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TRPA Affordable & Workforce Housing Parking Study

April 2025

In December 2023, TRPA approved the Phase 2 Affordable and Workforce Housing Amendments (i.e. Phase 2 Amendments), a set of policy changes to parking, density, height, and coverage regulations to help make deed-restricted housing[1] more financially viable. Research[2] shows that low density and high parking requirements discourage the development of smaller homes that could be more affordable to the local workforce. The policy changes approved as part of the Phase 2 Amendments allow for more flexible development standards, including reduced parking requirements for deed-restricted housing in town centers and areas of the basin zoned for multi-family residential. This new policy allows deed-restricted developments the flexibility to utilize more land for housing and can reduce the environmental impact by limiting the amount of land paved for parking.

The Phase 2 Amendments allow project applicants to request lower parking limits for their projects, provided the applicant submits a parking analysis that shows the anticipated demand for parking of their project, and how they will meet that demand. Demand can either be met by building parking spaces or through alternative transportation strategies. These strategies could include shared parking agreements with an adjacent property owner, unbundling parking from rent which allows tenants to rent a more affordable unit if they don't own a car, providing an onsite car share program, to name a few. TRPA and the local jurisdiction may approve a reduction in parking, to zero spaces per unit in a town center, and .75 spaces per unit (on average) in areas zoned for multi-family housing, if the applicant demonstrates the amount of parking is sufficient to meet the demand or the demand can be met through alternatives strategies.

To help advance deed-restricted housing in the basin, TRPA contracted with LCS Transportation Consultants, LLC. to conduct a parking study. The results of the study show that on average, approximately .75 spaces per bedroom, and 1.5 spaces per unit, are utilized at the twelve surveyed sites throughout the basin. These parking counts are shown in Table 4 below, with the full results in LSC's attached parking study. **Property owners and developers can use this parking study and the parking counts shown in Table 4 to satisfy the requirement in Code Section 34.4 and deviate from the local jurisdiction's parking requirements.** P**roperty owners and developers are still encouraged to conduct their own, site-specific parking study, which may show lower parking demand rates than TRPA's basin-wide study.**

[1] Deed-restricted refers to affordable, moderate, or achievable housing, as defined in Chapter 90 of the TRPA Code of Ordinances.

[2] https://www.trpa.gov/wp-content/uploads/Cascadia-TRPA-Zoning-and-Affordability-Slides-Final-042423.pdf

Table 4: TRPA Affordable Housing Parking - Parking Count Results

	Sites	Total Cars Parked[1]	Total Housing Units	Total Occupied Units	Average Number of Bedrooms per Unit	Parking Demand Per Housing Unit (spaces/unit)	Parking Demand Per Occupied Unit (spaces/unit)	Parking Demand Per Bedroom (spaces/bedroom)
1	Coldstream Commons	49	48	42	1.50	1.02	1.17	0.78
2	Henness Flats	211	92	92	3.61	2.29	2.29	0.64
3	Sierra Village Apartments	191	72	72	3.00	2.65	2.65	0.88
4	Truckee Pines Apartments	213	104	102	2.44	2.05	2.09	0.86
5	Housing Now Site #4	23	12	12	1.83	1.92	1.92	1.05
6	Pinebrook Condos	72	65	43	1.00	1.11	1.67	1.67
7	Toepa Condos	22	24	18	1.00	0.92	1.22	1.22
8	Aspen Grove at Roundhill	29	21	19	2.00	1.38	1.53	0.76
9	Lake Vista I, II, & Meadowbrook	69	94	92	1.95	0.73	0.75	0.39
10	Sierra Vista Apartments	107	94	86	1.51	1.14	1.24	0.82
11	Sugar Pine Village	8	68	8	1.75	0.12	1.00	0.57
12	Tahoe Pines Apartments	20	28	25	2.72	0.71	0.80	0.29
	Total	**1014**	**722**	**611**				
	Average[2]				**2.25**	**1.54**	**1.67**	**0.74**

Note 1: Time of day adjusted

Note 2: Data from Sugar Pine Village eliminated from calculations due to low occupancy

Source: LSC Transportation Consultants, Inc.

For more information about this parking study, contact TRPA's Long Range Housing Team at housing@trpa.gov.

LSC Transportation Consultants, Inc.

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TECHNICAL MEMORANDUM

DATE: April 11, 2025

TO: Alyssa Bettinger, Tahoe Regional Planning Agency

FROM: Bill Suen, PE, LSC Transportation Consultants, Inc.

SUBJECT: Tahoe Affordable Housing Parking Generation Rate Analysis

This memo presents the findings of the Tahoe Region Affordable Housing Parking Generation Rate Analysis. The Tahoe Regional Planning Agency (TRPA) has retained the services of LSC Transportation Consultants Inc. to conduct a study researching the parking demand of existing affordable-housing units within the Tahoe region with the existence of applied parking minimums. The term affordable-housing in the context of this study encompasses any deed-restricted or income-limited housing, including moderate, achievable, or workforce housing. The purpose of the study was to not only to determine the parking-generation rate of affordable-housing units within the Tahoe Region but if they differed from rates of other multi-family-housing land uses, how they may differ from affordable-housing units nationally, and to recommend parking rate options for this land use within the Tahoe basin. The objective was achieved by selecting twelve study sites within the region of mixed types of affordable-housing for which parking counts were conducted. The count data was compared to the number of units to determine existing parking demand.

EXECUTIVE SUMMARY

The parking-generation study conducted by LSC at twelve study locations shows a variation in parking-generation rates. A low correlation of data was found between the volume of parked vehicles per housing unit. A good correlation exists between the number of parked cars and the total number of bedrooms. Each site had its own unique parking-generation rate. Attempts to categorize the study sites into groups based on shared characteristics did not result in consitant parking rate trends. Based on the data gathered from this study, the following conclusions can be drawn:

- Based on parking counts, an average parking rate of 1.54 spaces per unit was observed.
- Based on parking counts, an average parking rate of 1.67 spaces per occupied dwelling unit was observed.
- Based on parking counts, an average parking rate of 0.74 spaces per occupied bedroom was observed.

- Based on the relationship of the total number of bedrooms of all sites to the total number of observed parked cars, a trendline with the equation Y = 0.7135X results, where Y equals the parking demand and X equals the number of bedrooms.
- Based on survey data, average parking rates of 1.23 spaces per unit and 0.69 vehicles per bedroom were observed.
- Based on survey data, one-bedroom units generate 0.84 vehicles per unit. Two-bedroom units generate 1.34 vehicles per unit. Three-bedroom units generate 1.82 vehicles per unit.
- Based on the results from this study, affordable-housing units with shared parking lots had an average parking rate of 1.67 (counts) and 1.23 (surveys) spaces per unit. The same study sites yield average per-bedroom parking-generation rates between 0.78 (counts) and 0.69 (surveys) cars. The first bedroom generates the highest number of parked vehicles, with additional bedrooms generating less than the first. A wide range of parking rates were found at each specific study site, with a single region-wide rate that represents all study locations.

STUDY SITE SELECTION

In collaboration with TRPA staff, a total of twelve sites within the Tahoe region were selected to be included in the parking study. The Tahoe region includes all areas within the Tahoe Basin, plus housing within the Town of Truckee. Sites located in the City of Reno, Carson City, Donner Summit, Echo Summit, and beyond were not included.

The site selection process began with a list of potential study locations compiled from several sources, including the TRPA, the Mountain Housing Council, and other known sites in the area.

The following types of residential housing units were included in the study:

- Deed Restricted Affordable
- Deed Restricted Moderate
- Deed Restricted Achievable
- Market Rate Multi-Family Rental Units

All of these housing types were considered, then each site was evaluated as to whether or not to be included in the study, based on the following criteria:

- Property Owner Cooperation
- Primary Residence
- Access to Parking Area

Property Owner Cooperation

First, the cooperation of the property owner was a requirement to be included in this analysis. This was necessary to receive permission to be on private property as well as to obtain housing occupancy data and the total number of units in each housing complex.

In summary, it was found that most of the multi-family study sites had a parking occupancy of 90 percent or greater with several reported to have 100 percent occupancy. The two Incline Village condos

(Pinebrook and Toepa) had relatively lower occupancies (66 and 75 percent, respectively). These condos contain both rentals and owner-occupied units. The Sugar Pine Village multi-family housing site only had an occupancy rate of 12 percent due to the fact that it recently opened, and units where just starting to become occupied. As the counts were conducted during the evening PM hours in fall (when the majority of residents were home), it was generally dark or twilight. When possible, a "lights on" inventory of units was conducted to determine the actual occupancy percentage during the parking lot count.

This study aims to determine parking demand per unit and per bedroom, so occupancy and bedrooms per unit data was collected from the owner/management. The breakdown of occupancy and number of bedrooms is presented in Table 2, and the average number of bedrooms per unit is calculated for each location.

Primary Residence

After discussion with owners/management, it was discovered that many of the potential study sites were used as primarily as either second homes or vacation rentals. These locations were eliminated from the list. This study focuses on the parking generation of affordable and workforce housing used as primary residences.

Access and Countability of Parking Area

Access to the study site and ease of physically counting parked vehicles was a consideration. Shared parking lots of multi-family housing developments allowed count staff to collect a concentrated amount of parking data over a smaller area Similarly, some units were found in a "townhome" type community where each home resembled a stand-alone, single-family home with garages and on-street parking. It was not possible to observe the interior of each garage to determine the number of parked cars, and not possible to discern which on-street parked car belonged to which unit. Additionally, it was not possible to obtain permission from all the homeowners within a townhome community. Not only was contacting each owner time-consuming, but most did not respond to contact. Therefore, single family types of housing were not included in the list.

Study Sites

Based on the selection criteria described above, the locations shown in Table 1 were selected for the study. Figure 1 indicates the approximate location of each site within the Tahoe Region. After selecting potential sites in which a parking count-based study could be accomplished, the possible study locations were reviewed and approved by TRPA staff. The selection process dictated what type of affordable housing units were possible to study.

Table 1: TRPA Affordable Housing Parking - Site Selection

	Site	City	Address	Year Built	# of units	Type	Income Restrictions	Parking Restrictions	Town Center
1	Coldstream Commons	Truckee	13051 Sawmill Road, Truckee, CA 96161	2021	48	Affordable	Y	None	N
2	Henness Flats	Truckee	11929 Waters Way, Truckee, CA 96161	2007	92	Affordable	Y	2 spaces	N
3	Sierra Village Apartments	Truckee	10081 Martis Valley Rd, Truckee, CA 96161	2001	72	Affordable	--	--	Y
4	Truckee Pines Apartments	Truckee	10100 Estates Drive, Truckee, CA 96161	1995	104	Affordable	Y	2 spaces	Y
5	Housing Now Site #4	Kings Beach	265 Fox Street, Kings Beach, CA 96143	2011	12	Affordable	Y	1Br/1Sp-3Br/2Sp	Y
6	Pinebrook Condos	Incline Village	972 Tanager Street, Incline Village, NV 89451	1980	65	Affordable/Moderate	N	2 spaces	Y
7	Toepa Condos	Incline Village	751 Tahoe Boulevard, Incline Village, NV 89451	1962	24	Moderate	N	2 spaces	Y
8	Aspen Grove at Roundhill	Round Hill Village	84 Mcfaul Way, Zephyr Cove, NV 89448	1966	21	Market	N	--	Y
9	Lake Vista I, II, & Meadowbrook	Stateline	129 Market Street, Stateline, NV 89449	2001	94	Affordable	Y	--	N
10	Sierra Vista Apartments	South Lake Tahoe	1821 Lake Tahoe Boulevard, South Lake Tahoe, CA 96150	1974	94	Market	N	2 spaces	Y
11	Sugar Pine Village	South Lake Tahoe	1029 Tata Lane, South Lake Tahoe, CA 96150	2024	68	Affordable	Y	--	Y
12	Tahoe Pines Apartments	South Lake Tahoe	3431 Spruce Avenue, South Lake Tahoe, CA 96150	1994	28	Affordable	Y	2 spaces	Y

Note: "--" denotes not able to determine, rather than none

Source: LSC Transportation Consultants, Inc.

Table 2: TRPA Affordable Housing Parking - Site Occupancy and Bedrooms per Unit

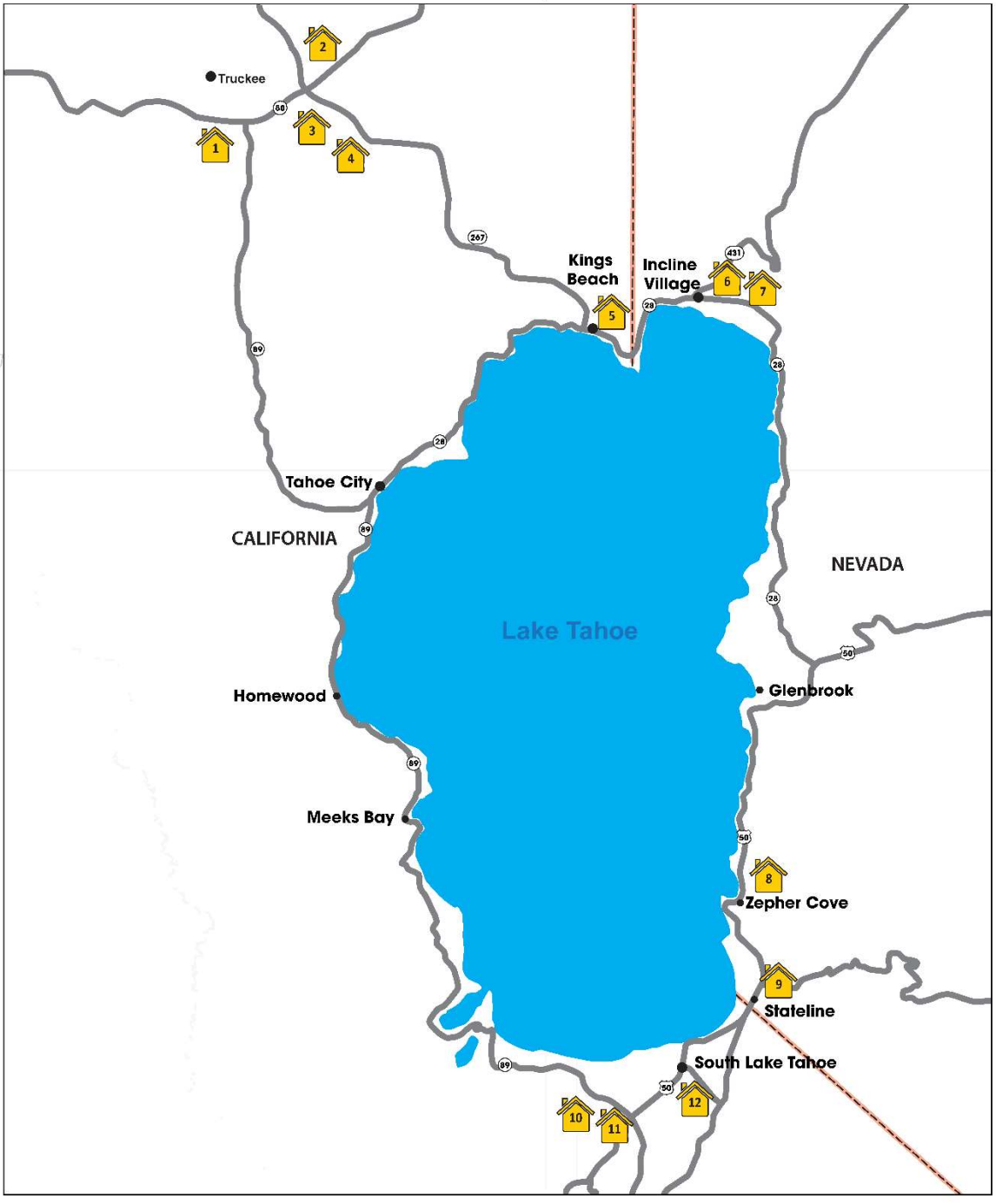
		Number of Units					Number of		Occupancy by Number of Bedrooms				Average Number of Bedrooms per
	Site	1 BR	2 BR	3 BR	4 BR	Total	occupied units	Occupancy	1 BR	2BR	3BR	4BR	Unit
1	Coldstream Commons	24	24	0	0	48	42	88%	21	21	0	0	1.5
2	Henness Flats	0	0	36	56	92	92	100%	0	0	36	56	3.6
3	Sierra Village Apartments	0	8	56	8	72	72	100%	0	8	56	8	3.0
4	Truckee Pines Apartments	8	52	32	12	104	102	98%	8	52	31	11	2.4
5	Housing Now Site #4	4	6	2	0	12	12	100%	4	6	2	0	1.8
6	Pinebrook Condos	65	0	0	0	65	43	66%	43	0	0	0	1.0
7	Toepa Condos	24	0	0	0	24	18	75%	18	0	0	0	1.0
8	Aspen Grove at Roundhill	0	21	0	0	21	19	90%	0	19	0	0	2.0
9	Lake Vista I, II, & Meadowbrook	20	60	14	0	94	92	98%	19	59	14	0	1.9
10	Sierra Vista Apartments	44	50	0	0	94	86	91%	42	44	0	0	1.5
11	Sugar Pine Village			--		68	8	12%	4	2	2	0	1.8
12	Tahoe Pines Apartments	0	12	16	0	28	25	89%	0	7	18	0	2.7

BR = Bedroom

"--" = data not available

Source: LSC Transportation Consultants, Inc.

Figure 1
TRPA Affordable Housing Parking Generation Study Site Location



PARKING DATA COLLECTION

The parking counts were conducted between late September and early November of 2024, prior to any snowfall, with all parking stall ground markings visible. LSC count staff collected parking counts after 7:00 PM on a weekday (Tues, Wed, Thurs) to ensure that most of the residents were present. The evening timeframe has the highest percentage of residents at home. As residents might travel on the weekend, have varying day-of-week commitments, and possible guest visits, weekdays were selected for data collection to best represent full-time residents. Each site was counted twice on separate days.

An inventory of all parking spaces was conducted with the following parking-space types:

- Assigned per Residential Unit parking
- ADA-marked spaces
- Guest parking
- Management only
- Unmarked/unrestricted spaces

In addition, it was observed that residents at some locations often would park outside of the designated parking lot. Some sites had non-designated overflow areas or on-street spaces available. As some of the study sites have limitations on the number of vehicles each unit was allowed to have parked on site, residents with additional vehicles would park in these unofficial overflow areas. It is also possible that some of these areas were closer to the residents' housing units and a more convenient place to park. If it was obvious that these additional spaces were used in conjunction with the study site, the vehicles were included in the parking count total. A summary of the parking counts is shown in Table 3.

ANALYSIS OF PARKING DATA

Parking Utilization

Parking utilization is the number of vehicles on site compared to the number of spaces available. In general, a utilization of 85-90 percent is considered ideal for parking lots. This ensures that those looking for parking do not have to spend unnecessary time looking for open parking stalls. Utilization under 85 percent suggests that too many parking spaces were provided, over 90 percent, and the parking lot is considered full, or not enough parking is provided. This rule of thumb, however, only applies to parking lots with unassigned open stalls, since drivers are guaranteed a parking space in an assigned parking space lot. Parking utilization per site is shown in Table 3. Utilization by parking type, as well as total utilization of each site, is provided. The Sierra Village Apartments was the only site that had utilization above 100 percent. This is a result of vehicles parked off-site on the nearby street, in non-designated open areas, or in areas not within marked parking spaces. Excluding Sugar Pine Village (as it only recently opened and had low occupancy), the study sites were observed to have utilization rates between 66 and 103 percent.

Table 3: TRPA Affordable Housing Parking - Parking Counts

Sites	Parking Space Type	Total Spaces	Higher of 2 Counts Count Total	Higher of 2 Counts Utilization	Adjusted for Time of Day	Adjusted for Occupancy	Max Theoretical Utilization[1]
Coldstream Commons	Spaces	91	35	38%	49	56	55%
	ADA	9	5	56%			
	Management	3	3	100%			
	Off Site/On Street	--	0	--			
	Total	*103*	*43*	*42%*			
Henness Flats	Assigned Residence	176	148	84%	211	211	**111%**
	ADA	8	6	75%			
	Management	2	1	50%			
	Spaces	5	5	100%			
	Off Site/On Street	--	16	--			
	No Parking	--	2	--			
	Total	*191*	*176*	*92%*			
Sierra Village	Space	*143*	*140*	98%	191	191	**124%**
	ADA	*6*	*4*	67%			
	Guest	*5*	*4*	80%			
	Off Site/On Street	--	*11*	--			
	Total	*154*	*159*	***103%***			
Truckee Pines Apartments	Assigned Residence	209	161	77%	213	217	94%
	ADA	9	2	22%			
	Management	1	1	100%			
	Guest	13	9	69%			
	Off Site/On Street	--	12	--			
	Total	*232*	*185*	*80%*			
Housing Now Site #4	Spaces	19	15	79%	23	23	**117%**
	ADA	1	0	0%			
	Off Site/On Street	--	3	--			
	Total	*20*	*18*	*90%*			
Pinebrook Condos	Spaces	103	57	55%	72	109	**104%**
	ADA	2	0	0%			
	Off Site/On Street	--	3	--			
	Total	*105*	*60*	*57%*			
Toepa Condos	Spaces	34	18	53%	22	29	86%
	No Parking	--	1	--			
	Total	*34*	*19*	*56%*			
Aspen Grove at Roundhill	Spaces	10	10	100%	29	32	**100%**
	Assigned Residence	21	13	62%			
	ADA	1	1	100%			
	No Parking	--	0	--			
	Total	*32*	*24*	*75%*			
Lake Vista I, II, & Meadowbrook	Assigned Residence	36	24	67%	69	71	71%
	ADA	8	3	38%			
	Management	1	0	0%			
	Spaces	55	26	47%			
	Off Site/On Street	--	7	--			
	Total	*100*	*60*	*60%*			
Sierra Vista Apartments	Spaces	131	87	66%	107	117	83%
	ADA	7	1	14%			
	Management	2	1	50%			
	Total	*140*	*89*	*64%*			
Sugar Pine Village	Spaces	45	7	16%	8	68	**132%**
	ADA	7	0	0%			
	Off Site/On Street	--	25	--			
	Total	*52*	*7*	*13%*			
Tahoe Pines Apartments	Assigned Residence	27	17	63%	20	22	55%
	ADA	3	1	33%			
	Management	2	1	50%			
	Guest	9	0	0%			
	Total	*41*	*19*	*46%*			

Note 1: Max theoretical percent utilization takes the highest count total and adjusts for to 100% site occupancy and time of day.
Note: Bold indicates utilization of over 100%

Source: LSC Transportation Consultants, Inc.

Maximum Parking Utilization

The parking counts consisted of two counts over the evening hours of two days. There are several variables that can affect the count results. First, during the evening period when parking data was collected, it is not expected that 100 percent of residents (and their parked vehicles) will be present. The Urban Land Institute's Shared Parking Manual (3rd edition, 2020) states that on average, only 70 to 85 percent of vehicles are on site in the evening, depending on the time of the count at multi-family housing properties. Therefore, all parking counts were adjusted by 15 to 30 percent (depending on the specific time of each count) to estimate parking demand when 100 percent of residents are on site.

Second, an occupancy adjustment was considered as some sites did not have all units occupied. Therefore, counts at sites with less than 100 percent occupancy were divided by the reported occupancy to estimate 100 percent occupancy of all units, based on the parking-demand rate of existing occupied units.

Based on the 'time of day' and 'occupancy' adjustments, a maximum theoretical utilization percentage was calculated, as shown in bold on the right side of Table 3. A maximum theoretical utilization of over 100 percent was found at six of the study sites, greater than 90 percent at one, 85-90 percent (ideal) at two sites, and under 85 percent at three of the locations.

CALCULATED PARKING DEMAND

Based on the parking counts and the observed number of occupied units, the parking demand was calculated as shown in Table 4. The total number of vehicles observed on site is based on the higher of the two parking-data counts and adjusted for the time of day. Next, the total number of dwelling units and the total occupied units for each study site are listed. Dividing the volume of parked vehicles by the number of occupied dwelling units (total units available per site) yields the number of parked vehicles generated by each unit. The results range from 0.75 to 2.65 vehicles per unit, with an average rate of 1.54 spaces per unit and 1.67 spaces per occupied unit. The data for Sugar Pine Village was eliminated from the average rate calculations due to the low occupancy rate.

As most of the study sites had a mixture of units with varying numbers of bedrooms per unit, the parking rate is affected not only by the number of units but the composition of the number of bedrooms per unit. Using the average number of bedrooms per site, the parking demand per bedroom can be calculated. As shown in Table 4, the results range from 0.29 to 1.67 spaces per bedroom. With a weighted average of 2.25 bedrooms per unit, this results in an average parking demand of 0.74 spaces per bedroom. In general, one-bedroom units have a higher number of spaces per bedroom rate than three-bedroom units, since additional bedrooms do not always generate additional vehicles.

The results of the counts are plotted on a graph comparing the number of parked cars to the number of units per site in Figure 2. A trendline is then plotted across the data points. The equation of the line yields a linear regression "R-Squared" value[1] of 0.63, meaning that there is a relatively modest correlation between the number of dwelling units and the number of parked vehicles generated between the various study sites. The Institute of Traffic Engineers (ITE) *Parking Generation Manual (6th Edition, 2023)* states that the equation of the trendline should be used if the R-Squared value is 0.75 or greater.

Plotting the number of parked cars generated by occupied dwelling units, as shown in Figure 3, increases the R-Squared value to 0.68. This is expected due to the elimination of the inconsistent

[1] The R-squared value reflects the correlation between the independent variable (in this case the number of units) and the dependent variable (in this case the number of parked vehicles), with 0.00 indicating no correlation and 1.00 indicating a perfect correlation (all of the variability in the dependent variable is explained by the independent variable).

unoccupied units per study site. Plotting the total number of bedrooms at each site versus the number of parked cars yields a trendline R-Squared value of 0.85, which can be seen in Figure 4. Forcing the X and Y interceptions to zero (zero bedrooms = zero parked cars) yields an even better R-Squared of 0.94. This shows a good correlation between the parked cars and the total number of bedrooms. The resulting equation Y = 0.7135X represents this relationship. The resulting correlation is specific to the twelve study sites and a result of the mix of unit types. It is a coincidence that such a strong correlation between parked cars and the total number of bedrooms resulted regardless of unit types. This relationship infers that a site with 100 one-bedroom units will generate the same number of parked cars as 50, two-bedroom units, which is known to be incorrect, as the first bedroom generates more parked cars than the subsequent rooms.

Parking counts, however, were not able to determine the number of cars each unit type (number of bedrooms) generated, since most study sites had a mix of unit types. The best estimation of cars per unit type is calculated by plotting the rate of parked cars per unit to the average number of bedrooms per site. This can be seen in Figure 5. A trendline R-square value of 0.39 results, which indicates a weak correlation between the average number of bedrooms per unit and parked cars generated. Due to the weak correlation, a region-wide parking demand rate was not found. Had the data shown a strong correlation, the equation of the trend line could have been used to estimate the number of parked cars each unit type would generate within the Tahoe Region.

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	Sites	Total Cars Parked[1]	Total Housing Units	Total Occupied Units	Average Number of Bedrooms per Unit	Parking Demand Per Housing Unit (spaces/unit)	Parking Demand Per Occupied Unit (spaces/unit)	Parking Demand Per Bedroom (spaces/bedroom)
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4	Truckee Pines Apartments	213	104	102	2.44	2.05	2.09	0.86
5	Housing Now Site #4	23	12	12	1.83	1.92	1.92	1.05
6	Pinebrook Condos	72	65	43	1.00	1.11	1.67	1.67
7	Toepa Condos	22	24	18	1.00	0.92	1.22	1.22
8	Aspen Grove at Roundhill	29	21	19	2.00	1.38	1.53	0.76
9	Lake Vista I, II, & Meadowbrook	69	94	92	1.95	0.73	0.75	0.39
10	Sierra Vista Apartments	107	94	86	1.51	1.14	1.24	0.82
11	Sugar Pine Village	8	68	8	1.75	0.12	1.00	0.57
12	Tahoe Pines Apartments	20	28	25	2.72	0.71	0.80	0.29
	Total	**1014**	**722**	**611**				
	Average[2]				**2.25**	**1.54**	**1.67**	**0.74**

Note 1: Time of day adjusted

Note 2: Data from Sugar Pine Village eliminated from calculations due to low occupancy

Source: LSC Transportation Consultants, Inc.

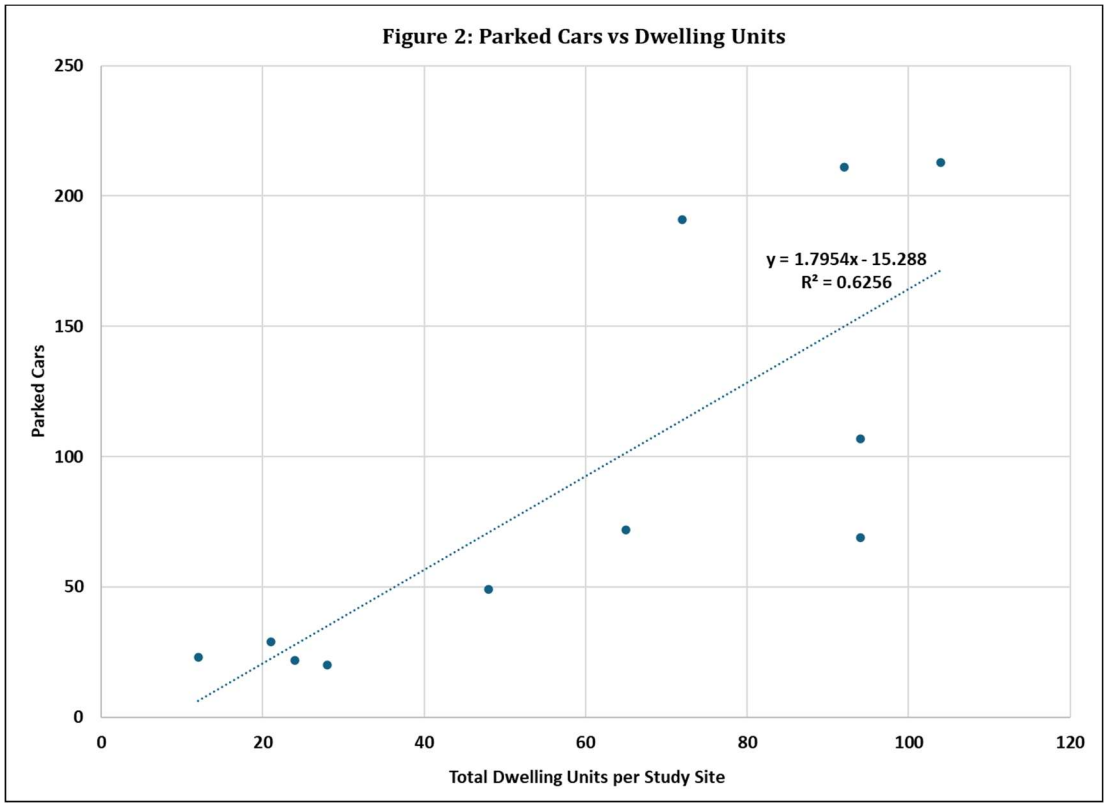


Figure 2: Parked Cars vs Dwelling Units
y = 1.7954x - 15.288
R² = 0.6256
Parked Cars
Total Dwelling Units per Study Site
0
50
100
150
200
250
0
20
40
60
80
100
120

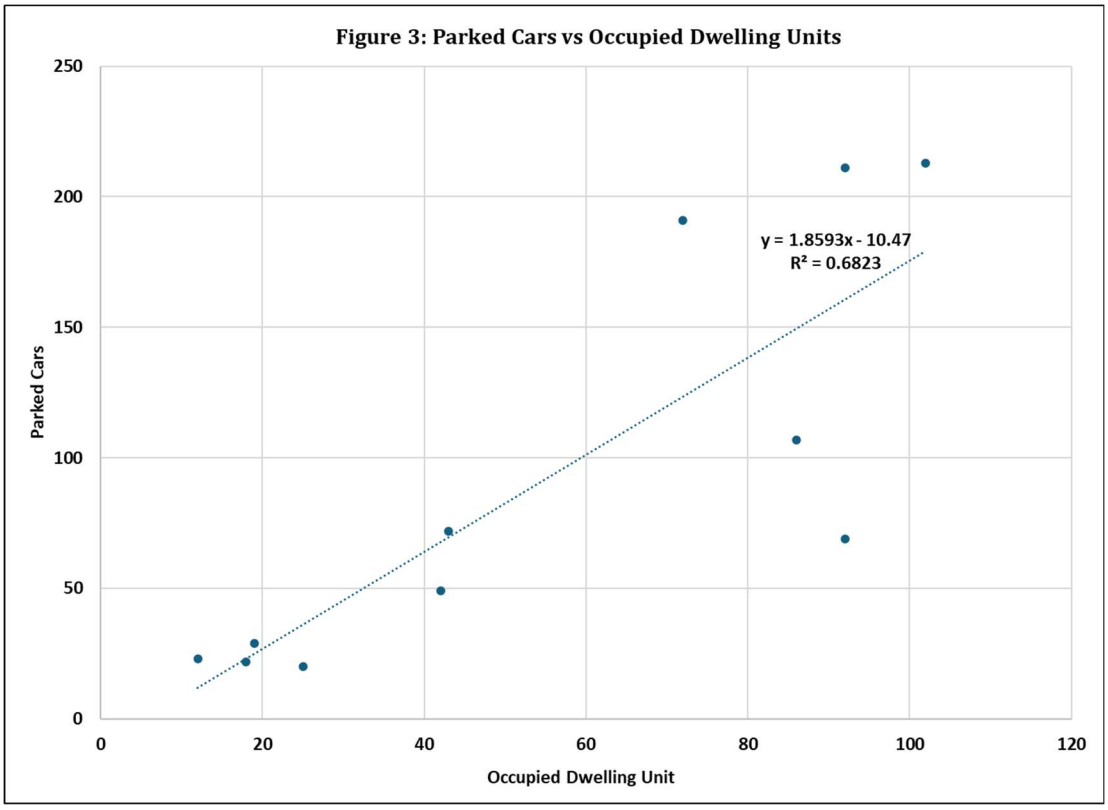


Figure 3: Parked Cars vs Occupied Dwelling Units
y = 1.8593x - 10.47
R² = 0.6823
Parked Cars
Occupied Dwelling Unit
0
50
100
150
200
250
0
20
40
60
80
100
120

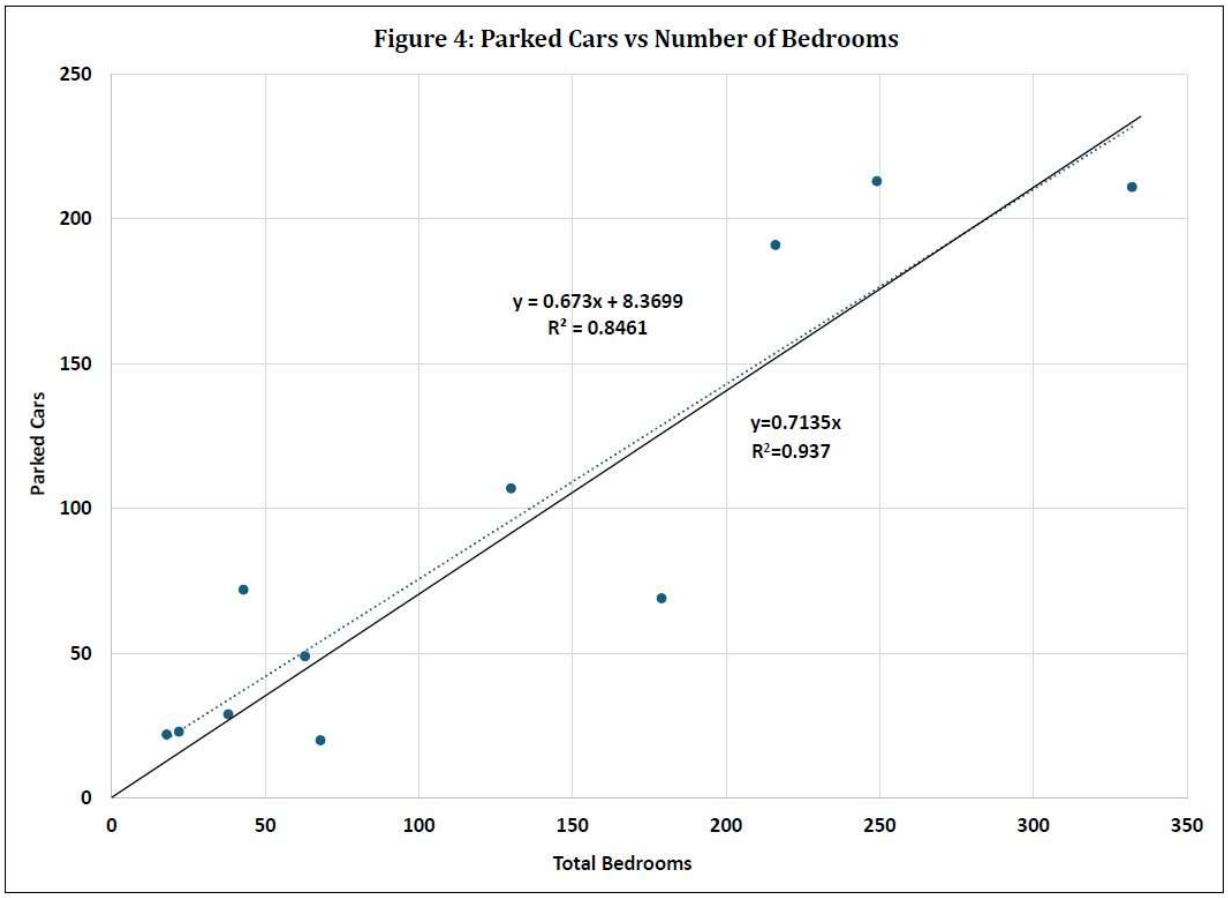
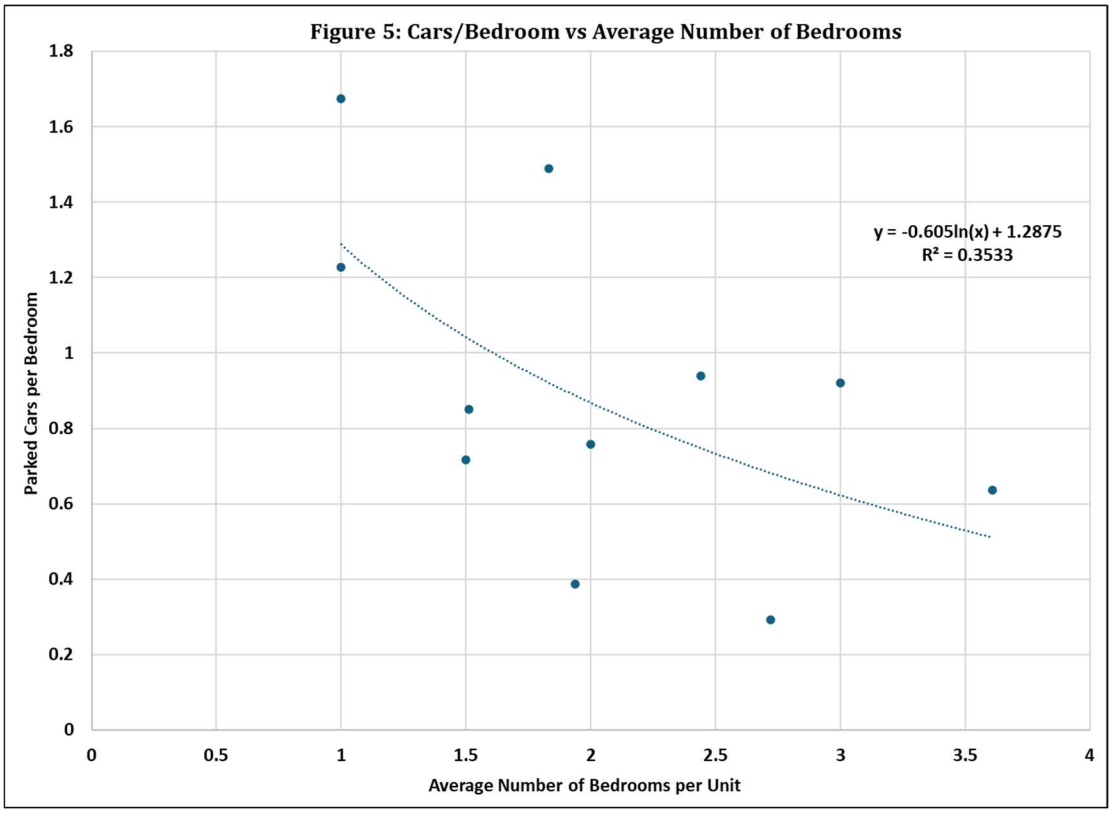


Figure 4: Parked Cars vs Number of Bedrooms
Parked Cars
Total Bedrooms
y = 0.673x + 8.3699
R² = 0.8461
y=0.7135x
R²=0.937
0
50
100
150
200
250
300
350



SURVEY DATA

Since the parking counts are not able to capture parking demand per unit type, additional in-person parking surveys were conducted at each site. The surveys are intended to determine the number of parked cars each unit generated by unit type (number of bedrooms). To avoid a lengthy survey gathering numerous demographic and travel mode questions, only questions needed to obtain parking demand by unit type were asked. It was determined that four questions in total would be asked as follows:

- Question 1: Do you feel there is enough parking available at your housing location?
- Question 2: How many bedrooms are there in your residential unit?
- Question 3: How many total parked cars does your unit generate?
- Question 4: Do you use any other form of transportation?

TRPA staff conducted the in-person surveys between the months of November and early December. The ideal time to conduct the survey is around the evening five o'clock hour when residents would be returning home from work. Due to the limited daylight hours, this time was adjusted to any PM daylight hour. Surveyors were instructed to make sure that those questioned clearly understood the question of "how many parked vehicles does your unit generate", e.g., that the number of vehicles reported was not just vehicles parked by the person answering the question but all persons living within the unit.

The survey results can be found in Table 5. The table presents the results for each location surveyed. The last row shows the total number of surveys collected, the total number of parked cars per bedroom type, the combined number of parked cars per bedroom type, and the percentage of surveyed using alternative means of transportation.

Table 5: TRPA Affordable Housing Parking - Survey Summary

	Site	Total Surveys	Sufficient Parking Yes %	Total Cars per Unit	Cars Parked by Bedroom Type 1	2	3	Total Cars per Unit	Average Number of Cars per Bedroom Type 1	2	3	Cars/BR	Other Transportation Walk	Bus/Tart	Bike	Carpool
1	Coldstream Commons	5	100%	3	2	1	-	0.60	0.5	1.0	0.0	0.5	1	1	0	0
2	Henness Flats	4	100%	7	-	3	4	1.75	0.0	1.5	2.0	0.7	0	2	0	0
3	Sierra Village Apartments	-	-	0	-	-	-	--	-	-	-	-	-	-	-	-
4	Truckee Pines Apartments	8	100%	9	1	4	4	1.13	0.3	1.3	2.0	0.6	1	5	0	0
5	Housing Now Site #4	5	80%	6	3	-	3	1.20	1.0	0.0	1.5	0.7	1	0	0	0
6	Pinebrook Condos	3	100%	3	3	-	-	1.00	1.0	0.0	0.0	1.0	3	0	0	0
7	Toepa Condos	4	100%	5	5	-	-	1.25	1.3	0.0	0.0	1.3	2	0	1	0
8	Aspen Grove at Roundhill	5	100%	6	-	6	-	1.20	0.0	1.2	0.0	0.6	1	0	0	0
9	Lake Vista I, II, & Meadowbrook	14	67%	17	3	14	-	1.21	1.1	1.3	0.0	0.7	0	0	2	0
10	Sierra Vista Apartments	4	75%	5	1	4	-	1.25	1.0	1.3	0.0	0.7	0	1	0	0
11	Sugar Pine Village	4	75%	4	2	-	2	1.00	0.7	0.0	2.0	0.7	2	1	0	1
12	Tahoe Pines Apartments	9	33%	15	1	7	7	1.67	1.0	1.8	1.8	0.7	5	5	4	1
	Total	**65**	**68%**	**80**	**21**	**39**	**20**	**1.23**	**0.84**	**1.34**	**1.82**	**0.69**	**25%**	**23%**	**11%**	**3%**

Source: LSC Transportation Consultants, Inc.

Question 1

68 percent of respondents stated that they felt there was enough parking. At six of the eleven total sites, 100 percent of respondents felt that there was enough parking. Only one site showed less than 50 percent who thought there was enough parking. It is possible that those surveyed parked early and easily found spots compared to those who arrived late, when the parking lot was mostly filled. Four of the surveyed sites had assigned parking spots. Of these four, two sites reported sufficient parking by 100 percent of the respondents, while the other two locations reported 33 and 67 percent believing there was sufficient parking.

Questions 2 and 3

Based on the surveys, the following results were calculated:

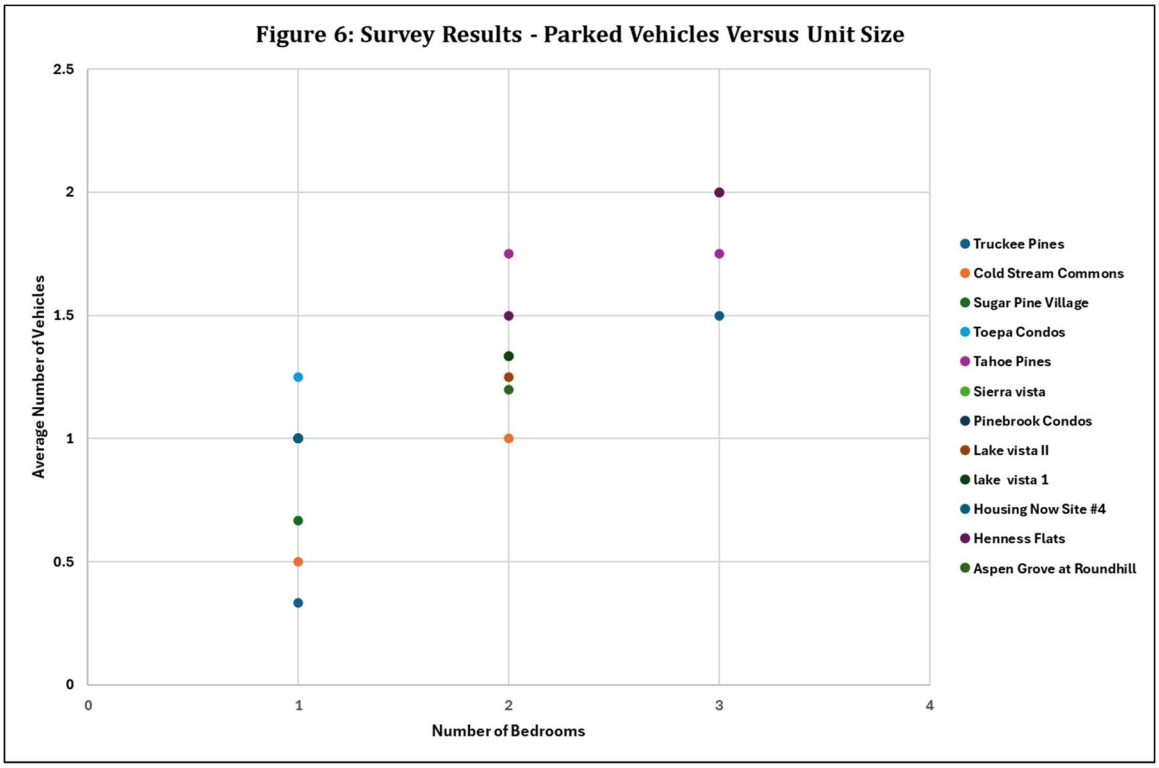
- A one-bedroom unit generated an average of 0.84 vehicles per unit
- A two-bedroom unit generated an average of 1.34 vehicles per unit
- A three-bedroom unit generated an average of 1.82 vehicles per unit

No residents of 4-bedroom units were surveyed.

The results from the survey data show that less than one (0.84) parked car was generated per one-bedroom unit, and almost exactly an additional 0.5 vehicles were generated per additional bedroom.

A plot of the results from questions 2 and 3 can be found in Figure 6. The figure shows a consistent distribution with an increase in the number of parked cars as the number of bedrooms increased.

A total rate of 1.23 parked cars/unit and 0.69 cars/bedroom was calculated from the survey data.



Question 4

Of those surveyed who reported the use of non-auto or alternative means of transportation, the non-auto/alternative travel mode percentages are as follows:

- 25 percent - Walk
- 23 percent - Bus/Public Transportation
- 11 percent - Bike
- 3 percent - Carpool

Note that respondents could indicate more than one non-auto/alternative travel mode. Of the 80 respondents surveyed, 7 (or 9 percent) did not generate a parked car and only used non-auto/alternative modes of transportation. All seven resided in a unit with only one bedroom. These seven respondents reported relying on public transportation, carpooling, or walking.

PARKING RATES BY CATEGORY

Although each study site had its own unique characteristics, which could have driven parking demand, the study sites can be grouped together based on similar characteristics. The following categories were used to group and calculate parking rates:

Affordable, Moderate, Market Rate

- Town Center
- Year of Construction
- Regional Sub-Area
- Parking Restrictions

Table 6 presents the combined parking rates, based on various categories for both the parking count and the survey data. In Table 1, the characteristics of each study site are defined and used for categorizing. Table 6 only presents the combined parking rate of each category and not the rate of each individual site. Parking rates for each site can be found in Table 4. The combined parking rates, based on count and survey data, are presented.

The rates based on category are not always consistent between the various methods of rate calculations (counts and survey data). As a result, parking-generation rates and trends based on the five categories are inconclusive, based on this study within the Tahoe Region.

Table 6: TRPA Affordable Housing Parking - Parking and Surveys by Category

		Parking Count			Surveys			
					Rate/Unit	Parking Rate/Unit Type		
Catagories	Criteria	Parking Rate/Unit	Avg # of BRs/Unit	Rate/Avg Bedroom		1 BR	2 BR	3 BR
Type	Affordable	1.76	2.57	0.68	1.23	0.70	1.38	1.83
	Moderate	1.54	1.00	1.54	1.14	1.14	-	-
	Market	1.29	1.60	0.81	1.22	1.00	1.25	-
Town Center	Yes	1.80	2.08	0.86	1.26	0.89	1.40	1.78
	No	1.44	2.54	0.57	1.17	0.71	1.29	2.00
Year Built	1962-1980	1.38	1.38	1.00	1.19	1.13	1.25	-
	1994-2001	1.69	2.45	0.69	1.29	0.70	1.39	1.86
	2007-2024	1.88	2.80	0.67	1.11	0.70	1.33	1.80
Area	Truckee	2.14	2.79	0.77	1.10	0.50	1.33	2.00
	North Lake	1.63	1.14	1.43	1.17	1.10	-	1.50
	South Lake	1.01	1.87	0.54	1.31	0.88	1.35	1.80
Parking Restriction	Limited	1.77	2.28	0.78	1.35	0.93	1.50	1.80
	Open	1.47	2.19	0.67	1.06	0.69	1.24	2.00

Source: LSC Transportation Consultants, Inc.

The following are some generalizations for each category, based on collected data and observations:

Type. Based on this study, there is no clear conclusion on the parking generation rate of affordable housing units vs market-rate units. This could be a result of the study sites for affordable housing having larger units (more bedrooms) than the moderate or market rate. On a per-bedroom basis, the affordable unit rate of 0.68 parked vehicles per bedroom is 15 percent lower than the market rate for unit bedrooms. However, the moderate rate affordable units have a parking rate of 1.54 per bedroom, which is 90 percent higher than the market rate unit bedrooms. This indicates that parking demand is largely impacted by the specific transportation needs of the residents rather than the type of rent control.

Town Center. The data collected shows that housing units within a town center was defined based on the relative distance to grocery stores, restaurants, and retail. Results are mixed as to whether it has an effect on parking generation rates of the sites studied.

Year Built. Older study sites generate less parking demand than newer ones. Newer sites not only have larger units, which generate more parking, but typically cost more to rent/buy. This could point to lower-income residents populating older units and not being able to afford multiple vehicles, and/or seniors who drive less (own fewer vehicles) and have fewer driving-age dependents living at home.

Regional Sub-Area. Though the data is inconsistent, a general observation suggests that the Truckee area had the highest parking-generation rate, followed by North Tahoe, and South Lake having the least. Not only do the sites in Truckee have more bedrooms per unit, but Truckee has a low walk and bike ability score as opposed to South Lake.

Parking Restrictions. Many of the study sites had a two car per unit parking restriction. Data shows that study sites with parking restrictions had higher parking-generation rates than those without. With the exception of three-bedroom parking rates generated from survey data, all other rates are consistent. Parking restrictions may have been imposed due to high parking demand based on location or site characteristics rather than restrictions driving the higher parking rate.

PARKING DEMAND LITERATURE REVIEW

The Institute of Traffic Engineering (ITE) publishes a *Parking Generation Manual* (6th edition, Oct 2023). Based on data gathered, parking demand rates for different land uses are compiled. Affordable Housing (Land Use Code 223) is described as:

“Affordable housing includes all multi-family housing that is rented at below market rate to households that include at least one employed member. Eligibility to live in affordable housing can be a function of limited household income and resident age.”

Table 7 shows a summary of average ITE parking rates for both affordable housing and multi-family low-rise (1-2 levels). The table also lists the study size and the R-squared value for each. The parking rates for each land use are presented for Suburban/Urban settings (which best fit the Tahoe region). ITE parking rates for Dense Multi-Use Urban are not included as it does not represent the Tahoe Region, and it consistently has a lower parking rate than Suburban/Urban. ITE does not include a “rural” rate, which

would most accurately describe the Tahoe Region. It is likely that had ITE included a rural rate, it would be higher than Suburban/Urban.

Table 7 also presents the parking-generation rates for multi-family dwelling units (Land Uses #217 and #220), as previous editions of the ITE Parking Generation land-use descriptions state the similarity between affordable and multi-family, it is worth comparing its rates.

The lower portion of Table 7 lists the parking-generation rates found in this study for a comparison between ITE and LSC parking rates. The LSC rates, derived from both parking counts and surveys, are higher than all ITE rates. The difference between the study-site locations in the ITE studies used (General Urban/Suburban) compared to the Tahoe Region (Rural) most likely had the greatest factor in the difference in parking rates. If the subcategory of "Rural" was available in ITE, the LSC study rates would likely align more closely.

The Tahoe Region study area is comprised of several governing jurisdictions, all with their own development parking requirement rates. Table 8 presents the parking requirements of all multi-family housing developments within the Tahoe Region. While most jurisdictions provide one parking space for one bedroom, the parking requirements for multi-bedroom units vary greatly.

Table 7: Affordable Housing Parking Rate Study- ITE Parking Rates

ITE Code	ITE Land Use	Location	Variable	Average rate	Study Size	R^2
223	Affordable housing	General Urban/Suburban	Dwelling Units	1.0	30	0.91
			Bedrooms	0.55	10	0.89
217	Multi Family - 1 BR (Low-Rise)	General Urban/Suburban	Dwelling Units	0.93	14	0.93
			Bedrooms	-	-	-
220	Multi Family - 2+ BR (Low-Rise)	General Urban/Suburban	Dwelling Units	1.27	143	0.95
			Bedrooms	0.68	97	0.95
LSC	Count Data	Tahoe Region	Dwelling Units	1.54	12	0.63
			Occupided DU	1.67	12	0.68
			Bedrooms	0.74	12	0.82
	Survey Data		Dwelling Units	1.23	11	--
			Bedrooms	0.69	11	--

Source: ITE Parking Generation Manual, 6th edition, Oct 2023

Table 8: TRPA Affordable Housing Parking - County and Town Parking Requirements

Location	Land Use	Bedrooms	Spaces Required	Spaces per Bedrooms 1	2	3	4	Additional Requirements
County								
Washoe	Multifamily	1 - 2	1	1	1	2	2.5	1 covered space for every 2 units
		3	2					
		4+	2.5					
Nevada	Multifamily and Dwelling Units	1	1	1	1.5	1.5	2	1 guest space per each 2 units. Tandem parking allowed
		2 - 3	1.5					
		4+	2					
Placer	Multifamily	1 - 2	1	1	1	1.5	2	
		+1	+0.5					
Douglas	Multifamily	-	2	2	2	2	2	
El Dorado	Multifamily	1	1.6	1.6	2	2	2	1 guest space for every 4 units
		2+	2					
Town								
South Lake Tahoe	Multifamily	1	1	1	2	2	2	1 guest space for every 4 units
		2+	2					
Truckee	Multifamily	1	1.5	1.5	2	2	2	
		2+	2					

Source: County and Town development codes.

WINTER DEMAND

Winter parking conditions in the Tahoe region can often differ from those found in Summer. The snowy winter months not only present challenges to driving conditions but also to parking. Based on engineering judgement and casual observation, parking demand and utilization rates increase in the winter months. This can be due to several reasons, which are discussed in this section.

Decreased Available Parking

As the winter snow accumulates, two things occur to reduce the parking supply.

- **Snow storage.** Though most developments have designated areas for snow storage, they are often not sufficient. Either due to unplowed spaces or piles not completely pushed into snow storage areas, a reduction of parking spaces typically occurs.
- **Obstruction of painted parking markings by snow.** The lack of well-delineated stalls, even when plowed, reduces the parking inventory. Vehicles often take up 1.5 spaces or more when drivers are allowed to determine the distance between vehicles.

Increased Parking Demand

Winter can potentially increase parking demand due to the following:

- **Travel mode.** Cold temperatures and wet/snowy conditions encourage non-auto (walk and bike) travelers to obtain vehicles and become drivers.
- **Reduction of on-street and other parking.** On-street parking is generally prohibited during the winter months within the Tahoe Region. Based on parking counts, vehicles associated with study sites were observed to park on streets and in undeveloped lots. During the

winter, these off-site locations are not plowed and are unavailable. As a result, these vehicles park within the designated lot, increased utilization.

OPTIONS FOR TAHOE REGION WIDE PARKING RATES

Tahoe Region Parking Rate Options

Table 9 shows the results of various parking-rate options. Rates from parking counts, surveys, and potential recommended rates are used to compare the parking supplied by the rate and the demand of the existing study sites. The various rates are applied to 100 percent of units of each study site (minus Sugar Pine Village due to low occupancy) and compared to an estimated parking demand adjusted to reflect 100 percent occupancy and 100 percent residents being on site, based on time-of-day adjustments. A parking balance between the supply and demand is presented for each site and a combined total of all sites; a negative balance represents a parking shortfall.

The parking rates calculated from the parking-count data are shown first. The rate of 1.67 cars per unit and 0.74 cars per bedroom is used. The cars per unit rate results in a parking shortfall at five of the eleven study sites, with a modest combined surplus of 13 spaces. The rate per bedroom results in a shortfall at most of the sites, with a modest combined shortfall of twenty spaces.

The parking rates from the surveys are presented next. The 1.23 cars per unit rate and the cars per unit-type rate found in Table 4 (1br=0.84. 2br=1.34. 3br=1.82) were applied to the study sites. The survey data collected resulted in a lower overall parking rate when compared to the count data. The survey rate resulted in a large, calculated shortfall of parking for both unit-based and bedroom per unit calculated supply.

The parking supply calculated with the equation of the line, representing the relationship between parked cars and total bedrooms (Figure 4), was used to estimate the parking supply of the study sites. The resulting number of sites where parking exceeds the parking supply match the plotted line found in Figure 4, where the majority of the data points are slightly above the line. A shortfall of 59 parking spaces will result from all study sites combined. The equation can be adjusted to increase or decrease the parking supply based on the desired outcome.

Since parking-generation rates are typically stated as the number of parking spaces per the number of bedrooms (as seen in Table 8), Table 9 also presents two examples of more traditional potential cars/unit-type (bedroom) rates. Rate 1 represents a traditional parking rate where the first two bedrooms require 1.7 parking spaces, and three and four bedrooms 2.8 parking spaces. Rate 1 is the minimum rate for which a parking shortfall does not occur at any study site. However, Rate 1 yields a combined 294-parking-space surplus over all study sites. In order to supply parking for the observed demand of all sites using a single region-wide rate, all but one study site (balance of zero) will have a parking supply surplus.

Table 9: TRPA Affordable Housing Parking - Parking Rate Calculated Supply Compared to Existing Demand

								Parking Rate from Counts				Parking Rate from Survey				Parking Rate from Equation		Parking Rate 1		Parking Rate 2 (Recommended)	
								Based on Units		Based on Bedrooms		Based on Units		Based on # of Bedrooms/Unit		Based on Cars/Bedroom					
		Number of Units					Parking	Parking		Parking		Parking		Parking		Parking		Parking		Parking	
	Site	1 BR	2 BR	3 BR	4 BR	Total	Count[1]	Supply	Balance	Supply	Balance	Supply	Balance	Supply	Balance	Supply	Balance	Supply	Balance	Supply	Balance
1	Coldstream Commons	24	24	0	0	48	56	80	24	53	-3	59	3	52	-4	51	-5	82	26	72	16
2	Henness Flats	0	0	36	56	92	211	153	-58	246	35	113	-98	130	-82	237	26	258	47	184	-27
3	Sierra Village Apartments	0	8	56	8	72	191	120	-71	160	-31	89	-102	29	-162	154	-37	193	2	140	-51
4	Truckee Pines Apartments	8	52	32	12	104	217	174	-43	190	-27	128	-89	98	-119	183	-34	226	9	178	-39
5	Housing Now Site #4	4	6	2	0	12	23	20	-3	16	-7	15	-8	8	-15	16	-7	23	0	19	-4
6	Pinebrook Condos	65	0	0	0	65	109	108	-1	48	-61	80	-29	80	-29	46	-63	111	2	98	-11
7	Toepa Condos	24	0	0	0	24	29	40	11	18	-11	30	1	0	-29	17	-12	41	12	36	7
8	Aspen Grove at Roundhill	0	21	0	0	21	32	35	3	31	-1	26	-6	28	-4	30	-2	36	4	32	0
9	Lake Vista I, II, & Meadowbrook	20	60	14	0	94	71	157	87	135	64	116	46	81	10	130	59	176	106	148	78
10	Sierra Vista Apartments	44	50	0	0	94	117	157	40	107	-10	116	-1	67	-50	103	-14	160	43	141	24
11	Sugar Pine Village									0	0	0	0	0	0						0
12	Tahoe Pines Apartments	0	12	16	0	28	22	47	25	53	31	34	12	16	-6	51	29	66	44	50	28
	Total	**189**	**233**	**156**	**76**	**654**	**1078**	**1091**	**13**	**1057**	**-20**	**806**	**-272**	**589**	**-488**	**1018**	**-59**	**1372**	**294**	**1098**	**20**

BR = Bedroom

Sugar Pine Village eliminated due to low occupancy

Note 1=Parking counts are adjust to represent 100% residents on site and occupancy

Rate Equation: Y=0.7135X

Rate 1: 1 BR=1.7 Cars. 2 BR =1.7 cars. 3 BR =2.8 cars. 4 BR =2.8 cars

Rate 2: 1 BR=1.5 cars. 2 BR =1.5 cars. 3 BR = 2 cars. 4 BR = 2 cars.

Source: LSC Transportation Consultants, Inc.

Tahoe Region Parking Rate Option

Parking Rate 2 is 1.5 parking spaces for one-bedroom and two-bedroom units and 2 spaces for three-bedroom and four-bedroom units, with no additionally specific guest parking spaces. This is a reasonable parking rate option for the Tahoe Region. This rate will provide sufficient parking for the majority of the study sites with a slight surplus summed at all sites of twenty parking spaces. Parking Rate 2 will result in a parking shortfall at some of the study sites. Parking Rate 2 balances the slight parking surplus at some sites and slight parking shortfalls at other sites. This option combined with implementing strategies to accommodate potential shortfalls including off-site shared parking and incentivizing parking reductions (unbundling parking from the units), would meet a good balance of parking supply and demand.

The following considerations should be included when determining parking-rate policies for new affordable housing units:

- Parking supply can drive parking demand. More parking spaces available can result in more cars parked per unit.
- Sub-areas within the Tahoe Region have different parking demands.
- Parking demand at new housing developments is higher and becomes lower as developments age. New housing developments can command higher rent than older ones.
- Unbundling parking (paying for parking separately from rent) can reduce parking demand (4% https://parkingpolicy.com/reduced-requirements/). Though the referenced study is based on sites located within an urban area where vehicle ownership is not always necessary, survey data from this study shows that some residents from the Tahoe Region do not own vehicles. As such, the application of unbundled parking can potentially reduce parking demand within the region.
- Shared off-site public parking, on-street, or lots, can increase parking supply by utilizing time-of-day shared-parking demands (residents park in the evenings, businesses park during the day).