

APPENDIX G: DATA AND FORECASTING

Introduction

As part of the 2020 TRPA Regional Transportation Plan (RTP), TRPA prepared regional development and transportation forecasts for the years 2035 and 2045. The regional development 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 development forecast and the transportation 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 2045 forecast years build upon the 2018 model base year, which was developed during the fall of 2019. More information about the 2018 base year can be found on the Tahoe [model website](#). The forecasts include a variety of projections related to land use and the characteristics of the regions' traveling population in the forecast years; this population includes residents, visitors, and commuters. The forecast years of 2035 and 2045 were selected to meet specific regulatory requirements of the California Sustainable Communities Strategy (SCS) and Federal RTP requirements.

Residents—The forecast projects Lake Tahoe's full-time residential population to increase slightly. The forecasted increase is a deviation from the declines in the region's population observed over the last 20 years and 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 (which restrict units from being used as second homes or vacation rentals). Similarly, the residential occupancy rate – the proportion of homes occupied by residents – is expected to increase due to the increase in housing supply available for residents from 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 in the last 20 years 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 will remain steady as increased provision of workforce and affordable housing counteract recent upward trends in household income. School enrollment will increase slightly because of overall population growth. Employment will also increase slightly as additional Commercial Floor Area (CFA) and Tourist Accommodation Units (TAU) are constructed throughout the region.

Visitation—The forecast projects both day and overnight visitation to the Lake Tahoe Region to increase during the forecast years. This forecasted increase is based upon the projected population growth in the mega-region (Bay Area/Sacramento/Reno), forecasted increases in traffic counts in adjacent areas, and the increasing popularity of the outdoor recreation experience. This increase in visitation will result in an increase in the number of occupied overnight lodging units, short-term rentals, and seasonal homes.

Table 20: 2045 Forecast Data Summary

Forecast Data Summary				
	Base Year 2018	Forecast 2045	change (#)	change (%)
Residential Units and Population				
Residential Population	51,624	58,041	+ 6,417	12.4 %
Occupied Units	21,624	24,315	+ 2,691	12.4 %
Unoccupied Units	26,031	28,056	+ 2,025	7.8 %
Total Residential Units	47,655	52,252	+ 4,597	9.6 %
Income of Occupied Residential Units				
Low Income Units	10,463	11,886	+ 1,423	13.6 %
Medium Income Units	4,891	5,437	+ 546	11.2 %
High Income Units	6,254	6,843	+ 589	9.4 %
Total Overnight Visitor Units				
Short Term Rentals	6,005	5,931	-74	-1.2 %
Seasonal Units	17,129	18,544	+ 1,415	8.3 %
Campground Spots	2,120	2,120	0	0 %
Total Lodging Units	11,107	12,052	+ 945	8.5 %
Occupied Overnight Visitor Units				
Occupied Short Term Rentals	2,227	2,240	+ 13	0.6 %
Occupied Seasonal Units	6,396	6,911	+ 515	8.1 %
Occupied Camping Spots	1,278	1,278	0	0 %
Occupied Lodging Units	6,190	7,086	+ 896	14.5 %
Other Key Data Points				
Commercial Floor Area	6,327,319	6,533,869	+ 206,550	3.3 %
Employment	28,604	29,462	+ 858	3 %
School Enrollment	8,887	9,992	+ 1,105	12.4 %

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 by 2035 but historic development rates have not kept pace with those forecasts. This forecast refines past methodologies by placing greater weight on observed development rates.

2. Recent overhaul of development rights system - This is the first forecast since significant changes were made to the development rights system to accelerate attainment of threshold

standards and Regional Plan goals and policies. The changes enable easier conversion between types and facilitates the attainment of State housing mandates.

The forecasts contained in this document represent a conservative yet 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 more accurately 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 2045.

Staff anticipates that by 2045 the unknown but likely time-limited economic impacts from the COVID-19 pandemic will be replaced by more normal economic forces.¹³

Residential Units

The number of housing units in the region is influenced by market conditions as well as TRPA's development rights system, which caps the total development potential for the region. The residential occupancy rate of the housing stock is influenced by economic factors, the number of residents, second home ownership, and visitors that frequent the region.

There are currently 47,655 residential units in the region (based on TRPA records); according to the occupancy rates published by the U.S. Census Bureau 2018 American Community Survey (ACS), an estimated 21,624 residential units (45%) are occupied by full-time residents and 26,031 units (55%) are not occupied by full-time residents (ACS 2018). Currently, approximately 20% of existing residential

units in the region are multi-family units (approximately 9,530 units) and 80% of existing units (38,125) are single family units. By 2045, an additional 4,597 units are expected to be constructed, bringing the total number of residential units in the region to 52,252, a 9% increase. This includes the construction of 1,823 additional single-family residential units (40% of additional units) and 2,774 additional multi-family residential units (60% of additional units). Forecasts of residential projects in the three California jurisdictions are sufficient to accommodate the Regional Housing Needs Assessment (RHNA) Cycle 5 (2013-2021) and Cycle 6 (2022-2029). The forecast includes a continuation of the RHNA requirements beyond 2029. These requirements were linearly extrapolated to 2045 based on requirements established to date and are accommodated in the forecasts.

All remaining residential allocations (2,234) are allocated and constructed in the forecast. This includes the award and construction of all residential bonus units (1,609), and all currently banked residential units (204) by 2045. The forecast also includes the conversion of 100,000 square feet of CFA and 130 TAUs to residential units, which will generate an additional 290 multi-family and 260 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 and towards 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 included 580 units expected to be built on California Tahoe Conservancy

¹³ Additional detail on the considerations related to COVID-19-19 are included in an addendum at the end of this document.

(CTC) asset lands¹⁴, redevelopment successor agency parcels¹⁵ and other publicly owned parcels where large multi-family and affordable/moderate-income housing projects are likely to be constructed¹⁶. 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 to distribute 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.

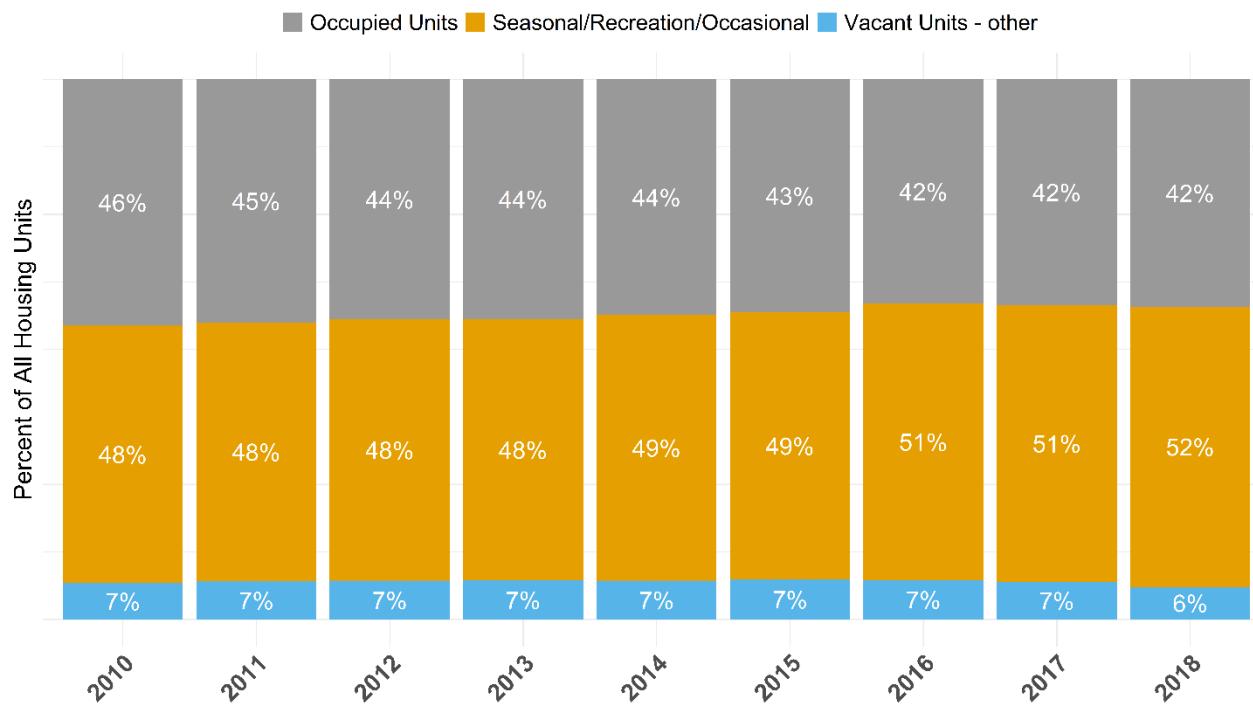
Residential Occupancy rate

The U.S. Census American Community Survey (ACS) estimates that, since 2010, the proportion of occupied housing units in the Tahoe Region has dropped from 46% to 42% in 2018 (U.S. Census Bureau 2020). The remaining 58% of the regional housing supply not occupied by full time residents is classified by the ACS as vacant (ACS classifies houses as “vacant” if they are permanently unoccupied, periodically occupied by seasonal residents, used as a second homes, or rented by visitors, including short-term rentals). In recent years, the total number of seasonal or short-term housing units increased by 24%, from 21,000 in 2010 to 26,000 units in 2018.

¹⁴ 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.

¹⁵ See <https://www.placer.ca.gov/3396/Housing> for information about potential housing development project opportunities in Placer County.

¹⁶ Includes housing commitments made by the Tahoe Transportation District as part of the Highway 50 Community Revitalization Project, see <https://www.tahoetransportation.org/us50>.



Source: American Community Survey (ACS)

Figure 119: Housing Occupancy (2010-2018)

Despite these trends over the past several years, the forecast includes an increase in the proportion of residential units occupied by full-time residents (owner-occupied and renter-occupied). Three factors are expected to contribute to the shift: 1) Housing Initiatives to promote construction of new workforce, achievable, and affordable housing in the region, 2) Housing initiatives to promote the transition of the existing stock of residential units from second homes and short-term rentals to resident-occupied units, and 3) Measure T in the City of South Lake Tahoe. Additional detail on each factor is provided below.

1. *Housing initiatives to promote new workforce and income-restricted housing.* The development forecast includes construction of all the remaining 1,609 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. *Housing initiatives to transition existing housing stock.* There are several initiatives underway to transition second homes, vacation rentals, and vacant houses into residential units for full time residents. The forecast includes significant level of success for these initiatives (and other initiatives unknown at this time) that results in 700 additional units (~1.5% of the 2018 housing stock) occupied by residents in 2035 and 2045. The increase is independent of the forecasted increases described in and 1 and 3.
3. *Measure T in the City of South Lake Tahoe.* Voters passed Measure T in the City of South Lake Tahoe in November

2018 (see <https://www.cityofslt.us/453/Vacation-Home-Rentals>). The measure includes broad restrictions on short term rentals (STRs) outside select areas in the city. The restrictions go into effect on December 31, 2021. As a result of the measure, approximately 1,372 currently permitted VHRs will not be renewed. The market value of the existing VHR stock skews higher than median values in the region, so a conservative, but optimistic forecast is that 15% of the units will be transitioned to be occupied by residents (rented or owned); other units are expected to become part of the second home market. A recent study on the economic impact of VHRs in South Lake Tahoe suggested that 10% of existing VHR owners would likely rent to full time if they could no longer use the property as VHR (MBI 2017).

Commercial Floor Area (CFA)

There are currently 556,796 square feet of unused commercial floor area in TRPA and local jurisdiction community/area plan pools. Since 2013, a total of 41,928 square feet of CFA has been allocated to projects: an average rate of 6,988 square feet of CFA per year. The forecast includes the construction of an additional of 130,067 square feet of CFA by 2035 and 206,550 square feet by 2045. The forecasted rate of development - 7,650 square feet - is just higher than the observed rate since the 2012 Regional Plan, but lower than rates used in prior regional forecasts. For the 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 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, 250,246 square feet of CFA remains unallocated and thus unconstructed.

Tourist Accommodation Units (TAU)

The forecast includes the construction of an additional 629 TAUs by 2035 and 945 TAUs by 2045. The forecast includes the completed construction of all currently permitted projects using 807 banked TAUs and the use of all 138 awarded TAU bonus units. Not all TAUs allowed in the Regional Plan are forecast to be constructed by 2045; an estimated 230 TAUs will remain undeveloped through 2045 (74 TAU bonus units and 156 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), and the forecast includes the removal and banking of some existing units. 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 130 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 21-23 summarize the fate of development rights in the forecast period.

- Table 21 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 22 summarizes the expected utilization of development rights in their current type.
- Table 23 summarizes the expected conversion of development rights between types.

The forecast includes the annual construction of 172 residential units, 7,650 square feet of commercial floor area and 35 tourist accommodation units (Table 21).

Table 21: Construction Forecast Summary

<i>Development Right Construction</i>	<i>Annual Construction Rate</i>	<i>2035</i>	<i>2045</i>
		<i>Net Change</i>	<i>Net Change</i>
<i>Residential Units</i>			
<i>Total Development of Residential Units</i>	+172	+2,924	+4,597
<i>Commercial Floor Area (in Square Feet)</i>			
<i>Total Utilization of CFA</i>	+7,650	+130,067	+206,550
<i>Tourist Accommodation Units</i>			
<i>Total Development of TAUs</i>	+35	+629	+945

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 22).

Table 22: Development Rights Utilization Forecast Summary

<i>Development Right Utilization</i>	<i>Annual Utilization Rate</i>	2035	2045
		<i>Net Change</i>	<i>Net Change</i>
<i>Residential Units</i>			
<i>Residential Allocations</i>	+83	+1,411	+2,234
<i>Residential Bonus Units</i>	+60	+1,020	+1,609
<i>Banked Residential Development</i>	+8	+136	+204
Total Development of Residential Units	+151	+2,567	+4,047
<i>Commercial Floor Area (in Square Feet)</i>			
<i>Commercial Floor Area Allocations</i>	+6,413	+109,021	+173,142
<i>Commercial Floor Area Allocations (TRPA special projects pool)</i>	+2,963	+50,371	+80,000
<i>Banked Commercial Development</i>	+1,979	+33,643	+53,408
Total Utilization of CFA	+11,355	+130,067	+306,550
<i>Tourist Accommodation Units</i>			
<i>TAU Allocations</i>	+5	+85	+130
<i>TAU Bonus Allocations</i>	+6	+102	+138
<i>Banked TAU Development</i>	+31	+527	+807
Total Development of TAUs	+42	+714	+1075

The forecast includes the conversion of development rights between the various types of development (Table 23). 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 Tahoe's environment and communities 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 3,700 square feet and 5 TAUs and creates an additional 21 residential units each year.

Table 23: Development Rights Conversion Summary

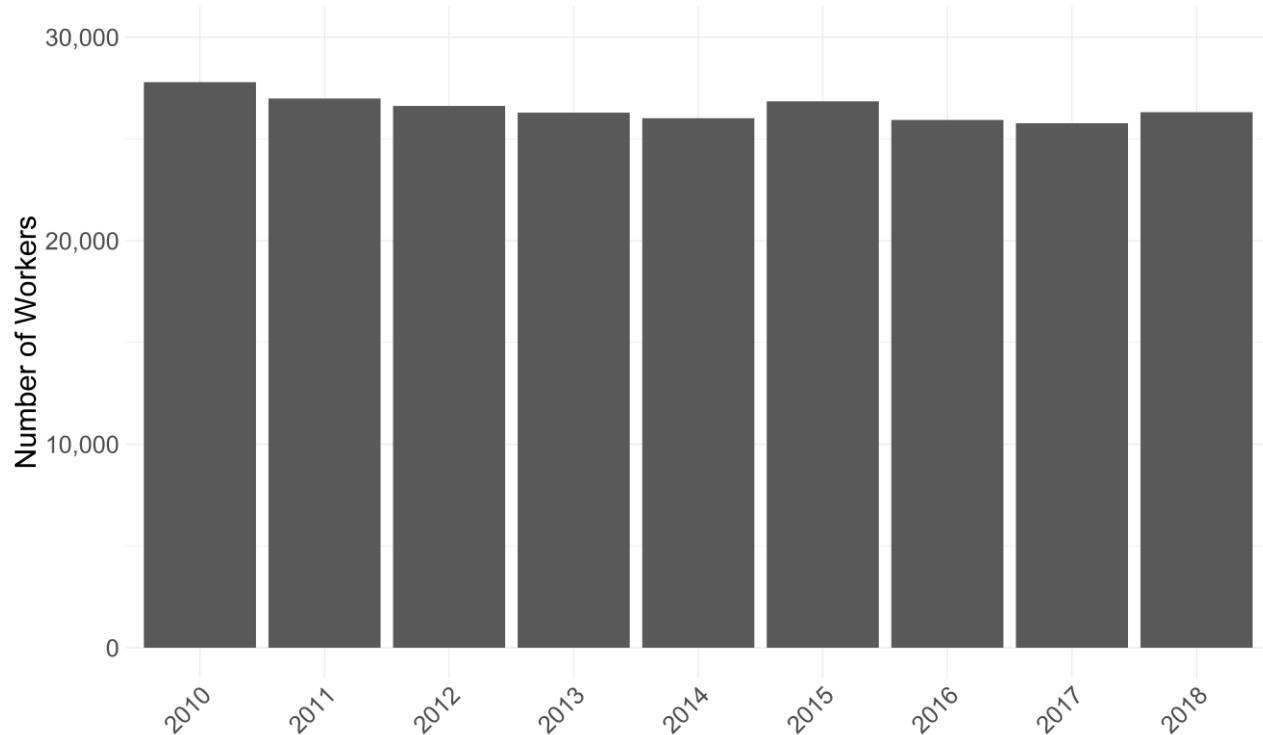
<i>Development Right Conversion</i>	<i>Annual Change as a Result of Conversion</i>	<i>2035</i>	<i>2045</i>
		<i>Net Change</i>	<i>Net Change</i>
<i>Residential Units</i>			
<i>Net Development Right Conversions to Residential</i>	+21	+357	+550
<i>Commercial Floor Area (in Square Feet)</i>			
<i>Net Development Right Conversions from CFA to RUU</i>	-3,704	-62,968	-100,000
<i>Tourist Accommodation Units</i>			
<i>Net Development Right Conversions from TAUs to RUU</i>	-5	-85	-130

Employment

The most recent region-wide data estimates that summer-time work opportunities in the Tahoe Region increased by 5% between 2014 and 2018, from 26,637 to 28,053 jobs. While employment increased, the number of

workers estimated to be living in the region decreased by 6%, from 27,785 in 2010 to 26,314 in 2018 (ACS, 2018). This indicates that an increasing number of workers may be commuting into the region for employment.

Figure 120: Number of Workers (2010-2018)



Source: American Community Survey (ACS)

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 2018 model base year there are an estimated 28,604 workers in the Tahoe Region (some residents hold jobs outside the region). The forecast projects continued growth of jobs in

the region, with 572 (+2%) and 858 (+3%) new jobs in the region by 2035 and 2045, respectively. 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



Figure 121: Tahoe Mega-Region

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 40% growth in the coming decades. The Sacramento Council of Governments (SACOG) predicts that population in the greater Sacramento region¹⁷ will grow 26% by 2045. SACOG models traffic volumes on Interstate-80 and US Highway-50 leading into the Tahoe Region, and forecasts between 18% and 22% increases in volume in the next two decades (SACOG 2019). Farther west, but still within the mega-region, the Association of Bay Area Governments (ABAG)¹⁸ forecasts 27% population increase by 2040 (MTC & ABAG 2017). To the north and east of Tahoe, RTC-Washoe predicts a 27% growth in population in the Reno/Sparks Metropolitan area¹⁹ by 2040 and the Carson Area MPO²⁰ predicts a 28% growth in population (CAMPO 2016; RTC-Washoe 2018). Population growth in the mega-region is likely to create increased demand for the recreation opportunities and the unique experience that Tahoe provides.

Table 24: Mega-Region Growth Forecasts

<i>Location</i>	<i>Metric</i>	<i>Growth</i>	<i>Forecast Year</i>	<i>Source</i>
<i>Sacramento Region</i>	Population	+26%	2045	SACOG 2020 MTP/SCS
<i>Sacramento Region</i>	Employment	+25%	2045	SACOG 2020 MTP/SCS
<i>Interstate-80</i>	Traffic Volumes	+22%	2040	SACOG 2020 MTP/SCS

¹⁷ 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.

¹⁸ The Association of Bay Area Governments (ABAG) region encompasses Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties

Tahoe Regional Planning Agency

¹⁹ Regional Transportation Commission (RTC) of Washoe County, Nevada serves the Reno and Sparks areas along with unincorporated areas of Washoe County.

²⁰ 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.

<i>Location</i>	<i>Metric</i>	<i>Growth</i>	<i>Forecast Year</i>	<i>Source</i>
<i>US Highway-50</i>	Traffic Volumes	+18%	2040	SACOG 2020 MTP/SCS
<i>Reno/Sparks Metro</i>	Population	+27%	2040	RTC-Washoe 2040 RTP, 2018
<i>Reno/Sparks Metro</i>	Employment	+37%	2040	RTC-Washoe 2040 RTP, 2018
<i>Carson City Region</i>	Population	+28%	2040	CAMPO 2040 RTP, 2018
<i>San Francisco Region</i>	Population	+27%	2040	ABAG 2040 RTP, 2017

Table 25: Sacramento and Reno Population Growth

<i>Location</i>	<i>Metric</i>	<i>Growth</i>	<i>Between</i>	<i>Source</i>
<i>Sacramento Region</i>	Population	+32% (+1.4% per year)	2000-2020	SACOG
<i>Reno-Sparks Metro</i>	Population	+36% (1.7% per year)	2000-2018	Nevada Regional Economic Analysis Project

Population growth outside the region over the last 20 years has not translated to a linear increase in visitation to the region. Over the past 20 years (Table 25), the population in the SACOG region surrounding Sacramento has increased by 32% overall, or 1.4% per year compounded. The population of the Reno-Sparks Metropolitan region increased by 36%, or 1.7% per year compounded. Therefore, the forecast does not project increases in visitation in proportion to the projected growth in the mega-region. The mega-region is forecast to add another two million people over the next 20 years. The primary challenge in forecasting future visitation is in establishing the relationship between future population growth in the mega-region and

visitation to the Tahoe Region. Looking at how historic growth in the mega-region has influenced travel into the region through, we find that since 1990, the mega-region populations on the California side have grown by 32%, while AADT at the California entry stations has grown by 15%. Put another way, the populations of San Francisco, Sacramento, and San Jose have grown by over two million people, which translated into 5,500 more trips through the entry or exits on the California side. The mega-region is forecast to add another two million people over the next 20 years. The challenge is further complicated by the impact of macro-economic conditions that affect visitation.

Despite the population growth outside the region, the number of rooms rented in the region is lower today than it was at the turn of the century. The recent observed trends in overnight lodging occupancy show generally flat or increasing occupancy in recent years, depending on location. Between 2013 and 2018, the number of hotel/motel rooms rented in the city of South Lake Tahoe increased by 37%. On the other hand, Douglas county casino occupancy (South Shore) has declined over the last two decades (Douglas County Room Tax Reports, 18-19); total rooms sold in the 2018-2019 fiscal year was 80% of the number sold in 2001-2002. The majority of the decline in Casino occupancy occurred between 2000-2010, and more recently occupancy has been relatively stable. Occupancy in Washoe county has varied between years over the last 20 years but overall is generally flat.

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 9% by 2045.

Overnight Visitors in Hotels/Motels/Casinos – In the 2018 model base year, 6,190 of the region's 11,107 TAUs are occupied (56%) during the modeled day. The forecast includes the construction of an additional 945 TAUs by 2045, an 8.5% increase in tourist accommodation units. Forecasted occupancy of TAUs was increased slightly to account for

the impact of Measure T in the City of South Lake Tahoe, which is expected to affect where visitors to the city can stay but not the overall demand (MBI 2017). The forecast estimates that 50% of the visitor parties that may have previously stayed overnight in STRs within the City of South Lake Tahoe would now stay in TAUs, because of the expected lower supply of STRs in the City. As a result, the regional overnight lodging occupancy rate (in TAUs) increases from 56% to 59% in the forecast years. As a result of both additional unit availability from new TAU construction and the higher occupancy rate, the actual number of occupied Hotel/Motel/Casino units increases by 14.5% in 2045.

Overnight Visitors in STRs – In 2018, TRPA estimated that there were 6,005 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, 37% of the units (2,227) are occupied. The forecast projects that both the total number and occupancy of STRs is relatively flat in the forecast years. This projection is highly influenced by the City of South Lake Tahoe's Measure T, which eliminates STRs within most of the City's jurisdiction. Measure T will reduce the number of available STRs in the City of South Lake Tahoe but is unlikely to reduce the overall regional demand for the home-based stay experience in Tahoe. As a result, the forecast includes the displacement of STRs from the city to other jurisdictions in the region. The result will be more STRs (in absolute and proportional terms) in other jurisdictions in the region and in areas of the City where STRs are still allowed. As a result of Measure T, approximately 1,372 STRs within the City of South Lake Tahoe but located outside of the Tourist Core area will not have their licenses renewed. During the model analysis period (model day), 508 of those 1,372 STRs were occupied. The forecast assumes that all 508 visitor parties will still visit the region and find overnight accommodations elsewhere. Of the visitor parties that would have been staying at one of the STRs impacted by Measure T, half are forecasted to find accommodations in STRs in the Tourist Core areas within the City

of South Lake Tahoe, where STRs remain allowed, or in STRs in other jurisdictions, and half of visitor parties are forecast to shift to accommodations in the casinos, hotels, motels, and resorts in the region.

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 modeled day in the 2018 base year. The forecast maintains these percentages into the forecast years. 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 in the forecast, due to three factors: 1) the construction of additional workforce housing units which cannot be used for second homes, and 2) initiatives focused on making the existing stocking more affordable for workers and residents, and 3) the conversion of some existing vacation rentals in the City of South Lake Tahoe to resident housing because of the Measure T requirements. The forecast

projects the occupancy rate of second units will remain the same, maintaining the 37% occupancy of the base year in 2035 and 2045. As a result of the increase in the total number of homes in the region the number of seasonal units increases by 8% in 2045.

Day Visitors – Day visitation is forecast to increase as a result of population growth in the mega-region, at a similar rate as 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 and is not expected to change in the forecast years.

Passenger Traffic at Reno Tahoe International Airport – TRPA staff also analyzed the total passenger data from the Reno Tahoe International Airport (Figure 115), which shows that passenger traffic has increased in each of the past 5 years but remains below the passenger volumes in the mid-2000s. Between 2014 and 2019, annual growth in passengers ranged from +4% to +10%, with the average annual growth from 2014 to 2019 of +6%.

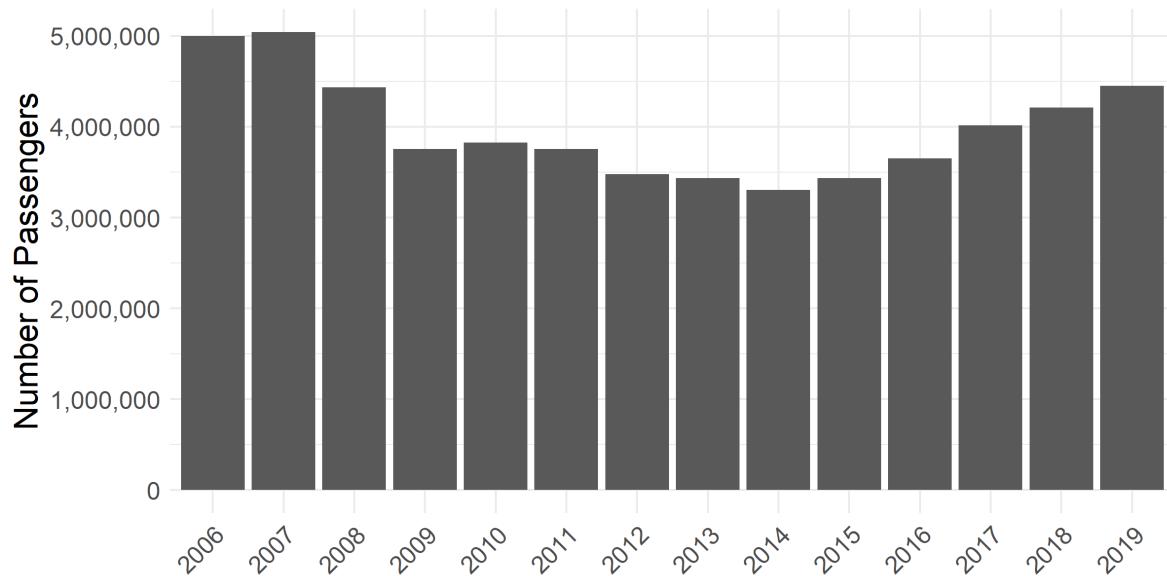


Figure 122: Reno-Tahoe International Airport: Total Passengers 2006-2019

Source: The Reno-Tahoe Airport Authority, Reno-Tahoe International Airport: Passengers and Cargo Statistics Reports 2008 through 2019, Retrieved May 25, 2020 from <https://www.renoairport.com/airport-authority/facts-figures/statistics>.

Sensitivity of Visitation Forecasts

In meetings with the TRPA Governing Board, Tahoe Model Working Group and other stakeholders, TRPA staff were asked to test and report on the sensitivity and impact of higher or lower than expected changes in visitation and different scenarios that might change the forecast assumptions. In response, staff assessed the sensitivity of VMT forecasts to a range of visitation assumptions. performed additional validation and testing for changes in visitation and the resultant effect on VMT.

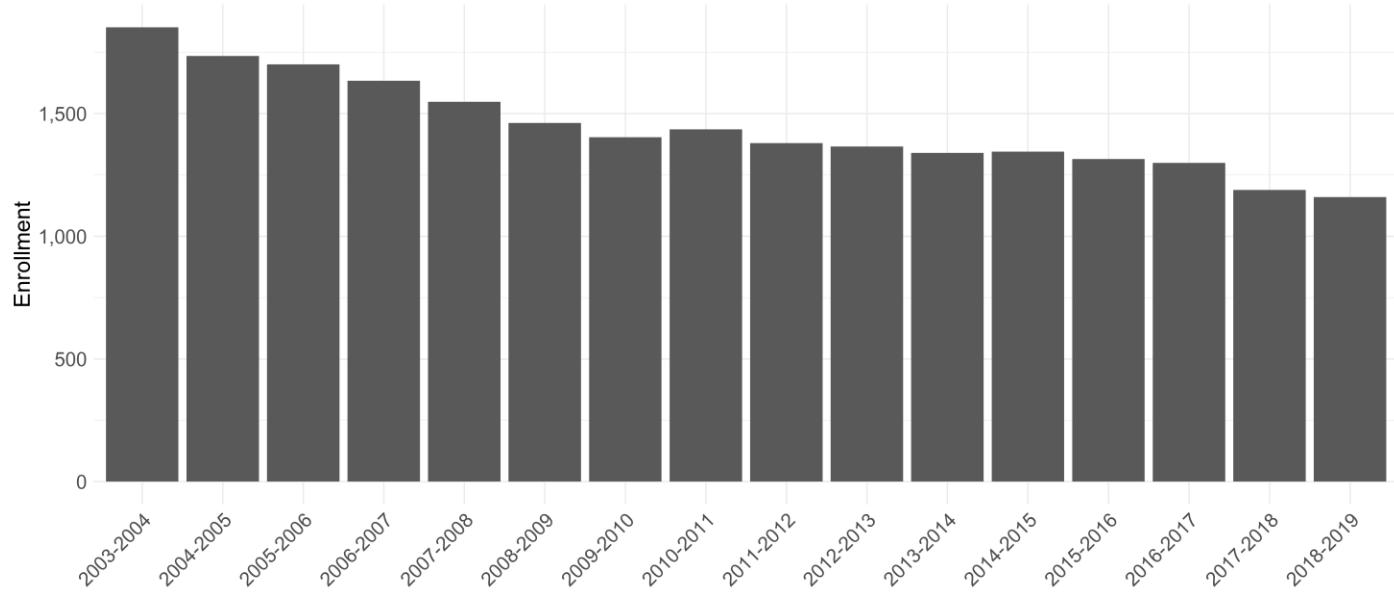
All visitors in the base year model (including day, overnight, second homeowners, and thru-travelers) average 7.9 in-region VMT a day. So, for every 100 additional (or fewer) visitors, regional VMT would change by 790 VMT. At a high level, Visitors make up 47.3% of the VMT in the model, so if total visitation increased by 10%, regional VMT would increase by approximately 4.7% increase in regional VMT.

If each of these visitor types were adjusted independently, the results would be as follows:

- A 10% increase in the number of day visitors would result in a 1.8% increase in regional VMT
- A 10% increase in overnight visitors would result in a 1.8% increase in regional VMT
- A 10% increase in second homeowners would result in a 0.9% increase in regional VMT

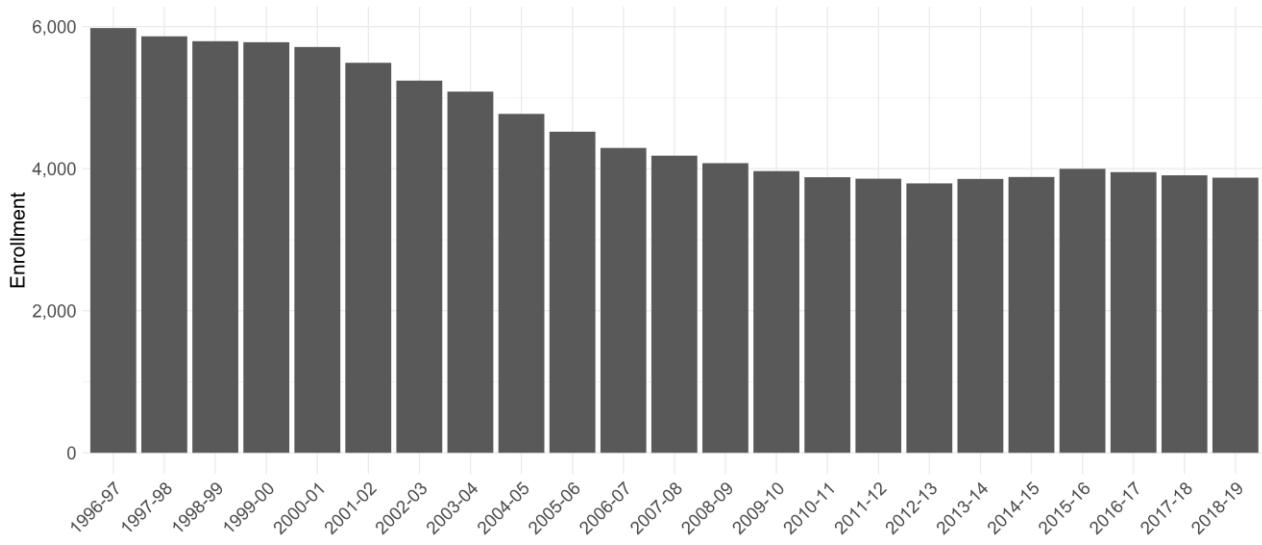
School Enrollment

Like the overall population, school enrollment in the region has decreased in the last two decades, but in most recent years has been relatively steady. Between 1996 and 2018, enrollment in the Lake Tahoe Unified School district in South Lake Tahoe, California decreased by 35%, while enrollment on the Nevada side decreased by 37%, from 1,852 in 2003 to 1,160 in 2019. The forecast projects that school enrollment will increase by 12.4% as new employment (858 additional jobs) and residents (6,417 additional full-time residents) are added to the region.



Source: <http://nevadareportcard.nv.gov/di/main/demoprof>

Figure 123: Figure 5: Tahoe - Nevada School Enrollment (2003-2019)



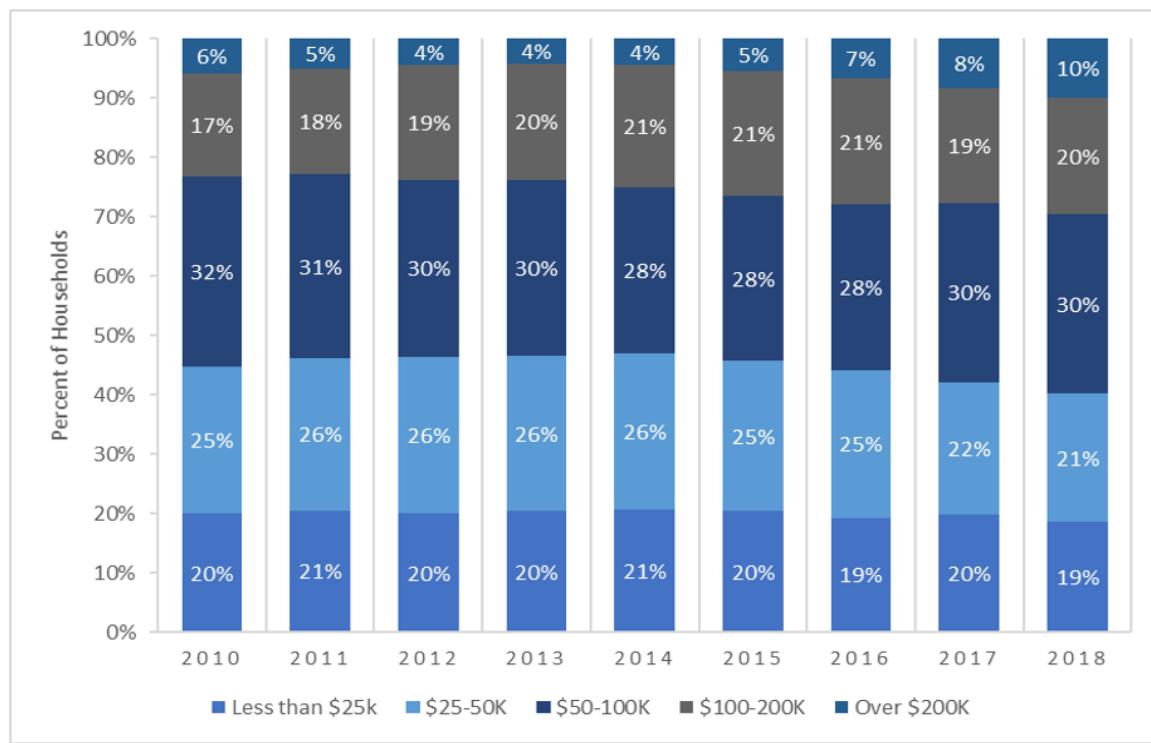
Source: dq.cde.ca.gov

Figure 124: Lake Tahoe Unified School District Enrollment (1996-2018)

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 (ACS 2010-2018). Annual median income for households nationally rose to \$61,937 in 2018, within California it is \$75,277, and in Nevada it is \$58,646 (Guzman 2019). Median income in the Tahoe Region has grown over the last five years as the region emerged from the Recession and is now close to the national average. However, the proportion of households earning less than \$25,000/year annually has remained at relatively stable, at about 20% of households. Between 2010 and

2018 the number of households earning over \$200,000/year grew by 67% and those earning between \$100,000 and \$200,000 increased by 11%. Despite these gains, households earning less than \$100,000/year outnumber households earning more than \$100,000/year by two to one. 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 at the current level. Initiatives to provide workforce and affordable housing are expected to increase the regional housing availability at the lower end of income distribution.



Source: American Community Survey (ACS)

Figure 125: Household Income Categories (% of Households 2010-2018)

Addendum

COVID-19

The research and majority of the forecasts for the 2020 Regional Transportation Plan were developed prior to the impact of COVID-19 on our community and the world. The immediate impact of COVID-19 on our community has been severe. Both states issued stay-at-home orders and the casinos, ski resorts and many other businesses closed in March 2020, furloughing or laying off thousands of employees. The Lakeside Inn and Casino announced that it would not reopen. The hotels, motels, restaurants, bars, and many of the recreation areas, beaches and parks that are the lifeblood of our tourism-based economy were closed for weeks. The impacts on transportation were apparent in the traffic volumes around the region. In early May, VMT in the counties that make up the Tahoe Region was estimated to be down 30-50% from levels observed in the same period in prior years.

The long-term impacts of COVID-19 on the region are uncertain. Some believe that the job losses, business closures, and economic hardship will continue. Others think that urban flight will result in a mass movement from cities to rural areas, as remote work continues and people seek to escape crowded cities for open spaces, resulting in massive population shifts and increased housing needs in the region.

Given this uncertainty, staff recommends maintaining the above assumptions for the forecast scenarios even considering the COVID-19 pandemic and associated economic downturn. The Harvard Business Review (HBR) recommends that in "moments of unprecedented uncertainty", one must "know when not to make a forecast" (Saffo, 2007). HBR suggests that "even in periods of dramatic, rapid transformation, there are vastly more elements that do not change than new things that emerge" (Saffo, 2007).

Transportation Projects & Strategies Forecast Summary

Transportation Projects & Strategies

The second element of the RTP/SCS forecast was the transportation forecast. The transportation projects and strategies were forecasted using both the Tahoe travel demand model and the Trip Reduction Analysis Tool (TRIA). All fixed-route transit projects were directly incorporated into the travel demand model; the route locations, fares, and headways were directly forecasted within the model network. In terms of roadway capacity, the plan does not include many changes. As a result, the Highway 50 Revitalization project was the only roadway project directly represented in the travel demand model. The rest of projects and strategies were incorporated in the forecast using TRIA; these include microtransit, bike/ped projects, ITS, TDM, parking, and others.

TRIA 2.0

The Tahoe Regional Planning Agency developed and maintains a Trip Reduction Impact Analysis (TRIA) spreadsheet tool to evaluate the trip and VMT reduction impacts of various transportation policies, programs, and trends under consideration as part of the Sustainable Communities Strategy (SCS) effort. TRIA 2.0 captures the strategies and trends that can have a significant effect on travel demand such as parking policies, traveler information systems, new transit operations, or construction of new bike trails and sidewalks but which cannot be accurately captured in the TRPA travel demand model. The purpose of the TRIA 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, vehicle miles traveled (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 2045 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS).

As much as possible, the TRIA 2.0 used estimates based on current conditions in the Tahoe Basin, or existing trip reduction estimates developed locally, particularly in the case of new transit services and new active transportation facilities such as bike trails and sidewalks. For policies or projects for which there are no local studies, the trip reduction impacts were estimated based on a review of the current (2020) literature and studies of locations where similar policies, programs, or investments have been implemented. Where research shows that a policy might vary in effectiveness a more conservative approach will be chosen, so as not to overstate the trip and VMT reduction potential.

The TRIA 2.0 is built around the main modes of transportation and analysis of how the land use plan and transportation strategies and policies proposed in the RTP/SCS will impact

these modes. The main categories previously considered in the tool are:

- Active transportation (bicycling and walking)
- Public transit service
- Intelligent Transportation System (ITS) technologies
- Transportation demand management (TDM) measures
- Parking policy changes

As well as updating the existing categories in TRIA, the update also includes the addition of the following categories:

- Shared Micromobility services (i.e., E-scooters)
- Microtransit Services

As noted above, the TRIA 2.0 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 2.0 applies separately 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, VMT and trip reduction goals.

As much as possible, TRIA 2.0 uses estimates based on current conditions in the Tahoe Basin, or trip reduction estimates developed based on locally observed conditions, particularly in the case of new transit services and new active transportation facilities such as bike trails and sidewalks. For policies or projects for which there were no local studies, the trip reduction impacts were estimated based on a review of the current (2020) literature 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 was generally chosen, except as

noted below, so as not to overstate the trip and VMT reduction potential. See Table 35 for an overview of the strategies analyzed and their individual estimated trip reduction potential in the 2035 and 2045 RTP/SCS scenarios.

Analysis by Mode

The approach taken in TRIA 2.0 for the strategies considered are summarized below. The table that follows lays out the full details on trip reduction by strategy, sources used and overall reduction.

Active Transportation

The following describes the three active transportation related trip reduction strategies.

Bike and Pedestrian Facilities

The vehicle trip reductions for bicycle and pedestrian trips were developed using the bicycle and pedestrian monitoring data collected by TRPA for the past three years. The monitoring data were used to develop an understanding of how walking and biking activity varies by different facility types (e.g., sidewalk, bike lanes, and shared-use paths) in different contexts (e.g., town centers, recreation corridors, campgrounds, etc.) to establish a relative classification of usage.

New bicycle and pedestrian improvements called for by the RTP were then classified into one of the facilities and context types to estimate the number of walking and biking trips expected based on the new facility. These usage estimates are then used to estimate a vehicle trip reduction associated with the new walking and biking facilities. Expected trip reductions for different improvement types (sidewalks, bike lanes, and shared-use paths) were established based on reductions documented by the California Air Pollution Control Officers Association (CAPCOA), the Sacramento Area Council of Governments (SACOG), and local trail survey data collected as part of TRPA's bicycle and pedestrian monitoring and modeling data. Calculated reductions for individual components range from 0.5% associated with

sidewalk and bike lane improvements to 16% for shared-use paths.

The TRIA tool assumes that the implementation of the bicycle and pedestrian network will develop across the timeframe of this plan. Therefore by 2035 only a portion of the network will have been completed, and the VMT reduction would not be as great in 2035 (1.12%) as in 2045, at 1.19%. These trip reductions are applied to all areas in the region given the broad expansion of bicycle and pedestrian facilities planned across the region.

Electric Bicycles

The increased prevalence of electric bicycles, or “e-bikes”, was introduced in the 2020 TRIA update 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 2045 RTP/SCS include:

- Pathway Partnership, a committee that includes government agencies, nonprofits, and advocacy representatives, has been examining regional e-bike policies on paths that vary between landowners. The Partnership’s goal is to create consistent messaging that encourages legal and safe use of e-bikes.
- Commute Tahoe program, where employers will also provide education and benefits of e-bikes to their employees.

E-bikes are gaining prevalence in many locations around the world through individual ownership, rental programs, and bikeshare services. In peak summer 2020, e-bike sales in the U.S. were up 190% from the prior year according to NPD Group consumer research²¹.

²¹ NPD Group, *Plot Twist: US Performance Bike Sales Rise in June*, 2020.

<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/>

²² Castro et al., *Physical activity of electric bicycle users compared to conventional bicycle users and*

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While this level of adoption of e-bikes may slow following the COVID-19 pandemic, it has sped the widespread adoption of e-bikes across the United States. E-bikes enable users to travel farther than a conventional bicycle in the same amount of time and 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. E-bikes can be owned by individuals, rented, or be part of a bikeshare program.

A literature review was conducted to determine how e-bikes 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 regular bicycle.²² As documented in TRPA’s *Bicycle Pedestrian Model Documentation*²³, the average trip distance in the Lake Tahoe Region is 2.4 miles. Because e-bikes allow for longer trips, the bike mode share is increased for longer trips to estimate their benefit. For bicycle trips between three and five miles, the use of e-bikes was assumed to increase bike mode share up to the current regional bike mode share (6.9%). For trips longer than five miles, the bike mode share was adjusted to follow the current decreasing bike mode share distribution for trips between three and five miles long, with mode shares adjusted to between 0.1% and 1% for bike trips between five and seven miles long, as shown in Table 26.

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 (0.79%).

The net reduction in vehicle trips based on the increased adoption of e-bikes (0.79%) was applied to all areas in the Tahoe Basin based

non-cyclists: Insights based on health and transport data from an online survey in seven European cities, 2019.

²³ TRPA, *Bicycle Pedestrian Model Documentation*, 2018.

on an expected bicycle mode share by trip length for both the 2035 and 2045 scenario.

Table 26: 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 – 5.5 miles	Increased to 1.0%
5.5 – 6.0 miles	Increased to 0.3%
6.0 – 7.0 miles	Increased to 0.1%
>7.0 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, Kittelson & Associates, Inc., 2020.

Shared Micromobility

Trip reductions associated with the trend in shared micromobility services were also included in the TRIA 2.0 update. 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. Overall trips reduction factors associated with shared mobility services were calculated using 2018 and 2019 trip data and survey data from South Lake Tahoe's implementation of the Lime e-scooter program which showed that 48% of e-scooter trips replaced an automobile trip.

The trip reduction is calculated using trips in the areas expected to provide shared micromobility service in the future: Tahoe City, Kings Beach, and South Lake Tahoe areas. This results in a trip reduction factor for South Lake Tahoe of 0.63%. These calculations are shown in Table 27. The total number of reduced trips is then divided by total regional trips to calculate a regional trip reduction percentage.

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 new RTP Policy 4.2: Enable growth of shared and on-demand shared ride mobility services (i.e., ride-, car-, and bike-sharing, e-hailing, etc.). 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 84% 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 (0.53%) was reduced from the trip reduction calculated based on the Lime e-scooter implementation from 0.63% to 0.53% for a regional application. The resulting trip reduction factor was corroborated through review of e-scooter trip research studies from Portland (48% of e-scooter trips divert from vehicles) and Chicago (65% of e-scooter trips divert from vehicles) and is more conservative (less trip reduction) than the current research indicates.

The trip reduction is taken only for the continual implementation of an e-scooter program and 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 pilot a bike-sharing program in North Lake Tahoe with Zagster with implementation delayed due to the COVID-19 pandemic. TRPA Transportation staff will be monitoring deployment of new micromobility options and consider potential of these options to serve travel needs in Tahoe.

Table 27: Micromobility Trip Reduction Calculation Summary

E-Scooter Trips/Day	1,859
Percent of Trips that Replaced Automobile Trips ²	48%
Number of Automobile Trips Removed by E-Scooters per Day	892
Total Automobile Trips per Day in SLT Area with Lime E-Scooters	141,745
Percent of Automobile Trips Reduced in Area with E-Scooters	0.63%

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

Transit Services and Facilities

The following four 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

The transit portion of the trip and VMT reductions are based on ridership projections for new or improved transit routes included in the RTP's constrained project list for 2035 and 2045. The model currently accounts for transit ridership for all transit trips internal to the TRPA's travel demand model network (e.g., the Tahoe Basin). Therefore, the transit portion of the trip reductions in TRIA is only based on trips that either originate or end external to the Tahoe Basin, such as TTD's commuter services to the Carson Valley. Additionally, trip reductions associated with circulator, ferry taxi, and other non-route-based services that cannot be represented in the travel demand model are also estimated in the TRIA 2.0 transit service calculations. The name and description of the new or improved transit routes included in the trip reduction calculations are listed below:

Year 2035 (2026-2035):

- TTD 20 and 19x (long)- Stateline TC to Carson (interlined)
- TTD 21x - Stateline TC to Carson via Spooner
- TART 89 (long) - Tahoe City TC to Truckee Depot
- TART 267 (long) - Stateline to Truckee Depot
- Event Center Circulator - Tourist Core to Round Hill
- South Shore Ferry Taxi - Round Hill Pines to Camp Richardson
- STS - STS Medical Transportation

Year 2045 (2036-2045):

- TTD 20 and 19x (long) - Stateline TC to Carson (interlined)
- TTD 21x - Stateline TC to Carson via Spooner
- TART 89 (peak) - Tahoe City TC to Truckee Depot
- TART 89 (off-peak) - Tahoe City TC to Truckee Depot
- TART 267 - Stateline to Truckee Depot
- TART 3 - Incline Village to Reno
- Trans Sierra 1 - Meyers to Stockton
- Trans Sierra 2 - Meyers to Sacramento
- Event Center Circulator - Tourist Core to Round Hill
- South Shore Ferry Taxi - Round Hill Pines to Camp Richardson
- North Shore Ferry Taxi - Sand Harbor to Tahoma
- STS - STS Medical Transportation

Trip reductions for additional transit services use the projected 2035 and 2045 daily ridership for each transit project obtained from TRPA's transit data that identifies expected ridership for each project included in the 2045 RTP/SCS. 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 staff.

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 28.

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 2045).

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 0.51% and 1.61% in 2035 and 2045, respectively. This trip reduction is applied to trips in all areas, including external trips.

Table 28: 2045 Transit Service and Capital Projects Trip Reduction Calculation Summary

Estimated Annual Ridership of External or Uncaptured Transit Service (2035)	540,261
Estimated Annual Ridership of External or Uncaptured Transit Service (2045)	2,361,399
Average Percentage of Ridership that is External or Uncaptured (2035)	91%
Average Percentage of Ridership that is External or Uncaptured (2045)	94%
Vehicle Trips Reduced (2035)	1,122
Vehicle Trips Reduced (2045)	3,606
2035 Percent of Automobile Trips Reduced by External or Uncaptured Transit Service	0.5%
2045 Percent of Automobile Trips Reduced by External or Uncaptured Transit Service	1.6%

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, Kittelson & Associates, Inc., 2020.

Intercept Lots

Additionally, a strategy implementing intercept parking lots to allow visitors or residents to park in designated lots and transfer to transit services was also evaluated in the updated TRIA calculations. The strategy, supported by RTP policy 2.22 Mobility Hubs, 2.13 Transit Coordination, 2.3 and 2.4 out of Basin Partner Collaboration, targets 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. The winter intercept lots at the Truckee Tahoe Airport District, school district administrative office, and the summer intercept lot at Northstar each include approximately 200 parking spaces, with potential for further expansion. In addition to these existing continuing services that are not currently reflected in the TRPA travel model, TRPA is beginning 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 and Mottsville, NV for carpooling to be coordinated with existing and future transit services for a completely car free Tahoe experience.

The initial 2018 winter pilot study reduced 115 trips per day from the airport location and the summer pilot served over 700 riders/trips from Northstar and 1,000 riders/trips from the Tahoe Biltmore for the Fourth of July pilot. Conservatively using the lower winter implementation usage compared to total travel on SR 267, the percentage of directional travel diverted to transit is 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%. For the Tahoe region, the initial park and ride intercept lot reduction assumption was approximately half of the 8% reported in Alameda County to conservatively estimate the number of visitors that would be willing to use the Tahoe region intercept lots. 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 29. 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 29: 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, Kittelson & Associates, Inc., 2020.

Microtransit Service Areas

Trip reductions associated with microtransit services, supported by Policy 2.14 On Demand Transit, were also included as a new strategy in the TRIA update. Microtransit services are on-demand transit services that typically provide flexible routes within a defined service area using lower-capacity transit vehicles.

Microtransit services such as Squaw Valley Mountaineer, can be funded by public agencies, private agencies, or through public-private partnerships. The following microtransit services are planned for implementation in the 2045 RTP/SCS:

- South Lake Tahoe Event Center Service – the on-demand microtransit service will offer trips within the Tourist Core of South Lake Tahoe. Service is expected to begin in 2022 and will be funded through the Tahoe South Event Center.
- Kings Beach, Tahoe City, and West Shore Services – Placer County plans to fund three on-demand microtransit pilot services along the West and North Shores over a three-year period. The first pilot service is expected to begin by 2025.

Overall trip reduction factors associated with microtransit were calculated using 2019 and 2020 trip data from the Squaw Valley and Alpine Meadows' Mountaineer microtransit service. The Mountaineer provides free, on-demand transit services for all resort guests within the resort areas. Kittelson received preliminary ridership data from Placer County and Truckee North Tahoe Transportation Management Association (TNT-TMA) which was used to calculate estimated trip reduction rates.

Average daily passengers, average passengers per rides, and the percent of rides shared by multiple groups was obtained for the Mountaineer program for the 2019/2020 winter season (before the closure of Squaw Valley and Alpine Meadows due to COVID-19). It was assumed that rides shared by multiple groups reduced private vehicle trips. The

Mountaineer data did not specify the percentage of microtransit trips that diverted from private vehicle trips. Therefore, the percent of rides replacing car trips was obtained from Aspen's Downtowner microtransit service (38%). This 38% was then multiplied by the total number of shared Mountaineer rides to estimate the daily number of car trips removed in the Mountaineer service area. The average number of vehicle trips removed was compared to the total daily car trips in the Squaw Valley Alpine Meadows area to calculate the percent of automobile trips reduced by microtransit (0.54%). These calculations are summarized in Table 30.

Vehicle trip reductions associated with microtransit service areas were then calculated based on the total number of trips in areas where microtransit services are planned as part of the RTP/SCS: Tahoe City, Kings Beach, and South Lake Tahoe. These planned services would serve areas responsible for over 83% of the region's expected trips in 2045. As a result, the trip reduction was recalculated as a regional trip reduction by factoring the average trip reduction within microtransit service areas (0.54%) by the percentage of trips impacted to arrive at regional trip reduction factors of 0.28% and 0.45% in 2035 and 2045, respectively. The trip reduction factor is lower for 2035 microtransit versus 2045 as service areas are expected to be expanded between 2035 and 2045 as included in the 2020 RTP. As a result, the expanded microtransit service in 2045 will reduce a higher percentage of regional automobile trips.

Average Daily Passengers	739
Average Passengers per Ride	2.02
Average Daily Rides	366
Percent of Rides Shared by Multiple Groups	56%
Average Daily Number of Shared Rides	205
% of Rides replacing Car Trips	38%
Daily Number of Car Trips Removed	78
Total Daily Car Trips in Squaw/Alpine	14,329
Percent of Automobile Trips Reduced in Areas with Microtransit (number of car trips removed / total daily trips in Squaw & Alpine)	0.54%

Table 30: Microtransit Trip Reduction Calculation Summary

Source: Placer County, TNT-TMA, City of Aspen, Kittelson & Associates, Inc., 2020.

Intelligent Transportation System (ITS) Technologies

Several strategies and trends that increase the functionality and usability of transit based on ITS technology improvements are supported by RTP technology focused Policies 4.9 and 4.10, and new Connectivity Policy 2.14 supporting on-demand dynamically routed transit shuttles. These include:

Improve Transit Information -

Improved transit coordination between local and regional providers, through simplified trip planning (e.g., Google Transit). This strategy estimates the increase in transit ridership associated with the introduction of transit trip planning, and the subsequent reduction in

vehicle trips. While some of these technologies have been implemented as of the date of this publication, they are not incorporated into the travel demand model which includes strategies up to 2018. Therefore, these strategies represent additional trip reductions. If the model is

updated and recalibrated to conditions that include transit information services, the Transit Information strategies may be removed from the TRIA trip reduction calculation.

This calculation assumes that enhanced transit trip planning would 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.²⁴ 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

²⁴ Trillium Transit,
<http://www.trilliumtransit.com/blog/2009/04/09/two-years-after-google-transit-for-humboldt-county/>;

<http://www.trilliumtransit.com/blog/2009/04/27/google-transit-some-numbers-from-missoula-montana/>.

vehicle trips by dividing the new ridership by the average vehicle occupancy. The resulting reduced vehicle trips are then divided by the 2035 and 2045 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 trip reduction

percentages of 0.68% and 0.66% of trips to or from Town Centers in 2035 and 2045, respectively. For external trips, this strategy is associated with trip reductions of 0.43% and 0.42% in 2035 and 2045, respectively. The calculations are summarized in Table 31.

Table 31: Improved Transit Information Trip Reduction Calculation Summary

Estimated Transit Ridership Affected for Town Center Trips	2,860,858
Estimated Transit Ridership Affected for Inter-Regional Trips	1,095,548
Transit Information Percentage Increase in Ridership	15%
New Ridership Due to Transit Information in Town Centers	429,129
New Ridership Due to Transit Information for Inter-Regional Trips	164,332
Vehicle Trips Shifted for Town Center Trips	203,836
Vehicle Trips Shifted for Inter-Regional Trips	78,058
2035 Annual Town Center Vehicle Trips	29,786,964
2035 Town Center Transit Information Trip Reduction Percentage	0.68%
2045 Annual Town Center Vehicle Trips	30,708,774
2045 Town Center Transit Information Trip Reduction Percentage	0.66%
2035 Annual Inter-Regional Vehicle Trips	18,165,769
2035 Inter-Regional Transit Information Trip Reduction Percentage	0.43%
2045 Annual Town Center Vehicle Trips	18,531,967
2045 Town Center Transit Information Trip Reduction Percentage	0.42%

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

Improved Transit Information

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 to eliminate "transfer anxiety". This strategy/trend reduces the transfer penalty (the walking and waiting time of transfers) 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. Intraregional 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.

The assumed value was developed based on observations of transit in the Tahoe region and qualitative findings from other studies regarding "transfer anxiety." Consideration was given to the fact that the transfer penalty may be stronger in rural environments where transfers may occur in more isolated locations.

The A recent literature review did not reveal new information to inform the elasticity value for ridership with respect to transfer time to update this assumption. The trip reduction assumptions for this strategy were not updated in the latest TRIA 2.0 tool update.

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 2045 to determine the trip reduction percentage.

This strategy is associated with trip reduction percentages of 0.08% and 0.10% of trips to or from Town Centers in 2035 and 2045,

Table 32: Improved Transit Coordination Trip Reduction Calculation Summary

2035 Excepted Ridership Growth due to Transit Coordination	19.2%
2045 Excepted Ridership Growth due to Transit Coordination	25.6%
Expected Ridership Affected by Transit Coordination	375,625
2035 Increased Ridership due to Transit Coordination	72,696
2045 Increased Ridership due to Transit Coordination	96,928
2035 Vehicle Trips Shifted	23,020
2045 Vehicle Trips Shifted	30,694
2035 Annual Town Center Vehicle Trips	29,786,964
2035 Transit Information Trip Reduction Percentage	0.08%
2045 Annual Town Center Vehicle Trips	30,708,774
2045 Transit Information Trip Reduction Percentage	0.10%

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

Real-Time Transit Arrival Information

The TRIA tool estimates the increase in transit ridership associated with the implementation of real-time arrival information, and the subsequent reduction in vehicle trips, supported RTP Policy 4.9 Implementation of Tahoe Basin Intelligent Transportation Systems Strategic Plan. Real-time transit arrival information provides information on when the transit vehicle is expected to ride versus the trip-planning capabilities accounted for in the Transit Information category above. While real-time arrival information has been implemented in the Tahoe Region as of the date of this publication, the base year for the travel model is 2018. Therefore, the strategies are not reflected in the travel demand model calibration. If the model is updated and recalibrated to conditions that include transit arrival information, these strategies will be removed from the TRIA trip reduction calculation.

It is assumed that the availability of real-time transit information would increase ridership by 2.2%. This assumption is based on a case

respectively. The calculations are summarized in Table 32.

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. 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 2045 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 0.04% 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 **Error! Reference source not found..**

Table 33: Improved Transit Information Trip Reduction Calculation Summary

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

Estimated Transit Ridership Affected for Town Center Trips	2,860,858
Real-Time Transit Arrival Information Percentage Increase in Ridership	2.2%
New Ridership Due to Real-Time Arrival Information	62,939
Vehicle Trips Shifted	29,896
2035 Annual Vehicle Trips	82,086,727
2035 Real-Time Information Trip Reduction Percentage	0.04%
2045 Annual Vehicle Trips	84,793,580
2045 Real-Time Information Trip Reduction Percentage	0.04%

Dynamic Ridesharing

This strategy/trend introduces services and/or subsidies to encourage commuters 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, marketing, online ride matching, etc.) would reduce trips by 1%. This assumption was based on the findings of the MIT "Real-Time" Rideshare Research program²⁵, 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 2017 as the most recent research supports the previous assumptions used in the 2017 TRIA tool. The higher level of implementation may be considered if subsidies are assumed in the RTP scenario, but it is recommended to maintain the assumptions associated with the lower level of implementation unless subsidies are provided. 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.

²⁵ Massachusetts Institute of Technology, Real-Time Rideshare Research program,

Tahoe Regional Planning Agency

<http://ridesharechoices.scripts.mit.edu/home/ridesharemit/>.

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 1.7 focused on employer trip reduction programs, 2.1 coordination with the region's Transportation Management Associations, 2.11 multimodal amenities for new or redeveloped projects, 4.8 increasing outreach and advertising for non-motorized transportation, 4.14 expanding and building the Transportation Management Associations, 4.15 expanding data collection and 4.16 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 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 2.0 compares the effect of improving the participation rate of the existing Employer Trip Reduction ordinance 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 38.91% with higher proportions

of larger employers (80%) already participating and lower proportions of small employers (30%). 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 was assumed to be 75% for small employers, 90% for medium firms, and 100% for large firms by 2045.

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 and SACOG documentation, as described below. 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 85.5, 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. 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. TRPA also recently started an ad hoc committee that includes the two TMAs and Placer County staff to build out the Commute Tahoe Program. The program provides resources for employers to establish their own employee trip reduction program that is scalable to business size and budget. This initiative is

underway and working towards a TRPA municipal code update that sets specific requirements for employers to meet trip reduction targets. This will be coordinated with existing Placer County Code requirements for TDM. The group is working through a short list of pilot employers for early 2021 and building out the program over the next several years by utilizing the reach of the two TMAs and Placer County staff.

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 40% 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 (1.86%) and existing development (0.82%). 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 34.

Table 34: 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%	75%	56%	34%	0.56%	0.34%
Firms with Between 100 and 200 Employees	5%	17%	90%	16%	8%	0.90%	0.40%
Firms with More than 200 Employees	5%	8%	100%	8%	2%	0.4%	0.08%
Total						1.86%	0.82%

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

Parking Management

The RTP introduces parking management strategies and the implementation of parking fee programs in specific areas of the Tahoe Basin supported by RTP Policies 2.19 Parking Programs that incentivize non-auto modes, 2.20 maintain parking maximus, 2.21 parking revenues staying at the source and 5.3 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 are underway across the region. The Placer County Resort Triangle Transportation Plan identifies focus areas for parking management that are being integrated into Placer County Capital Improvement Program, the east shore of SR 28 has just completed a parking pricing and management and dynamic pricing study that will continue at the new parking lot located at Tunnel Creek, and the South Shore Community Revitalization project has incorporated parking management into its adopted plan. In addition to this a recently adopted project on the south shore, South Tahoe Event Center has specific permit requirements that requires paid parking for the main south shore casinos. TRPA will continue to encourage and when possible require projects to incentivize parking management.

TRIA 2.0 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, shared parking arrangements, etc. 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 2.0 updates 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 identified a trip reduction percentage of 2.7% for implementing a \$3 a day parking fee. For the Tahoe Region, half of the reduction is assumed (1.35%) to reflect the lower potential impact of parking management policies based on the higher recreational share of travel in the Tahoe Region. 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. 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 including the broader South Lake/Meyers, Emerald Bay, Tahoe City, Dollar Point, Kings Beach, and Incline Village areas (extending beyond the Town Centers) is planned represent one end of more than 90% of regional travel. Therefore, the estimated trip reduction percentage of 1.35% was factored by 0.9 to calculate the trip reduction factor as a regional trip reduction percentage (1.2%).

Trip Reductions Summary

Table 35 is 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 2045 percent reductions.

Trip reductions are classified into one of three vehicle trip 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 35: Trip Reduction Impact Analysis (TRIA) Estimates – 2045 RTP/SCS

Vehicle Trip Reduction Strategy	Primary Source of Reduced Vehicle Trips	Vehicle Trip Types Impacted	Employer Type	2035 Percent Reductions in Vehicle Trips	2045 Percent Reductions in Vehicle Trips
Active Transportation					
Complete regional network of bike and pedestrian facilities (includes expanded bike parking)	Increased bike and pedestrian mode share for trips in the corridor/district served by the project, partially drawn from former vehicle trips of 3 miles or less.	Regional Trips	--	1.12%	1.19%
Shared micromobility service areas	Reduced vehicle trips due to use of shared micromobility devices (e.g., e-scooters or shared e-bikes)	Regional Trips	--	0.53%	0.53%
Promotion of electric bicycle use	Reduced vehicle trips due to the widespread use of electric bicycles	Regional Trips	--	0.79%	0.79%
Public Transit Service					
Intra-regional transit capital projects within the Tahoe Basin; currently this only includes south shore water taxi service)	Increased transit mode share, partially drawn from former vehicle trips.	Regional Trips	--	0.51%	1.64%
Inter-regional transit service that extends outside the Tahoe Basin.	Reduced commuter and recreational trips.	External Trips	--	0.51%	1.64%
Intercept lots at entrances to the Tahoe Basin providing frequent shuttle service into the Region.	Reduced visitor trips.	External Trips	--	2.80%	2.80%
Microtransit service areas	Reduced trips for all types served by Microtransit service areas.	Regional Trips	--	0.28%	0.45%
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	--	0.68%	0.68%
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	--	0.08%	0.10%
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	--	0.04%	0.04%
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	--	0.43%	0.42%

Vehicle Trip Reduction Strategy	Primary Source of Reduced Vehicle Trips	Vehicle Trip Types Impacted	Employer Type	2035 Percent Reductions in Vehicle Trips	2045 Percent Reductions in Vehicle Trips
<i>Regionally implemented dynamic ridesharing (conservative implementation).</i>	Reduced commuter and recreational trips.	External Trips	--	1.00%	1.00%
TDM Measures					
<i>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.)</i>	Reduced peak-hour commuter trips.	Town Center Trips	New Employers	1.86%	1.86%
		Town Center Trips	Existing Employers	0.82%	0.82%
Parking Management					
<i>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.</i>	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 as a result of shared parking requirements or changes to parking standards for new development.	Town Center Trips	--	1.22%	1.22%

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

Cumulative Effect

While the effect of each policy or project type is analyzed individually, the cumulative effect of these strategies was estimated to apply to the TRPA travel demand model. The cumulative effect of each individual strategy is not simply the sum of the individual strategy effects. The impact of some strategies depends on the origin and destination trip type – for example whether they affect trips that start in Tahoe but end outside the region, or if the entire trip takes place within the Tahoe Basin.

Where there are several reduction measures that are not mutually exclusive, the total cumulative reduction does not equal Measure A + Measure B. Once Measure A has been applied, Measure B will be applied to a base that has already been reduced by Measure A. For example, if two trip reduction measures would each give a 10% trip reduction, the total cumulative reduction is not 20%. Rather, it would be equal to $100\% - (90\% * 90\%) = 19\%$.

This process continues for each additional strategy considered for a grouping.

Table 36 summarizes the cumulative impact by trip area type impacted. These cumulative impacts for each of the three trip area types (Town Center, Non-Town Center, and Internal-External) are calculated using the method described above. The strategies applied to trip each area type are combinations of the vehicle trip types noted for each individual strategy in Table 35. These combinations are summarized below:

- **Town Centers:** all “Regional Trips” and “Town Center Trips” strategies are combined in this trip area type.
- **Non-Town Centers:** only “Regional Trips” strategies are combined for these trip types.
- **Internal-External:** only “External Trips” strategies are combined for this trip area type.

Table 36: Cumulative Impact by Trip Area Type Impacted

<i>Trip Area Type</i>	<i>Employer Type</i>	<i>2035 Percent Reduction in Vehicle Trips</i>	<i>2045 Percent Reduction in Vehicle Trips</i>
<i>Town Centers</i>	Existing employers	5.92%	7.21%
	New employers	6.91%	8.18%
	Overall	5.95%	7.28%
<i>Non-Town Centers</i>	--	3.20%	4.53%
<i>Internal-External</i>	--	4.67%	5.75%

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

For Town Centers, the TDM measures strategy distinguishes between new and existing employers. As a result, a vehicle trip reduction percentage is calculated for each scenario and employer type. These are then combined into overall trip reductions by year using a weighted average based on the assumption that new employer trips represent 3% of all travel consistent with the 2017 RTP/SCS assumptions. The cumulative impacts by trip area type are then applied to the TRPA travel demand model as described below.

Travel Demand Model Integration

An additional component of the 2020 TRIA 2.0 update was to integrate the overall trip reductions directly into the TRPA travel demand modeling process rather than relying on off-model reductions using the TRIA tool to post-process vehicle trips. As part of this integration, the TRIA trip reduction factors for each traffic analysis zone (TAZ) in the travel

demand model is calculated based on the strategies that are applicable to a trip starting or ending in that zone using the trip area types described above. The trip reduction factors vary based on whether trips are within the Tahoe Basin, travel to a Town Center, or start or end external to the Tahoe Basin. The TRIA 2.0 trip adjustment factor model script is run for each RTP/SCS scenario and the travel demand model's trip table is adjusted to account for the reduction in vehicle trips for each origin-destination pair (e.g., Kings Beach to Tahoe City, or South Lake Tahoe to Carson City). These reduced trips are then reassigned to the travel demand model network to obtain an estimate of trips and vehicle miles traveled for the entire model roadway network. The resulting trip and VMT data can then be used to calculate RTP/SCS performance metrics and impacts based on the expected number of trips after considering the strategies included in the TRIA.

Table 37: Total Proportion of Vehicle Trip Reductions

Parking	TDM	Transit	Rideshare	Ped/Bike	Micromobility
9.8%	22.1%	32.9%	4.3%	24.0%	6.8%

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APPENDIX H (NEW): CONGESTION MANAGEMENT PROCESS

Background

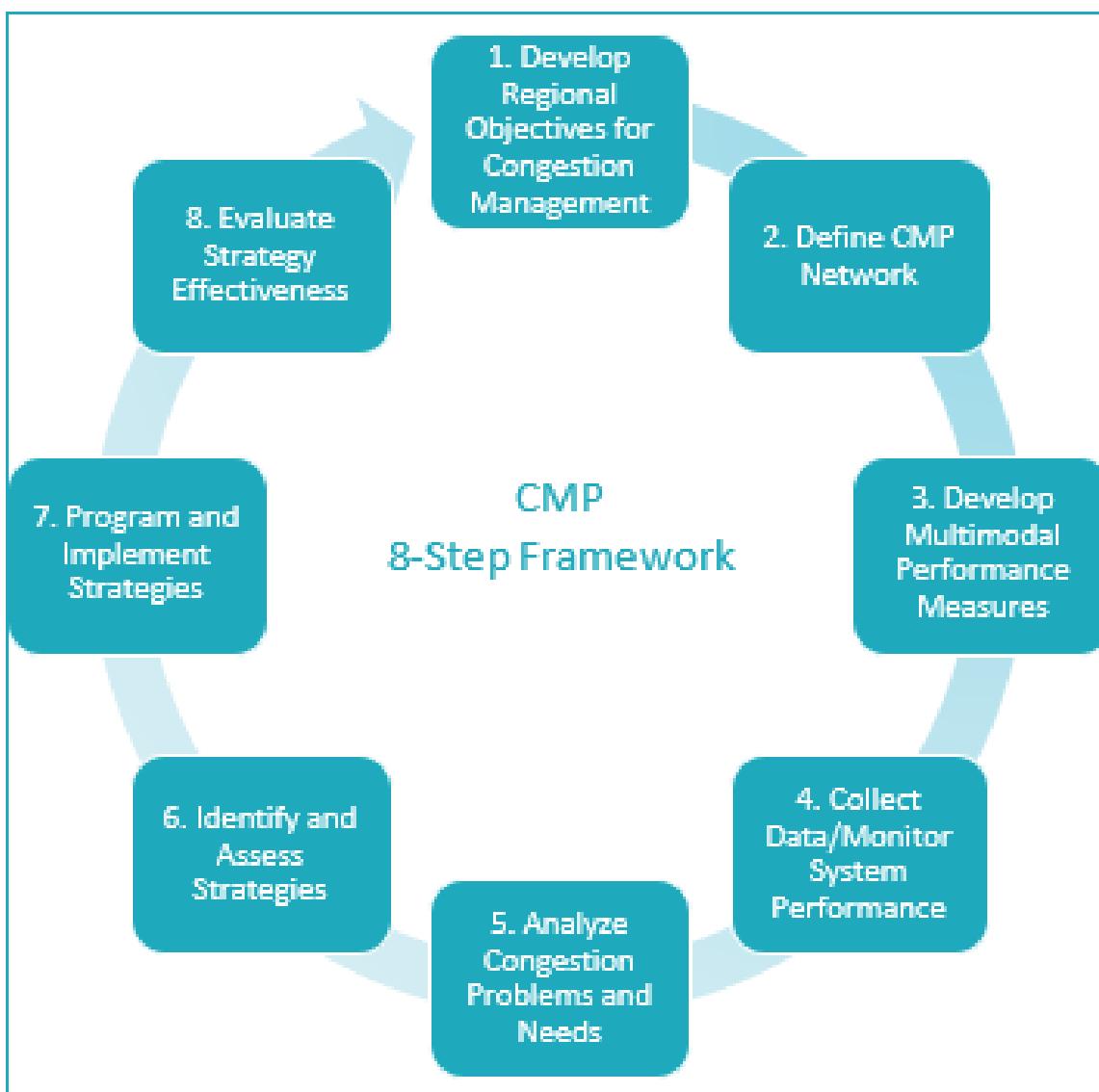
All MPOs with a population over 200,000 are federally required (23 CFR 450.320) to develop, establish, and implement a formal congestion management process (CMP).

The CMP is a systematic way of measuring and monitoring current and forecasted future congestion on the region's multimodal transportation system; monitoring and evaluating performance measures related to congestion; and requiring strategies to address current and future regional congestion.

Figure 126: Congestion Management Process 8-Step Framework

Federal regulations are not prescriptive regarding the methods and strategies of a CMP. This flexibility allows MPOs to design appropriately for their individual needs. The CMP must, at minimum, be updated often enough to provide relevant and timely information for the region's transportation plan update. For efficiency, many metropolitan planning organizations sync updates to their RTP, CMP, and TIP cycles.

Flexible approaches are needed because congestion in Tahoe does not occur during the typical weekday commutes. Rather, congestion occurs in Tahoe from a high volume of visitors to the region and its



popular recreation destinations on roadways that have a fixed capacity. In Tahoe, the road network will not be expanded; rather congestion will be addressed by improving mobility for all users, including pedestrians, bicyclists, transit riders, and automobile drivers. In a recreation destination like Tahoe, there may be times that congestion is accepted, for example on a winter Sunday when skiers are returning to neighboring regions. Instead of addressing these discrete periods of congestion, the plan and this CMP provide multimodal benefits, such as bikeable and walkable destinations that are connected by frequent transit.

Federal Requirements and 8-Step Framework

The Federal Highway Administration's (FHWA), Congestion Management Process: A Guidebook (2011), outlines an 8-step framework for the development of a CMP. A review of the required steps and current development approach is provided below.

Step 1: Develop Regional Objectives for Congestion Management

The Regional Transportation Plan goals and policies represent the guidance of the TRPA Bi-State Compact, federal and state (California) transportation planning requirements, and serve as the Regional Objectives for Congestion Management for the plan's CMP. The goals of the Regional plan and the RTP are consistent with CMP objectives.

Step 2: Define the CMP Network

The defined CMP network includes roadways, transit and trails that serve pedestrians and cyclists. The transit, bike/ped maps that follow include highlighted priority communities from the Environmental Justice analysis which include high populations of elderly, low income, and minorities. Keeping these communities in mind when analyzing congestion is important to ensure that no community is being affected more than another.

The Tahoe Roadway Network includes all local, county, and state-maintained roadways

within the Lake Tahoe Basin. The network is controlled by six entry and exit points that include SR 28/US50 Spooner Summit, SR 89 Alpine Meadows, SR 89 Luther Pass, Highway 50 Echo Summit, SR 431 Mount Rose, SR 267 Brockway Summit, and SR 207 Kingsbury Grade within the Tahoe basin.

The transit network includes all existing transit service within the Region and those transit lines that carry off of the map connect to inter-regional routes to and from Truckee and Reno to the north, Carson City to the east, Minden Gardnerville to the southeast and Sacramento to the south.

The bicycle and pedestrian network include shared-use paths (Class I), bike lanes (Class II), bike routes (Class III), sidewalks, marked crosswalks, and enhanced pedestrian crossings.

Step 3: Develop Multimodal Performance Measures

Performance measures are used in the CMP to measure progress toward meeting regional objectives, such as congestion mitigation, and to communicate performance to public officials, private sector stakeholders, and the general public. The following CMP performance measures are discussed in more detail in the Measuring and Managing for Success chapter and Appendix I: Performance Measures.

TRPA tracks # people walking, biking, and using transit. Federal and state performance measures require tracking of key safety measures, such as the number and severity of crashes; transit performance measures, to make sure buses are running on time and transit service is efficient; and roadway infrastructure performance measures, including pavement and bridge condition, to make sure routine maintenance is completed. These along with vehicle miles traveled per capita helps us ensure that the transportation system is a well-balanced, efficient multimodal system.

Step 4: Collect Data/Monitor System Performance

TRPA conducts ongoing data collection and monitoring of system performance through its monitoring program. The monitoring map includes bicycle and traffic monitoring sites for the Region. TRPA maintains an activity-based travel model for estimating daily activity of persons, households, and traveler groups on our transportation system; and has access to vehicle probe data (INRIX) which can be utilized to monitor real-time speed and travel times on the Region's roadways. TRPA also coordinates with each state's department of transportation to collect and monitor roadway volumes and collects real time bike and ped volumes from partner jurisdictions and through intercept surveys.

ROADWAY NETWORK

TAHOE REGION ROADWAYS & FACILITY TYPES

Roadway Types

- 2 Lane City/County Arterial
- 2 Lane State Hwy
- 2 Lane Hwy w/ Center Lane
- 3 Lane Hwy
- 4 Lane City/County Arterial
- 4 Lane Urban Undivided Hwy
- 4 Lane Rural Undivided Hwy

— TRPA Jurisdiction

TRPA MAP DISCLAIMER: This map was developed and produced by the TRPA GIS department. It is provided for reference only and is not intended to show map scale accuracy or all inclusive map features.

DATA SOURCES: TRPA; Open Street Map;
Fehr & Peers 2011; Kittelson & Associates
2020



NEVADA
CALIFORNIA

KINGS
BEACH

INCLINE
VILLAGE

TAHOE
CITY

TAHOMA

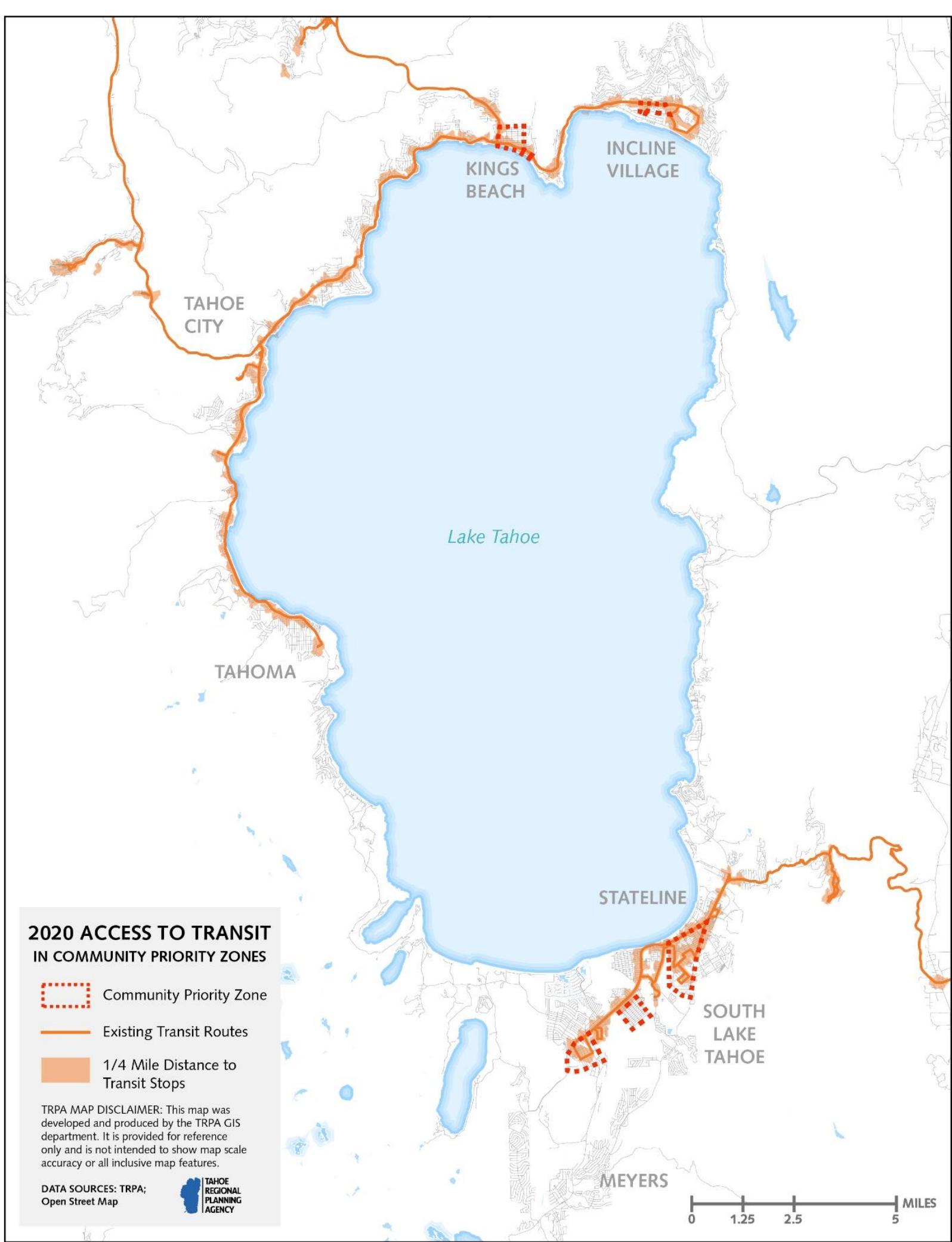
STATELINE

SOUTH LAKE
TAHOE

MEYERS

0 1.25 2.5 5 MILES

Basemap: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N
Robinson, NCEAS, NLS, OS, NMA, Geodatasyrelsen,
Rijkswaterstaat, GSA Geoland, FEMA, Intermap and the
GIS user community



TAHOE ROAD NETWORK

- Major Roads
- Arterial Streets
- Regional Entry/Exit
- [---] TRPA Jurisdiction

TRPA MAP DISCLAIMER: This map was developed and produced by the TRPA GIS department. It is provided for reference only and is not intended to show map scale accuracy or all inclusive map features.

DATA SOURCES: TRPA;
Open Street Map



Mount Rose

Brockway Summit

89 - Alpine Meadows

TAHOE CITY

TAHOMA

89

KINGS BEACH

28

INCLINE VILLAGE

431

CARSON CITY

NEVADA
CALIFORNIA

28

50

Spooner Summit

Kingsbury Grade

207

50
SOUTH LAKE TAHOE

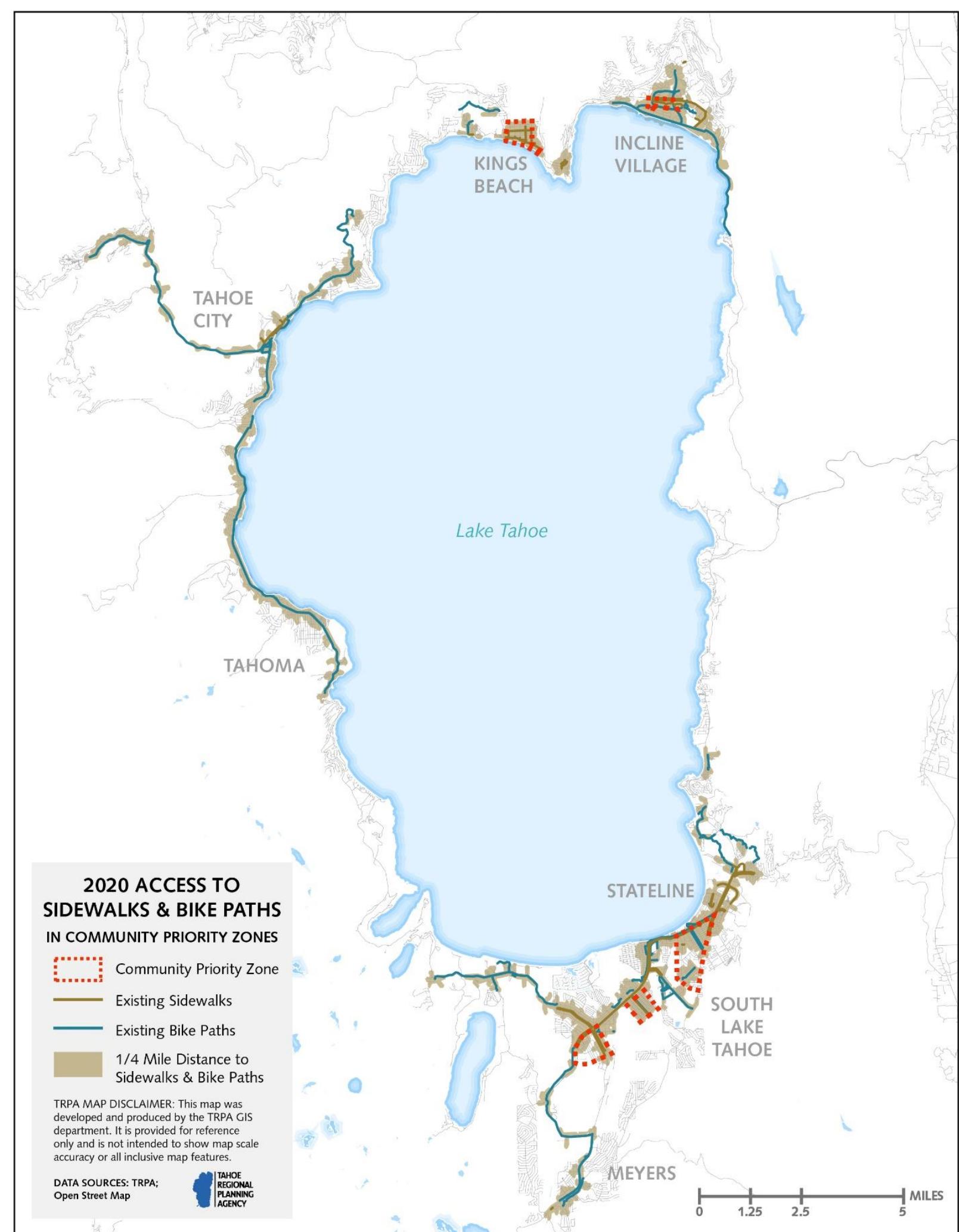
MEYERS

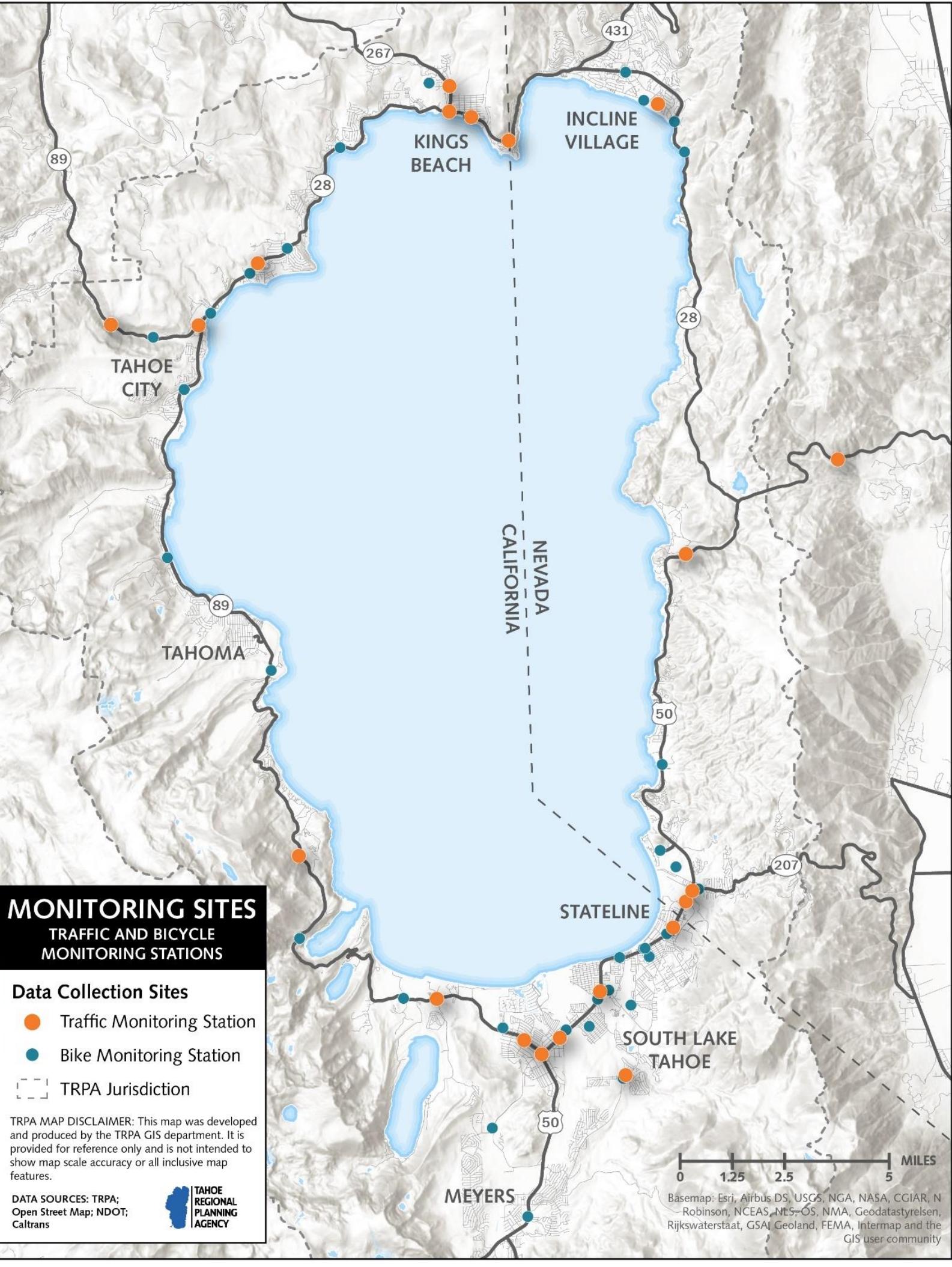
Echo Summit

Luther Pass

0 1.25 2.5 5 MILES

Basemap: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatistyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community





Regional data trends are reported every four years with RTP updates and the Lake Tahoe Info webpage Monitoring Dashboard (www.laketahoeinfo.org). Improvements to Tahoe's model and monitoring data will be implemented into Future CMP's.

The screenshot shows the Lake Tahoe INFO Monitoring Dashboard. At the top, there are links for 'Data Center', 'Request Support', and 'Log in'. Below the header, there are navigation links for 'About', 'Monitoring Programs', 'MONITORING PROGRAM' (which is highlighted in green), and 'TRAFFIC VOLUMES'. A sub-section title 'PROGRAM OVERVIEW' is visible. The main content area is titled 'MONITORING SITES' and features a map of the Lake Tahoe region with numerous yellow location markers indicating monitoring sites. A sidebar lists the names of these sites, including 'Country Club - North of First Green Drive', 'Country Club - North of Lakeshore Blvd', 'Country Club - North of SR-28', 'Elks Point Road', 'Lakeshore Blvd - 100ft E of Village Blvd', 'Lakeshore Blvd - N of SR-28 (0.1 mile)', 'Lakeshore Boulevard - 100 ft E of SR-28', and 'Northwood Blvd - East of Village Blvd'. A search bar at the top right of the map area says 'Select a Site to see Details'.

Step 5: Analyze Congestion Problems and Needs

TRPA staff analyzes collected data on a biennial basis. Once collected, raw data is analyzed and translated into meaningful measures of performance that identify and document progress toward meeting the Region's goals. The Regional Transportation Plan sets the performance measurement framework including monitoring and managing. The CMP will be implemented in such a way as to identify the underlying causes of recurring and non-recurring congestion.

Step 6: Identify and Assess Strategies

The RTP goals and policies provide a "toolbox" for addressing local and regional congestion needs, such as supporting mixed-use, transit-oriented development, and community revitalization projects that encourage walking, bicycling, and easy access to existing and planned transit stops, and to collaborate with jurisdictions and state departments of transportation to develop adaptive traffic management strategies.

Development of the RTP project list includes evaluation of strategies identified to implement CMP related goals and policies at the local and regional level. For example, regional CMP strategies will support carpooling and vanpooling, inter-regional

transit service, and expanded park-and-ride lots.

Step 7: Implement Strategies and Evaluate Effectiveness

The RTP lays out multimodal strategies that address congestion. The projects and programs to be implemented in the future as identified in the RTP are focused on transit improvements, trail connections, capitalizing on technology and building complete streets. The plan provides forceable revenue to carry out the implementation.

Data collection and analysis post-implementation of the 2020 RTP's projects and programs will evaluate the effectiveness of each strategy. The RTP policies support data collection and analysis for the congestion management process and identify in the plan a performance management framework.

2020 RTP Policy 4.16: Maintain monitoring programs for all modes that assess the effectiveness of the long-term implementation of local and regional mobility strategies on a publicly accessible reporting platform (e.g., www.laketahoeinfo.org website).

Policy Highlight

Policy 4.6: Collaborate with jurisdictions and state departments of transportation to develop adaptive management strategies.

The MPO also plays another role in the congestion management process with its regional grant program. Proposed transportation projects selected to receive MPO programmed funding are scored based on their ability to meet the regional transportation plan goals. This allows the MPO to manage priorities based on effectiveness of the strategies, making needed adjustments based on performance.

The outcome of this analysis will inform future RTP financially constrained project lists and biennial updates of the FTIP. The CMP is built into the Regional Transportation Plan and will

examine the effectiveness of regional strategies by continuously and iteratively applying performance management framework adopted as part of the RTP and this planning process.

Step 8: CMP Review and Update Process

The CMP review and update process commit to:

- Regional Plan and RTP goals and policies will be reflected in the CMP with revisions occurring no less often than the RTP update
- Changes to federal rules and associated requirements will be reflected in the CMP no less often than the RTP update
- Congestion management objectives will be reviewed and revised as necessary, in coordination with updates to the RTP
- Transportation metrics such as bike trail use, transit ridership will be made available on the Lake Tahoe Info monitoring dashboard – found here <https://monitoring.laketahoeinfo.org/>.
- Observed traffic volumes will be incorporated into the CMP database as they are made available by Caltrans and NDOT
- Regional system performance will be analyzed on a cycle consistent with, and no less often than, the RTP
- Regional system performance will be factored into the MPO Regional Grant Program project selection

Other elements of the CMP may be reviewed and updated on a case-by-case basis as requested by federal and state partners.

Conclusion

The CMP includes a systematic process for determining acceptable mobility levels in the

Region, measuring the effectiveness of transportation strategies on the transportation system, and prioritizing changes to strategies and project development standards as needed. TRPA will continue to establish and implement the most relevant and feasible CMP performance measures and congestion management strategies, which should be considered and refined iteratively in conjunction with other transportation planning processes.