

Appendix F: Data and Forecasting

INTRODUCTION

As part of the 2025 TRPA Regional Transportation Plan (RTP), TRPA prepared regional and transportation forecasts for the years 2035 and 2050. The regional forecast includes changes in development, population demographics, and visitation. The transportation forecast includes the RTP project list, as well as the transportation strategies. The regional forecast and the transportation infrastructure forecast are implemented in the Tahoe travel demand model and the Trip Reduction Impact Analysis (TRIA) tool to allow planners to assess the efficacy of policies and projects that promote the goals of the Regional Plan and the RTP.

DEVELOPMENT FORECAST SUMMARY

The 2035 and 2050 forecast years build upon the 2022 model base year. The forecast includes a variety of projections related to land use and the characteristics of the region's traveling population in the forecast years; this population includes residents, visitors, and commuters. The forecast years of 2035 and 2050 were selected to meet specific regulatory requirements of the California Sustainable Communities Strategy (SCS) and Federal RTP requirements and to align with the forecasts periods used by nearby regional partners, including the Sacramento Area Council of Governments (SACOG), Carson Area Metropolitan Planning Organization (CAMPO), the Regional Transportation Commission of Washoe County (RTC-Washoe), and the Bay Area Metropolitan Transportation Commission (MTC).

Residents– The forecast projects Lake Tahoe's 2035 and 2050 full-time residential population to increase slightly. The Region's population has been steady for the last 10 years, and the projected slight increase is influenced by a suite of factors. First, the number of regional housing units will increase as residential allocations are distributed and workforce housing/affordable housing programs are implemented using residential bonus units. Second, the residential occupancy rate – the proportion of homes occupied by residents – is expected to increase slightly due to implementation of workforce and affordable housing initiatives as local and regional efforts to increase the housing supply for local residents take effect. The downward trend in regional population between 2000 and 2010 was likely influenced by the declines in gaming and associated job loss. The precipitous declines in gaming revenues observed in the early part of the century following the opening of casinos in northern California have not continued into the second decade as revenues appear to have stabilized.

The income distribution of the residential population has shifted significantly in recent years, with more high-income households and fewer low-income households. For the forecast period, with the proposed increase in workforce and affordable housing, TRPA anticipates that the recent upward trends in household income will stabilize; the forecast shows the same distribution of occupied households by household income in 2050 as was observed in 2022. School enrollment will increase slightly as a result of overall population growth, however as census data indicates that the age distribution of Tahoe's

population has increased in recent years, the forecast assumes slightly less of an increase in school enrollment than the overall population increase as the data trends show fewer residents with school-aged children. Employment will also increase as additional Commercial Floor Area (CFA) and Tourist Accommodation Units (TAU) are constructed throughout the region.

Visitation – The forecast projects slight growth in both day and overnight visitation. This forecasted increase is based upon the projected population growth in the mega-region (Bay Area/Sacramento/Reno), and the recovery to pre-Covid occupancy rates at hotels. This increase in visitation will result in an increase in the number of occupied overnight lodging units and short-term rentals. The forecast assumes a return to pre-Covid occupancy rates for seasonal homes. These rates have increased during the past couple of years with increased remote work opportunities during the pandemic. However, recent data suggests that workers are returning (or being required to return) to their offices more frequently, so the second home occupancy rate was reduced to 2018 levels.

	Base Year 2022	Forecast 2050	Change(#)	Change(%)
Residential Units and Population				
Residential Population	53,842	57,611	3,769	7.0
Occupied Units	23,296	25,840	2,544	10.9
Unoccupied Units	26,128	27,969	1,841	7.0
Total Residential Units	49,424	53,809	4,385	8.9
Income and Occupied Residential Units				
Low Income Units	9,910	11,109	1,199	12.1
Medium Income Units	4,724	5,078	354	7.5
High Income Units	8,662	9,653	991	11.4
Total Overnight Visitor Units				
Short Term Rentals	4,313	4,803	490	11.4
Seasonal Units	19,073	20,417	1,344	7.0
Campground Spots	1,964	2,017	53	2.7
Total Lodging Units	11,268	11,951	683	6.1
Occupied Overnight Visitor Units				
Occupied Short Term Rentals	1,941	2,161	221	11.4
Occupied Seasonal Units	7,439	7,350	-89	-1.2
Occupied Camping Spots	1,159	1,286	127	11.0
Occupied Lodging Units	5,409	5,736	328	6.1
Other Key Data Points				
Commercial Floor Area	6,486,960	6,648,333	161,373	2.5
Employment	26,777	27,580	803	3.0
School Enrollment	9,089	9,407	318	3.5

Forecast Methodology

The overall approach to forecast development was to apply the best available information and data. The development rate forecast was informed by a review of historical development rates, and an assessment of the performance of past forecasts. The forecast differs from past forecasts in at least two ways:

1. More rational development rates – Prior forecasts have generally assumed that full build out of the Region would occur. Historic development rates have not kept pace with those forecasts (additional detail on observed rates is available in the data trends appendix). This forecast refines past methodologies by placing greater weight on observed development rates.
2. Development rights system - significant changes were made to the development rights system to accelerate the attainment of threshold standards and Regional Plan goals and policies. The changes enable easier conversion between types and facilitate the attainment of state housing mandates.

The forecasts contained in this document represent a realistic view of the continued build out of the Lake Tahoe Regional Plan. Prior forecasts by TRPA had projected significantly faster growth and a faster consumption of the remaining development rights. The annual rate of consumption for commercial floor area and tourist accommodation units were adjusted to align with observed trends since the adoption of the 2012 Regional Plan update. Additionally, the forecast assumes that not all the remaining development potential for commercial floor area and tourist accommodation units will be constructed by 2050.

Residential Units

There are currently 49,424 residential units in the Region (based on TRPA records); according to the occupancy rates published by the U.S. Census Bureau 2022 American Community Survey (ACS), an estimated 23,141 residential units (47%) are occupied by full-time residents and 26,283 units (53%) are not occupied by full-time residents (U.S. Department of Commerce, 2022). Approximately 20% of existing residential units in the region are multi-family units (approximately 9,885 units) and 80% of existing units (39,539) are single-family units. By 2050, an additional 4,385 units are expected to be constructed, bringing the total number of residential units in the region to 53,809, a 9% increase. This includes the construction of 1,754 additional single-family residential units (40% of additional units) and 2,631 additional multi-family residential units (60% of additional units). Forecasts of residential projects in the California jurisdictions are sufficient to accommodate the Regional Housing Needs Assessment (RHNA) Cycle 5 (2013-2021) and Cycle 6 (2022-2031). However, local housing needs assessments have identified a greater number of affordable and workforce housing units needed beyond what the forecast assumes will be newly constructed and occupied. The conversion of existing housing from market rate to workforce or affordable housing would also be required to fully meet the housing needs identified.

All remaining residential allocations (1,892) are allocated and constructed in the forecast. This includes the award and construction of all residential bonus units (1,448) and all currently banked residential units (345) by 2050. The forecast also includes the conversion of 100,000 square feet of CFA and 300

TAUs to residential units, which will generate an additional 350 multi-family and 350 single-family units. The projected conversions are consistent with conversion trends since the adoption of the conversion programs and observed development rights utilization rates. The observed trends indicate a net conversion from CFA and TAUs to Residential.

Several key assumptions informed the spatial distribution of residential development in the forecast. First, new residential units were allocated to projects known to be in the pipeline, including multi-family and affordable-/moderate-income projects on public lands. This includes 710 units expected to be built on California Tahoe Conservancy asset lands¹, redevelopment successor agency² parcels and other publicly owned parcels where large multi-family and affordable/moderate-income housing projects are likely to be constructed. For multi-family development on private properties, where the exact number of units to be constructed was not fully known, a computer-generated random selection distributed units to vacant buildable multi-family and existing underbuilt residential parcels throughout the region. For these parcels, the number of units allocated was 60% of the maximum allowable buildout based on current zoning, coverage constraints, and density restrictions. This assumption is consistent with observed buildout patterns, and conservative in that it distributes new residential development throughout the region (rather than modeling the most compact possible pattern). Multi-family units were only assigned to parcels that are currently zoned for multi-family residential, meet density requirements, and that have remaining coverage available to support additional units. Finally, the remaining private residential units were constructed as single-family units through random assignment to vacant buildable properties throughout the region. Figures 3 – 5 show the impact of these added residential units on housing density, highlighting that the impacts are concentrated in town center areas that may already have similar density.

¹ See <https://tahoe.ca.gov/programs/tahoe-livable-communities/asset-land-sales/> for more details about potential housing development opportunities that have been identified by the California Tahoe Conservancy.

² See <https://www.placer.ca.gov/3396/Housing> for information about potential housing development project opportunities in Placer County.

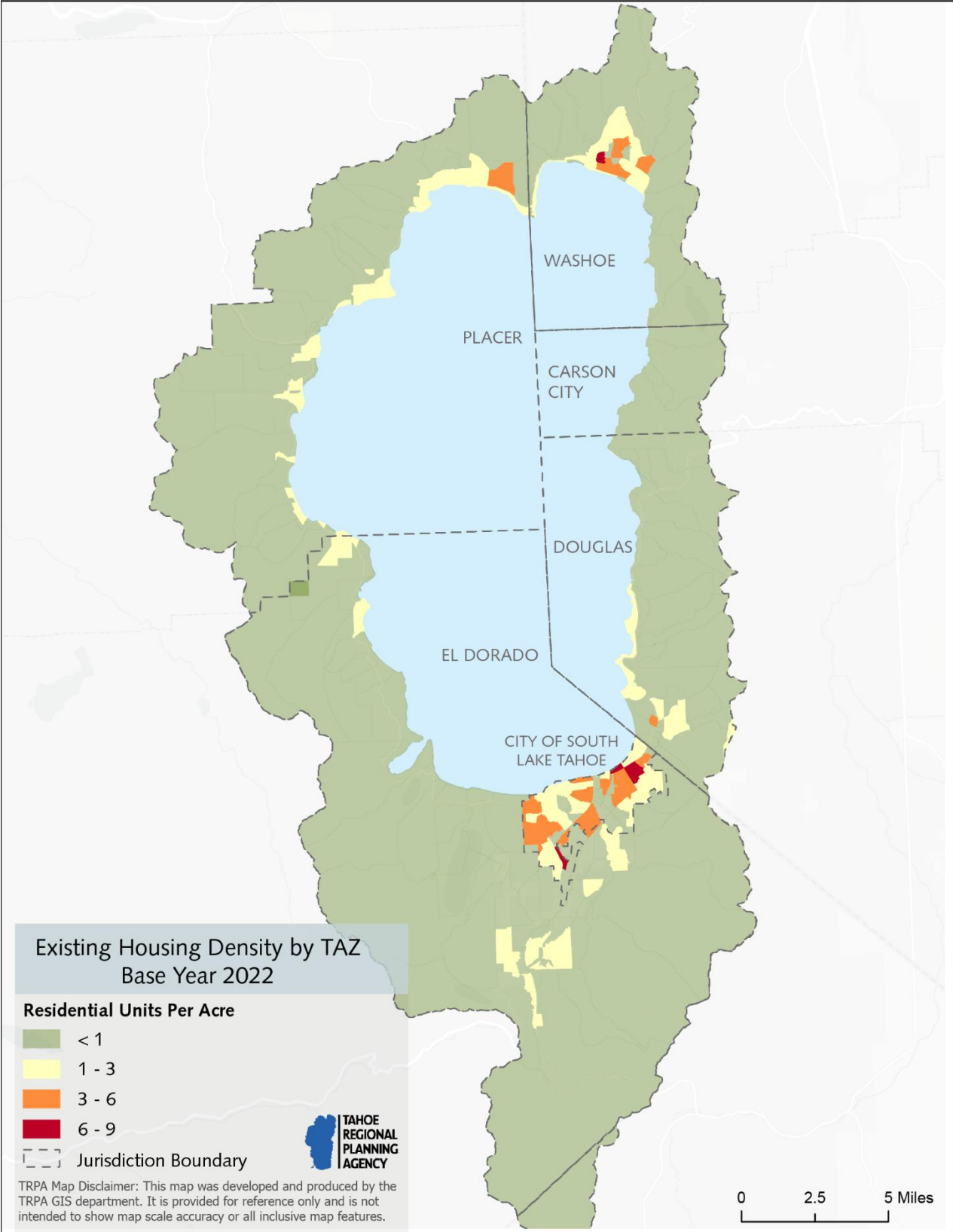


Figure 2

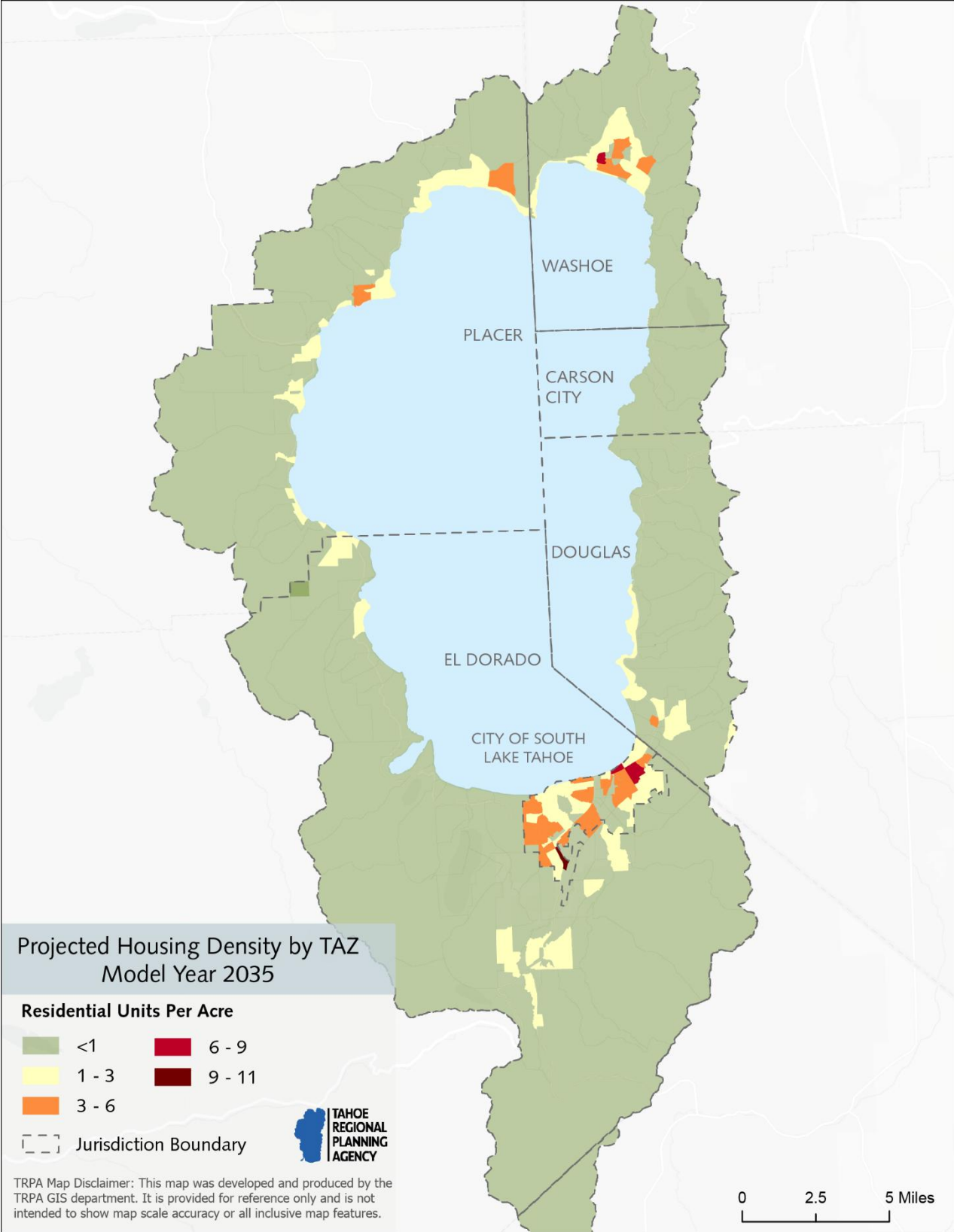


Figure 3

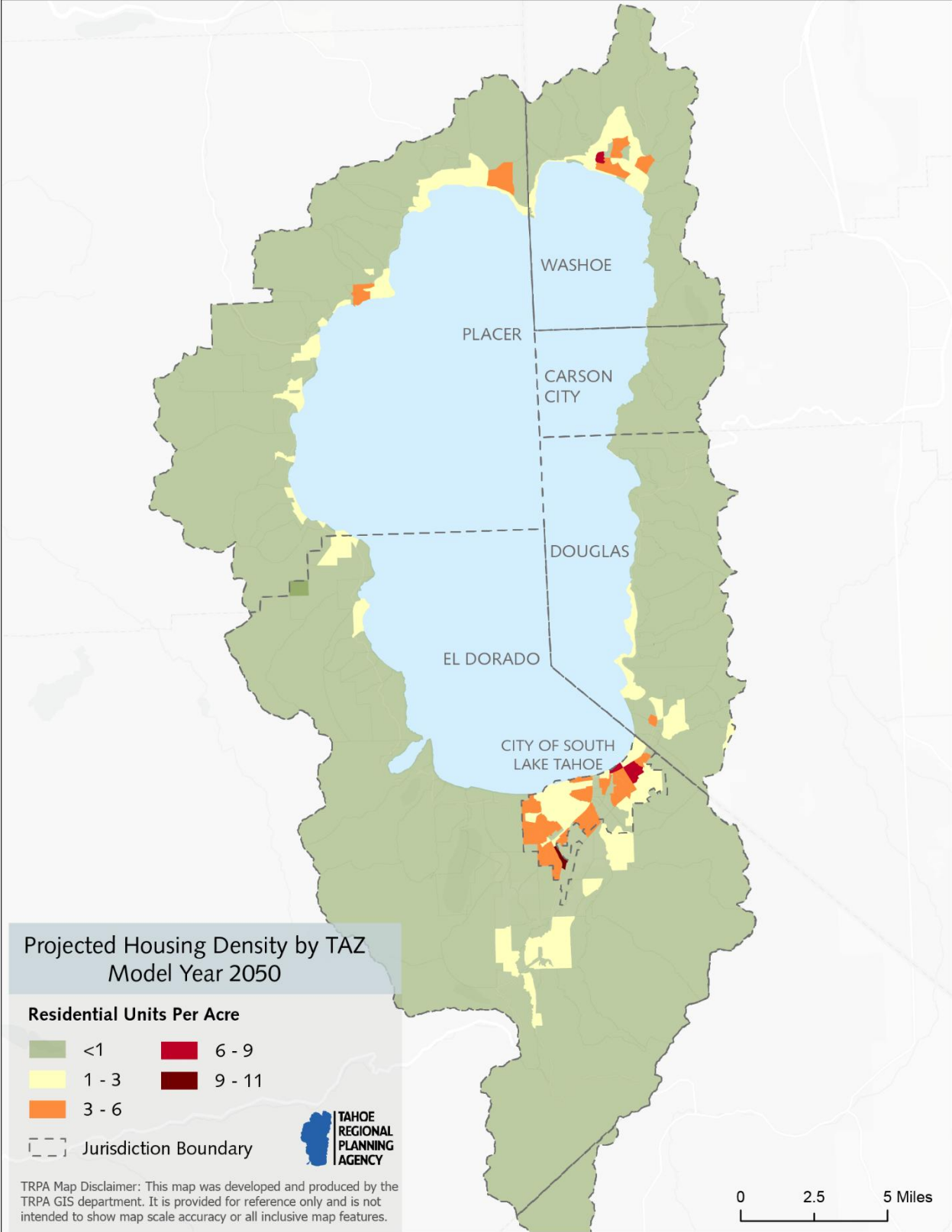


Figure 4

Residential Occupancy Rate

The 2020 Decennial Census estimates that the proportion of occupied housing units in the Tahoe Region was 50% in 2020 (U.S. Department of Commerce, 2023). The remaining 50% of the regional housing supply not occupied by full-time residents is classified by the ACS as seasonal use (44%, including short-term rentals) or otherwise vacant (6%). These figures were slightly higher than the 2010 Census, which reported that 49% of Tahoe’s housing units were occupied, 44% were seasonal use, and 7% were otherwise vacant.

The 2020 housing occupancy data varies significantly by jurisdiction and community around the Tahoe Region, with some communities on the west shore of Tahoe approaching 70% to 80% seasonal and vacant housing units, and some east shore communities at 33% seasonal and vacant.

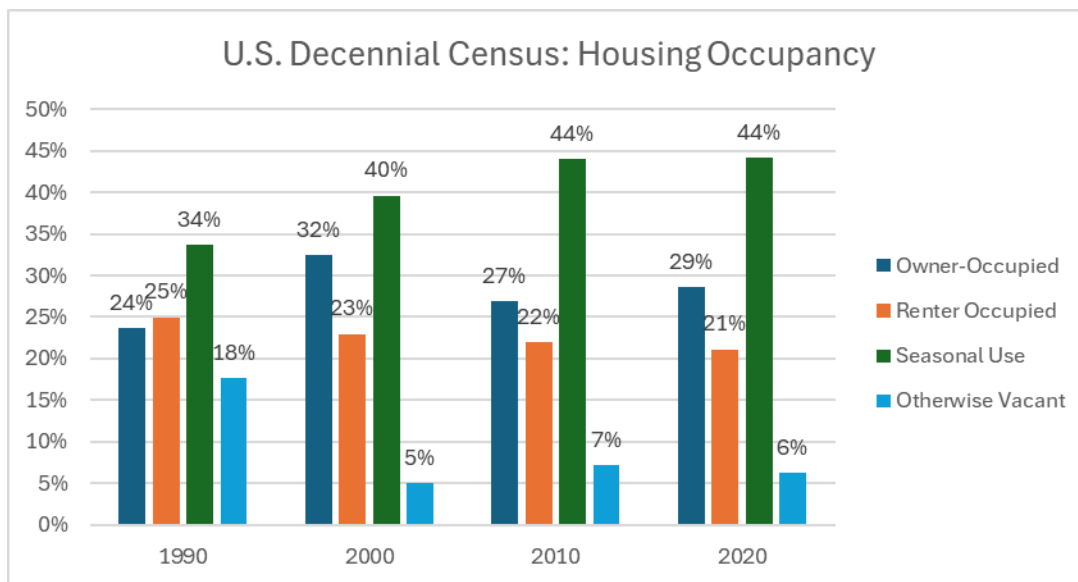


Figure 5

The forecast includes an increase in the proportion of residential units occupied by full-time residents (owner-occupied and renter-occupied) and assumes a return to pre-Covid level of second home occupancy. Three factors are expected to contribute to the shift: 1) Housing Initiatives to support construction of new workforce, achievable, and affordable housing in the region, 2) Housing initiatives to support the transition of the existing stock of residential units from second homes and short term rentals to resident-occupied units, and 3) Short term rentals regulations. Additional details on each factor are provided below.

1. *Housing initiatives to promote new workforce and income-restricted housing:* The development forecast includes construction of all of the remaining 1,448 residential units from the TRPA residential bonus unit pool. Residential Bonus Units are awarded as transfer incentives for relocating remote development into town centers, and for the construction of affordable/moderate/achievable housing. New housing constructed with Residential Bonus

Units is required by TRPA Code to be deed-restricted to prohibit these housing units from being used for second homes or vacation rentals.

2. *Short term rental regulations:* Since the 2020 RTP, there have been numerous changes in the regulation of short-term rentals by local jurisdictions.
 - a. *Measure T in the City of South Lake Tahoe:* Voters passed Measure T in the City of South Lake Tahoe in November 2018. The measure includes broad restrictions on short term rentals (STRs) outside select areas in the city. The restrictions went into effect on December 31, 2021. As a result of the measure, approximately 1,372 previously permitted VHRs were not renewed. (City of South Lake Tahoe, n.d.)
 - b. *Douglas County:* In 2021, Douglas County adopted changes to its vacation home rental ordinance that placed a cap on the total number of permits available (600) in the Tahoe Township, placed caps on the number of permits available in each subdivision, established a tiered permit structure, created an advisory board, and substantially increased the penalties for violations. The current version of Douglas County's Lake Tahoe Vacation Home Rentals ordinance (chapter 20.622 of the Douglas County Code) was adopted March 21, 2024. Under current regulations, vacation home rentals are either prohibited or heavily restricted in and north of Lincoln Park, with VHRs in allowed subdivisions limited to 15% of housing stock. Many neighborhoods have reached their caps, with additional permit requests added to a waitlist. (Douglas County Board of County Commissioners, 2024)
 - c. *El Dorado County:* El Dorado County adopted a new county-wide VHR ordinance on December 2, 2020. This ordinance limited the number of permits in the Tahoe Basin to 900 permits. On August 24, 2021, the ordinance was amended to require a 500-foot buffer around all active VHR permits. El Dorado County's permit cap was reached in May 2023. (El Dorado County, n.d.)
 - d. *Placer County:* Placer County adopted a STR ordinance in November 2019, going into effect in January 2020. This ordinance was repealed and replaced with the current STR ordinance on February 8, 2022, effective March 11, 2022, with later amendments. The current ordinance limits the number of STR permits east of Kingvale to 3,900 permits, with 3,227 permits active as of October 2024. About two-thirds of the active permits are located within the Tahoe Basin, with most of the remainder in the Northstar, Soda Springs, Schaffer's Mill, and Olympic Valley/Alpine Meadows areas outside of the Tahoe Basin. There is no specific cap on Tahoe permits, though Placer County representatives have stated that the cap may be lowered if additional hotel or resort capacity is constructed. (Placer County Code Enforcement Services, 2024)
 - e. *Washoe County:* Unlike other jurisdictions in the Tahoe Basin, Washoe County does not place a limit on the number of STR permits that may be issued. The current Washoe County STR ordinance was adopted May 10, 2022. More recently, STR fees were increased, with the latest fee schedule becoming effective on July 1, 2024. Separate from county regulations, some homeowners' associations in Washoe County ban STRs. (Washoe County Community Services Department, 2024)

Commercial Floor Area (CFA)

There are currently 529,880 square feet of unused commercial floor area in TRPA and local jurisdiction community/area plan pools. Since 2013, a total of 50,200 square feet of CFA has been allocated to projects; an average rate of 5,020 square feet of CFA per year. The forecast includes the construction of an additional of 85,765 square feet of CFA by 2035 and 161,373 square feet by 2050. The forecasted rate of development – 5,763 square feet - is higher than the observed rate since the 2012 Regional Plan, but lower than rates used in prior regional forecasts. CFA was allocated to known projects that have been permitted or are in the planning phase, but not constructed; remaining CFA was allocated to town centers and community plans or area plans using the observed proportions from recent allocations.

The forecast includes the conversion of 100,000 square feet of CFA to residential units, consistent with conversion trends since the adoption of the conversion program; recent trends indicate the net conversion from CFA and TAUs towards Residential. The converted CFA is forecasted to result in the construction of 400 additional residential units --200 multifamily units, and 200 single family units. At the end of the forecast period, 457,627 square feet of CFA remains unallocated or banked, and thus unconstructed.

Tourist Accommodation Units (TAU)

The forecast includes the construction of an additional 489 TAUs by 2035 and another 503 TAUs by 2050. The forecast includes the completed construction of all currently permitted projects using 854 banked TAUs and the use of 138 awarded TAU bonus units. Furthermore, the forecast includes the removal, banking, and conversion to residential of 300 existing units, including units at Lakeside Inn, that were considered as part of the baseline 2022 data but have been since removed, and Motel 6 that is expected to be removed in coming years. Not all TAUs allowed in the Regional Plan are forecast to be constructed by 2050; an estimated 326 TAUs will remain undeveloped through 2050 (204 TAU bonus units and 122 banked TAUs). The TAU development rights pool is not exhausted within the forecast horizon, because of the slow rate of TAU right utilization and construction over the past 30 years. No TAUs have been allocated to projects and constructed since adoption of the 2012 Regional Plan, and only 58 TAUs have been allocated since the adoption of the 1987 Regional Plan. TAUs were allocated to projects that are permitted but not yet constructed (Homewood, Boulder Bay, Edgewood Casitas, Tahoe City Lodge, and Chateau/Project 3). Bonus TAUs were assigned to permitted projects (Homewood, Boulder Bay, Tahoe City Lodge) and no additional allocations other than existing permits were included.

The forecast also includes the conversion of 300 TAUs to residential units, consistent with recent conversion trends since the adoption of the conversion programs; observed trends indicate the net conversion from CFA and TAUs and towards Residential.

Development Rights Forecast Summary

Total development in the Tahoe Region is capped by the Regional Plan. The type and rate of that development is further controlled by a complex system governing development rights in the Region.

Development rights are land use units someone must acquire before a property is developed. Development rights include tourist accommodation units (TAUs), single and multi-family residential units of use (RUUs), and commercial floor area (CFA). Residential units of use (RUUs) are formed by combining a potential residential unit of use (PRU) and a residential allocation. The forecast differentiates between when a development right is allocated from TRPA or another jurisdiction’s pool and the final use of that development right. Development rights can be utilized in one of two ways; they can be used to construct a project (e.g. a house) or converted to a different type of development right. The forecast is grounded in projections about the utilization, transfer, conversion, and construction of development rights. Tables 2-4 summarize the fate of development rights in the forecast period.

- Table 2 summarizes new construction which influences land use in the future scenarios. Tables 3 and 4 provide background detail on the underlying accounting that enabled the development.
- Table 3 summarizes the expected utilization of development rights in their current type.
- Table 4 summarizes the expected conversion of development rights between types.

The forecast includes the net annual construction of 157 residential units, 5,763 square feet of commercial floor area and 25 tourist accommodation units (Table 2).

Table 1: Construction Forecast Summary

Development Right Construction	Annual Construction Rate	2035 Net Change	2050 Net Change
Residential Units			
Total Development of Residential Units	+157	+2,041	+4,385
Commercial Floor Area (in Square Feet)			
Total Utilization of CFA	+5,763	+85,765	+161,373
Tourist Accommodation Units			
Total Development of TAUs	+25	+325	+692

The forecast includes the utilization of allocation pools held by TRPA and local jurisdictions in the area plan, community plan, or plan area statement pools, as well as the use of bonus and incentive pools, special projects pools, and banked development rights (Table 3).

Table 3: Development Rights Utilization Forecast Summary

Development Right Utilization	Annual Utilization Rate	2035 Net Change	2050 Net Change
Residential Units			
Residential Allocations	+68	+884	+1,892
Residential Bonus Units	+52	+676	+1,448
Banked Residential Development	+12	+156	+345
Total Development of Residential Units	+132	+1,716	+3,685

Commercial Floor Area (in Square Feet)			
Commercial Floor Area Allocations	+6,052	+78,676	+169,452
Commercial Floor Area Allocations (TRPA special projects pool)	+1,609	+20,921	+20,921
Banked Commercial Development	+21,536	+32,968	+71,000
Total Utilization of CFA	+10,197	+132,565	+261,373
Tourist Accommodation Units			
TAU Allocations	+0	+0	+0
TAU Bonus Allocations	+5	+65	+138
Banked TAU Development	+31	+403	+854
Total Development of TAUs	+36	+468	+992

The forecast includes the conversion of development rights between the various types of development (Table 4). TRPA approved a comprehensive update to Tahoe’s development rights system in 2018. This allows conversions between different types of development rights using environmentally-neutral exchange rates and makes development rights simpler to transfer around the Basin, keeping limits on Tahoe’s total development potential. The changes make it easier for the private sector to invest in redevelopment projects that benefit the Tahoe region and provide needed workforce housing. The projected conversions are consistent with conversion trends since the adoption of the conversion programs and observed development rights utilization rates. The observed trends indicate a net conversion that reduces CFA by 3,600 square feet and 11 TAUs and creates an additional 28 residential units each year.

Table 4: Development Rights Conversion Summary

Development Right Conversion	Annual Change as a Result of Conversion	2035 Net Change	2050 Net Change
Residential Units			
Net Development Right Conversions to Residential	+25	+325	+700
Commercial Floor Area (in Square Feet)			
Net Development Right Conversions from CFA to RUU	-3,600	-46,800	-100,000
Tourist Accommodation Units			
Net Development Right Conversions from TAUs to RUU	-11	-143	-300

Employment

The most recent region-wide data estimates that summertime employment in the Tahoe region decreased by 6% between 2018 and 2022, from 28,604 to 26,777 jobs. The forecast projects a small increase in employment in the region as a result of increased visitation, construction of new CFA and TAUs, and population growth. In the 2022 model base year there are an estimated 28,558 workers living in the Tahoe region and 26,777 jobs (some residents hold jobs outside the region). The forecast projects

continued growth of jobs in the region, with 803 (+3%) new jobs in the region by 2050. The number of external workers (those commuting into the region for work) is not expected to grow because more workers are expected to find housing locally as a result of the regional housing initiatives.

Visitation

The forecast includes an increase in visitation which is influenced by several factors. The Tahoe Region is located near and draws visitors from several regions that are projected to experience between 20% and 30% growth in the coming decades (Figure 5, Table 5). The Sacramento Council of Governments (SACOG), predicts that population in the greater Sacramento Region³ will grow 26% by 2050 (Sacramento Area Council of Governments, 2022). Farther west, but still within the Tahoe Mega-Region, the Association of Bay Area Governments (ABAG)⁴ forecasts 30% population increase by 2050 (Association of Bay Area Governments, 2021). To the north and east of Tahoe, RTC-Washoe predicts a 28% growth in population in the Reno/Sparks Metropolitan area⁵ by 2050 (Regional Transportation Commission of Washoe County, 2024) and the Carson Area MPO⁶ predicts a 23.5% growth in population (Carson Area Metropolitan Planning Organization, 2024). Population growth in the mega-region is likely to create increased demand for recreation opportunities and the unique experience that Tahoe provides.

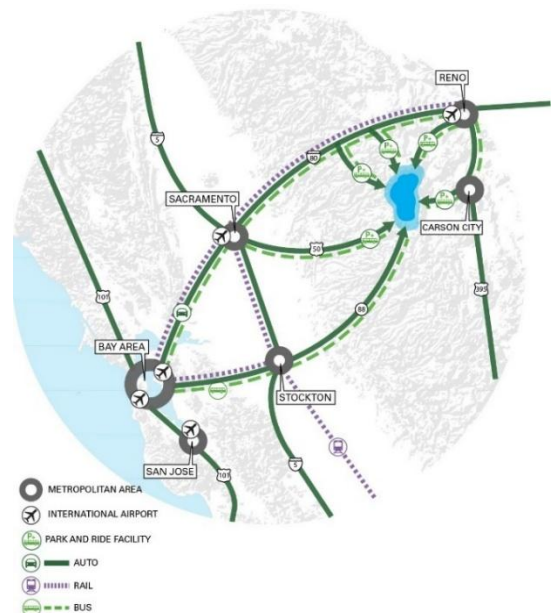


Figure 6: Tahoe Mega-Region

Table 5: Mega-Region Growth Forecasts

Location	Metric	Growth	Forecast Year	Source
Sacramento Region	Population	+23%	2050	SACOG 2025 MTP/SCS
Sacramento Region	Employment	+23%	2050	SACOG 2025 MTP/SCS
Reno/Sparks Metro	Population	+28%	2050	RTC-Washoe 2050 RTP, 2018
Reno/Sparks Metro	Employment	+34%	2050	RTC-Washoe 2040 RTP, 2018

³ The Sacramento Area Council of Governments (SACOG) includes the counties of El Dorado, Placer, Sacramento, Sutter, Yolo, Yuba and the 22 cities within this six-county region.

⁴ The Association of Bay Area Governments (ABAG) region encompasses Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano and Sonoma counties.

⁵ Regional Transportation Commission (RTC) of Washoe County, Nevada serves the Reno and Sparks areas along with unincorporated areas of Washoe County.

⁶ The Carson Area Metropolitan Planning Organization (CAMPO) covers the Carson City urbanized area, which consists of Carson City, northern Douglas County, and western Lyon County.

Carson City Region	Population	+23.5%	2050	CAMPO 2040 RTP, 2018
San Francisco Region	Population	+30%	2050	ABAG 2050 RTP

Population growth outside the region over the last 20 years has not translated to a linear increase in visitation into the region. Therefore, the forecast does not project increases in visitation in proportion to the projected growth in the mega-region. It is uncertain why past population growth has not translated in a linear fashion to increased visitation, but working theories include the decline in popularity of the local casinos as the gaming experience has become more widely available, limited tourist accommodation capacity, the limited roadway capacity into the region and associated willingness to travel to the region given the longer travel times.

The visitation forecast is comprised of related but independent projections regarding the expected characteristics of both the number and occupancy of overnight lodging accommodations types, and day visitation. The visitation forecast can be broken down into overnight visitors (staying in Hotels/Motels/Casinos/STRs/Private homes) and day visitors. The number of occupied overnight visitor units is forecast to grow by 7% by 2050.

Overnight Visitors in Hotels/Motels/Casinos – In the 2022 model base year, 5,666 of the region’s 11,805 TAUs are occupied (48%) during the modeled day. The forecast includes the construction of an additional 683 TAUs by 2050, a 5.8% increase in tourist accommodation units. TRPA is assuming added TAUs are occupied at the same rate as current units, keeping the occupancy rate the same in the future. As a result of additional unit availability from new TAU construction, the actual number of occupied Hotel/Motel/Casino units increases by 5.8% in 2050.

Overnight Visitors in STRs – In 2022, TRPA estimated that there were 4,313 permitted STRs in the Tahoe Region, which comprised approximately 13% of all existing residential units and 23% of the vacant housing units. On the model day, 45% of the units, or 1,941 properties are occupied. The forecast projects that the number of occupied STRs is relatively flat in the forecast years, with an assumption that the number of Douglas County and Placer County units increases to the legal cap. Future year STR occupancy rates were decreased slightly from 2022 numbers to account for recent data indicating that California side summer weekday visitors have decreased since 2022, as well as statements by Placer County indicating that there are plans to reduce the county STR cap when more hotel units become operational.

Overnight Visitors in Seasonal Units – Seasonal units are residences within the model that are not claimed as the primary residence for the owner. Within the model they could be occupied by the owner, friends of the owner, time-shares, informally rented, but are not accounted for included in the total of STRs. These units comprise approximately 36% of the total housing market in the region, of which 37% were estimated to be occupied on the modeled day in the 2018 base year. During Covid, the occupancy rate for seasonal units increased significantly to 45% as seasonal homes were used more frequently. The forecast assumes a return to pre-Covid occupancy rates for seasonal homes. Recent data suggests that workers are returning (or being required to return) to their offices more frequently, so the current model returned the second home occupancy rate to the 2018 levels. The proportion of seasonal units in

the region has grown in the last 10 years. The proportion of seasonal units is not forecast to continue to increase, due to three factors: 1) the construction of additional workforce housing units which cannot be used for second homes, 2) initiatives focused on making the existing housing more affordable for workers and residents, and 3) the conversion of some existing vacation rentals to resident housing. As a result of the increase in the total number of homes in the region the number of seasonal units increases by 7% in 2050.

Day Visitors – Day visitation is forecast to increase as a result of population growth in the mega-region, at a rate slightly faster than overnight visitation. Day visitors are one of the more challenging travel parties to forecast. The model assumes the factors that drive overnight visitation are positively correlated with factors driving day visitation. The relationship between these two types of visitors was established as part of the calibration and validation for the 2018 base year.

Passenger Traffic at Reno-Tahoe International Airport – The Reno Tahoe International Airport has a significant role in visitation to the Tahoe Region, as increases in the number of passengers through the airport can affect both overnight and day visitation to the Lake Tahoe. The Reno Tahoe Airport Authority publishes monthly data on passenger volumes through the airport (Figure 18). Passenger volumes dropped precipitously during the Covid-19 pandemic, with lower volumes through 2020 and 2021. By 2022, passenger volumes through Reno had recovered and exceeded 2018 levels. Passenger volumes have continued to rise since 2022, with the full year 2023 volumes reaching the highest level since 2007, and through August 2024, ten of the last twelve months have recorded the highest monthly passenger volumes since 2018 (Reno-Tahoe Airport Authority, 2024).

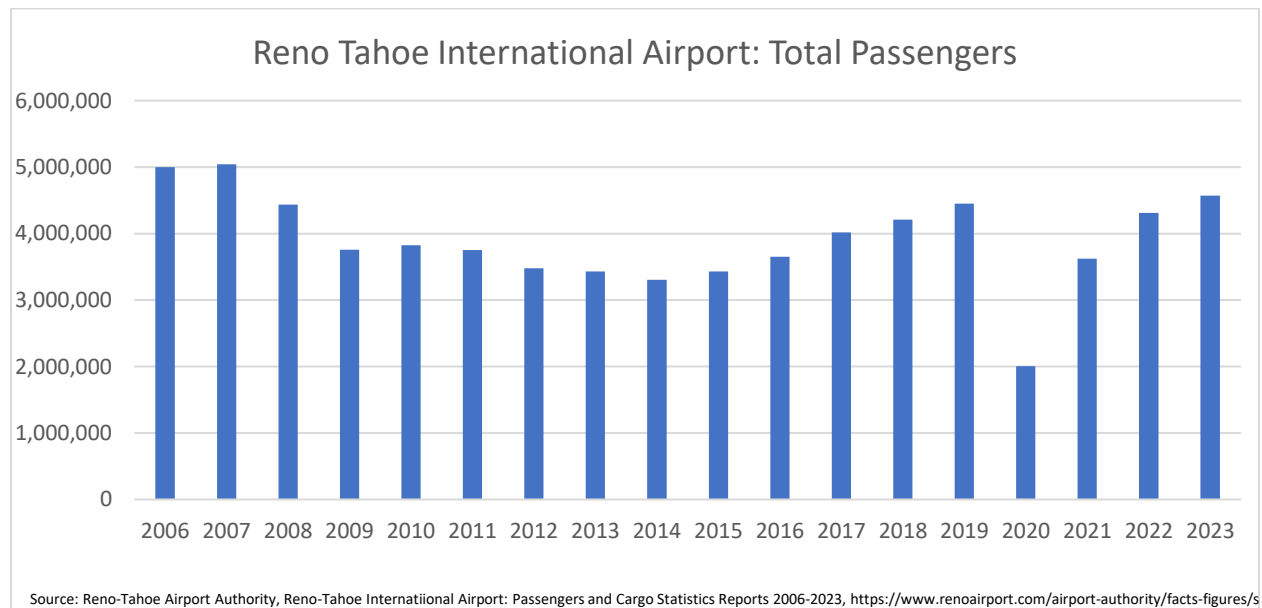


Figure 7

School Enrollment

Like the overall population, school enrollment in the region has decreased in the last two decades. In recent years, school enrollment has remained relatively level on the California side, with decreases continuing on the Nevada side. Between 2003 and 2022, enrollment on the California side decreased by 17% (California Department of Education, 2024), while enrollment on the Nevada side decreased by 46% (Nevada Department of Education, 2023). The forecast projects that school enrollment will increase by 3.5% as new employment (803 additional jobs) and residents (3,769 additional full time residents) are added to the region. As many of Tahoe’s new residents do not have school-aged children, school enrollment is expected to increase at about one-half the rate of population growth.

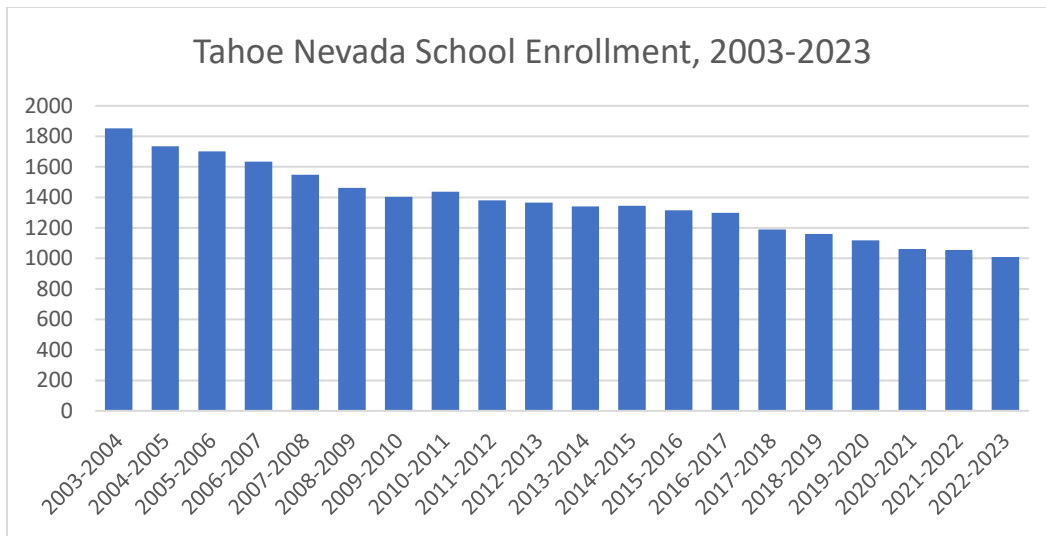


Figure 8

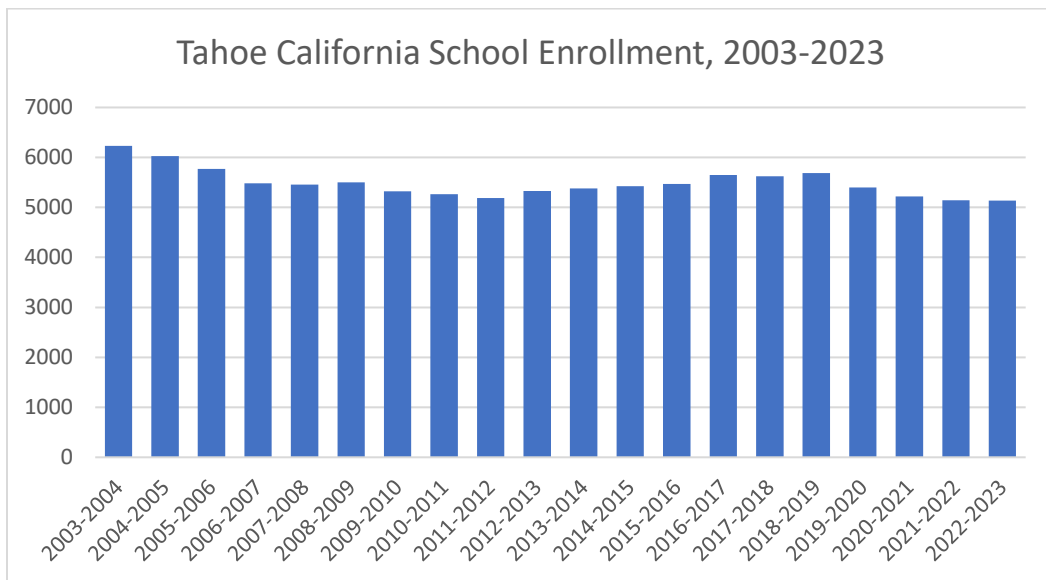


Figure 9

Household Income

Household income is a key characteristic of the residential population, which influences travel behavior. Census data over the last nine years show that household income in the region is trending upwards towards higher incomes (U.S. Department of Commerce, 2022). Median annual income for households nationally rose to \$74,580 in 2022, within California it is \$91,905, and in Nevada it is \$71,646 (Guzman 2024). Median income in the Tahoe Region has continued to grow in recent years, with the regional median remaining near or slightly above the national median. Between 2010 and 2018, the proportions of households in each income category have remained relatively stable, but in recent years, there has been a substantial shift towards higher-income households in Tahoe. Between 2018 and 2022, the proportion of households earning less than \$25,000/year fell significantly, from 19% to 12%. Between 2018 and 2022, the number of households earning over \$200,000/year doubled and those earning between \$100,000 and \$200,000 increased from 20% to 26%. While households earning less than \$100,000/year outnumber households earning more than \$100,000/year, only 54% of households earn less than \$100,000/year. Some have suggested the decline in lower-income households has been driven by workers leaving the region in search of more affordable housing. The forecast projects that the relative distribution of household incomes will be maintained near the current level, with slight increases among those earning less than \$75,000/year or above \$125,000/year. Initiatives to provide workforce and affordable housing are expected to increase the regional housing availability at the lower end of income distribution.

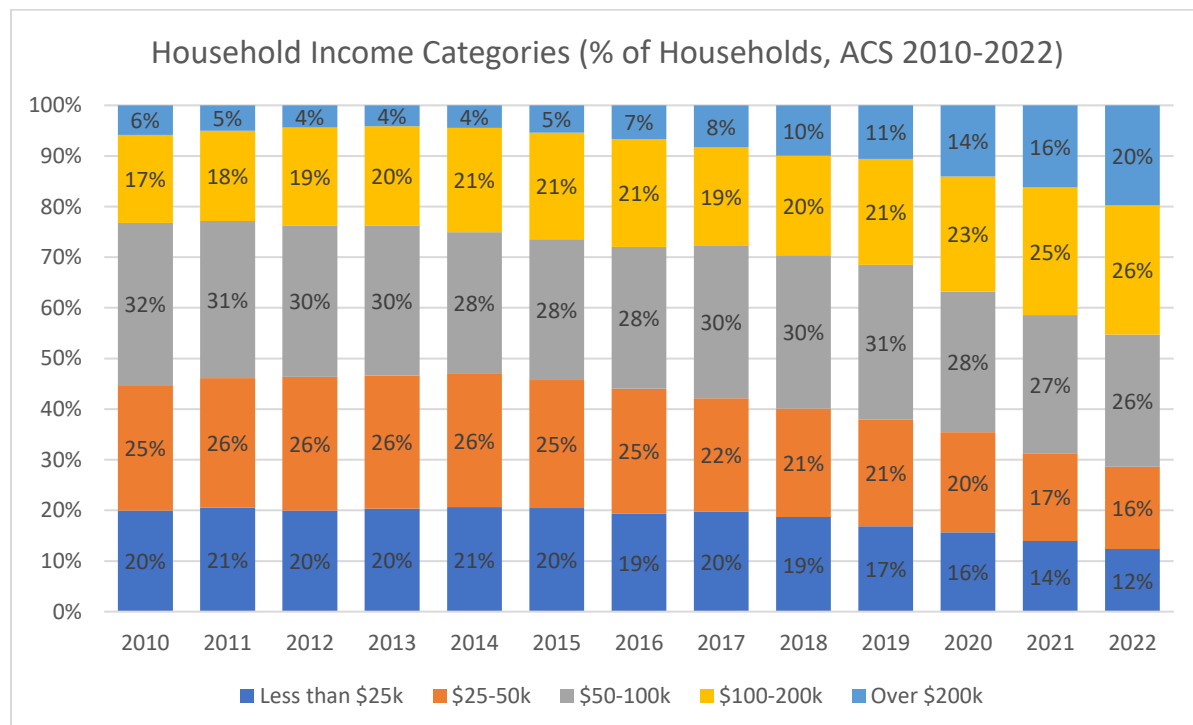


Figure 10

Addendum

TRANSPORTATION PROJECTS & STRATEGIES FORECAST SUMMARY

Transportation Projects

In this model update, several changes were made to better reflect the changing economy in the Lake Tahoe region, account for methodological advances and new technologies, and ensure future development is properly represented.

The largest single update in advance of the 2025 RTP was a full revision of nonmotorized mode choice, creating a dedicated network to model bicycle and pedestrian trips. In previous model runs, it was only possible to route bicycle and pedestrian trips along the roadway network, without consideration for actual infrastructure. Furthermore, all nonmotorized modes were combined into a single “nonmotorized” option in the mode choice equations in previous model runs, not accounting for differences between bicycle and pedestrian travel. The new active transportation network included all current and future shared-use paths, as well as attributes for each roadway that indicate the type of bicycle facility. The routing function for bicycle and pedestrian modes favors shared-use paths, bicycle-friendly facilities, and low-volume streets in decreasing priority, only routing along high-traffic and high-speed roads when unavoidable. The effect of this new network is the ability to incorporate projected active transportation projects into the model, greatly improving the accuracy of projected active transportation trips and ensuring that the model can properly represent recreational trips and benefits the trail network can provide to the regional economy.

With both nonmotorized network improvement and improvements in available data, TRPA and its contractors modified mode share to best reflect current behavior as shown by TRPA’s monitoring program, big data, and surveys from around the United States. Walk trips are capped at 3 miles in the model, with increasing cost for longer trips, while bicycle trips have no limit, though mode share decreases with distance and mode share for trips over 8 miles in length is less than 0.5%. The changes resulted in increased nonmotorized model mode share, particularly for overnight visitors and seasonal residents, with approximately one-third of overnight visitor and seasonal resident trips occurring by nonmotorized modes. Over half of trips shorter than one-half mile and over 40% of trips shorter than one mile use nonmotorized modes, a large increase from previous assumptions. The new calibration targets provided by TRPA’s consultants also include some initial E-bike use, reducing reliance on TRPA’s off-model tools to evaluate the projected effect of E-bikes.

Yet another significant change to the TRPA model involved a recalibration of origin-destination trip pairs to better reflect modern travel patterns. Over the past two decades, there has been a large shift away from casino visitation to recreation trips, and TRPA expects this shift to be permanent. Therefore, it was

important to recalibrate to ensure that the impacts of proposed recreation and hotel projects are properly accounted for. This recalibration used StreetLight data to examine the start and end points of trips and use that information to make modifications to the model. The analysis performed by TRPA's contractors indicated that the prior model was overestimating trips to and from the south shore casino core while underestimating trips to recreation sites across the region. Using the results of this analysis, trip patterns were recalibrated to ensure that recreation and gaming travel was properly represented.

TRANSPORTATION STRATEGIES

See attachment at end of document

REFERENCES

- Association of Bay Area Governments. (2021). *Plan Bay Area 2050 Forecasting and Modeling Report*. San Francisco.
- Carson Area Metropolitan Planning Organization. (2024). *2050 Regional Transportation Plan*. Carson City, Nevada.
- City of South Lake Tahoe. (n.d.). *Measure T*. Retrieved from City of South Lake Tahoe: <https://cityofslt.us/2418/Measure-T>
- Douglas County Board of County Commissioners. (2024, March 21). Chapter 20.622: Lake Tahoe Vacation Home Rentals. *Douglas County Code*. Minden, Nevada: Douglas County. Retrieved from <https://www.douglascountynv.gov/common/pages/DownloadFileByUrl.aspx?key=Saa9swlNqveUYCQRdoh9q6nHI4aw3oLFXiatih5MFm5SIGRV3cTmKuWcX%2f%2bel8qQwh2ceV0q8iKNsz52mT9Oz5X8MpJMUaxgXopGsO0fimm9EiFcmvaC6UtgV9XvNa2ZYC%2buVUaaZBRBn570fSbtJmfBpgnLWZjbkuVsmolx%2bxoMv64>
- El Dorado County. (n.d.). *VHR Ordinance Information*. Retrieved from El Dorado County: <https://www.eldoradocounty.ca.gov/Services/My-Property/Vacation-Home-Rentals-Division/VHR-Ordinance-Information>
- Placer County Code Enforcement Services. (2024). *Short-Term Vacation Rental Program*. Retrieved from Placer County Community Development Resource Agency: <https://www.placer.ca.gov/6109/Short-Term-Rental-Program>
- Regional Transportation Commission of Washoe County. (2024). *2050 Regional Transportation Plan*. Reno, Nevada.
- Reno-Tahoe Airport Authority. (2024, October). *About the Reno-Tahoe Airport Authority*. Retrieved from Reno-Tahoe International Airport: <https://www.renoairport.com/airport-authority/about/>
- Sacramento Area Council of Governments. (2022). *Sacramento Region Draft Growth Projections*. Sacramento, California.
- U.S. Department of Commerce. (2022). *American Community Survey*. Washington, DC.
- U.S. Department of Commerce. (2023). *H14: Occupied Housing Units*. Washington, DC.
- Washoe County Community Services Department. (2024, July 1). *Short Term Rentals*. Retrieved from Washoe County, Nevada:

https://www.washoecounty.gov/csd/planning_and_development/short_term_rentals/index.php



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TECHNICAL MEMORANDUM

TRPA Connections 2050: 2025 RTP/SCS Environmental Methodology

Attachment A: Trip Reduction Impact Analysis (TRIA) 3.0 Documentation

Date:	January 29, 2025
To:	California Air Resources Board (CARB)
From:	Tahoe Regional Planning Agency (TRPA)

INTRODUCTION

This memorandum provides updated documentation of the Tahoe Regional Planning Agency’s (TRPA) Trip Reduction Impact Assessment (TRIA) tool which TRPA applies to account for trip reductions based on projects, programs, strategies, and trends that are not able to be represented directly in the TRPA travel demand model 2025 update.

TRPA refers to the current iteration of TRIA for the Connections 2050 Regional Transportation Plan/Sustainable Communities Strategies (2025 RTP/SCS) as Version 3.0 (TRIA 3.0). TRIA 3.0 supports TRPA’s 2025 RTP/SCS by integrating several programmatic initiatives and assigning trip reductions into TRPA’s travel demand modeling processes. TRIA 2.0 (Kittleson & Associates, 2020) was used for the previous 2020 RTP/SCS (Tahoe Regional Planning Agency, 2021). TRPA 3.0 includes minor revisions to anticipate the effects of the trip reduction strategies and update transportation trends based on current research and practices. TRIA 3.0 accounts for changes that have occurred in the Tahoe Region since the last RTP/SCS. TRIA 3.0 does not include new strategies from TRIA version 2.0; however, all literature and trends have been updated since the previous review. References for the newly updated research and studies, including CARB policy briefs (Agarwal & Fitch-Polse, 2024; Fitch-Polse & Hung, 2024; Volker, 2024), used to develop the revised TRIA 3.0 methodology are documented throughout this document.

Model upgrades are continually a priority. The TRPA travel demand model has been updated to incorporate new travel trends to dispersed recreation sites and other areas based on observed traffic counts and big-data analyses of travel behavior from location-based service and global positioning system (GPS) data. Upgrades to TRIA 3.0 also include updating the existing bicycle and pedestrian facilities network, previously analyzed in TRIA 2.0, and incorporating future bicycle and pedestrian facilities into the forecasts.

TRIA METHODOLOGY

TRPA developed and maintains a TRIA spreadsheet tool to evaluate the trip and vehicle-miles of travel (VMT) reduction impacts of various transportation policies, programs, and trends under consideration as part of the RTP/SCS. TRIA captures strategies and trends that can significantly affect travel demand such as parking policies, employer trip reduction programs, and new innovative transit operations, which cannot be accurately captured in the TRPA travel demand model. The purpose of the TRIA tool is to provide planning-level, order-of-magnitude, comparative estimates of the quantitative vehicle trip reductions in the travel demand modeling process to inform expected total trips, and by extension, VMT and greenhouse gas (GHG) emissions based on the combined impact of the capital improvement projects, operational enhancements, policies, programs and trends considered in the TRPA 2025 RTP/SCS.

TRPA built TRIA 3.0 around the main modes of transportation and analysis of how the regional land use plan and transportation strategies and policies proposed in the RTP/SCS will impact these modes. The main categories considered in the tool are:

- ▶ Inter-regional public transit service, where the service is not captured in the travel demand model such as out of basin public services and airport shuttles
- ▶ Intelligent Transportation System (ITS) technologies
- ▶ Transportation demand management (TDM) measures
- ▶ Parking policy changes
- ▶ Electric bicycles (e-bikes)
- ▶ Shared micromobility services (i.e., e-scooters)
- ▶ Microtransit services

As noted above, the TRIA 3.0 tool provides a way to make comparisons between different policy alternatives and their ultimate effect on vehicle trips, VMT, and GHG emissions. For each strategy included in TRIA, a trip reduction percentage is calculated based on local data, assumptions based on engineering judgment and the state of the practice, and current research on trip reductions associated with the strategy.

TRIA separately applies the trip reductions associated with the strategies to each of three trip location types (Town Center, Regional, and External trips) as appropriate. The cumulative trip reduction effect for each area type is calculated to avoid double counting the impact of any given strategy in combination with other strategies (for more information on the cumulative effect calculation see the Cumulative Effect section below).

After calculating the cumulative effect for each area type, the trip reduction percentages are then applied in the TRPA Travel Demand Model to calculate trip reductions for every origin-destination pair within the model based on the area type. Trip reductions are classified into one of three area type groupings:

- ▶ **Regional Trips:** This grouping applies the vehicle trip reduction to all trips in the region.

- ▶ **Town Center Trips:** This grouping only applies the vehicle trip reduction to trips that are going to or from a designated Town Center.
- ▶ **External Trips:** This grouping only applies the vehicle trip reduction to trips that are entering or exiting the region.

The trip reductions are applied to the travel demand model’s vehicle trip matrix prior to the trip assignment stage. The adjusted trips are then assigned to the travel demand model network to obtain an estimate of vehicle trips and associated trip data for the entire model network. The network results are then used to calculate RTP/SCS performance metrics and effects having considered the TRIA strategies. This process allows TRPA to understand the impact of policies, programs, and other investments tailored to the Tahoe area that will help the Region meet the GHG emissions reduction targets set by the California Air Resources Board under California’s Senate Bill 375, the VMT reduction targets under California’s Senate Bill 743, and other VMT and trip reduction goals.

TRIA 3.0 uses estimates based on current conditions in the Tahoe Basin, and trip reduction estimates developed based on locally observed conditions, particularly in the case of new transit services such as on demand shuttles. Previously, such shuttles only operated from outside of the Basin, but recently have been successful on the north and south shore since the 2020 RTP/SCS. For policies or projects for which there were no local studies, the trip reduction impacts were estimated based on a review of the current literature, CARB policy briefs and reports, and studies of locations where similar policies, programs, or investments have been implemented. Where research shows that a policy might vary in effectiveness, the more conservative outcomes are generally chosen, except as noted below, so as not to overstate the trip and VMT reduction potential. See Table 9 for an overview of all of the strategies analyzed and their individual estimated trip reduction potential in the 2035 and 2050 RTP/SCS forecast scenarios.

TRIA ANALYSIS BY MODE

The approaches taken in the previous versions of TRIA for different travel types, or modes, have been carried forward for the strategies considered and summarized below for TRIA 3.0, except for bicycle and pedestrian facilities, which are now incorporated directly into the TRPA travel demand model.

Active Transportation

The following sections describe the two active transportation-related trip reduction strategies. Table 1 lays out the details on trip reduction by strategy, sources used, and the strategy-specific trip reductions for electric bicycles and table 2 considers the reductions for short-term rentals of electric scooters and electric bicycles through sharing programs.

Electric Bicycles

The increased prevalence of electric bicycles, or “e-bikes”, was introduced in the TRIA 2.0, and updated for TRIA 3.0 to calculate trip reductions associated with current trends, programs, and policies to

encourage the safe use of e-bikes. Programs and policies promoting e-bikes as part of the 2025 RTP/SCS include:

- The pathway partnership, a committee that includes government agencies, nonprofits, and advocacy representatives, monthly meeting focused on increasing use and maintenance of class 1 paths. The partnership’s goal is to create consistent messaging that encourages legal and safe use of e-bikes.
- The Commute Tahoe program, where employers will also provide education and benefits of e-bikes to their employees.
- The following policies support the use of e-bikes.
 - o Goal Safety: Policy 1.7 Encourage partners to develop and implement plans coordinating wayfinding signage, and education campaigns to build awareness of safety and alternative transportation opportunities including transit and active transportation modes.
 - o Goal Environment: Policy 2.9 Coordinate with state and local agencies to support the expeditious installation of electric vehicle (EV) and other electric mobility modes (including scooters, bikes, transit, etc.) charging infrastructure within Community Priority Zones.
 - o Goal Resilience: Policy 5.1 Prioritize regional and local investments that fulfill TRPA objectives in transit, active transportation, transportation demand management, and other programs which support identified TRPA transportation performance outcomes.

E-bike sales nationally have soared since 2020, and rentals of electric bikes now exist at many of the rental shops in Tahoe. In peak summer 2020, just after the last RTP was approved, e-bike sales in the U.S. were up 190% from the prior year according to NPD Group consumer research (NPD Group, 2020). Since the COVID-19 pandemic, the widespread adoption of e-bikes across the United States, as access to e-bikes, and sales of e-bikes have continued to increase. According to the Light Electric Vehicle Association, e-bike sales in 2021 were double 2020 sales, while sales in 2022 were nearly triple 2020 sales, with over 1 million e-bikes sold in the United States in 2022. Sales are expected to continue at a rapid pace as the technology becomes cheaper and additional incentive programs are introduced (Torchinsky, 2023). E-bikes enable users to travel farther than a conventional bicycle in the same amount of time and e-bikes can be used for a greater proportion of trips that would usually be made via a car. They also enable users to ride on routes with steep grades, like some roadways in Tahoe, that would be too strenuous for a conventional bike. E-bikes can be owned by individuals, rented from bicycle shops, or may be part of a bikeshare program.

A review of literature was conducted to determine how increased e-bike usage may affect travel behavior and patterns. The primary finding of the literature was that, on average, people are willing to travel nearly twice as far using an e-bike than a conventional bicycle (Castro et al., 2019). As documented in TRPA’s Bicycle Pedestrian Model Documentation, the average bicycle trip distance in the Lake Tahoe region is 2.4 miles (Tahoe Regional Planning Agency, 2018) . Because research shows that using e-bikes may allow for longer trips to be taken, bike mode share may be increased to include

these longer trips that would be taken using e-bikes. As of 2022, the travel demand model mode share increasingly includes e-bikes, and TRPA expects that TRIA will eventually phase out these reductions as these increases become a higher proportion of all bicycle trips. For bicycle trips between three and five miles, the use of e-bikes was assumed to increase bike mode share up to the RTP 2020 regional bike mode share (6.9%), which is the expected mode share once e-bikes reach saturation. For trips shorter than three miles or longer than five miles, the bike mode share was unchanged, as shown in Table 1, to ensure a conservative estimate. The increased bike mode share was then used to calculate the total number of vehicle trips removed by the increase in bike mode share. This total was then divided by the total vehicle trips within the region to arrive at the e-bike trip reduction (0.39%).

Table 1: Bicycle Mode Share Adjustment for E-Bicycles Summary

Trip Length	Bicycle Mode Share Adjustment
<3.0 miles	No Change
3.0 – 5.0 miles	Increased to 6.9%
>5.0 miles	No Change

Note: 6.9% is the current average bicycle mode share for all trips. For trips longer than five miles long, the mode share decrease follows the current mode share decrease starting at three miles.

Source: TRPA, 2024; RSG, 2024; Kittelson & Associates, Inc., 2020.

The net reduction in vehicle trips based on the increased adoption of e-bikes (0.39%) was applied to all areas in the Tahoe Basin based on an expected bicycle mode share by trip length for both the 2035 and 2050 scenario.

Shared Micromobility

Shared micromobility services include shared e-scooters and e-bikes, that are accessed and paid for via applications and allow trips within a defined service area. Trip reductions associated with the trend in shared micromobility services were also included in TRIA 2.0. Overall trip reduction factor associated with shared mobility services was calculated using 2018 and 2019 trip data and survey data from South Lake Tahoe’s implementation of the Lime e-scooter program. Rider surveys conducted by Lime after the completion of a trip determine how a rider would have made the trip if the e-scooter service was not available. The two year survey average suggested that 48% of riders would have used a car to make their trip if no scooter was available(Lime, 2020). The existing shared micromobility programs are not accounted for in the TRPA travel demand model as TRPA continues to research best practice guidance regarding how to incorporate micromobility services into travel demand models.

The TRIA 3.0 trip reduction is calculated using actual trip data from the Lime e-scooter implementation. The percentage of e-scooter trips that replaced automobile trips are divided by the total automobile trips per day in the South Lake Tahoe area served by Lime e-scooters. This results in a trip reduction factor for South Lake Tahoe of 0.47%. These calculations are shown in Table 2. The total number of reduced trips is then divided by total regional trips to calculate a regional trip reduction percentage.

Table 2: Micromobility Trip Reduction Calculation Summary

E-Scooter Trips/Day	1,181
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Percent of Trips that Replaced Automobile Trips ²	48%
Number of Automobile Trips Removed by E-Scooters per Day	567
Total Automobile Trips per Day in SLT Area with Lime E-Scooters	119,684
Percent of Automobile Trips Reduced in Area with E-Scooters	0.47%

Source: Lime, 2024, Kittelson & Associates, Inc., 2020.

The current e-scooter service extends well beyond the City of South Lake Tahoe town center. The RTP/SCS supports the expected expansion of share micromobility options to the north and west shore communities through revised RTP Prosperity Policy 4.7: Support micromobility options that are safe and accessible and do not have barriers for use, including requiring smart devices. Therefore, the trip reduction factor was calculated to be applied as a regional trip reduction rather than the smaller area associated with the Town Centers area type. This approach was chosen given 82% of the region’s trips occur in areas where shared micromobility is expected to be available. As some areas within the region are unlikely to contribute to trip reductions, the regional trip reduction percentage (0.39%) was reduced from the trip reduction calculated based on the Lime e-scooter implementation from 0.47% for a regional application. The resulting trip reduction factor was corroborated through review of e-scooter trip studies from Portland (48% of e-scooter trips divert from vehicles) (Portland Bureau of Transportation, 2018) and Chicago (65% of e-scooter trips divert from vehicles) (Chicago Department of Transportation, 2021). COVID-era and early recovery studies have shown lower mode shift, with Meroux et al. (2023) showing 30-33% of e-scooter trips diverted from vehicles (Meroux et al., 2023), Wang et al. (2023) showing 33% to 60% of e-scooter trips replacing vehicle trips (Wang et al., 2023), and a NABSA report published in 2024 indicating that 37% of bikeshare and e-scooter trips diverted from vehicles (North American Bikeshare & Scootershare Association, 2024), with these results supported by CARB policy briefs (Fitch-Polse & Hung, 2024). Given the high amount of uncertainty in bikeshare and e-scooter share programs in the years following the COVID-19 pandemic, TRPA is maintaining the reduction factor used for the 2020 RTP.

The trip reduction is taken only for the e-scooter program expanded penetration on the south shore and service expansion to the north shore, so there is no overlap between reductions for e-bikes and shared micromobility services. While the current Lime e-scooter implementation is used for the trip reduction calculations, many forms of shared micromobility are expanding beyond just standup e-scooters including shared bikes, e-bikes, and seated scooters. Placer County is currently planning to implement a bike-sharing program in North Lake Tahoe as identified in their adopted Resort Triangle Transportation Plan. TRPA Transportation staff continually monitors the deployment of new micromobility options and considers the potential of these options to serve travel needs in Tahoe.

Transit Services and Facilities

The following three strategies describe the trip reductions calculated in TRIA associated with new or improved transit services not captured by the TRPA travel demand model.

Transit Service and Capital Projects

Transit trip and VMT reductions in TRIA 3.0 include only routes on the RTP's constrained project list for 2035 and 2050. The fiscally constrained project lists include only projects that have reasonably foreseeable funding commitments and have a high likelihood of implementation. The TRPA travel demand model accounts for transit ridership for all fixed-route transit trips that are internal to the model network (e.g., the Tahoe Basin). Therefore, additional trip reductions in TRIA related to transit are only applied; 1) fixed route service originating or terminating outside of the Tahoe Basin, such as the Tahoe Transportation District's (TTD) commuter services to the Carson Valley, and 2) variable-route services, such as microtransit or employer-led vanpool services.

Microtransit services are on-demand transit services that typically provide flexible routes within a defined service area using lower-capacity transit vehicles. Microtransit services near the Tahoe region started with the Olympic Valley Mountaineer service, which was funded through a public-private partnership of public agencies and private businesses. While this service was operational at the time of the TRIA 2.0 update, most of the service area was outside TRPA's jurisdiction, so Mountaineer ridership was used to inform estimates in TRIA 2.0. Microtransit operations now extend into the Tahoe Region, as planned in the 2020 RTP, operating on both the north and south shores, offering free -to-the-rider on-demand services for all residents and visitors. Therefore, data are now available for actual ridership figures and estimates of trip reductions. The following microtransit services are planned for implementation in the 2025 RTP/SCS:

- South Lake Tahoe – An on-demand microtransit service offers trips within a service area extending from the Round Hill Village shopping district in the northeast to the Tahoe Sierra neighborhood in the west. This service area includes the lower Kingsbury neighborhood in Nevada, all south shore casinos, the Tahoe Blue Event Center, Heavenly Village, and many of the South Lake Tahoe hotels and tourist attractions. Service is expected to expand to the South Lake Tahoe Y in future years, however funds are not secured for this expansion, therefore this expansion is not included in the TRIA 3.0 analysis. A newly formed South Tahoe Transit Joint Powers of Authority is taking over the planning, programming, financing, acquisition, ownership and operation of public transit services and facilities to serve the Lake Tahoe south shore area in January 2025. Microtransit service in this region is currently branded as Lake Link, with multiple service expansions occurring since service was introduced (South Shore Transportation Management Agency, 2024)
- Incline Village, Kings Beach, Tahoe City, and West Shore Services – Placer County has expanded microtransit since the 2020 RTP. Microtransit started as a pilot program in 2022, and following a very successful pilot program, the service has been continually funded along the West and North Shores over the last three-year period and is forecasted to continue into 2050. Microtransit service in this region is branded as Tahoe Truckee Area Regional Transit (TART), TART Connect, with three distinct service regions serving the Tahoe City/ west shore, Kings Beach, and Incline Village tourist districts. As of April 2024, TART Connect served over 1 million riders in the North Lake Tahoe-Truckee Region and ridership continues to grow (Placer County, California & Truckee North Tahoe Transportation Management Association, 2024).

- Vanpool is operated by TNT/TMA on the north shore and SSTMA on the south shore. In 2024, the TNT/TMA north shore employer vanpools served approximately 34,000 riders, with ridership increasing throughout the year (Truckee North Tahoe Transportation Management Association, 2024b). Short- and medium-term plans involve many new vans, with ridership expected to grow accordingly.

The names and descriptions of the new, improved, or external transit routes included in the trip reduction calculations are listed below:

□ **Year 2035:**

- TTD Fixed Route 22 and 19x (long)- Stateline Transit Center to Carson (interlined)
- TART Fixed Route 89 (long) - Tahoe City Transit Center to Truckee Depot
- TART Fixed Route 267 (long) - Stateline to Truckee Depot
- North Shore Tahoe Express – North Shore airport shuttle to/from Reno Airport
- South Tahoe Airporter – South Shore airport shuttle to/from Reno Airport
- Lake Link Zone 1 – Round Hill to Sierra Tract
- TART Connect Zones 1 & 2 – West shore/ Tahoe City (Zone 1) & Kings Beach (Zone 2)
- TART Connect Zone 3 – Incline Village
- TNT/TMA Vanpool – North shore vanpool program
- SSTMA Vanpool – South shore vanpool program

□ **Year 2050:**

- TTD Fixed Route 22 and 19x (long)- Stateline Transit Center to Carson (interlined)
- TART Fixed Route 89 (long) - Tahoe City Transit Center to Truckee Depot
- TART Fixed Route 267 (long) - Crystal Bay to Truckee Depot
- North Shore Tahoe Express – North Shore airport shuttle to/from Reno Airport
- South Tahoe Airporter – South Shore airport shuttle to/from Reno Airport
- Lake Link Zone 1 – Round Hill to Sierra Tract
- TART Connect Zones 1 & 2 – West shore/ Tahoe City (Zone 1) & Kings Beach (Zone 2)
- TART Connect Zone 3 – Incline Village
- TNT/TMA Vanpool – North shore vanpool program
- SSTMA Vanpool – South shore vanpool program

To estimate the trip reduction for transit service not captured in the model, the projected 2035 and 2050 daily ridership for each transit project was obtained from the Tahoe Transportation District and Tahoe Truckee Area Regional Transit data that identifies expected ridership for each project included in the 2025 RTP/SCS (Tahoe Regional Planning Agency, 2024b). The percent of ridership taking trips with one end outside of the Tahoe Basin was estimated for each project based on the expected ridership distribution, route characteristics, and discussions with TRPA, TTD, and TART staff.

Trip reductions associated with microtransit services, supported by Policy 3.7 on-demand transit, were included again in the TRIA 3.0 update as part of the “transit service and capital” section of TRIA. Since TRPA now has actual ridership figures to use for future estimates, the overall trip reduction factors

associated with microtransit were calculated using actual reported data from the two microtransit service operators, an improvement from the estimates used in TRIA 2.0.

The estimated transit project ridership associated with external travel or otherwise uncaptured trips was converted to estimated vehicle trip reductions, by dividing the “external” portion of transit ridership by the average vehicle occupancy for vehicle trips that would be replaced. Average vehicle occupancy was calculated using a weighted average of TRPA travel demand model trip data for residents and visitors, based on the expected proportion of residents and visitors using each service. The calculation for this trip reduction is summarized in Table 3.

Table 3: 2050 All Transit Service and Capital Projects Trip Reduction Calculation Summary

Estimated Annual Ridership of External or Uncaptured Transit Service (2035)	967,789
Estimated Annual Ridership of External or Uncaptured Transit Service (2050)	967,789
Average Percentage of Ridership that is External or Uncaptured (2035)	96%
Average Percentage of Ridership that is External or Uncaptured (2050)	96%
Vehicle Trips Reduced (2035)	1,528
Vehicle Trips Reduced (2050)	1,528
2035 Percent of Automobile Trips Reduced by External or Uncaptured Transit Service	0.64%
2050 Percent of Automobile Trips Reduced by External or Uncaptured Transit Service	0.64%

Note: All calculations are done for each individual route and are summarized in total above. Vehicle trips reduced are calculated based on weighted average vehicle occupancies for each route based on the proportion of residents and visitors using each service.

Source: TRPA, 2024, Kittelson & Associates, Inc., 2020.

The sum of all reduced passenger vehicle trips based on new transit services is then divided by the total regional trips for the model year (2035 or 2050). The result of this calculation is the expected vehicle trip reduction percentage due to new transit services.

Trip reduction calculations associated with these additional transit services results in trip reductions of 0.64% in both 2035 and 2050. This trip reduction is applied to trips in all areas, including external trips.

Intercept Parking Lots

Intercept parking lots allow visitors or residents to park in designated lots and transfer to transit services. This strategy, supported by RTP policies 3.5 Mobility Hubs, Transit Coordination, 5.5 and 3.4 out of Basin Partner Collaboration, targets increasing funding and reducing visitor vehicle trips into the Tahoe Basin. In 2018, Placer County began piloting seasonal winter and summer intercept lots operating from the Tahoe Truckee Unified School District administrative offices, Truckee Tahoe Airport District, Tahoe Biltmore, and Tahoe City Transit Center (Truckee North Tahoe Transportation Management Association, 2024a). The winter intercept lots currently serving Northstar California and Palisades ski resorts include the Truckee High School and school district administrative office, the Lift Co Work space near the Truckee Airport, and the Transit Center and adjacent “64 Acre” lots in Tahoe City for a total of 444 spaces. Placer County, the TNT-TMA, and TART continue to coordinate additional opportunities to expand park-and-ride services to the ski resorts and for special events. In addition to these existing continued services that are not currently reflected in the TRPA travel model, TRPA continues to work

with Placer County Transportation Planning Agency, Placer County Public Works, and Nevada Department of Transportation to promote carpooling from parking lots outside of the basin along the US 50 and I-80 Corridors, and expand existing lots in Carson City, NV where possible for carpooling to be coordinated with existing and future transit services for a completely car free Tahoe experience.

An initial 2018 winter pilot study performed by the Truckee North Tahoe Transportation Management Association (TNT/TMA) found that the intercept lots at the Truckee airport location reduced 115 trips per day and the summer pilot served over 700 riders from Northstar and 1,000 riders from the Tahoe Biltmore for the Fourth of July pilot (Placer County, California, 2020). Conservatively using the lower winter implementation usage compared to total travel on SR 267, the percentage of directional travel diverted to transit was 2.9%.

To confirm the reasonableness of this trip reduction estimate, the impact was compared to an Alameda County Transportation Commission study of drive-to-transit mode shares. While these Alameda County park and ride situations differ from the visitor-oriented facilities in the Lake Tahoe Region, the Alameda County travel patterns are similar with long-distance drivers switching to transit and private shuttles to avoid the final congested portion of the trip. The Alameda County study estimated a trip reduction of 8% (Alameda County Transportation Commission, 2017). For the Tahoe region, the initial park and ride intercept lot reduction assumption is approximately 4%, half of the assumed 8% reported in Alameda County, to conservatively estimate the number of visitors that would be willing to use a Tahoe region intercept lot. A conservative estimate for the percentage of Tahoe region external traffic generated by visitors is 70%, therefore the calculated trip reduction for intercept lots was 2.8% (70% times 4%). The calculations are shown in Table 4. This estimate is nearly identical to the trip reduction observed at the pilot intercept lots in Placer County. This trip reduction factor is only applied to external trips entering or leaving the region.

Table 4: Intercept Parking Lot Reduction Calculation

Intercept Lot Trip Reduction (50% of Alameda CTC reduction)	4%
Percentage of external traffic associated with visitors	70%
Percent of Automobile Trips Reduced by Intercept Lots	2.8%

Source: Alameda CTC, 2017, TRPA, 2018, Kittelson & Associates, Inc., 2020.

Intelligent Transportation System (ITS) Technologies

TRIA 3.0 includes several strategies that increase the functionality and usability of transit based on ITS technology improvements and are supported by RTP technology focused Policies 6.6, 6.7, and 6.8, and new Connectivity Policy 3.7 supporting on-demand dynamically routed transit shuttles:

- **Improve Transit Information**

Improved transit coordination between local and regional providers, through simplified trip planning (e.g., Google Transit). The TRIA tool estimates the increase in transit ridership associated with the introduction of transit trip planning, and the subsequent reduction in vehicle trips. In TRIA 3.0, improved transit information has been implemented for many regional services, but

there remain gaps, particularly for external services and microtransit, which are not all integrated into Google Transit. Therefore, this update of TRIA only considers ridership in “Transit Service and Capital” for additional trip reductions.

This calculation assumes that enhanced transit trip planning will increase transit ridership for inter-regional trips and trips in Town Centers. This assumption is based on an average 20% ridership increase experienced by transit agencies in Humboldt County, CA and Missoula, MT after implementing Google Transit (Trillium Transit, 2009a, 2009b). Based on this research applied to local conditions, TRPA assumed a more conservative 15% reduction.

The overall trip reductions are calculated by multiplying the ridership change percentages noted above by the sum of existing annual transit ridership plus projected new transit ridership from other programs or services. The resulting new ridership due to improved transit information is then converted into vehicle trips by dividing the new ridership by the average vehicle occupancy. The resulting reduced vehicle trips are then divided by the 2035 and 2050 annual auto trips for the applicable trip type (External, Town Center, or Total Regional trips) to calculate an expected trip reduction percentage for each area type. This strategy is associated with a trip reduction percentage of 0.12% of trips to or from Town Centers in both 2035 and 2050. For external trips, this strategy is associated with a trip reduction of 0.22% in both 2035 and 2050. The calculations are summarized in Table 5.

Table 5: Improved Transit Information Trip Reduction Calculation Summary

Estimated Transit Ridership Affected for Town Center Trips	933,535
Estimated Transit Ridership Affected for Inter-Regional Trips	443,475
Transit Information Percentage Increase in Ridership	15%
New Ridership Due to Transit Information in Town Centers	140,030
New Ridership Due to Transit Information for Inter-Regional Trips	89,696
Vehicle Trips Shifted for Town Center Trips	66,514
Vehicle Trips Shifted for Inter-Regional Trips	42,606
2035 Annual Town Center Vehicle Trips	54,163,027
2035 Town Center Transit Information Trip Reduction Percentage	0.12%
2050 Annual Town Center Vehicle Trips	56,034,358
2050 Town Center Transit Information Trip Reduction Percentage	0.12%
2035 Annual Inter-Regional Vehicle Trips	18,942,012
2035 Inter-Regional Transit Information Trip Reduction Percentage	0.22%
2050 Annual Inter-Regional Vehicle Trips	19,478,682
2050 Inter-Regional Transit Information Trip Reduction Percentage	0.22%

Source: TRPA, 2024, Kittelson & Associates, Inc., 2020.

□ **Improved Transit Coordination**

The term “*transfer penalty*” refers to the perceived inconveniences that users could experience when connecting from one vehicle or provider to another or waiting for the next vehicle to arrive. Improved transit coordination between local and regional providers, through the elimination or shortened wait time of transfers, as well as improvements to ticketing structure and agency cooperation seek to eliminate user stress during transfers . This strategy/trend reduces the transfer penalty on interregional transit routes. The TRIA tool estimates the increase in transit ridership associated with different reductions in transfer penalties.

Transfer penalties apply primarily to interregional trips and longer trips between the north/south shores. Intra-regional trips are generally shorter, and transfers less often required. The elasticity value (ratio of ridership percent changes to time percent changes) for ridership with respect to transfer time was assumed to be -1.28 as part of the prior version of TRIA, or twice the elasticity value (-0.64) for ridership with respect to wait time (Balcombe et al., 2004; Casello & Hellings, 2008). The assumed value was developed based on observations of transit in the Tahoe region and qualitative findings from other studies regarding “transfer anxiety,” or fear of missing a connection when trip frequency is low. Consideration was given to the fact that the transfer penalty may be stronger in rural environments where transfers may occur in more isolated locations and under extreme weather conditions.

A recent literature review did not identify any new information that could be used to inform and update to the value of elasticity for ridership with respect to transfer time. Therefore, trip reduction assumptions for this strategy were maintained from the previous TRIA 2.0 tool. Transit operators around the Basin are working to integrate different service types and operators into existing trip planning technologies (microtransit trip apps, Google transit, etc.). Integrating services is expected to increase overall system efficiency and reduce the number of transfers required for users, however, these systems are not yet in place, so real data is not yet available.

The applied trip reduction is calculated by multiplying the expected average reduction in transfer penalty by the elasticity to calculate a percentage of ridership growth due to improved transit coordination. This percentage is then multiplied by interregional ridership to calculate the number of expected new riders. Ridership is then converted into vehicle trips by dividing the trips by average vehicle occupancy. The resulting number of reduced vehicle trips are then divided by the number of Town Center trips in 2035 and 2050 to determine the trip reduction percentage.

This strategy is associated with trip reduction percentages of 0.04% and 0.05% of trips to or from Town Centers in 2035 and 2050, respectively. The calculations are summarized in Table 6.

Table 6: Improved Transit Coordination Trip Reduction Calculation Summary

2035 Excepted Ridership Growth due to Transit Coordination	19.2%
2050 Excepted Ridership Growth due to Transit Coordination	25.6%

Expected Ridership Affected by Transit Coordination	378,625
2035 Increased Ridership due to Transit Coordination	72,696
2050 Increased Ridership due to Transit Coordination	96,928
2035 Vehicle Trips Shifted	23,020
2050 Vehicle Trips Shifted	30,694
2035 Annual Town Center Vehicle Trips	54,163,027
2035 Transit Information Trip Reduction Percentage	0.04%
2050 Annual Town Center Vehicle Trips	56,034,358
2050 Transit Information Trip Reduction Percentage	0.05%

Source: TRPA, 2024, Kittelson & Associates, Inc., 2020.

□ **Real-Time Transit Arrival Information**

The TRIA 3.0 tool estimates the increase in transit ridership associated with the implementation of real-time transit arrival information, and the subsequent reduction in vehicle trips, supported RTP Policy 6.8 Implementation of Tahoe Basin Intelligent Transportation Systems Strategic Plan. Real-time transit arrival information provides information on when the next transit vehicle is expected to arrive. In TRIA 3.0, improved transit information has been implemented for many regional services, but there remain gaps, particularly for external services and microtransit, which are not all integrated into Google Transit. Therefore, this update of TRIA only considers ridership in “Transit Service and Capital” for additional trip reductions.

It is assumed that the availability of real-time transit information would increase ridership by 2.2%. This assumption is based on a case study of transit in Chicago which showed a 1.8% to 2.2% increase in ridership with availability of real-time transit information, as presented in the *Impact of Real-Time Transit Information on Ridership and Mode Share* (Tang & Thakuria, 2012; Watkins et al., 2015). Given the more rural nature of the Lake Tahoe Region and less frequent transit service, it is expected that real-time transit information would provide a greater benefit than an urban area with more frequent service like Chicago. As a result, the high-end of the reported trip reduction (2.2%) was used for the TRIA analysis.

The overall trip reduction is calculated by multiplying the ridership change percentages noted above by the sum of existing annual transit ridership plus projected new ridership from other programs or services. The resulting new ridership due to improved real-time arrival information is then converted into vehicle trips by dividing the new ridership by the average vehicle occupancy. The resulting reduced vehicle trips are then divided by the 2035 and 2050 annual auto trips for the applicable trip type (External, Town Center, or Total Regional trips) to calculate an expected trip reduction percentage. The trip reduction factor for this strategy is 0.01% and is applied to trips to or from Town Centers as trips to and from these zones are the most likely to benefit from the transit information improvements. The calculations are summarized in Table 7.

Table 7: Improved Transit Information Trip Reduction Calculation Summary

Estimated Transit Ridership Affected for Town Center Trips	933,535
Real-Time Transit Arrival Information Percentage Increase in Ridership	2.2%
New Ridership Due to Real-Time Arrival Information	20,538
Vehicle Trips Shifted	9,755
2035 Annual Vehicle Trips	84,259,716
2035 Real-Time Information Trip Reduction Percentage	0.01%
2050 Annual Vehicle Trips	87,056,015
2050 Real-Time Information Trip Reduction Percentage	0.01%

Source: TRPA, 2024, Kittelson & Associates, Inc., 2020.

□ **Dynamic Ridesharing**

This strategy/trend introduces services and/or incentives to encourage individuals entering the Lake Tahoe region for non-work purposes to rideshare, such as carpool matching services and vanpools supported by RTP Policy 4.2 Shared Ride Mobility Services. The TRIA tool calculates the expected reduction in trips with the introduction of these services for internal-external and external-internal trips only.

It is assumed that a low, non-mandatory level of implementation (no price incentive/ subsidies, marketing, online ride matching, etc.) would reduce trips by 1%. This assumption was based on the findings of the MIT "Real-Time" Rideshare Research program (Webb, 2009), which estimates a 2% reduction in VMT or 1% reduction in private vehicle trips if a ridesharing program were applied at a regional level. Higher levels of implementation (i.e., providing subsidies to encourage ridesharing or charging for parking at places of employment) would reduce vehicle trips by 2.25% to 5.5%, as described in the Trip Reduction Tables. The higher level of implementation is available as an option in the TRIA tool but not currently assumed by TRPA as part of the TRIA analysis.

The trip reduction assumptions for this strategy remained the same as in TRIA 2.0 as the most recent research supports the previous assumptions used in the 2020 RTP. TRIA 2.0 noted higher level of implementation may be considered if subsidies are assumed in the RTP scenario, it is recommended to maintain the assumptions associated with the lower level of implementation to be conservative. The TRIA tool calculates the expected reduction in trips with the introduction of these services as 1.00% and this reduction is applied to internal-external and external-internal trips only. This strategy only considers informal and recreational use ridesharing strategies, such as carpools arranged informally/on social media or carpools for non-work purposes, and not formal employer-led vanpools, which are covered under Transit Service and Capital.

Transportation Demand Management (TDM) Measures

This strategy improves existing employer vehicle trip reduction programs. These programs can include carpool and vanpool matching programs, employee shuttles, on-site secure bicycle storage and shower

facilities, flexible work hours, telecommuting, and parking and transit use incentives. The TRIA tool calculates the reduction in vehicle trips associated with these strategies and supported by RTP Policies:

- 4.3 employer trip reduction programs,
- 6.3 coordination with the region's Transportation Management Associations,
- 3.1 multimodal amenities for new or redeveloped projects,
- 4.8 increasing outreach and advertising for non-motorized transportation,
- 5.7 expanding and building the Transportation Management Associations,
- 6.12 expanding data collection and
- 6.2 monitoring programs.

This trip reduction strategy is only applied to Town Center areas, as it primarily applies to peak-hour commuter trips and most employment trips in the Tahoe region start or end in one of the Town Center areas.

The TRIA 3.0 TDM calculations were updated with current employer data. The businesses are categorized by size with small (less than 100 employees), medium (between 100 and 200 employees) and large employers (more than 200 employees) included in the data set. The distribution of firms in the Tahoe Basin by number of employees was obtained from the TRPA travel demand model sociodemographic data.

TRIA 3.0 compares the effect of improving the participation rate of the existing Employer Trip Reduction ordinance (TRPA Code 65.5) through improved compliance and/or updating policies and programs. Target participation rates (percentages of employers participating in TDM programs) for small, medium, and large employers were established and compared to an estimated participation rate by employer size. The estimated weighted average participation rate (based on the percentage of existing employment for each employer size grouping) is 18.37% with higher proportions of larger employers (80%) already participating and lower proportions of small employers (5%). The expected change in participation based on TRPA's new and expanded TDM programs and policies, as mentioned above, is then used to calculate reduced trips based on expected impacts consistent with the current literature and average local employer size data. Target participation rates in the programs were assumed to be 30% for small employers, 75% for medium firms, and 100% for large firms by 2050.

The maximum percent reduction in commute trips due to TDM programs ranges from 1% to 5% as established in prior versions of TRIA. The trip reduction percentages were not updated as they are conservative values relative to current trip reduction references such as the CAPCOA, SACOG, and CARB documentation, as described below (Agarwal & Fitch-Polse, 2024; California Air Pollution Control Officers Association, 2010; Sacramento Area Council of Governments, 2020). The CAPCOA information estimates voluntary commute trip reduction VMT impacts at between 1.0% and 6.2% and mandatory commute trip reduction impacts at between 4.2% and 21.0%. In addition to CAPCOA information, TRPA's Code of Ordinances Section 65.5, Employer-Based Trip Reduction Program, requires participation for all employers, and has more stringent requirements for employers above 100 employees, by increasing compliance and participation with the TDM programs (Tahoe Regional Planning Agency,

2024a). Therefore, the 1% to 5% estimated trip reductions conservatively estimate the potential impact of TRPA’s broader TDM Program which includes established transportation management associations (TMAs) on the north and south shore who work closely with the business community to identify programs that reduce use of the automobile and encourage incentive programs for employees that walk, bike, carpool, or take transit to work. This program, branded as “Commute Tahoe, provides an on-line tool and resources for employers to establish their own employee trip reduction program that is scalable to an organization or business size and budget. The pilot program in 2021 included targeted outreach and surveys to the City of South Lake Tahoe, Barton Hospital, Vail Resorts, hotels, and casinos, all large employers in the Region. TRPA continues to work closely with these employers, the two TMAs, to build out the Commute Tahoe Program. The 2025 RTP/SCS will include a TRPA code amendment that sets specific requirements for employers to meet trip reduction targets, and a monitoring program to ensure compliance.

The regional trip reduction is calculated by multiplying the weighted average targeted participation in TRPA’s TDM programs by the percentage reduction in commute trips by firm size (5% for employers with more than 100 employees and 1% for employers with fewer than 100 employees). Given the trip reduction is applied to all trips rather than just commute trips to maintain consistency with the broader TRIA implementation, the effectiveness percentages were not updated consistent with the average CAPCOA effectiveness for voluntary (3.6%) and mandatory TDM programs (12.6%) to account for the regional application of the trip reduction. The trip reduction values used for small (1%) and large (5%) employers are less than half of CAPCOA’s average estimated effect to account for the reduced TDM impact when applied to all trips.

The trip reductions for different firm sizes are then summed to arrive at an overall trip reduction for the region. The trip reduction for TDM measures trip reduction is calculated separately for new development (1.25%) and existing development (0.48%). New development is estimated to be 3% of all new trips in the region based on planned growth and is used to weight the potential trip reduction of TDM measures. The TDM measures trip reductions are only applied to trips going to or from a Town Center as most commute trips start or end in these areas. The calculations for the trip reductions are summarized in Table 8.

Table 8: Transportation Demand Management Trip Reduction Calculations

Employment Category	Trip Reduction Percentage	Percentage of Existing Employment	Target Participation Rate	Weighted Participation Rate	Increase from Existing Participation Rate	New Development Percentage Reduction	Existing Development Percentage Reduction
Firms with Fewer than 100 Employees	1%	75%	30%	23%	19%	0.23%	0.19%
Firms with Between 100 and 200 Employees	5%	17%	75%	14%	5%	0.68%	0.23%
Firms with More than 200 Employees	5%	8%	100%	7%	1%	0.35%	0.07%
Total						1.25%	0.48%

Source: TRPA, 2024, Kittelson & Associates, Inc., 2020.

Parking Management

The 2025 RTP/SCS introduces parking management strategies and the implementation of parking fee programs in specific areas of the Tahoe Basin supported by RTP Policies 6.5 Parking Programs that incentivize non-auto modes, 4.6 maintain parking maximums, 5.6 parking revenues staying at the source and 3.9 which encourages collaboration with land managers to support multimodal access. Examples of parking management implementations expected as part of the RTP/SCS or by partner agencies within the region include recently adopted plans and pilot projects that are underway across the region. For example, the Placer County Resort Triangle Transportation Plan identifies focus areas for parking management that are being integrated into Placer County Capital Improvement Program; the south shore casinos, the most parking densest area of the region, have all implemented paid parking in their garages and surface lots for stays longer than one hour; and the east shore of SR 28 successfully implement dynamic parking pricing at the largest parking lot along the corridor located at Tunnel Creek. Additional paid lots are proposed along the SR 28 corridor and at Spooner Summit as approved in the SR28 Corridor Management Plan. TRPA will continue to encourage and when possible, using its land use authority, will require projects to incentivize paid and parking management strategies.

TRIA 3.0 evaluates the expected reduction in vehicle trips associated with parking pricing and parking management strategies in select parking management zones in the Tahoe Basin. This includes demand-responsive pricing in commercial areas combined with residential permits to prevent parking spillover into residential areas, changes to parking standards, and shared parking arrangements. Parking management can encourage people to travel to their destination via other modes of transportation. This regional trip reduction percentage is calculated relative to regionwide trips based on the trips reduced in areas implementing parking strategies. TRIA calculates the total vehicle trips reduced for zones where the implementation of parking management strategies and/or parking fees is planned.

TRIA 3.0 updated the trip reduction calculation methodology to simplify the overall calculation method and account for a wider range of parking strategies in an inclusive calculation based on an updated literature review on the latest research into parking impacts on vehicle trip reductions. The Victoria Transport Policy Institute (VTPI) identified a trip reduction percentage of 2.7% for implementing a \$3 per day parking fee (Litman, 2024; Volker, 2024). For the Tahoe region, half of this documented reduction was assumed in the 2020 update (1.35%) to reflect the lower potential impact of parking management policies based on the higher recreational share of travel in the Tahoe region and visitors from outside the region may be less sensitive to parking pricing incentives and the trip reduction percentage was halved to account for this potential effect. Several sources support a lower elasticity for recreational travel, but the one-half figure may be conservative in shopping districts with high walkability and transit access which is where we see the greatest influx in paid parking and parking management (Lehner & Peer, 2019). For TRIA 3.0 and the 2025 RTP/SCS, the reduction percentage was increased to account for current and projected parking rates around the Tahoe region, which often range from \$10 to \$25 or more. VTPI's trip reduction percentage of 2.7% had an elasticity of -0.1 – -0.3. Applying this elasticity to a conservative average parking price of \$12-14 per day, the trip reduction percentage of 1.35% increases to 4.0%.

This trip reduction percentage was then applied to trips in areas across the region that were expected to implement parking management strategies to calculate the total number of vehicle trips reduced. The areas where parking management is planned include the broader South Lake/Meyers, Emerald Bay, Tahoe City, Dollar Point, Kings Beach, and Incline Village areas (extending beyond the Town Centers). These areas represent one end of approximately 82% of regional travel. Therefore, the estimated trip reduction percentage of 4.0% was factored by 0.82 to calculate the trip reduction factor as a regional trip reduction percentage (3.31%).

TRIP REDUCTIONS SUMMARY

Table 9 presents a summary of the trip reductions by individual strategy described above. The summary table provides a brief description of the vehicle trip reduction strategy, the primary source of reduced vehicle trips, the type of vehicle trips impacted, employer type, and the individual 2035 and 2050 percent reductions.

Trip reductions are classified into one of three area type groupings:

- ▶ **Regional Trips:** This grouping applies the vehicle trip reduction to all trips in the region.
- ▶ **Town Center Trips:** This grouping only applies the vehicle trip reduction to trips that are going to or from a designated Town Center.
- ▶ **External Trips:** This grouping only applies the vehicle trip reduction to trips that are entering or exiting the region.

For the TDM strategy, reductions are calculated for new and existing employers. Given some employers are already participating in employer trip reduction programs, the impact on existing employers is lower than for new employers. This is the only strategy for which the employer type is considered.

Table 9: Trip Reduction Impact Analysis (TRIA) Estimates – 2025 RTP/SCS

Vehicle Trip Reduction Strategy	Primary Source of Reduced Vehicle Trips	Vehicle Trip Types Impacted	Employer Type	2035 Percent Reductions in Vehicle Trips	2050 Percent Reductions in Vehicle Trips
Active Transportation					
Shared micromobility service areas	Reduced vehicle trips due to use of shared micromobility devices (e.g., e-scooters or shared e-bikes)	Regional Trips	--	0.39%	0.39%
Promotion of electric bicycle use	Reduced vehicle trips due to the widespread use of electric bicycles	Regional Trips	--	0.39%	0.39%
Public Transit Service					
Intra-regional transit capital projects and microtransit within the Tahoe Basin	Increased transit mode share, partially drawn from former vehicle trips.	Regional Trips	--	0.64%	0.64%
Inter-regional transit service that extends outside the Tahoe Basin.	Reduced commuter and recreational trips.	External Trips	--	0.64%	0.64%
Intercept lots at entrances to the Tahoe Basin providing frequent shuttle service into the region.	Reduced visitor trips.	External Trips	--	2.80%	2.80%
ITS Technologies					
Improved transit coordination between local and regional providers, through simplified trip planning (for example Google Transit).	Increased transit mode share for trips in the corridor/district served by the project, partially drawn from former vehicle trips.	Town Center Trips	--	0.12%	0.12%
Improved transit coordination between local and regional providers, through the elimination or shortened wait time of transfers, improvements to ticketing structure and agency cooperation to eliminate "transfer anxiety".	Increased transit mode share for trips in the corridor/district served by the project, partially drawn from former vehicle trips.	Town Center Trips	--	0.04%	0.05%
Real-time arrival information at transit stops, online, and/or via web-enabled mobile devices.	Increased transit mode share for trips in the corridor/district served by the project, partially drawn from former vehicle trips.	Town Center Trips	--	0.01%	0.01%
Enhanced transit trip planning (for example Google Transit).	Increased transit mode share for trips in the corridor/district served by the project, partially drawn from former vehicle trips.	External Trips	--	0.22%	0.22%
Regionally implemented dynamic ridesharing (conservative implementation).	Reduced commuter and recreational trips.	External Trips	--	1.00%	1.00%
TDM Measures					
Improve existing employer vehicle trip reduction program (carpool and vanpool matching programs, employee shuttles, on-site secure bicycle storage and shower facilities, flexible work hours, parking, and transit use incentives.)	Reduced peak-hour commuter trips.	Town Center Trips	New Employers	1.25%	1.25%
		Town Center Trips	Existing Employers	0.48%	0.48%
Parking Management					
Parking pricing and parking management strategies, including demand-responsive pricing in commercial areas with residential permits to prevent parking spillover into residential areas, changes to parking standards, shared parking arrangements, etc.	Reduced trip generation from managed on- and off-street parking spaces for trips to and from managed areas. Reduced demand due to reduced parking spaces because of shared parking requirements or changes to parking standards for new development.	Town Center Trips	--	3.31%	3.31%

Source: TRPA, 2024, Kittelson & Associates, Inc., 2020.

TRAVEL DEMAND MODEL INTEGRATION

TRIA 3.0 integrates the overall trip reductions directly into the TRPA travel demand modeling process rather than relying on off-model post-process reductions in vehicle trips. This integration was achieved in the following steps:

1. Trip reduction percentages for each strategy are calculated in the TRIA spreadsheet.
2. The individual TRIA strategies are then combined into a cumulative trip reduction percentage to reflect the effect of all 2050 RTP/SCS-related policies, programs, and supportive actions by partner agencies on trips within the region.
3. Trip reduction percentages are then applied to each origin-destination pair based on the origin and destination area types (Town Center, External, Non-Town Center).
4. After an initial run of the travel demand model, a script is run before the trip assignment stage of the model that applies the applicable trip reduction factor to trips associated with each origin-destination pair.
5. The post-TRIA vehicle trip file (accounting for the TRIA strategies trip reductions) is then assigned to the model network to complete the model run.

The resulting vehicle volume data can then be used to calculate RTP/SCS performance metrics including the strategies in the 2050 RTP/SCS whose effects are estimated by the TRIA process.

REFERENCES

- Agarwal, S., & Fitch-Polse, D. T. (2024). *Employer-Based Trip Reduction Policy Brief*. California Air Resources Board.
- Alameda County Transportation Commission. (2017). *Tri-Valley Integrated Transit and Park and Ride Study*. https://www.alamedactc.org/wp-content/uploads/2018/11/AlamedaCTC_Tri-Valley_Integrated_Transit_and_Park-and-Ride_Study_May2017.pdf
- Balcombe, R., Mackett, R., Paulley, N., Preston, J., Shires, J., Titheridge, H., Wardman, M., & White, P. (2004). The demand for public transport: A practical guide. In (*Transportation Research Laboratory Report TRL593*). *Transportation Research Laboratory: London, UK*. (Report No. TRL593; Issue TRL593). Transportation Research Laboratory. <https://discovery.ucl.ac.uk/id/eprint/1349/>
- California Air Pollution Control Officers Association. (2010). *Quantifying Greenhouse Gas Mitigation Measures*. <https://www.aqmd.gov/docs/default-source/ceqa/handbook/capcoa-quantifying-greenhouse-gas-mitigation-measures.pdf>
- Casello, J. M., & Hellinga, B. (2008). Impacts of Express Bus Service on Passenger Demand. *Journal of Public Transportation*, 11(4), 1–23. <https://doi.org/10.5038/2375-0901.11.4.1>
- Castro, A., Gaupp-Berghausen, M., Dons, E., Standaert, A., Laeremans, M., Clark, A., Anaya-Boig, E., Cole-Hunter, T., Avila-Palencia, I., Rojas-Rueda, D., Nieuwenhuijsen, M., Gerike, R., Panis, L. I., de Nazelle, A., Brand, C., Raser, E., Kahlmeier, S., & Götschi, T. (2019). Physical activity of electric bicycle users compared to conventional bicycle users and non-cyclists: Insights based on health and transport data from an online survey in seven European cities. *Transportation Research Interdisciplinary Perspectives*, 1, 100017. <https://doi.org/10.1016/j.trip.2019.100017>
- Chicago Department of Transportation. (2021). *2020 E-Scooter Pilot Evaluation*. City of Chicago.

- Fitch-Polse, D., & Hung, E. (2024). *Micromobility Services Policy Brief*. California Air Resources Board.
- Kittleson & Associates. (2020). *Trip Reduction Impact Analysis (TRIA) Documentation*.
- Lehner, S., & Peer, S. (2019). The price elasticity of parking: A meta-analysis. *Transportation Research Part A: Policy and Practice*, 121, 177–191. <https://doi.org/10.1016/j.tra.2019.01.014>
- Lime. (2020). *South Lake Tahoe E-Scooter 2018 and 2019 Trip Database and Rider Survey Data*.
- Litman, T. (2024). *Parking Pricing Implementation Guide*. Victoria Transport Policy Institute. <https://www.vtpi.org/parkpricing.pdf>
- Meroux, D., Broaddus, A., Telenko, C., & Chan, H. W. (2023). How Should Vehicle Miles Traveled Displaced by E-Scooter Trips be Calculated? *Transportation Research Record*, 2677(1), 356–369. <https://doi.org/10.1177/03611981221099506>
- North American Bikeshare & Scootershare Association. (2024). *Shared Micromobility State of the Industry Report for North America*. <https://nabsa.net/2024/08/06/2023industryreport/>
- NPD Group. (2020). *Plot Twist: US Performance Bike Sales Rise in June*. <https://www.npd.com/wps/portal/npd/us/news/press-releases/2020/plot-twist-us-performance-bike-sales-rise-in-june-reports-the-npd-group/>
- Placer County, California. (2020). *Winter and Summer Park and Ride Summary Data* [Dataset].
- Placer County, California & Truckee North Tahoe Transportation Management Association. (2024). *2023 TART Connect Usage Data* [Dataset].
- Portland Bureau of Transportation. (2018). *2018 E-Scooter Findings Report*. <https://www.portland.gov/transportation/regulatory/escooterpx/2018-e-scooter-findings-report>
- Sacramento Area Council of Governments. (2020). *Senate Bill 743 Implementation Tools*. <https://www.sacog.org/planning/data-resource-center/sb-743-technical-assistance>
- South Shore Transportation Management Agency. (2024). *2023 Lake Link Usage Data* [Dataset].
- Tahoe Regional Planning Agency. (2018). *Bicycle Pedestrian Model Documentation*.
- Tahoe Regional Planning Agency. (2021, April). *2020 Regional Transportation Plan*. <https://www.trpa.gov/rtp/>
- Tahoe Regional Planning Agency. (2024a). Employer-Based Trip Reduction Program. In *TRPA Code of Ordinances* (pp. 65-17-65–26).
- Tahoe Regional Planning Agency. (2024b). *Master Transit Package Data* [Dataset].
- Tang, L., & Thakuriah, P. (Vonu). (2012). Ridership effects of real-time bus information system: A case study in the City of Chicago. *Transportation Research Part C: Emerging Technologies*, 22, 146–161. <https://doi.org/10.1016/j.trc.2012.01.001>
- Torchinsky, R. (2023, October 7). E-Bikes In the Fast Lane: How Buyers In 19 States Are Getting Big Rebates. *Forbes*. <https://www.forbes.com/sites/rinatorchinsky/2023/10/04/welcome-to-the-year-of-the-e-bike/>
- Trillium Transit. (2009a, April 9). *Two years after: Google Transit for Humboldt County*. <https://trilliumtransit.com/2009/04/09/two-years-after-google-transit-for-humboldt-county/>
- Trillium Transit. (2009b, April 27). Google Transit: Some numbers from Missoula, Montana. *Trillium Transit*. <http://www.trilliumtransit.com/blog/2009/04/27/google-transit-some-numbers-from-missoula-montana/>
- Truckee North Tahoe Transportation Management Association. (2024a). *Park and Ride and Sugar Bowl/Donner Summit Shuttle*. Tahoe Truckee Area Regional Transit. <https://tahoetruckeetransit.com/park-and-ride-3/>
- Truckee North Tahoe Transportation Management Association. (2024b). *Vanpool Ridership Report*.
- Volker, J. (2024). *Parking Pricing Policy Brief*. California Air Resources Board.

- Wang, K., Qian, X., Fitch, D. T., Lee, Y., Malik, J., & Circella, G. (2023). What travel modes do shared e-scooters displace? A review of recent research findings. *Transport Reviews*, 43(1), 5–31. <https://doi.org/10.1080/01441647.2021.2015639>
- Watkins, K. E., Brakewood, C., & National Center for Transportation Systems Productivity and Management (U.S.). (2015). *Evaluating the Impact of Real-time Transit Information on Ridership and Mode Share*. <https://rosap.ntl.bts.gov/view/dot/36971>
- Webb, V. (2009). *Rideshare at MIT* (MIT “Real-Time” Rideshare Research). Massachusetts Institute of Technology. <http://ridesharechoices.scripts.mit.edu/home/ridesharemit/>