external model adjustments (part of the model development process) need to be resolved prior to implementing these steps. However, this material is retained here to memorialize the process.**

Information on the step-by-step calculation process is included in Section 3 of the Appendix.

RESULTS

Table 14 lists the Milwaukie VMT per capita evaluation summary results for the scenarios. As shown in the table, Milwaukie is shown to produce more overall VMT in the year 2040 than in the year 2015 under the RTP scenario. This growth in VMT is more than offset by the growth in population, resulting in an overall decrease in VMT per capita of approximately 6.5%. The 2040 CFA scenario shows a further decrease to VMT per capita, with a reduction of 9.3% relative to the 2015 model.

Table 15 lists the various trip and VMT components that are included in the overall VMT per capita calculation (the rows in green) for each scenario. As listed in the table, while overall external trips are a small portion of the total trips (approximately 5%) they represent a disproportionate amount of VMT (30% to 40%) due to the longer trip lengths. The results of the “2040 CFA NET” scenario that incorporated modifications to the centroid connector network was inconclusive. This is in part because the preliminary results indicated higher a higher VMT, which is counterintuitive. While the results of the 2040 CFA NET are shown in Table 15, more work needs to be in the future to better test and understand these model modifications.

TABLE 14. MILWAUKIE VMT PER CAPITA EVALUATION RESULTS

SCENARIO	MILWAUKIE POPULATION	ESTIMATED VMT	VMT/CAPITA
2015 RTP	20,505	717,145	34.97
2040 RTP	23,149	756,235	32.67 (-6.59%)
2040 CFA	23,149	734,407	31.73 (-9.29%)

TABLE 15. MILWAUKIE VMT PER CAPITA COMPONENTS

	TRIPS				VMT				TRIP LENGTH			
	2015	2040	2040 CFA	2040 CFA NET ¹	2015	2040	2040 CFA	2040 CFA NET	2015	2040	2040 CFA	2040 CFA NET
Milwaukie HB												
Without External	48,033	50,726	49,962	52,730	315,806	331,015	318,653	331,080	6.57	6.53	6.38	6.28
External ²	1,688	1,589	1,570	1,629	153,883	150,038	148,257	153,864	91.18	94.43	94.45	94.47
NHB-work from Milwaukie												
Without External	11,392	12,537	12,345	13,744	69,660	77,457	74,921	81,940	6.11	6.18	6.07	5.96
External	534	546	538	610	44,949	47,520	46,835	53,396	84.24	87.03	87.01	87.51
NHB-nonwork from Milwaukie												
Without External	16,540	18,709	18,447	19,108	78,079	89,296	86,023	88,172	4.72	4.77	4.66	4.61
External	619	663	650	667	54,768	60,910	59,718	61,400	88.48	91.89	91.91	92.07
NHB from Milwaukie												
Without External	28,636	32,078	31,589	33,158	152,605	172,811	166,661	172,682	5.33	5.39	5.28	5.21
External	1,171	1,235	1,213	1,274	101,931	111,492	109,498	115,256	87.02	90.25	90.25	90.43

1. "CFA NET" REFERS TO THE RESULTS FROM THE RTDM MODEL WHICH WAS MODIFIED TO BETTER REPRESENT WALKING CONDITIONS IN A CFA.

2. EXTERNAL VMT INCLUDES THE PORTION WITHIN THE REGIONAL MODEL FOR EXTERNAL TRIPS

CASE STUDY FINDINGS

Through the process of conducting the case study, the following findings were observed:

- The Portland Metro area has a wealth of land use, demographic, and other data as part of Metro's RLIS GIS and other datasets. The availability of and easy access to data allows for a detailed understanding of current and future demographics, existing housing supply, and employment information. Knowing the quantity of housing units and type (e.g., single family, multi-family) in an area is important for modeling trip generation accurately and subsequently calculating VMT per capita in alignment with the definition in the TPR. Access to up-to-date housing information, such as data contained in a Housing Needs Analysis or other planning efforts by local jurisdictions, help improve the accuracy of the results of travel demand modeling.
- Prior planning efforts by the City of Milwaukie (including the HCA and EOA) supported analysis assumptions.
- While analytical methods were used to adjust land use and demographics, future processes should build on this and include direct coordination with local staff to blend analytical methods and local knowledge about market conditions.
- The year 2040 RTP forecast assumes that approximately 23% of households in the city would reside in the CFA. This was increased to 30% in the CFA scenario in the year 2040.
- The year 2040 CFA scenario reallocated 450 additional households and 423 new jobs into the CFA boundaries relative to the reference scenario, while maintaining overall city population control totals by age and income. No new changes were assumed to pedestrian, bicycle, transit networks or services, or to parking costs or coverage.
- The CFA analysis was able to further reduce the growth of total Milwaukie household-based light vehicle VMT between the years 2019 to 2040 relative to the year 2040 RTP by half (+5.0% to +2.4%), despite an overall population growth of 13.0%. This would have the effect of reducing VMT per capita (-6.6% to -9.3%).
- SWIM provides an opportunity for estimating trip distances external to the regional model. As shown in this case study results, those external trip distances can be significantly longer than trips that don't leave the model area.
- The VMT per capita calculation process is complex due to the limitations of trip-based models, especially when attempting to trace all light vehicle trips back to a home in the region.
- Further exploration of the VMT per capita calculation process may allow for some simplifications, such as using an average trip length matrix rather than calculating a different matrix for each period of the day.
- The case study demonstrated that the land use changes related to Climate-Friendly areas as identified in the TPR and applied within a travel demand model can result in a measurable reduction in VMT per capita at the jurisdictional level.

APPENDIX

CONTENTS

SECTION 1. PRIOR PLAN REVIEW

SECTION 2. RTDM INPUTS

SECTION 3: VMT CALCULATION



SECTION 1. PRIOR PLAN REVIEW

HOUSING NEEDS ANALYSIS

A draft of the Housing Capacity Analysis for Milwaukie was released in May 2023 and was produced by ECONorthwest. According to the report, in 2021 there were 21,235 residents within Milwaukie, up from the 20,291 people who lived there in 2010. The median age for Milwaukie was 40 years old, which is younger than Clackamas County's median age of 42.

The analysis determined that in 2022 there were a total of 120 vacant acres of land within city limits and 51 of those acres were unconstrained. Most of that land was in moderate density designation zones (R-MD) as shown in Figure 17.

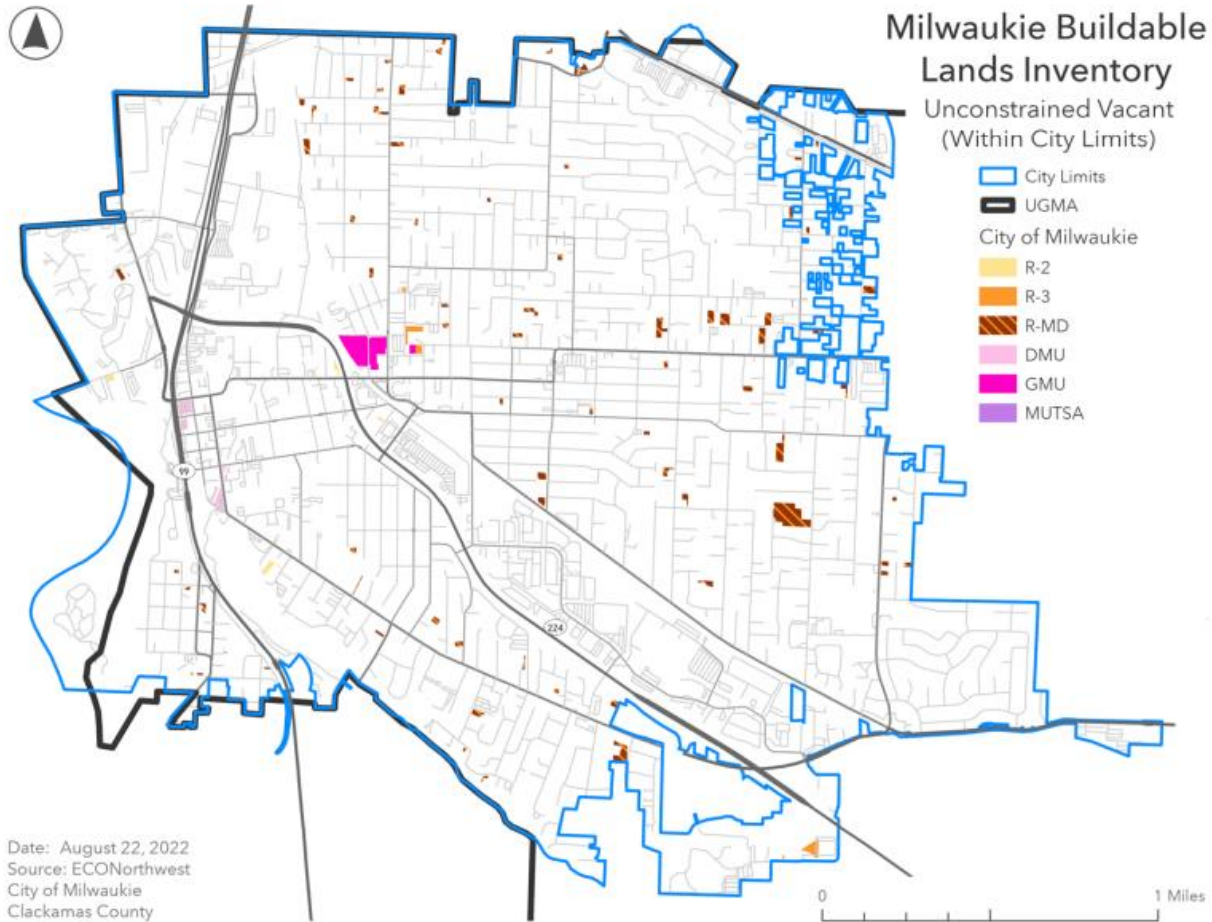


FIGURE 17. UNCONSTRAINED VACANT RESIDENTIAL LAND 2022 BY ECONORTHWEST

Table 16 shows the projected change in housing stock within Milwaukie. Single-dwelling detached housing accounted for most new housing permitted in Milwaukie between 2010 and 2021.

It is projected that by the year 2043 there will need to be an addition of 1,670 new housing units to the Milwaukie housing inventory to accommodate forecast population growth. A total of 11,230 households are expected to be in the Milwaukie city limits in 2043.

TABLE 16. CHANGE IN HOUSING MIX 2023 TO 2043

YEAR	SINGLE DWELLING DETACHED		SINGLE DWELLING ATTACHED		DUPLEX, TRIPLEX, QUADPLEX		MULTI DWELLING UNIT	
	# of Units	Percent	# of Units	Percent	# of Units	Percent	# of Units	Percent
2023¹	6,404	67	191	2	574	6	2,390	25
2043	7,072	63	274	2	908	8	2,975	27

1. The 2023 Housing mix percentage is based on 2015-2019 values

Milwaukie’s downtown has experience seen investment interest as shown via several recently completed projects and further development in the works. Figure 18 shows areas identified by city staff as potential sites for mixed-use redevelopment. All locations indicated on the map are within the boundaries of the CFA.

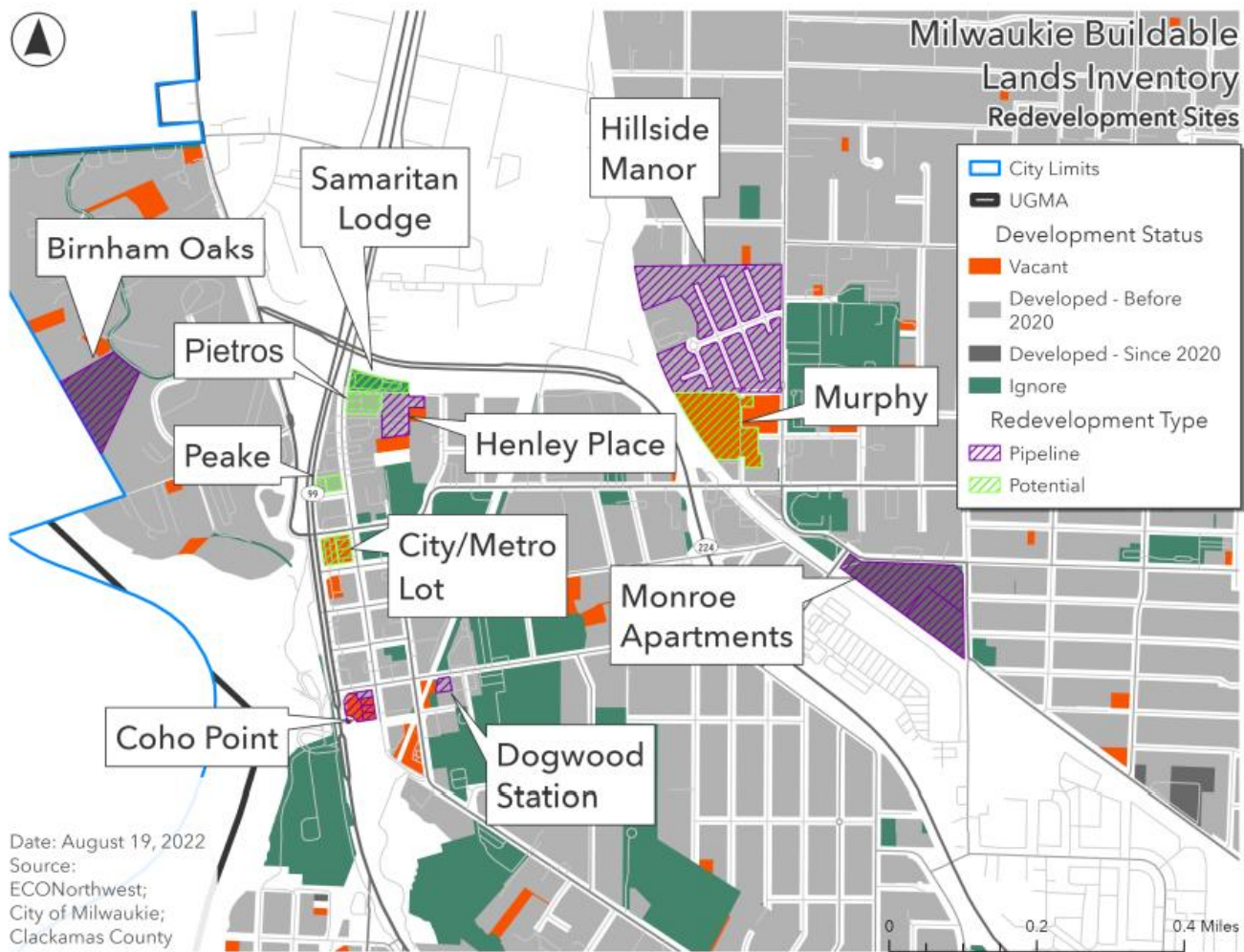


FIGURE 18. MILWAUKIE DOWNTOWN REDEVELOPMENT ANALYSIS BY ECONORTHWEST

If all potential redevelopment occurs within the Milwaukie downtown area, there would be an addition of 1,871 housing units added to the CFA.

ECONOMIC OPPORTUNITY ANALYSIS

According to Census data reported within the 2023 ECONorthwest Housing Capacity Analysis, 15,198 people worked in Milwaukie in 2019. This is an increase in employment compared to the economic opportunity analysis for Milwaukie which was released in October of 2016. Data from that analysis found that a total of 11,770 people were employed in Milwaukie in 2014. Of those jobs, approximately 1,500 were employed in the retail or service industry. According to the report, this sector of the job market is expected to double in size and employ closer to 3,000 people by the year 2035.

Other key findings from the report include:

- The most specialized industry in Milwaukie was the Primary Metal Manufacturing Industry.
- The 20 most specialized industries accounted for over 57 percent of all employment in the City's economy.

- Less than eight percent of the local workforce lives and works within Milwaukie.
- Over 45 percent of the workforce commutes to the City of Portland
- 95 percent of the local labor needs are met by people living outside of the city limits.

At the time there were 44 firms with more than 50 employees and 66 firms that employed between 20 and 49 people. It was estimated that by 2035 there will be the creation of between 6,131 and 7,750 jobs within Milwaukie. The employment estimates for Milwaukie are expected to be between 23,000 and 25,000 job in the year 2040. Figure 19 shows areas near the city that are likely to develop for industrial and commercial use. Only commercial space that is already developed is located within the CFA.

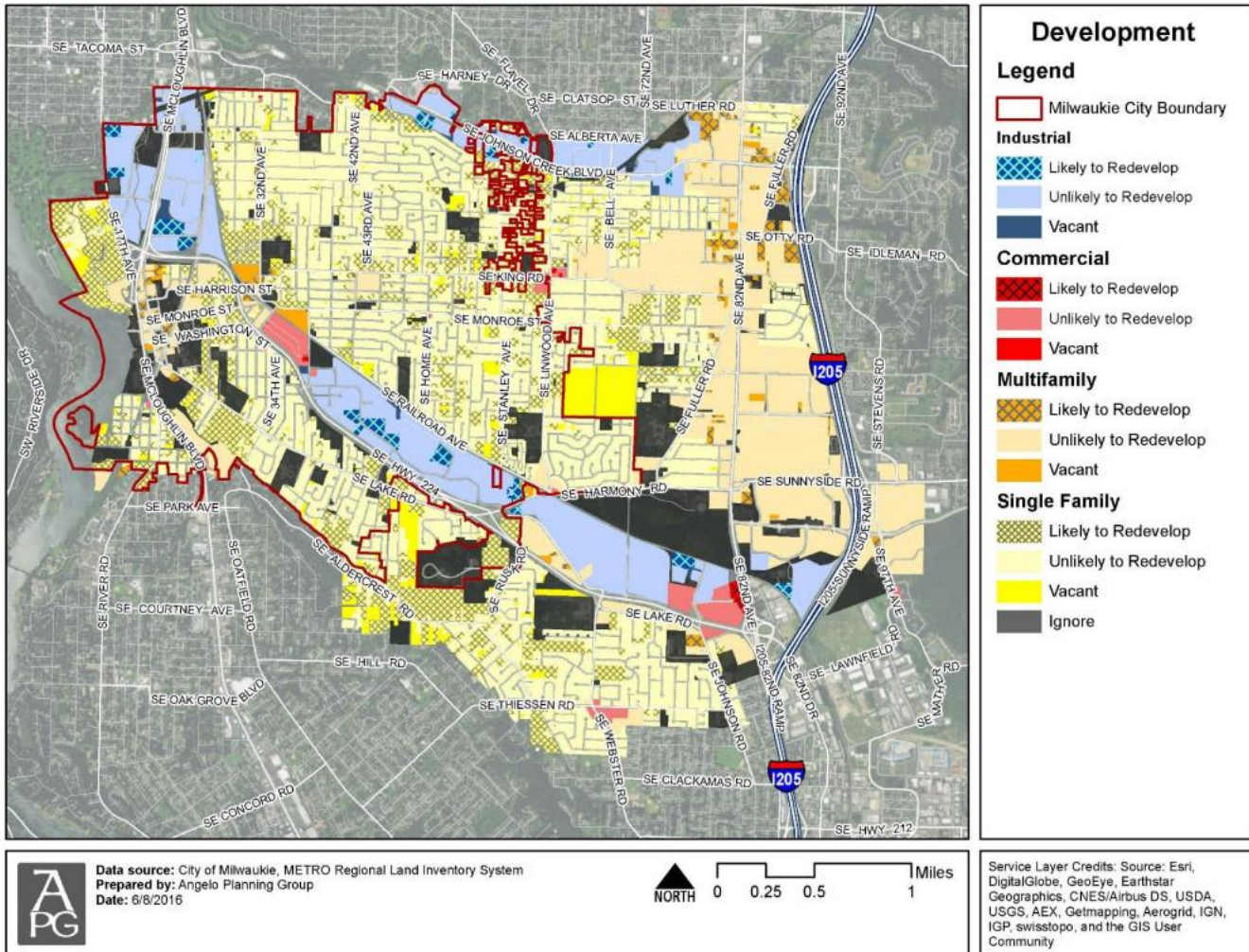


FIGURE 19. BUILDABLE LAND INVENTORY BY ANGELO PLANNING GROUP

METRO RTDM UPDATE

The following describes an in-depth analysis of findings within the most recent RTDM inputs for employment and housing. This version of the RTDM was not used for the case study because it is still in development but it contains important information as to how the region is predicted to change. The process to update the Metro 2023 RTP is currently underway to establish horizon year 2045 conditions. The base year for the new update is 2020.

HOUSING ASSUMPTIONS

Figure 20 shows the change in household assumptions between the base years of the two RTP processes. Between the five years, the highest household growth occurred within the CFA as well as some growth in the northeast corner of Milwaukie.

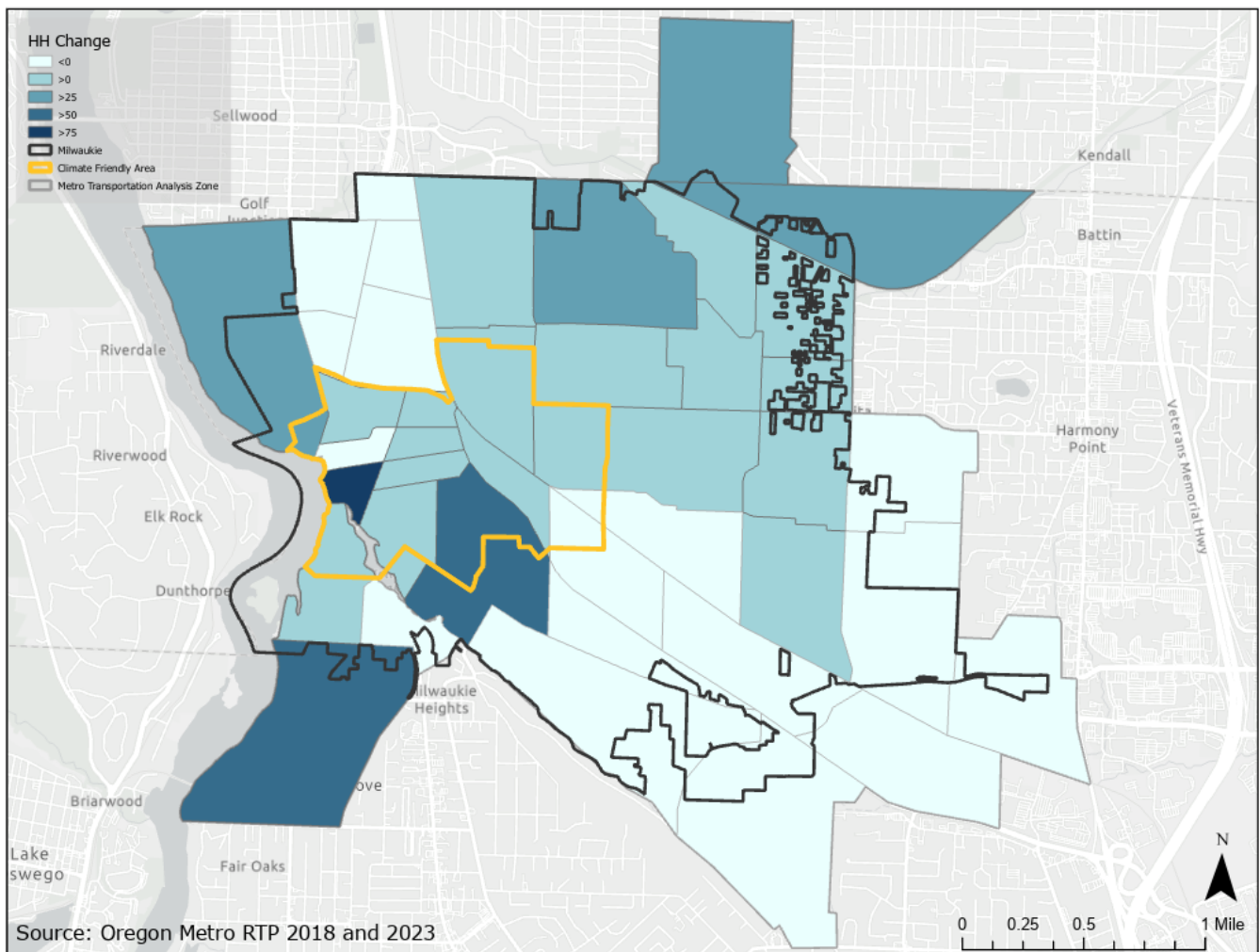


FIGURE 20. CHANGE IN HOUSEHOLDS BETWEEN 2015 AND 2020 (2018 RTP VS. 2023 RTP)

Figure 21 shows the forecast change in households between the years 2040 and 2045 based on the assumptions in the two models. In the year 2045 model, growth within the Milwaukie area is expected to occur predominantly in the CFA with TAZs near the edges of the city expected to see fewer households. This decrease does not necessarily mean the removal of existing houses. It represents a change in growth pattern assumptions within the new model. These new assumptions better model CFA assumptions by concentrating growth within the CFA.

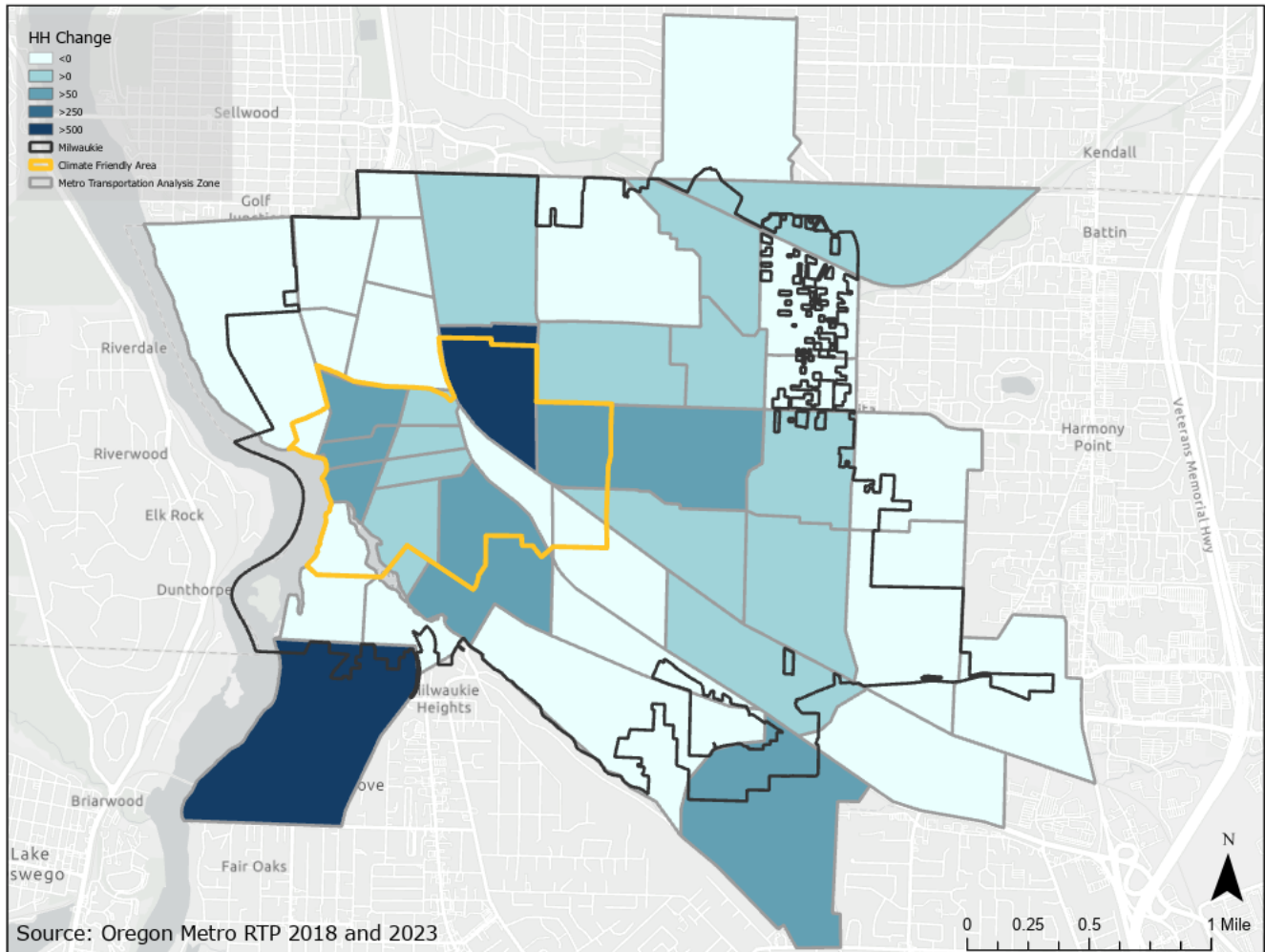


FIGURE 21. CHANGE IN HOUSEHOLDS BETWEEN 2040 AND 2045 (2018 RTP VS. 2023 RTP)

SECTION 2. RTDM INPUTS

INCOME, AGE AND HOUSEHOLD SIZE DISTRIBUTIONS



INCOME DISTRIBUTION

Households are divided into four groups by income level. Group 1 contains households with the lowest income and group 4 contains those of highest income. Within the CFA in the year 2015, income groups are roughly evenly divided between the first three income strata at approximately 30% each (Table 17) each and the remaining 10% in is Income category 4. While most TAZs have a similar income distribution between the two model years, TAZ 672 is an outlier. A reason for this disparity is that the Axletree Apartments complex, which was constructed in 2019 and contains 110 units, has no age or income restrictions.

TABLE 17. INCOME DISTRIBUTION (METRO RTDM 2040 INPUTS)

TAZ	INCOME 1		INCOME 2		INCOME 3		INCOME 4	
	2015	2040	2015	2040	2015	2040	2015	2040
668	25%	33%	26%	27%	37%	29%	13%	11%
669	25%	25%	26%	28%	37%	36%	13%	12%
670	0%	25%	0%	26%	0%	26%	0%	24%
671	25%	26%	26%	28%	37%	35%	13%	11%
672	0%	57%	0%	32%	0%	9%	0%	1%
673	25%	25%	26%	30%	37%	34%	13%	10%
674	25%	26%	26%	32%	37%	33%	13%	10%
677	25%	25%	26%	27%	37%	36%	13%	12%
678	25%	25%	26%	28%	37%	36%	13%	12%
679	28%	33%	30%	34%	30%	25%	12%	9%
688	18%	20%	26%	30%	37%	36%	18%	14%
CFA	24%	27%	27%	30%	36%	32%	14%	12%
MILWAUKIE	25%	28%	27%	30%	34%	32%	14%	11%

HOUSEHOLD SIZE DISTRIBUTION

Household size is the number of individuals living in a single household. As shown in Table 18, Household size Group 1 contains the smallest households (1 person) and household size Group 4 contains the largest households (4+ people). Within the CFA in the year 2015, the highest percentage of households contain two people (37%). People that live in studio and one-bedroom apartments tend to constitute smaller households than those who live in single-family homes. Therefore, it follows that TAZs with a larger percentage of studio and one-bedroom apartments should have an overall smaller household size on average. Today, while there is no

residential development in TAZ 672, but the area is forecast to contain almost 40% of single person households in the year 2040.

TABLE 18. HH SIZE

CFA TAZ	HH SIZE 1		HH SIZE 2		HH SIZE 3		HH SIZE 4	
	2015	2040	2015	2040	2015	2040	2015	2040
668	34%	44%	39%	30%	15%	15%	12%	11%
669	34%	35%	39%	38%	15%	16%	12%	12%
670	0%	21%	0%	21%	0%	21%	0%	37%
671	34%	36%	39%	36%	15%	16%	12%	12%
672	0%	69%	0%	16%	0%	10%	0%	5%
673	34%	36%	39%	36%	15%	16%	12%	12%
674	34%	37%	39%	34%	15%	17%	12%	12%
677	34%	35%	39%	38%	15%	15%	12%	12%
678	34%	35%	39%	38%	15%	16%	12%	12%
679	31%	40%	37%	31%	16%	17%	16%	12%
688	19%	22%	33%	32%	25%	26%	24%	20%
CFA	29%	34%	37%	34%	18%	18%	16%	14%
MILWAUKIE	29%	33%	35%	34%	17%	18%	18%	15%

HEAD OF HOUSEHOLD AGE DISTRIBUTION

Table 19 shows the division between the four age categories used within the RTDM. The age group is based on the age of the head of the household. Households headed by younger people are in Age Group 1 and older households are within Age Group 4. The majority of households within the CFA fall within the Age Group 2 or Age Group 4. Note the distribution in TAZ 672, which indicates that most households (75%) are in Age Group 4. For future modeling efforts, if it is known that there is a high prevalence of age-restricted housing or senior living communities, the distribution for age can be adjusted to match existing or forecast conditions.

TABLE 19. HEAD OF HH AGE

CFA TAZ	AGE 1		AGE 2		AGE 3		AGE 4	
	2015	2040	2015	2040	2015	2040	2015	2040
668	5%	4%	51%	39%	18%	14%	27%	44%
669	5%	4%	51%	46%	18%	17%	27%	33%
670	0%	18%	0%	42%	0%	21%	0%	19%
671	5%	4%	51%	44%	18%	17%	27%	35%
672	0%	2%	0%	21%	0%	1%	0%	75%



CFA TAZ	AGE 1		AGE 2		AGE 3		AGE 4	
	2015	2040	2015	2040	2015	2040	2015	2040
673	5%	3%	51%	41%	18%	16%	27%	40%
674	5%	3%	51%	37%	18%	15%	27%	45%
677	5%	4%	51%	48%	18%	18%	27%	31%
678	5%	4%	51%	47%	18%	17%	27%	32%
679	1%	1%	56%	40%	20%	15%	23%	44%
688	3%	3%	57%	52%	20%	19%	20%	27%
CFA	3%	3%	54%	44%	19%	17%	24%	36%
MILWAUKIE	3%	3%	53%	44%	18%	16%	26%	37%

SINGLE FAMILY PERCENTAGE

As previously noted in Table 16, which summarized findings from the housing needs assessment, 67% of housing units in the year 2023 were single dwelling detached - this was projected to be reduced to 63% in the year 2043. Both of those values are larger than what is represented in the RTDM for similar time periods (but not for *exactly* the same years). The RTDM has a lower percentage of single-family households than the housing needs assessment, but this measurement is based on total households as opposed to total housing units. Table 20 shows the year 2019 and 2040 RTDM model assumptions prior to development of CFA scenario.

TABLE 20. PERCENTAGE OF SINGLE-FAMILY HOUSEHOLDS

CFA TAZ	SF 2019	SF 2040	% CHANGE
668	21%	21%	0
669	13%	23%	10
670	0%	0%	0
671	15%	25%	10
672	0%	0%	0
673	22%	41%	19
674	61%	73%	12
677	68%	71%	3
678	52%	58%	6
679	22%	25%	3
688	97%	97%	0
CFA	33%	39%	6
MILWAUKIE	52%	55%	3

OTHER ZONAL DATA

Table 21 summarizes other zonal data inputs used in the analysis and represent the current inputs in the year 2040 RTDM model. While the data was reviewed it was not adjusted for the CFA scenario. Parking data is the average hourly cost of parking within a TAZ. Transit coverage is the percentage of households or jobs within a quarter-mile walking distance of a transit route. Specifically, a value of 100% means that all households or jobs within the TAZ are within a quarter-mile of walking distance to a transit route, and a value of 50% would mean that only half of households or jobs would have that level of access. Transit routes include bus, MAX, or streetcar line routes. Intersection Density is a proxy representation based on block length. Areas with shorter blocks have a higher intersection density than those with longer blocks. A higher intersection density encourages more pedestrian activity because there is better connectivity. All TAZs already met the intersection density of their proposed Metro 2040 Growth Concept typologies, so this variable was not adjusted in the CFA scenario.

TABLE 21: REFERENCE INPUT ASSUMPTIONS BY TAZ

TAZ	PARKING DATA (\$)	TRANSIT COVERAGE	INTERSECTION DENSITY (INTERSECTION / MILE)
236	0	88%	139
662	0	65%	90
663	0	100%	90
664	1.14	100%	142
665	0	100%	111
666	0	100%	90
667	0	100%	70
668	0.82	100%	100
669	0.82	100%	100
670	0.82	100%	100
671	0.82	100%	105
672	0.82	100%	100
673	0.82	100%	113
674	0.82	100%	110
675	0.82	96%	100
676	0	100%	114
677	0.82	100%	111
678	0.82	100%	111
679	0.82	100%	107
680	0	100%	112
681	0	53%	124
682	0	74%	129
683	0	94%	143

TAZ	PARKING DATA (\$)	TRANSIT COVERAGE	INTERSECTION DENSITY (INTERSECTION / MILE)
684	0	84%	139
685	0	100%	136
686	0	69%	135
687	0	80%	123
688	0.82	72%	121
689	0	82%	112
690	0	86%	110
691	0	76%	90
692	0	72%	90
693	0	48%	90
694	0	100%	100
695	0	100%	90
696	0	100%	90
697	0	72%	79
698	0	20%	70
699	0	85%	70
700	0	95%	70
706	0	89%	89

Note: Shaded rows indicate TAZs included in the CFA

SECTION 3: VMT CALCULATION

VMT CALCULATION STEPS

The Milwaukie case study was used to create the methodology for calculating household-based light-vehicle VMT per capita in collaboration with modeling staff at Metro, the consultant team, members of the OMSC Working Group, and ODOT staff.

The complete documentation on the VMT per capita methodology is a separate document that is part of Technical Memoranda 7 from ODOT's Analysis and Modeling project and the methodology will be added to the Analysis Procedures Manual, Chapter 17, in late 2024.