Land Use Assumptions

Prepared for:
Sedona, Arizona

November 27, 2018

TischlerBise
FISCAL | ECONOMIC | PLANNING

4701 Sangamore Road

Suite S240

Bethesda, MD 20816

301.320.6900

www.TischlerBise.com

[PAGE INTENTIONALLY LEFT BLANK]

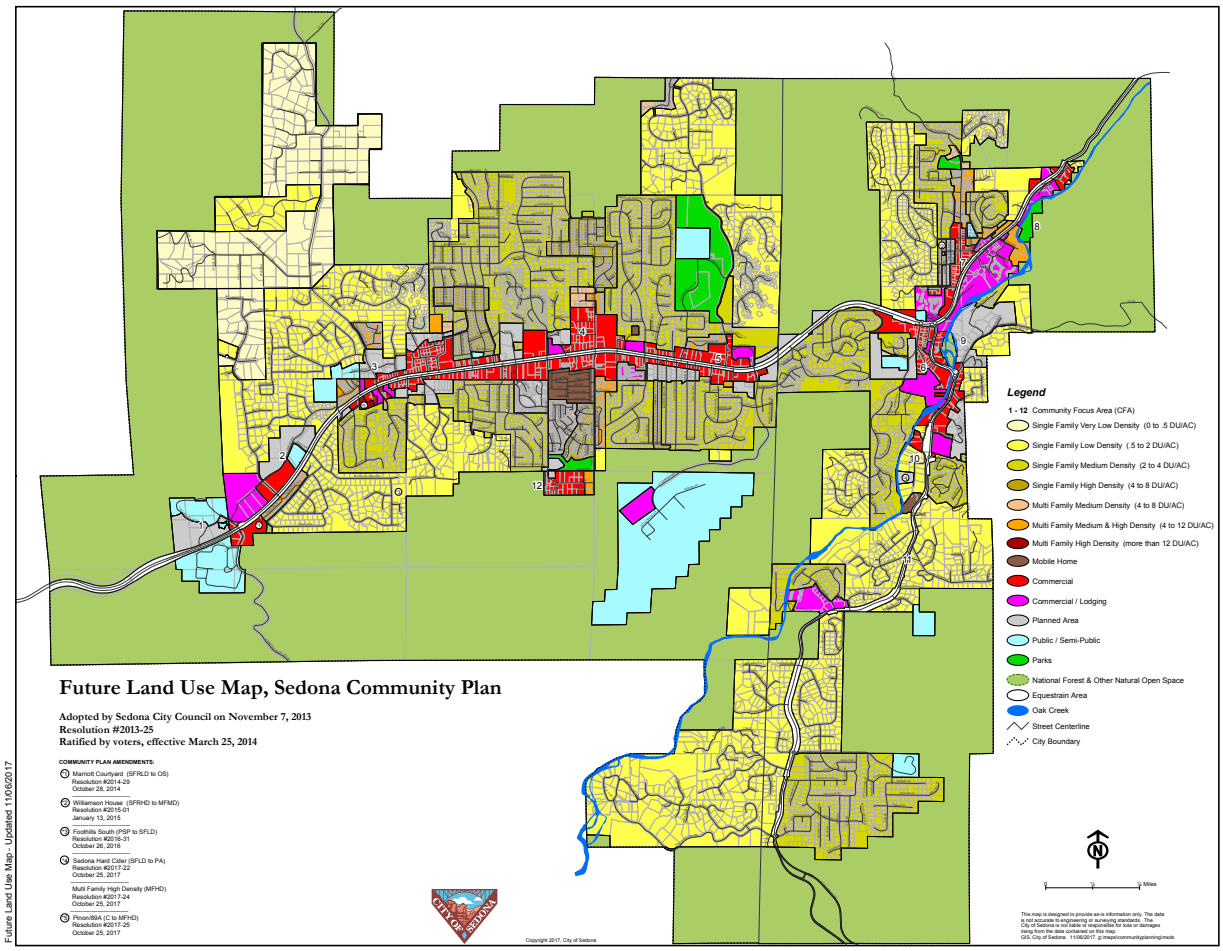
TABLE OF CONTENTS

[PAGE INTENTIONALLY LEFT BLANK]

INTRODUCTION

The estimates and projections of residential and nonresidential development in this Land Use Assumptions document are for areas within the boundaries of the City of Sedona, Arizona. The map below illustrates the area within Sedona's city limits.

Figure A1: City of Sedona Service Area



SUMMARY OF GROWTH INDICATORS

Arizona's Development Fee Act requires the preparation of Land Use Assumptions, which are defined in Arizona Revised Statutes § 9-463.05(t)(6) as:

> *"projections of changes in land uses, densities, intensities and population for a specified service area over a period of at least ten years and pursuant to the General Plan of the municipality."*

TischlerBise prepared current demographic estimates and future development projections for both residential and nonresidential development for use in the Infrastructure Improvements Plan (IIP) and calculation of the development fees. Demographic data estimates for 2018 are used in calculating levels of service (LOS) provided to existing development in Sedona. The development projections are also used in forecasting the amount and cost of infrastructure required by new development that will be documented in the cash flow analysis.

Development fee methodologies are designed to reduce sensitivity to accurate development projections in the determination of the proportionate-share fee amounts. If actual development is slower than projected, development fee revenues will decline, but so will the need for growth-related infrastructure. In contrast, if development is faster than anticipated, Sedona will receive an increase in development fee revenue, but will also need to accelerate the capital improvements program to keep pace with development.

Key land use assumptions for Sedona's development fee study are population, housing units, and employment projections. City staff estimated Sedona's 2017 population to include 10,437 year-round residents and 6,564 housing units. The projected increase in population is based on projections from the Arizona Department of Administration. The development fee study assumes a compound annual growth rate of 0.72 percent for population, consistent with projections from the City of Sedona. ARS § 9-463.05 requires that "a municipality shall update the land use assumptions and infrastructure improvements plan at least every five years." Therefore, the development fee study did not vary the persons per household ratio over time.

Based on estimates from Esri's Business Analyst, Sedona's 2017 employment total included 9,439 jobs. To project employment, this study maintains the 2017 ratio of jobs to housing units. Projected employment was converted to nonresidential square footage using average square-feet-per-employee multipliers provided by the Institute of Transportation Engineers. For nonresidential development, the development fee study assumes a compound annual growth rate of 0.72 percent.

RESIDENTIAL DEVELOPMENT

Current estimates and future projections of residential development are detailed in this section including population and housing units by type.

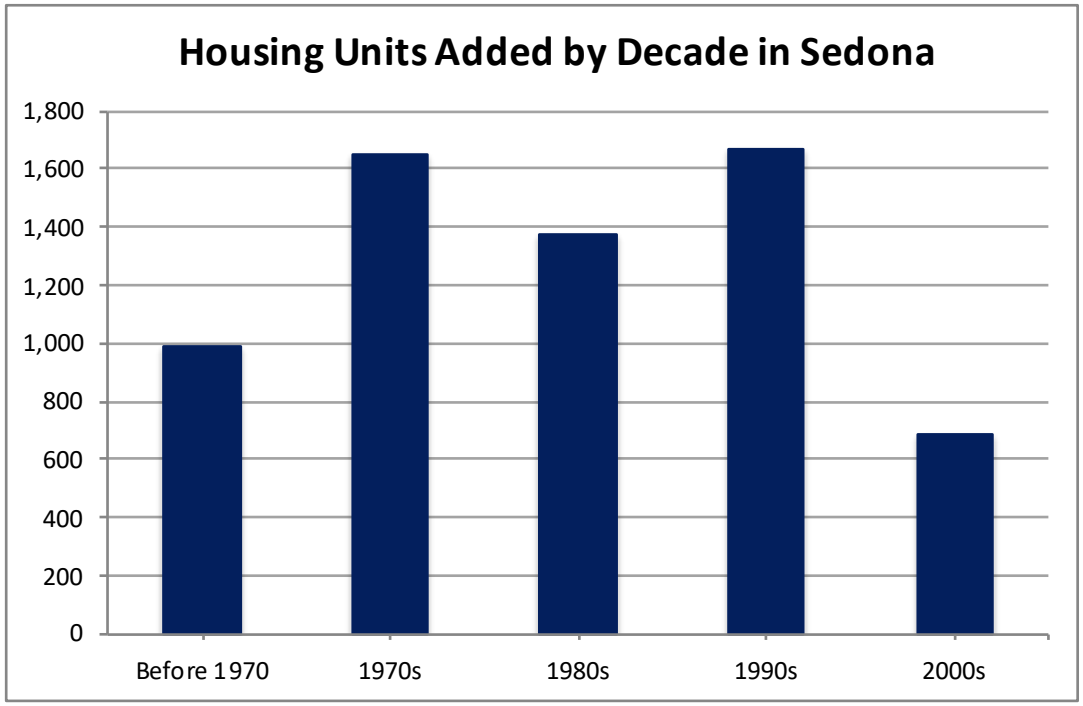
Recent Residential Construction

From 2000 to 2010, Sedona's housing stock grew by an average of 68 units per year. The chart at the bottom of Figure A2 indicates the estimated number of housing units added by decade in Sedona using American Community Survey estimates. Like many communities in Arizona, Sedona experienced an increase in housing starts during the 1990s and early 2000s, but growth slowed during the Great Recession. Based on building permits issued from 2015 through 2017, Sedona's housing stock grew by 43 units annually.

Figure A2: Housing Units by Decade

Census 2010 Population	10,031
Census 2010 Housing Units	6,367
Census 2000 Housing Units	5,684
New Housing Units 2000 to 2010	683

Sedona added an average of 68 housing units per year from 2000 to 2010.



Source: U.S. Census Bureau, Census 2010 Summary File 1, Census 2000 Summary File 1, 2012-2016 Year American Community Survey (for 1990s and earlier, adjusted to yield total units in 2000).

Household Size

According to the U.S. Census Bureau, a household is a housing unit that is occupied by year-round residents. Development fees often use per capita standards and persons per housing unit (PPHU) or persons per household (PPH) to derive proportionate share fee amounts. When PPHU is used in the fee calculations, infrastructure standards are derived using year-round population. When PPH is used in the fee calculations, the development fee methodology assumes a higher percentage of housing units will be occupied, thus requiring seasonal or peak population to be used when deriving infrastructure standards. To recognize the impacts of seasonal population, Sedona should impose development fees for residential development according to the number of persons per household (PPH).

PPH requires data on population in occupied units and the types of units by structure and bedroom count. The 2010 census did not obtain detailed information using a "long-form" questionnaire. Instead, the U.S. Census Bureau switched to a continuous monthly mailing of surveys, known as the American Community Survey (ACS), which has limitations due to sample-size constraints. For example, data on detached housing units are now combined with attached single units (commonly known as townhouses). For development fees in Sedona, detached units, attached units (townhouses), and mobile homes are included in the "Single Unit" category. The "Multi-Unit" category includes duplexes and structures with two or more units on the same parcel of land.

As shown below in Figure A3, Census data indicate Sedona had a population of 10,207 occupying 5,125 households. Single-unit structures averaged 2.02 persons per household and multi-unit households averaged 1.55 persons per household. In 2016, Sedona's housing stock averaged 1.99 persons per household with a citywide vacancy rate of 21 percent.

Figure A3: Persons per Household by Housing Type

Units in Structure	Persons	Households	Persons per Household	Housing Units	Persons per Housing Unit	Housing Mix	Vacancy Rate
Single Unit[1]	9,669	4,778	2.02	5,969	1.62	92%	20%
Multi-Unit[2]	538	347	1.55	491	1.10	8%	29%
Total	10,207	5,125	1.99	6,460	1.58	100%	21%

Source: TischlerBise analysis and calculation based on U.S. Census Bureau, 2012-2016 American Community Survey, 5-Year Estimates.

1. Includes detached, attached (townhouse), and mobile home units.

2. Includes duplexes and structures with two or more units.

Seasonal Households

To account for seasonal residents, the analysis includes vacant households used for seasonal, recreational, or occasional use. According to 2016 ACS estimates shown in Figure A4, seasonal units account for 1,040 of Sedona's 1,335 vacant units. With all seasonal units occupied, Sedona's peak vacancy rate is 4.57 percent (6,165 peak households / 6,460 housing units). Applying Sedona's persons per household factor of 1.99 to seasonal households provides a seasonal population estimate of 2,071 persons. Sedona's peak population estimate for 2016 is 12,278 (10,207 population in households + 2,071 seasonal population).

Figure A4: Seasonal Households

Population in Households	10,207
Housing Units	6,460
Vacant Housing Units	1,335
Vacancy Rate	20.67%
Households	5,125
Seasonal Households	1,040
Peak Households	6,165
Persons per Household	1.99
Population in Households	10,207
Seasonal Population	2,071
Peak Population in 2016	12,278

Source: U.S. Census Bureau, 2012-16 American Community Survey, 5-Yr Estimates

Population and Housing Unit Estimates

City staff estimates Sedona's household population to be 10,437 in 2017 – this is similar to the 2017 Arizona Department of Administration population estimate of 10,319. Based on permit data, city staff estimates 2017 housing units to equal 6,564. To estimate year-round households, the ACS year-round occupancy rate of 79.33 percent (100 percent – 20.67 percent vacancy) is applied to the 2017 estimate of housing units. This yields a 2017 estimate of 5,208 year-round households (6,564 housing units X 79.33 percent year-round vacancy rate). Peak households in 2017 are estimated to equal 6,264 units (6,564 housing units X 95.43 percent peak occupancy). To estimate peak population, multiply the peak household estimate of 6,264 by the persons per household ratio of 1.99. This results in a 2017 peak population estimate of 12,466—seasonal population accounts for 2,029 residents (12,466 peak – 10,437 household).

Residential Projections

To project future residential development, TischlerBise analyzed recent population and housing growth trends, reviewed population projections provided by the Arizona Department of Administration, and had discussions with city staff. Reviewing permit data provided by Sedona's Community Development Department, Sedona issued approximately 43 permits annually from 2015 to 2017.

Population projections use a compound annual growth rate of approximately 0.72 percent, based on the Arizona Department of Administration's 2017 to 2028 population projections, to project Sedona's household population beyond the 2017 estimate of 10,437. This results in a base year (2018) household population estimate of 10,512 and a 2028 estimate of 11,298. Seasonal population remains stable throughout the study period at 2,029 residents, therefore, peak population in 2018 is 12,541 and reaches 13,327 by 2028.

To convert projected household population to housing units, divide the annual population increase by 1.99 persons per household. The projected household population increase from 2018 to 2019 is 76 persons (10,588 – 10,512). When divided by 1.99 persons per household, the projected population increase results in 38 additional housing units. For 2018, this results in 6,602 housing units. Projected housing units are distributed by type of structure using the 2016 ACS housing unit mix shown in Figure A3 – 92 percent single-family units and 8 percent multi-family units. For example, Figure A5 estimates the construction of 38 new housing units from 2018 to 2019 (6,640 - 6,602). Based on the existing housing unit mix, this will include 35 single-family units (38 X 92 percent) and 3 multi-family units (38 X 8 percent).

This report uses 2018 as the base year of all development projections. In 2018, Sedona's estimated peak population is 12,541 with a housing unit estimate of 6,602. Based on the development projections discussed above, Sedona's 2028 peak population is projected to reach 13,327—an average annual increase of 79 persons. By 2028, Sedona is projected to have 6,996 housing units—an average annual increase of 39 units. See Figure A5 below for a summary of population and housing unit projections.

Figure A5: Population and Housing Unit Projections

	2018	2019	2020	2021	2022	2023	2028	Ten-Year
	Base	1	2	3	4	5	10	Increase
Population								
Household	10,512	10,588	10,665	10,742	10,820	10,898	11,298	785
Peak	12,541	12,617	12,694	12,771	12,849	12,927	13,327	785
Housing Units								
Single Family	6,074	6,109	6,144	6,180	6,216	6,251	6,436	362
Multi-Family	528	531	534	537	540	544	560	32
Total Housing Units	6,602	6,640	6,678	6,717	6,756	6,795	6,996	394

NONRESIDENTIAL DEVELOPMENT

Current estimates and future projections of nonresidential development are detailed in this section including jobs and nonresidential floor area.

Employment Estimates

TischlerBise estimates 2017 employment using data available through Esri's Business Analyst. Shown below in Figure A6, base year employment totals 9,439 jobs. Employment estimates are grouped into four categories: Industrial, Commercial, Office / Other Services, and Institutional. For the 2017 base year, employment estimates include 843 industrial jobs, 4,507 commercial jobs, 3,663 office / other services jobs, and 426 institutional jobs. Estimated floor area uses square feet multipliers published by the Institute of Transportation Engineers. The conversion from employment to nonresidential floor area is discussed below.

Figure A6: Estimated Employment and Distribution by Industry Type

Nonresidential Category	2017 Jobs[1]	Percent of Total Jobs	Sq. Ft. per Job[2]	2017 Estimated Floor Area[3]	Jobs per 1,000 Sq. Ft.[2]
Industrial[4]	843	8.9%	613	516,759	1.63
Commercial[5]	4,507	47.8%	427	1,924,489	2.34
Office / Other Services[6]	3,663	38.8%	337	1,234,431	2.97
Institutional[7]	426	4.5%	1,075	457,950	0.93
Total	9,439	100.0%	438	4,133,629	2.28

1. Esri Business Summary for Sedona, Arizona, 2017.
2. Trip Generation, Institute of Transportation Engineers, 10th Edition (2017).
3. TischlerBise analysis and calculation.
4. Major sectors are Manufacturing and Transportation, ITE 110.
5. Major sectors are Retail Trade, Accommodation, and Food Services, ITE 820.
6. Major sectors are Health Care and Real Estate, ITE 710.
7. Major sectors are Educational Services and Public Administration, ITE 520.

Nonresidential Floor Area Estimates

Employment estimates are used to estimate nonresidential floor area based on nationally recognized average square feet per employee data published by The Institute of Transportation Engineers (ITE) and shown in Figure A7 below. Rows shaded in gray are used as prototypes for development in Sedona. TischlerBise uses ITE data to calculate the total nonresidential floor area for the development categories used in the calculation of development fees.

To estimate current nonresidential floor area, ITE square feet per employee factors are applied to 2017 employment estimates shown in Figure A6. For industrial development, light industrial (ITE 110) is the prototype for future development, with an average of 613 square feet per job. For future commercial development, an average size shopping center (ITE 820) is a reasonable proxy with an average of 427 square feet per job. The prototype for future office / other services development is a general office (ITE 710). This type of development averages approximately 337 square feet per job. For future institutional development, an elementary school (ITE 520) is a reasonable proxy with 1,075 square feet per job. TischlerBise estimates Sedona has approximately 4.13 million square feet of nonresidential floor area.

Figure A7: Institute of Transportation Engineers, Employee and Building Area Ratios

ITE Code	Land Use / Size	Demand Unit	Wkdy Trip Ends Per Dmd Unit[1]	Wkdy Trip Ends Per Employee[1]	Emp Per Dmd Unit	Sq Ft Per Emp
110	**Light Industrial**	**1,000 Sq Ft**	**4.96**	**3.05**	**1.63**	**613**
130	Industrial Park	1,000 Sq Ft	3.37	2.91	1.16	862
140	Manufacturing	1,000 Sq Ft	3.93	2.47	1.59	629
150	Warehousing	1,000 Sq Ft	1.74	5.05	0.34	2,941
310	Hotel	room	8.36	14.34	0.58	na
520	**Elementary School**	**1,000 Sq Ft**	**19.52**	**21.00**	**0.93**	**1,075**
530	High School	1,000 Sq Ft	14.07	22.25	0.63	1,587
610	Hospital	1,000 Sq Ft	10.72	3.79	2.83	353
620	Assisted Living	bed	3.06	2.91	1.05	na
710	**General Office (average size)**	**1,000 Sq Ft**	**9.74**	**3.28**	**2.97**	**337**
715	Single Tenant Office	1,000 Sq Ft	11.25	3.77	2.98	336
720	Medical-Dental Office	1,000 Sq Ft	34.80	8.70	4.00	250
730	Government Office	1,000 Sq Ft	22.59	7.45	3.03	330
820	**Shopping Center (average size)**	**1,000 Sq Ft**	**37.75**	**16.11**	**2.34**	**427**

1. Trip Generation, Institute of Transportation Engineers, 10th Edition (2017).

Employment and Nonresidential Floor Area Projections

Based on discussions with staff, and recent employment trends, TischlerBise projects employment based on housing unit growth. Using Esri's 2017 employment estimate of 9,439 jobs and Sedona's estimate of 6,564 housing units, Sedona's ratio of jobs to housing units is 1.44. To project total employment beyond 2017, TischlerBise multiplies projected housing units by 1.44 jobs per housing unit. For 2018, projected employment equals 9,507 (6,602 housing units X 1.44). Projected employment maintains the 2017 allocation of employment (8.9 percent industrial, 47.8 percent commercial, 38.8 percent office / other services, and 4.5 percent institutional). This results in a 10-year increase of 567 jobs with an associated increase of 249,000 square feet of nonresidential floor area.

Figure A8: Projected Nonresidential Development

	2018	2019	2020	2021	2022	2023	2028	Ten-Year
	Base	1	2	3	4	5	10	Increase
Employment								
Industrial	849	854	859	864	869	874	900	51
Commercial	4,539	4,566	4,592	4,618	4,645	4,672	4,810	271
Office / Other Services	3,689	3,711	3,732	3,753	3,776	3,797	3,909	220
Institutional	430	431	433	437	439	442	455	25
Total Employment	9,507	9,562	9,616	9,672	9,729	9,785	10,074	567
Nonresidential Floor Area (KSF)								
Industrial	520	524	527	530	533	536	552	32
Commercial	1,938	1,950	1,961	1,972	1,983	1,995	2,054	116
Office / Other Services	1,243	1,251	1,258	1,265	1,273	1,280	1,317	74
Institutional	462	463	465	470	472	475	489	27
Total Floor Area	4,163	4,188	4,211	4,237	4,261	4,286	4,412	249

AVERAGE DAILY VEHICLE TRIPS

Average Daily Vehicle Trips are used as a measure of demand by land use. Vehicle trips are estimated using average weekday vehicle trip ends from the reference book, Trip Generation, 10th Edition, published by ITE in 2017. A vehicle trip end represents a vehicle either entering or exiting a development (as if a traffic counter were placed across a driveway).

Trip Rate Adjustments

Trip generation rates are adjusted to avoid double counting each trip at both the origin and destination points. Therefore, the basic trip adjustment factor is 50 percent. As discussed further below, additional adjustments are made to ensure the fees are proportionate to the infrastructure demand for particular types of development.

Adjustment for Journey-To-Work Commuting

Residential development has a trip adjustment factor of 60 percent to account for commuters leaving Sedona for work. According to the 2009 National Household Travel Survey, weekday work trips are typically 31 percent of production trips (i.e., all out-bound trips, which are 50 percent of all trip ends). As shown in Figure A9, the Census Bureau's web application OnTheMap indicates that 62 percent of resident workers traveled outside Sedona for work in 2015. In combination, these factors (0.31 x 0.50 x 0.62 = 0.10) support the additional 10 percent allocation of trips to residential development.

Figure A9: Commuter Adjustment

Trip Adjustment Factor for Commuters[1]	
Employed Residents	3,473
Residents Working in Sedona	1,320
Residents Working Outside Sedona	2,153
Percent Commuting out of Sedona	**62%**
Additional Production Trips[2]	**10%**
Residential Trip Adjustment Factor	**60%**

1. U.S. Census Bureau, OnTheMap Application and LEHD Origin-Destination Employment Statistics.
2. According to the National Household Travel Survey (2009)*, published in December 2011 (see Table 30), home-based work trips are typically 30.99 percent of "production" trips, in other words, out-bound trips (which are 50 percent of all trip ends). Also, LED OnTheMap data from 2015 indicate that 62 percent of Sedona's workers travel outside the city for work. In combination, these factors (0.3099 x 0.50 x 0.62 = 0.10) account for 10 percent of additional production trips. The total adjustment factor for residential includes attraction trips (50 percent of trip ends) plus the journey-to-work commuting adjustment (10 percent of production trips) for a total of 60 percent.

Adjustment for Pass-By Trips

For commercial development, the trip adjustment factor is less than 50 percent because retail development attracts vehicles as they pass by on arterial and collector roads. For example, when someone stops at a convenience store on the way home from work, the convenience store is not the primary destination. For the average shopping center, ITE data indicate 34 percent of the vehicles that enter are passing by on their way to some other primary destination. The remaining 66 percent of attraction trips have the commercial site as their primary destination. Because attraction trips are half of all trips, the trip adjustment factor is 66 percent multiplied by 50 percent, or approximately 33 percent of the trip ends.

Nonresidential Vehicle Trips

ITE publishes national average weekday trip generation rates for many types of development. For industrial development, light industrial (ITE 110) is the prototype for future development, generating 4.96 trip ends per 1,000 square feet on an average weekday. For future commercial development, an average size shopping center (ITE 820) is a reasonable proxy with 37.75 trip ends per 1,000 square feet. The prototype for future office / other services development generates 9.74 trip ends per 1,000 square feet. For future institutional development, an elementary school (ITE 520) is a reasonable proxy with 19.52 trip ends per 1,000 square feet.

Figure A10: Institute of Transportation Engineers, Average Weekday Vehicle Trip Ends

ITE Code	Land Use / Size	Demand Unit	Wkdy Trip Ends Per Dmd Unit[1]	Wkdy Trip Ends Per Employee[1]	Emp Per Dmd Unit	Sq Ft Per Emp
110	**Light Industrial**	**1,000 Sq Ft**	**4.96**	**3.05**	**1.63**	**613**
130	Industrial Park	1,000 Sq Ft	3.37	2.91	1.16	862
140	Manufacturing	1,000 Sq Ft	3.93	2.47	1.59	629
150	Warehousing	1,000 Sq Ft	1.74	5.05	0.34	2,941
310	Hotel	room	8.36	14.34	0.58	na
520	**Elementary School**	**1,000 Sq Ft**	**19.52**	**21.00**	**0.93**	**1,075**
530	High School	1,000 Sq Ft	14.07	22.25	0.63	1,587
610	Hospital	1,000 Sq Ft	10.72	3.79	2.83	353
620	Assisted Living	bed	3.06	2.91	1.05	na
710	**General Office (average size)**	**1,000 Sq Ft**	**9.74**	**3.28**	**2.97**	**337**
715	Single Tenant Office	1,000 Sq Ft	11.25	3.77	2.98	336
720	Medical-Dental Office	1,000 Sq Ft	34.80	8.70	4.00	250
730	Government Office	1,000 Sq Ft	22.59	7.45	3.03	330
820	**Shopping Center (average size)**	**1,000 Sq Ft**	**37.75**	**16.11**	**2.34**	**427**

1. Trip Generation, Institute of Transportation Engineers, 10th Edition (2017).

DEMAND INDICATORS BY DWELLING SIZE

As an alternative to simply using national average trip generation rates for residential development, published by ITE, TischlerBise derived custom trip rates using local demographic data. Key inputs needed for the analysis (i.e. average number of persons and vehicles available per housing unit) are available from ACS data.

Sedona Control Totals

According to the U.S. Census Bureau, a household is a housing unit that is occupied by year-round residents. Development fees often use per capita standards and persons per housing unit (PPHU) or persons per household (PPH) to derive proportionate share fee amounts. When PPHU is used in the fee calculations, infrastructure standards are derived using year-round population. When PPH is used in the fee calculations, the development fee methodology assumes a higher percentage of housing units will be occupied, thus requiring seasonal or peak population to be used when deriving infrastructure standards. To recognize the impacts of seasonal population, Sedona should impose development fees for residential development according to the number of persons per household.

As shown below in Figure A11, Census data indicate Sedona had a population of 10,207 occupying 5,125 households. Single-unit structures averaged 2.02 persons per household and multi-unit households averaged 1.55 persons per household. In 2016, Sedona's housing stock averaged 1.99 persons per household with a citywide vacancy rate of 21 percent.

Figure A11: Persons per Household by Housing Type

Units in Structure	Persons	Households	Persons per Household	Housing Units	Persons per Housing Unit	Housing Mix	Vacancy Rate
Single Unit[1]	9,669	4,778	2.02	5,969	1.62	92%	20%
Multi-Unit[2]	538	347	1.55	491	1.10	8%	29%
Total	10,207	5,125	1.99	6,460	1.58	100%	21%

Source: TischlerBise analysis and calculation based on U.S. Census Bureau, 2012-2016 American Community Survey, 5-Year Estimates.

1. Includes detached, attached (townhouse), and mobile home units.

2. Includes duplexes and structures with two or more units.

Trip generation rates are also dependent upon the average number of vehicles available per dwelling. Key independent variables needed for the analysis (i.e., vehicles available, housing units, households, and persons) are available from the U.S. Census Bureau American Community Survey. Based on 2016 ACS estimates there were 9,136 vehicles available to 5,125 households. This indicates an average of 1.78 vehicles per household in Sedona.

Demand Indicators by Dwelling Size

Development fees must be proportionate to the demand for infrastructure. Because averages per housing unit, for both persons and vehicle trip ends, have a strong, positive correlation to the number of bedrooms, TischlerBise recommends residential fee schedules that increase by unit size. Custom tabulations of demographic data by bedroom range can be created from individual survey responses provided by the U.S. Census Bureau in files known as Public Use Microdata Samples (PUMS). PUMS files are only available for areas of at least 100,000 persons with Sedona included in Public Use Microdata Areas (PUMA) 400 and 500.

Cells shaded yellow below are survey results for PUMAs 400 and 500. Unadjusted persons per household (2.40), derived from PUMS data for the PUMAs listed above, are adjusted downward to match the control total for Sedona (1.99), as shown in Figure A11. Adjusted persons per household totals are shaded in gray.

Figure A12: Persons by Bedroom Range

Bedroom Range	Persons[1]	Vehicles Available[1]	Households[1]	Housing Mix	Unadjusted PPH	Adjusted PPH[2]
0-1	1,317	935	783	11%	1.68	**1.40**
2	4,010	3,177	1,962	28%	2.04	**1.70**
3	7,942	6,463	3,181	46%	2.50	**2.07**
4	2,752	2,003	862	12%	3.19	**2.65**
5+	710	483	191	3%	3.72	**3.09**
Total	16,731	13,061	6,979	100%	2.40	**1.99**

Persons by Dwelling Size

Average floor area and number of persons by bedroom range are plotted in Figure A13 with a logarithmic trend line derived from 2016 square footage estimates provided by the U.S. Census Bureau (west region). Dwellings with one bedroom or less average 1,000 square feet of floor area—based on multi-family dwellings constructed in the West census region. Two-bedroom dwellings average 1,800 square feet, three-bedroom dwellings average 2,200 square feet, four-bedroom dwellings average 3,100 square feet, and dwellings with five or more bedrooms average 4,200 square feet—based on single-family dwellings constructed in the West census region. Using the trend line formula shown in the chart, TischlerBise derived the estimated average number of persons, by dwelling size, using 10 size thresholds.

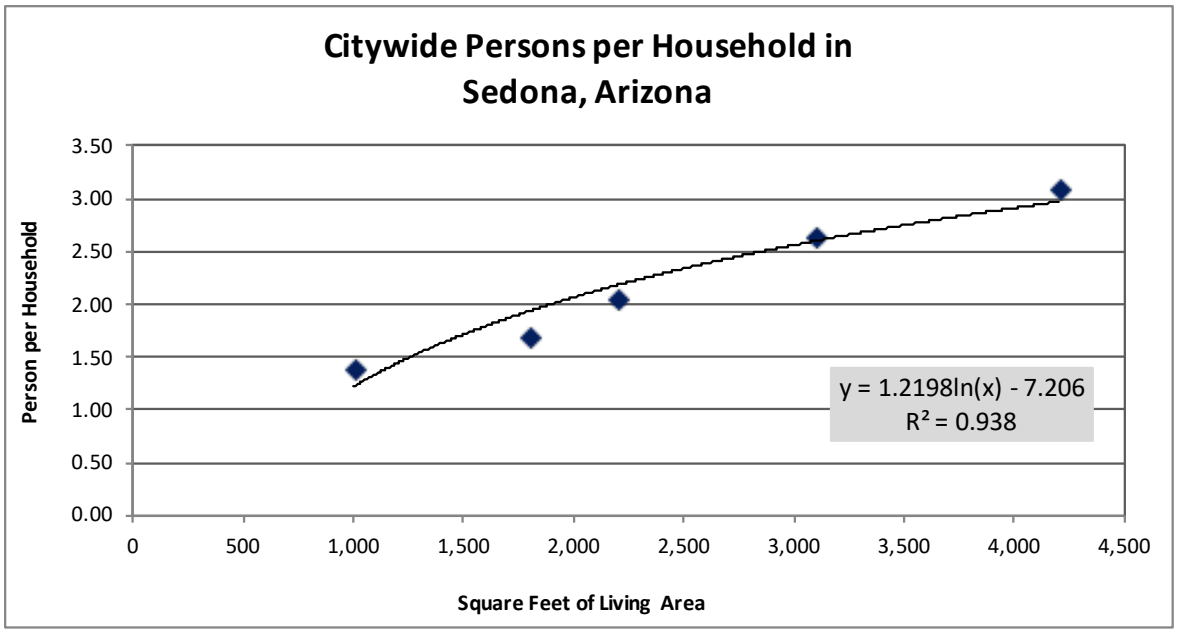
As shown in the upper-right corner of the table below, the smallest floor area range (700 square feet or less) has an estimated average of 1.00 person per dwelling. The largest floor area range (4,701 square feet or more) has an estimated average of 3.20 persons per dwelling.

Figure A13: Persons by Dwelling Size

Average persons per household derived from 2016 ACS PUMS data for the area that includes Sedona. Unit size for 0-1 bedroom from the 2016 U.S. Census Bureau average for all multi-family units constructed in the Census West region. Unit size for all other bedrooms from the 2016 U.S. Census Bureau average for single-family units constructed in the Census West region.

Actual Averages per Household		
Bedrooms	Square Feet	Persons
0-1	1,000	1.40
2	1,800	1.70
3	2,200	2.07
4	3,100	2.65
5+	4,200	3.09

Fitted-Curve Values	
Sq Ft Range	Persons
700 or less	1.00
701 to 1,200	1.40
1,201 to 1,700	1.90
1,701 to 2,200	2.20
2,201 to 2,700	2.40
2,701 to 3,200	2.60
3,201 to 3,700	2.80
3,701 to 4,200	3.00
4,201 to 4,700	3.10
4,701 or more	3.20



Trip Generation by Dwelling Size

Rather than rely on one methodology, the recommended trip generation rates shown at the bottom of Figure A14, shaded gray, are an average of trip rates based on persons and vehicles available for all types of households. In Sedona, each household is expected to generate an average of 8.26 Average Weekday Vehicle Trip Ends (AWVTE), compared to the national average of 9.22 trip ends per household.

Figure A14: Average Weekday Vehicle Trip Ends by Bedroom Range

Bedroom Range	Persons[1]	Vehicles Available[1]	Households[1]	Housing Mix	Unadjusted PPH	Adjusted PPH[2]	Unadjusted VPH	Adjusted VPH[2]
0-1	1,317	935	783	11%	1.68	**1.40**	1.19	1.14
2	4,010	3,177	1,962	28%	2.04	**1.70**	1.62	1.54
3	7,942	6,463	3,181	46%	2.50	**2.07**	2.03	1.94
4	2,752	2,003	862	12%	3.19	**2.65**	2.32	2.21
5+	710	483	191	3%	3.72	**3.09**	2.53	2.41
Total	16,731	13,061	6,979	100%	2.40	**1.99**	1.87	1.78

National Averages According to ITE

ITE Code	AWVTE per Person	AWVTE per Vehicle	AWVTE per HU	Sedona Housing Mix	Persons per Household	Vehicles per Household
210 SFD	2.65	6.36	9.44	92%	3.56	1.48
220 Apt	3.31	5.10	6.65	8%	2.01	1.30
Weighted Avg	2.70	6.26	9.22	100%	3.44	1.47

Recommended AWVTE per Housing Unit

Bedroom Range	AWVTE per Hhld Based on Persons[3]	AWVTE per Hhld Based on Vehicles[4]	AWVTE per Household[5]
0-1	3.78	7.14	**5.46**
2	4.59	9.64	**7.12**
3	5.59	12.14	**8.87**
4	7.16	13.83	**10.50**
5+	8.34	15.09	**11.72**
Average	5.37	11.14	**8.26**

1. American Community Survey, Public Use Microdata Sample for AZ PUMAs 400 and 500 (2012-2016 5-Year unweighted data).
2. Adjusted multipliers are scaled to make the average PUMS values match control totals for Sedona, based on American Community Survey 2012-2016 5-Year Estimates.
3. Adjusted persons per household multiplied by national weighted average trip rate per person.
4. Adjusted vehicles available per household multiplied by national weighted average trip rate per vehicle.
5. Average trip rates based on persons and vehicles per household.

Vehicle Trip Ends by Dwelling Size

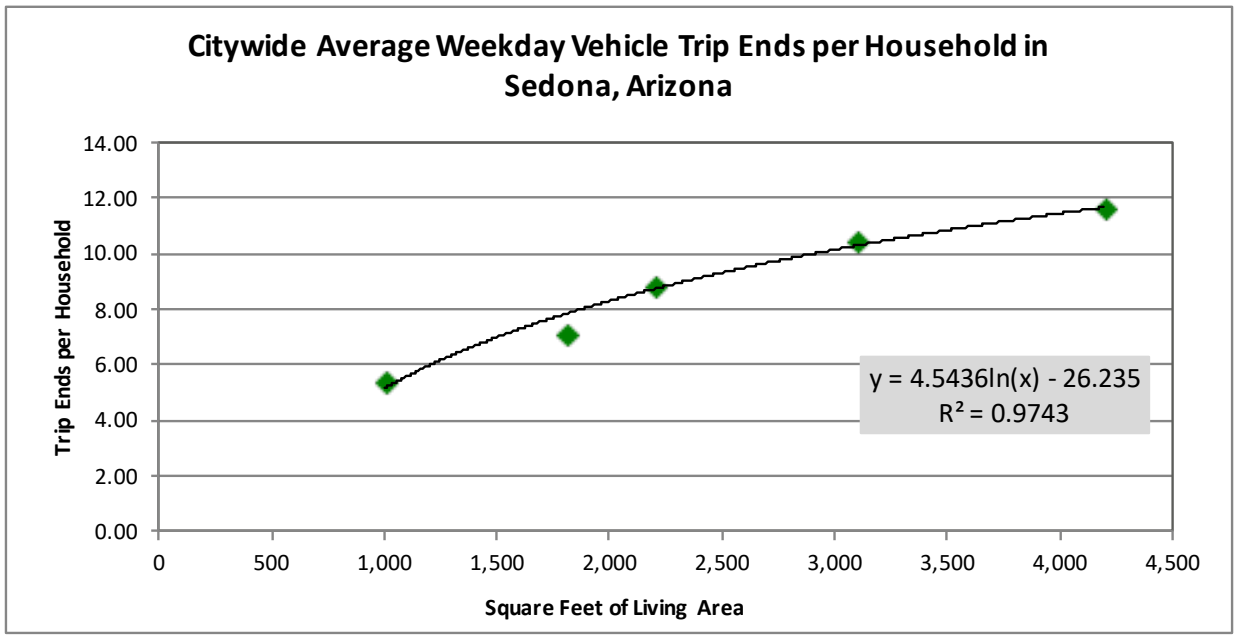
To derive AWVTE by dwelling size, TischlerBise matched trip generation rates and average floor area, by bedroom range, as shown in Figure A15, with a logarithmic trend line derived from 2016 square footage estimates provided by the U.S. Census Bureau (west region). Dwellings with one bedroom or less average 1,000 square feet of floor area—based on multi-family dwellings constructed in West census region. Two-bedroom dwellings average 1,800 square feet, three-bedroom dwellings average 2,200 square feet, four-bedroom dwellings average 3,100 square feet, and dwellings with five or more bedrooms average 4,200 square feet—based on single-family dwellings constructed in West census region. Using the trend line formula shown in the chart, TischlerBise derived the estimated average weekday vehicle trip ends, by dwelling size, using 10 size thresholds.

As shown in the upper-right corner of the table below, the smallest floor area range (700 square feet or less) generates an estimated average of 4.41 trip ends per dwelling. The largest floor area range (4,701 square feet or more) generates an estimated average of 12.64 trip ends per dwelling.

Figure A15: Vehicle Trip Ends by Dwelling Size

Average weekday vehicle trips per household derived from 2016 ACS PUMS data for the area that includes Sedona. Unit size for 0-1 bedroom from the 2016 U.S. Census Bureau average for all multi-family units constructed in the Census West region. Unit size for all other bedrooms from the 2016 U.S. Census Bureau average for single-family units constructed in the Census West region.

Actual Averages per Household			Fitted-Curve Values	
Bedrooms	Square Feet	Trip Ends	Sq Ft Range	Trip Ends
0-1	1,000	5.46	700 or less	4.41
2	1,800	7.12	701 to 1,200	5.98
3	2,200	8.87	1,201 to 1,700	7.56
4	3,100	10.50	1,701 to 2,200	8.73
5+	4,200	11.72	2,201 to 2,700	9.66
			2,701 to 3,200	10.44
			3,201 to 3,700	11.10
			3,701 to 4,200	11.67
			4,201 to 4,700	12.18
			4,701 or more	12.64



FUNCTIONAL POPULATION

For certain infrastructure facilities TischlerBise often uses "functional population" to establish the relative demand for infrastructure from both residential and nonresidential development. As shown in Figure A16, functional population accounts for people living and working in a jurisdiction. Residents who do not work are assigned 20 hours per day to residential development and four hours per day to nonresidential development (annualized averages). Residents who work in Sedona are assigned 14 hours to residential development and 10 hours to nonresidential development. Residents who work outside Sedona are assigned 14 hours to residential development. Inflow commuters are assigned 10 hours to nonresidential development. Based on 2015 functional population data, the resulting proportionate share is 72 percent from residential development and 28 percent from nonresidential development.

Figure A16: Functional Population

Demand Units in 2015			Demand Hours/Day	Person Hours	Proportionate Share
Residential					
Peak Population	12,076				
Residents Not Working	8,603		20	172,056	
Employed Residents	3,473				
Employed in Service Area		1,320	14	18,480	
Employed outside Service Area		2,153	14	30,142	
		Residential Subtotal		220,678	72%
Nonresidential					
Non-working Residents		8,603	4	34,411	
Jobs in Service Area	5,292				
Residents Employed in Service Area		1,320	10	13,200	
Non-Resident Workers (inflow Commuters)		3,972	10	39,720	
		Nonresidential Subtotal		87,331	28%
			Total	308,009	100%

Source: U.S. Census Bureau, OnTheMap 6.1.1 Application, 2015.

DETAILED DEVELOPMENT PROJECTIONS

Provided below is a summary of cumulative development projections to be used for the Development Fee Report.

Figure A17: Development Projections Summary

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Ten-Year
	Base	1	2	3	4	5	6	7	8	9	10	Increase
Population												
Household	10,512	10,588	10,665	10,742	10,820	10,898	10,977	11,056	11,136	11,217	11,298	785
Peak	12,541	12,617	12,694	12,771	12,849	12,927	13,006	13,085	13,165	13,246	13,327	785
Housing Units												
Single Family	6,074	6,109	6,144	6,180	6,216	6,251	6,288	6,325	6,362	6,399	6,436	362
Multi-Family	528	531	534	537	540	544	547	550	553	556	560	32
Total Housing Units	6,602	6,640	6,678	6,717	6,756	6,795	6,835	6,875	6,915	6,955	6,996	394
Hotels												
Hotel Rooms	2,525	2,565	2,605	2,645	2,685	2,725	2,765	2,805	2,845	2,885	2,925	400
Lodging Population	5,053	5,133	5,213	5,293	5,373	5,453	5,533	5,613	5,693	5,773	5,853	800
Employment												
Industrial	849	854	859	864	869	874	879	884	889	894	900	51
Commercial	4,539	4,566	4,592	4,618	4,645	4,672	4,699	4,727	4,755	4,782	4,810	271
Office / Other Services	3,689	3,711	3,732	3,753	3,776	3,797	3,819	3,842	3,864	3,887	3,909	220
Institutional	430	431	433	437	439	442	445	447	450	452	455	25
Total Employment	9,507	9,562	9,616	9,672	9,729	9,785	9,842	9,900	9,958	10,015	10,074	567
Nonresidential Floor Area (KSF)												
Industrial	520	524	527	530	533	536	539	542	545	548	552	32
Commercial	1,938	1,950	1,961	1,972	1,983	1,995	2,006	2,018	2,030	2,042	2,054	116
Office / Other Services	1,243	1,251	1,258	1,265	1,273	1,280	1,287	1,295	1,302	1,310	1,317	74
Institutional	462	463	465	470	472	475	478	481	484	486	489	27
Total Floor Area	4,163	4,188	4,211	4,237	4,261	4,286	4,310	4,336	4,361	4,386	4,412	249