

Sonoma County Transportation Authority Model Enhancement Report

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FEHR & PEERS

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1. Introduction

The Sonoma County Transportation Authority (SCTA) uses a combination of digital databases, computer software, and scientific theory to replicate the real world transportation system in the Authority's travel demand modeling program. The Sonoma County Travel Model (SCTM) is used to forecast future travel patterns and demand based on changes to the transportation system (new roads, changes in capacity, etc.), housing and employment growth (changes in residential densities, or locations, new job sites, etc.), and changing demographics and travel preferences.

SCTA recently recalibrated and revalidated the SCTM to a base year of 2015. Concurrently with that effort, Fehr & Peers conducted a countywide travel behavior study to provide an understanding of vehicular travel that occurs within Sonoma County. The study utilized traffic counts and mobile device data from StreetLight to quantify vehicle trips associated with residents, employees, and visitors, where those trips started and ended, the purpose and length of those trips, the times of travel, and the demographics of the travelers.

The goal of the SCTA Model Enhancement effort was to refine and enhance the SCTM based on the observed trip generation and distribution patterns from the mobile device data collected, increasing the accuracy and sensitivity of the model to planned infrastructure and development projects. Specifically, this effort sought to increase the model's representation of winery uses, inter-county/visitor travel, land use occupancies, trip lengths, and weekend travel patterns.

Below is a brief summary of the five key enhancements made to SCTM, which are discussed in further detail in the following chapters.

1. Enhanced the model's representation of winery uses to increase the sensitivity of the model to the effects of infrastructure projects and planned land use developments on existing wineries, as well as the potential impact of future wineries.
2. Enhanced the model's representation of inter-county/visitor travel by SCTM gateway and trip purpose.
3. Enhanced the model's representation of land use occupancy to streamline the process and more accurately account for land uses not fully occupied throughout the year in unincorporated areas.
4. Enhanced the model to capture the full length of all trips generated by land uses in Sonoma County as recommended by the California Governor's Office of Planning and Research (OPR) for vehicle miles travelled (VMT) reporting purposes.
5. Developed a weekend model for weekend planning purposes.

2. Enhanced Representation of Winery Uses

The Sonoma County winery database provides detailed characteristics for roughly 693 winery parcels in Sonoma County. These characteristics include the winery type, annual production capacity, tasting room hours, number of annual events, and acres of land. The unique characteristics of winery uses make it very difficult for a travel model such as SCTM to forecast their trip generation and trip distribution patterns, leading to wineries being represented as special generator uses where trip generation was an input in a "WINE_TRIPS" field in the model land use table input file as opposed to being forecasted. This approach can accurately model existing wineries, but greatly reduces the sensitivity of the model to forecast the effects of infrastructure projects and planned land use developments on existing wineries, as well as the potential impact of future wineries.

As part of the SCTA Model Enhancement effort, Fehr & Peers incorporated the Sonoma County winery database characteristics, observed trip generation and distribution patterns from mobile device data collected as part of the Sonoma County Travel Behavior Study, and Napa Valley winery survey data to increase the sensitivity of the model to existing and future winery uses in Sonoma County. Below is a bulleted summary of the modifications made to SCTM.

- Two winery tourism areas were added based on a review of winery characteristics and locations from the Sonoma County winery database.
- Two winery trip purposes were added with production and attraction rates derived from regression analysis and survey work performed as part of the 2014 Napa Valley Travel Behavior Study.
- Three winery characteristic fields were added to the model land use input table (number of wineries, annual production, and annual events) for trip generation purposes.
- Refinements were made to trip generation coefficients and external production and attraction tables to account for the percent of winery trips coming from Sonoma County residences, Sonoma County non-residential uses, and outside the model from the mobile device data analysis.
- Two new friction factor curves derived from travel patterns associated with zones that include large wineries from the mobile device data analysis were added for trip distribution purposes.
- Winery person trip estimation was added based on average group size information collected as part of an in-person winery survey from the 2014 Napa Valley Travel Behavior Study.

2.1 Winery Tourism Areas

A review of winery locations from the Sonoma County winery database revealed two distinct winery tourism areas within Sonoma County: the Alexander Valley north of Santa Rosa and the Arnold Drive area south of the City of Sonoma. It was hypothesized that being in either area likely did not affect overall winery trip generation but that the large distance between the areas and closer proximity of the Arnold Drive area to population centers in other counties would likely result in very different inter-county trip patterns. A review of mobile device data from the Sonoma County Travel Behavior Study confirmed the hypotheses, indicating 2% of trips to/from Alexander Valley wineries are directly from outside Sonoma County compared to 61% for the Arnold Drive area, but that visitor and total vehicle trips generated by the zones containing the wineries on a per winery basis were similar.

To better account for this observed difference in inter-county trip patterns, two winery tourism areas and corresponding trip purposes were added to SCTM. The two winery tourism areas and their characteristics from the Sonoma County winery database, as well as the visitor and total vehicle trip generation per winery analysis from the 2017 mobile device data, are summarized in **Table 2-1**.

Table 2-1: Winery Tourism Areas

| Winery Tourism Area | Sonoma County Winery Database | | | 2017 Mobile Device Data | |
|-----------------------|-------------------------------|-------------------------|--------------------|--------------------------|------------------------|
| | # of Wineries | Annual Gallons Produced | # of Annual Events | Visitor Trips Per Winery | Total Trips Per Winery |
| North County Wineries | 286 | 31,222,069 | 930 | 123 | 369 |
| South County Wineries | 95 | 5,092,740 | 660 | 146 | 332 |
| All Wineries | 381 | 36,314,809 | 1,590 | 128 | 360 |

Source: Fehr & Peers.

The following two winery tourism trip purposes were added to SCTM.

- Tourism North – representing the Alexander Valley north of Santa Rosa and any other wineries in northern and western Sonoma County and abbreviated “TN” in the model scripts and input tables
- Tourism South – representing the Arnold Drive area south of the City of Sonoma and any other wineries in Sonoma Valley and southern Sonoma county and abbreviated “TS” in the model scripts and input tables

2.2 Winery Trip Generation

SCTM’s winery trip generation component was refined to incorporate production and attraction rates derived from regression analysis performed as part of the 2014 Napa Valley Travel Behavior Study, as well as observed trip generation from an analysis of mobile device data collected as part of the Sonoma County Travel Behavior Study, for each winery tourism trip purpose. Given the mobile device data trip generation analysis indicated similar levels of activity on a per winery basis, **a single set of regression coefficients were developed that were applied to the production and attraction rates for both winery tourism areas.**

2.2.1 Regression Variables and Coefficients

Table 2-2 summarizes the independent variables and regression coefficients from the 2014 Napa Valley Travel Behavior Study that served as the basis for the two winery tourism area production and attraction rates.

Table 2-2: 2014 Napa Valley Travel Behavior Study Winery Regression Coefficients

| Independent Variable | Thursday Coefficient | Saturday Coefficient |
|---|----------------------|----------------------|
| Constant | 102 | 222 |
| Annual Gallons Produced (thousands) | 0.31 | 0.35 |
| Advanced Appointments Required (binary) | -68 | -229 |
| On the Valley Floor (binary) | 69 | 83 |
| R-Squared | 0.82 | 0.79 |

Source: Fehr & Peers.

The winery regression coefficients in **Table 2-2** make intuitive sense as they suggest that Napa Valley wineries generate trips just for existing (owner, workers, deliveries, etc.) based on the use of a constant, and generate additional trips based on their size which is accounted for using annual gallons produced as opposed to acres or square footage. They generate fewer trips if appointments are required, but generate more trips if they are located on the valley floor. The next step was to determine which independent variables, if any, were suitable for incorporation into SCTM.

A comparison of the Napa Valley independent variables to winery characteristics available in the Sonoma County winery database indicated that both contained “annual gallons produced” and “advanced appointment required,” but that “on the valley floor” was not applicable given the two distinct winery areas observed within Sonoma County. It was also determined that “number of annual events” available in the

Sonoma County winery database was likely a very important characteristic that should be included in the SCTM winery trip generation, but was unavailable for the Napa Valley regression analysis. Furthermore, it was assumed that annual events in Napa Valley were likely accounted for in the “constant” and “advanced appointment required” independent variables in the absence of a separate variable, reducing the applicability of those variables for SCTM.

Based on the independent variable comparison and analysis, it was determined that “annual gallons produced” and “number of annual events” were the most appropriate and representative variables to use. In the absence of winery driveway counts at individual wineries in Sonoma County, an iterative analysis was conducted using mobile device data and trip generation estimates provided by SCTA staff for model TAZs (many of which contained multiple wineries) as the dependent variable, representing total zonal winery vehicle trip generation. “Number of wineries” in each zone (acting as the constant to represent owner, workers, deliveries, etc.), total “annual gallons produced” for all wineries within the zone, and total “number of annual events” for all wineries within the zone were used as the independent variables to determine the appropriate values for the weekday coefficients. The final weekday coefficients for each independent variable are provided in **Table 2-3**.

Table 2-3: Sonoma County Winery Regression Coefficients

| Independent Variable | Weekday Coefficient |
|-------------------------------------|---------------------|
| # of Wineries | 10 |
| Annual Gallons Produced (thousands) | 0.31 |
| # of Annual Events | 2.06 |

Note: The # of annual events weekday coefficient was derived by dividing the number of events by 52 weeks to get the number of average weekly events, multiplied by an assumed 150 average person attendance, divided by a 2.8 average party size from the Napa survey work, and multiplied by 2 to account for the trip there and trip home.
 Source: Fehr & Peers.

As shown in **Table 2-3**, the winery trip generation analysis indicated that each Sonoma County winery generates ten weekday vehicle trips regardless of their characteristics, and generates an additional 0.31 vehicle trips per thousand annual gallons produced and 2.06 vehicle trips per annual event.

2.2.2 Land Use Table Modifications

In order to incorporate the necessary winery regression coefficient input data, the following three winery characteristic fields were added to the model land use input table for trip generation.

- Wineries – total number of wineries in the TAZ
- Production - total annual gallons produced by the wineries in the TAZ
- Events – total number of annual events at the wineries in the TAZ

The special generator trip generation input field “WINE_TRIPS” was also set to 0 for all model TAZs since winery trip generation was now being forecasted as opposed to input in trips.

2.2.3 Winery Vehicle Attraction Coefficients

When estimating the trip generation of a land use type, travel models estimate the total trips “produced” by the use and the total trips “attracted” to the use, and then balance the two to ensure all productions have a matching attraction. Typically uses produce trips when they have a need that is unmet at their location and attract trips when they offer “satisfaction” for needs generated elsewhere. In the case of winery uses, they satisfy the need for social recreation from other uses and therefore “attract” trips in terms of travel model productions and attractions. Therefore, the SCTM trip generation component was modified to forecast winery vehicle attractions based on the winery characteristics and coefficients in **Table 2-3**.

Total winery vehicle attractions are forecasted on a per zone basis using a multi-variable linear equation where the winery characteristic amount (independent variable) from the land use input table is multiplied by the corresponding coefficient (e.g. number of wineries multiplied by the weekday coefficient of 10). The resulting values for each independent variable are then added together to forecast the total winery vehicle attractions for the zone. The same weekday coefficients are used for both winery tourism area trip purposes. The total forecasted daily winery vehicle attractions for base year (2015) conditions are shown in **Table 2-4**.

Table 2-4: Total Daily Winery Vehicle Attractions

| Winery Tourism Area | Total Daily Winery Vehicle Attractions |
|-----------------------|--|
| North County Wineries | 14,978 |
| South County Wineries | 4,260 |
| All Wineries | 19,237 |

Source: Fehr & Peers.

As shown in **Table 2-4**, the base year (2015) SCTM forecasts 19,237 daily winery vehicle attractions.

2.2.4 Winery Vehicle Production Coefficients

As discussed above, winery uses satisfy the need for social recreation produced by other uses. Therefore, the SCTM trip generation component was modified to forecast winery vehicle productions from other uses in the model. Based on a review of model land use categories it was determined that winery trips would likely be produced from single- and multi-family homes, senior dwelling units, hotel rooms, and from commercial areas (includes restaurants and retail).

Total winery vehicle productions are forecasted on a per zone basis using a multi-variable linear equation where the land use amount (independent variable) from the land use input table is multiplied by the corresponding coefficient (e.g. number of single-family homes multiplied by the weekday coefficient of 0.0174). To account for differences in inter-county travel patterns between the two winery tourism areas the mobile device data analysis was used to adjust winery vehicle production coefficients for each winery tourism trip purpose to match the observed percentage of winery trips coming from Sonoma County residences, Sonoma County non-residential uses, and outside the model (discussed in the next section). The percentages and resulting trips for each origin type for base year (2015) conditions are shown in **Table 2-5**.

Table 2-5: Winery Vehicle Productions by Origin Type

| Origin of Winery Trips | North County Wineries | | South County Wineries | | All Wineries | |
|-----------------------------|-----------------------|--------|-----------------------|-------|---------------|--------|
| | Percent | Trips | Percent | Trips | Percent | Trips |
| From County Residences | 22% | 3,295 | 13% | 552 | 20% | 3,847 |
| From County Non-Residential | 76% | 11,383 | 26% | 1,121 | 65% | 12,504 |
| From Outside Model | 2% | 300 | 61% | 2,586 | 15% | 2,886 |
| Total Winery Trips | 14,978 | | 4,260 | | 19,237 | |

Source: Fehr & Peers.

As shown in **Table 2-5**, roughly 76% of North County winery trips come from non-residential uses within Sonoma County, likely representing visitors from outside the county who stop for lunch, shopping, or recreation prior to travelling to the wineries due to the long distance travelled. Conversely, roughly 61% of South County winery trips come from outside the model, likely due to the relatively shorter distance to the county boundary and nearby population centers where the visitors likely live or stop prior to travelling to the wineries.

The resulting winery vehicle production coefficients for each winery tourism area are provided in **Table 2-6**.

Table 2-6: Winery Vehicle Production Coefficients

| Land Use | North County Wineries Weekday Coefficient | South County Wineries Weekday Coefficient |
|----------------------|---|---|
| Single-Family Home | 0.0174 | 0.0029 |
| Multi-Family Home | 0.0174 | 0.0029 |
| Senior Dwelling Unit | 0.0174 | 0.0029 |
| Hotel Room | 0.4913 | 0.0484 |
| General Commercial | 0.4913 | 0.0484 |

Source: Fehr & Peers.

2.2.5 External Winery Trips

As discussed above, mobile device data indicated distinct differences in inter-county travel patterns between the two winery tourism areas. To account for these differences, modifications were made to the SCTM external production and attraction input trip tables, which provide the trip productions and trip attractions for each SCTM gateway by trip purpose. Two new winery tourism trip purposes were added to this table with trip values matching the observed mobile device data for winery trips coming from outside the model. The winery external trips added to the base year (2015) SCTM are shown in **Table 2-7**.

Table 2-7: External Winery Trips

| SCTM Gateway | Winery Tourism North Productions | Winery Tourism North Attractions | Winery Tourism South Productions | Winery Tourism South Attractions |
|---|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| U.S. 101 at the Marin County Line | 104 | 104 | 200 | 200 |
| SR 37 at the Marin County Line | 0 | 0 | 546 | 546 |
| SR 37 at the Solano County Line | 76 | 76 | 76 | 76 |
| SR 121/12 at the Napa County Line | 36 | 36 | 1234 | 1234 |
| Petrified Forest Road at the Napa County Line | 30 | 30 | 10 | 10 |
| U.S. 101 at the Mendocino County Line | 54 | 54 | 20 | 20 |
| Total | 300 | 300 | 2,086 | 2,086 |

Source: Fehr & Peers.

As shown in **Table 2-7**, 300 external trip productions and attractions were added for the northern winery tourism area while 2,086 external trip productions and attractions were added for the southern winery tourism area.

2.2.6 Winery Trip Balancing

As discussed above, when estimating trip generation of a land use type the total trips “produced” by the use and the total trips “attracted” to the use are balanced to ensure all productions have a matching attraction. Typically attractions are balanced to productions to ensure all needs are “satisfied” and that uses are not satisfying trips for which demand would likely not exist. However, due to the requirement of use permits in Sonoma County which restrict the number of events allowed and impose other use limitations on parking and capacity for wineries, **trip productions were balanced to trip attractions for the two winery tourism trip purposes.**

2.3 Winery Trip Distribution

In addition to distinct differences in inter-county travel patterns between the two winery tourism areas, the mobile device data also indicated distinct differences between Sonoma County zones that interact with wineries in the Alexander Valley and the Arnold Drive area. The mobile device data indicated that zones within and North of Santa Rosa were three times more likely to visit the Alexander Valley winery area compared to the Arnold Drive winery area, while zones south of Santa Rosa were three times more likely to visit the Arnold Drive winery area compared to the Alexander Valley winery area.

To account for this intra-county trip distribution pattern in SCTM, each model zone was assigned to a winery tourism area to which they would be roughly three times as likely to visit wineries within that area as opposed to wineries in the other area. The winery tourism area zones are listed in **Table 2-8.**

Table 2-8: Winery Tourism Area Zones

| Winery Tourism Area | Model Zones |
|--|---|
| Alexander Valley (North County Winery Area) | 1-104,106,108-128,130-139,141-156,158-159,194-200,204,206-209,215-237,243,247,250-251,253-254,278-300,351-611,614-769,800-820,832-885,900 |
| Arnold Drive Area (South County Winery Area) | 105,107,129,140,157,160-193,201-203,205,210-214,238-242,244-246,248-249,252,255-277,301-350,612,613,770-799,821-831,886-899 |

Source: Fehr & Peers.

Two new friction factors curves (one for each winery tourism trip purpose) were developed based on an analysis of travel patterns associated with zones that include large wineries from the mobile device data analysis and added to the SCTM based on a combination of existing home-based work and home-based other friction factor curves. Rather than develop completely new curves it was determined more appropriate to utilize and refine existing curves already calibrated to Sonoma County travel patterns.

2.4 Winery Time-of-Day Factors

SCTM relies on time-of-day factors to allocate a percentage of daily trips to the peak hours for each trip purpose. The time-of-day factors for the two winery tourism trip purposes were developed based on an analysis of the typical hours of operation for wineries in Sonoma County. Typical time-of-day factors for daily to peak hour conditions are in the range of 8% to 12%. However, the analysis indicated that wineries are typically open between roughly 10 AM and 4 PM, predominantly outside the typical AM and PM peak hours. It was assumed that 1% of daily winery trips occurred in the AM peak hour and 3% of daily winery trips occurred in the PM peak hour as shown in **Table 2-9**.

Table 2-9: Winery Time-of-Day Factors

| Winery Tourism Trip Purpose | AM Peak Hour | PM Peak Hour |
|---------------------------------------|--------------|--------------|
| Tourism North (North County Wineries) | 1% | 3% |
| Tourism South (South County Wineries) | 1% | 3% |

Source: Fehr & Peers.

2.5 Forecasted Winery Trip Generation

The resulting base year (2015) SCTM-forecasted winery person and vehicle trip generation are summarized in **Table 2-10**, forecasting roughly 19,000 vehicle trips and 51,000 person trips generated by 381 Sonoma County wineries.

Table 2-10: Forecasted Winery Trip Generation

| Winery Tourism Area | Daily | AM Peak Hour | PM Peak Hour |
|-----------------------|--------|--------------|--------------|
| Vehicle Trips | | | |
| North County Wineries | 13,301 | 133 | 399 |
| South County Wineries | 5,724 | 57 | 172 |
| All Wineries | 19,025 | 190 | 571 |
| Person Trips | | | |
| North County Wineries | 35,582 | 356 | 1,067 |
| South County Wineries | 15,311 | 153 | 459 |
| All Wineries | 50,893 | 509 | 1,527 |

Note: Winery person trips were estimated by applying the average group size of 2.8 from the Napa Valley Travel Behavior Study winery survey to the vehicle trip forecasts.

Source: Fehr & Peers.

3. Enhanced Representation of Inter-County Travel

The SCTM is a countywide model referred to as a “windowed” model due to its inclusion of only roadways and land uses within Sonoma County. SCTM gateways generally match Sonoma County gateways and inter-county travel patterns are derived from the MTC regional model which includes the nine-county Bay Area. The aggregate nature of regional models make them very good at forecasting county-to-county travel flows, but they have limitations when it comes to determining which gateways are being used, the origins and destinations within counties, and the purposes of the trips. An additional limitation of the MTC regional model for determining Sonoma County inter-county travel patterns is that Mendocino, Lake, Yolo, and Sacramento counties are not included.

SCTM uses two input files for inter-county trips: “IX_XI_updated_2015.DBF” for inter-Sonoma County trips and “XX_2015.mat” for Sonoma County pass-through trips. As part of the SCTA Model Enhancement effort, Fehr & Peers refined both inter-county trip tables based on mobile device data analysis to more accurately capture inter-county travel. Below is a bulleted summary of the modifications made to SCTM.

- Refinements were made to “IX_XI_updated_2015.DBF” to more accurately capture inter-Sonoma County trips.
- Refinements were made to “XX_2015.mat” to more accurately capture Sonoma County pass-through trips.

3.1 Inter-Sonoma County Trips

Inter-Sonoma County trips are provided as a model input in “IX_XI_updated_2015.DBF,” which provides trip productions and trip attractions for each SCTM gateway by trip purpose. The unmodified base year (2015) trip productions (“_P”) and trip attractions (“_A”) for inter-Sonoma County trips are provided in **Table 3-1** for the following SCTM trip purposes.

- “HW” – home-based work trips
- “SC” – home-based school trips
- “HO” – home-based other trips
- “NH” – non-home-based trips

Winery tourism inter-Sonoma County trips (“TN” and “TS”) are discussed and provided in Chapter 2.

Table 3-1: Unmodified Inter-Sonoma County Trips

| Zone | Gateway | HW_P | SC_P | HO_P | NH_P | HW_A | SC_A | HO_A | NH_A |
|--------------|--------------------------------|---------------|---------------|---------------|---------------|---------------|--------------|---------------|---------------|
| 901 | SR 1 South (Marin) | 108 | 19 | 172 | 137 | 514 | 134 | 396 | 119 |
| 902 | Tomales Road (Marin) | 302 | 54 | 479 | 381 | 1,433 | 373 | 1,104 | 332 |
| 903 | Chileno Val Road (Marin) | 94 | 17 | 150 | 119 | 448 | 116 | 345 | 104 |
| 904 | D Street (Marin) | 452 | 80 | 718 | 571 | 2,150 | 559 | 1,656 | 498 |
| 905 | Novato (Marin) | 2,047 | 1,659 | 5,107 | 3,195 | 8,870 | 726 | 7,167 | 2,109 |
| 906 | San Rafael (Marin) | 1,098 | 195 | 1,742 | 1,386 | 5,217 | 1,357 | 4,018 | 1,208 |
| 907 | Mill Vall/Saus (Marin) | 460 | 70 | 695 | 858 | 5,092 | 1,531 | 4,805 | 1,253 |
| 908 | Other SF/Alameda Co. (Marin) | 3,327 | 711 | 7,959 | 5,581 | 11,467 | 475 | 9,308 | 3,774 |
| 909 | San Fran. CBD (Marin) | 104 | 0 | 184 | 1,111 | 9,973 | 130 | 4,175 | 526 |
| 910 | SR 37 West (Marin) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 911 | SR 37 East (Solano) | 4,730 | 1,376 | 5,426 | 2,320 | 4,020 | 0 | 3,325 | 2,894 |
| 912 | SR 121/12 (Napa) | 5,399 | 2,532 | 7,892 | 3,766 | 9,153 | 2,217 | 7,351 | 3,766 |
| 913 | Trinity Road (Napa) | 100 | 47 | 148 | 84 | 170 | 41 | 136 | 70 |
| 914 | Calistoga/Pet Forest Rd (Napa) | 1,530 | 717 | 2,261 | 1,287 | 2,485 | 602 | 1,993 | 1,022 |
| 915 | SR 128 East (Napa) | 2,157 | 1,843 | 5,309 | 2,117 | 1,001 | 242 | 803 | 1,485 |
| 916 | US 101 North (Mendocino) | 1,833 | 840 | 3,545 | 1,743 | 0 | 0 | 0 | 7,729 |
| 917 | SR 128 North (Mendocino) | 308 | 66 | 471 | 1,777 | 0 | 0 | 0 | 1,771 |
| 918 | SR 1 North (Mendocino) | 622 | 134 | 951 | 568 | 0 | 0 | 0 | 3,591 |
| Total | | 24,670 | 10,361 | 43,209 | 27,000 | 61,993 | 8,504 | 46,583 | 32,252 |

Source: Fehr & Peers.

The mobile device data refined base year (2015) trip productions and trip attractions for inter-Sonoma County trips are provided in **Table 3-2**.

Table 3-2: Refined Inter-Sonoma County Trips

| Zone | Gateway | HW_P | SC_P | HO_P | NH_P | HW_A | SC_A | HO_A | NH_A |
|--------------|--------------------------------|---------------|---------------|---------------|---------------|---------------|--------------|---------------|---------------|
| 901 | SR 1 South (Marin) | 108 | 19 | 172 | 137 | 514 | 134 | 396 | 119 |
| 902 | Tomales Road (Marin) | 302 | 54 | 479 | 381 | 1,433 | 373 | 1,104 | 332 |
| 903 | Chileno Val Road (Marin) | 94 | 17 | 150 | 119 | 448 | 116 | 345 | 104 |
| 904 | D Street (Marin) | 452 | 80 | 718 | 571 | 2,150 | 559 | 1,656 | 498 |
| 905 | Novato (Marin) | 2,847 | 1,659 | 5,907 | 3,195 | 9,670 | 726 | 7,967 | 2,109 |
| 906 | San Rafael (Marin) | 1,248 | 195 | 1,742 | 1,386 | 5,367 | 1,357 | 4,018 | 1,208 |
| 907 | Mill Vall/Saus (Marin) | 460 | 70 | 695 | 858 | 5,092 | 1,531 | 4,805 | 1,253 |
| 908 | Other SF/Alameda Co. (Marin) | 4,327 | 711 | 8,959 | 5,581 | 12,467 | 475 | 10,308 | 3,774 |
| 909 | San Fran. CBD (Marin) | 104 | 0 | 184 | 1,111 | 10,973 | 130 | 5,175 | 526 |
| 910 | SR 37 West (Marin) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 911 | SR 37 East (Solano) | 4,730 | 1,376 | 5,426 | 2,320 | 4,020 | 0 | 3,325 | 2,894 |
| 912 | SR 121/12 (Napa) | 4,399 | 2,532 | 6,892 | 3,266 | 8,153 | 2,217 | 6,351 | 3,266 |
| 913 | Trinity Road (Napa) | 100 | 47 | 148 | 84 | 170 | 41 | 136 | 70 |
| 914 | Calistoga/Pet Forest Rd (Napa) | 2,530 | 717 | 2,261 | 1,287 | 3,485 | 602 | 2,493 | 1,022 |
| 915 | SR 128 East (Napa) | 2,157 | 1,843 | 5,309 | 2,117 | 1,001 | 242 | 803 | 1,485 |
| 916 | US 101 North (Mendocino) | 1,333 | 840 | 1,545 | 1,743 | 1,200 | 800 | 1,500 | 1,729 |
| 917 | SR 128 North (Mendocino) | 308 | 66 | 471 | 1,777 | 0 | 0 | 0 | 1,771 |
| 918 | SR 1 North (Mendocino) | 622 | 134 | 551 | 568 | 1,000 | 0 | 0 | 791 |
| Total | | 26,120 | 10,361 | 41,609 | 26,500 | 67,143 | 9,304 | 50,383 | 22,952 |

Source: Fehr & Peers.

The differences between the unmodified and mobile device data refined base year (2015) trip productions and trip attractions for inter-Sonoma County trips are provided in **Table 3-3**.

Table 3-3: Inter-Sonoma County Trip Differences

| Zone | Gateway | HW_P | SC_P | HO_P | NH_P | HW_A | SC_A | HO_A | NH_A |
|--------------|--------------------------------|--------------|----------|---------------|-------------|--------------|------------|--------------|---------------|
| 901 | SR 1 South (Marin) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 902 | Tomales Road (Marin) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 903 | Chileno Val Road (Marin) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 904 | D Street (Marin) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 905 | Novato (Marin) | 800 | 0 | 800 | 0 | 800 | 0 | 800 | 0 |
| 906 | San Rafael (Marin) | 150 | 0 | 0 | 0 | 150 | 0 | 0 | 0 |
| 907 | Mill Vall/Saus (Marin) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 908 | Other SF/Alameda Co. (Marin) | 1,000 | 0 | 1,000 | 0 | 1,000 | 0 | 1,000 | 0 |
| 909 | San Fran. CBD (Marin) | 0 | 0 | 0 | 0 | 1,000 | 0 | 1,000 | 0 |
| 910 | SR 37 West (Marin) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 911 | SR 37 East (Solano) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 912 | SR 121/12 (Napa) | -1,000 | 0 | -1,000 | -500 | -1,000 | 0 | -1,000 | -500 |
| 913 | Trinity Road (Napa) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 914 | Calistoga/Pet Forest Rd (Napa) | 1,000 | 0 | 0 | 0 | 1,000 | 0 | 500 | 0 |
| 915 | SR 128 East (Napa) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 916 | US 101 North (Mendocino) | -500 | 0 | -2,000 | 0 | 1,200 | 800 | 1,500 | -6,000 |
| 917 | SR 128 North (Mendocino) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 918 | SR 1 North (Mendocino) | 0 | 0 | -400 | 0 | 1,000 | 0 | 0 | -2,800 |
| Total | | 1,450 | 0 | -1,600 | -500 | 5,150 | 800 | 3,800 | -9,300 |
| | | -650 | | | | 450 | | | |

Source: Fehr & Peers.

As shown in **Table 3-3**, base year (2015) total daily home-based work productions were increased by 1,450 trips while home-based other and non-home-based productions were decreased by 1,600 and 500 trips, respectively. For trip attractions, home-based work attractions were increased by 5,150 trips, home-based school attractions were increased by 800 trips, and home-based other attractions were increased by 3,800 trips, while non-home-based attractions were decreased by 9,300 trips.

Overall, base year (2015) trip productions were decreased by 650 trips and trip attractions were increased by 450 trips, indicating the majority of refinements were the shifting of trips between SCTM gateways and trip purposes.

3.2 Sonoma County Pass-Through Trips

Sonoma County pass-through trips are provided as a model input in "XX_2015.mat," which provides vehicle trip origin-destination pairs for daily, AM peak hour, and PM peak hour conditions. The unmodified base year (2015) model, 2017 mobile device data, and adjustments made to pass-through origin-destination pairs for daily conditions are provided in **Table 3-4**, AM peak hour conditions are provided in **Table 3-5**, and PM peak hour conditions are provided in **Table 3-6**.

Table 3-4: Daily Sonoma County Pass-Through Trips

| From Zone | From Gateway | To Zone | To Gateway | Mobile Device Data | Unmodified Model | Adjustment |
|--------------|------------------------------|---------|------------------------------|--------------------|------------------|---------------|
| 908 | Other SF/Alameda Co. (Marin) | 916 | US 101 North (Mendocino) | 1,493 | 1,493 | 0 |
| 908 | Other SF/Alameda Co. (Marin) | 918 | SR 1 North (Mendocino) | 83 | 83 | 0 |
| 910 | SR 37 West (Marin) | 911 | SR 37 East (Solano) | 8,358 | 8,208 | 150 |
| 910 | SR 37 West (Marin) | 912 | SR 121/12 (Napa) | 2,409 | 4,409 | -2,000 |
| 911 | SR 37 East (Solano) | 910 | SR 37 West (Marin) | 8,358 | 8,208 | 150 |
| 912 | SR 121/12 (Napa) | 910 | SR 37 West (Marin) | 2,409 | 4,409 | -2,000 |
| 916 | US 101 North (Mendocino) | 908 | Other SF/Alameda Co. (Marin) | 1,493 | 1,493 | 0 |
| 918 | SR 1 North (Mendocino) | 908 | Other SF/Alameda Co. (Marin) | 83 | 83 | 0 |
| Total | | | | 24,686 | 28,386 | -3,700 |

Source: Fehr & Peers.

Table 3-5: AM Peak Hour Sonoma County Pass-Through Trips

| From Zone | From Gateway | To Zone | To Gateway | Mobile Device Data | Unmodified Model | Adjustment |
|--------------|------------------------------|---------|------------------------------|--------------------|------------------|-------------|
| 908 | Other SF/Alameda Co. (Marin) | 916 | US 101 North (Mendocino) | 259 | 259 | 0 |
| 908 | Other SF/Alameda Co. (Marin) | 918 | SR 1 North (Mendocino) | 30 | 30 | 0 |
| 910 | SR 37 West (Marin) | 911 | SR 37 East (Solano) | 489 | 689 | -200 |
| 910 | SR 37 West (Marin) | 912 | SR 121/12 (Napa) | 269 | 569 | -300 |
| 911 | SR 37 East (Solano) | 910 | SR 37 West (Marin) | 652 | 952 | -300 |
| 912 | SR 121/12 (Napa) | 910 | SR 37 West (Marin) | 200 | 200 | 0 |
| 916 | US 101 North (Mendocino) | 908 | Other SF/Alameda Co. (Marin) | 63 | 63 | 0 |
| 918 | SR 1 North (Mendocino) | 908 | Other SF/Alameda Co. (Marin) | 0 | 0 | 0 |
| Total | | | | 1,962 | 2,762 | -800 |

Source: Fehr & Peers.

Table 3-6: PM Peak Hour Sonoma County Pass-Through Trips

| From Zone | From Gateway | To Zone | To Gateway | Mobile Device Data | Unmodified Model | Adjustment |
|--------------|------------------------------|---------|------------------------------|--------------------|------------------|-------------|
| 908 | Other SF/Alameda Co. (Marin) | 916 | US 101 North (Mendocino) | 144 | 144 | 0 |
| 908 | Other SF/Alameda Co. (Marin) | 918 | SR 1 North (Mendocino) | 3 | 3 | 0 |
| 910 | SR 37 West (Marin) | 911 | SR 37 East (Solano) | 678 | 978 | -300 |
| 910 | SR 37 West (Marin) | 912 | SR 121/12 (Napa) | 365 | 665 | -300 |
| 911 | SR 37 East (Solano) | 910 | SR 37 West (Marin) | 465 | 665 | -200 |
| 912 | SR 121/12 (Napa) | 910 | SR 37 West (Marin) | 330 | 330 | 0 |
| 916 | US 101 North (Mendocino) | 908 | Other SF/Alameda Co. (Marin) | 132 | 132 | 0 |
| 918 | SR 1 North (Mendocino) | 908 | Other SF/Alameda Co. (Marin) | 0 | 0 | 0 |
| Total | | | | 2,117 | 2,917 | -800 |

Source: Fehr & Peers.

4. Enhanced Representation of Land Use Occupancy

According to a 2016 Sonoma Index-Tribune article, Sonoma County had 1,333 approved vacation rental properties in 2016, representing a substantial number of dwelling units not fully occupied throughout the year.¹ Furthermore, many of these properties are located in unincorporated areas and are likely not occupied on all weekdays throughout the year. Given SCTM uses occupied housing units as a key residential input and was developed to forecast travel patterns for an average weekday in 2015 and 2040, it can be assumed that trip generation in unincorporated areas of Sonoma County is likely overestimated if a single set of residential trip generation rates are used for all of Sonoma County. To previously account for this, occupancy fields were added to the model land use input table, allowing users to specify the percent reduction in productions and attractions for residential uses.

As part of the SCTA Model Enhancement effort, Fehr & Peers refined the land use occupancy factors based on an analysis of observed mobile device data and incorporated them into the SCTM trip generation script to streamline the process and more accurately account for land use occupancy in unincorporated areas. Below is a bulleted summary of the modifications made to SCTM.

- Land use occupancy factors were refined based on an analysis of observed mobile device data and added to the SCTM trip generation script.
- **All "OCC_XXXX" fields in the model land use input table were set to "1" as land use occupancy is now accounted for through the SCTM trip generation script.**

4.1 Land Use Occupancy Factors

Table 4-1 presents a comparison of 2017 mobile device data trip generation in select unincorporated areas to model forecasted trip generation. This comparison was used to develop residential land use occupancy factors that were incorporated into the SCTM trip generation script to more accurately account for dwelling units that are not fully occupied on weekdays throughout the year. The residential land use occupancy factors were applied to trip productions of the SCTM TAZs to reduce the trips produced by households in select unincorporated areas/zones. The factors were not applied to trip attractions of the SCTM TAZs so as to not reduce the attractions of non-residential uses that likely attract visitors from outside the area.

¹ <https://www.sonomanews.com/article/news/sharp-rise-in-sonoma-county-vacation-rentals-offers-mix-of-benefits-and-con/>

Table 4-1: Unincorporated County Residential Land Use Occupancy Factors

| Area | Model TAZs | 2017 Big Data Trips | 2015 SCTM Trips | Residential Occupancy Factor | Final Refined Trips |
|-----------------------------------|---|---------------------|-----------------|------------------------------|---------------------|
| North County Unincorporated Areas | 10,11,21-33,40-50,53,75-80,87,93,95,100,108,112,120,121,131,137,145-152,158,292-295 | 105,549 | 142,228 | 0.73 | 103,826 |
| South County Unincorporated Areas | 107,129,140,157,161-165,173-178,181-190,211,257,262-265,276 | 31,554 | 70,638 | 0.50 | 35,319 |
| Total | | 137,103 | 212,866 | 0.65 | 139,145 |

Source: Fehr & Peers.

As shown in **Table 4-1**, the mobile device data to SCTM comparison suggests that residential trip generation in the select unincorporated areas may be 65% of what is included in the unmodified model, resulting in roughly 139,000 daily trips as opposed to roughly 213,000 daily trips in the base year (2015) SCTM.

Two additional sets of residential land use occupancy factors were included in the unmodified model’s land use input table. Factors of 0.50 were included for coastal unincorporated areas in northern Sonoma County and for the Russian River area. A mobile device data analysis was conducted to refine the factors but it was determined that the original 0.50 factor from the model land use input file was appropriate and was maintained for both areas as shown in **Table 4-2**.

Table 4-2: Additional Residential Land Use Occupancy Factors

| Area | Model TAZs | Factor from Land Use Input File |
|------------------------------|------------|---------------------------------|
| Coastal Unincorporated Areas | 1-6,12-16 | 0.50 |
| Russian River Area | 61-74 | 0.50 |

Source: Fehr & Peers.

4.1.1 Land Use Table Modifications

All “OCC_XXXX” fields in the model land use input table were set to “1” as land use occupancy is now accounted for through the SCTM trip generation script.

5. Expanded Model Boundaries

The SCTM is a trip-based model that generates daily person trip-ends for each TAZ across four trip purposes based on land use input variables. This creates a challenge for complying with OPR guidance on VMT estimation for SB 743 compliance because VMT generation is not directly tied to specific land use categories but to the four trip purposes at the TAZ level, which often contain a mix of land uses. However, since production trip-ends are generated by residential land uses and attraction trip-ends are generated by non-residential land uses, we can translate OPR's land uses into model terms. For instance, the closest approximation for residential is home-based production trips while the closest for office is home-based work attraction trips. VMT can then be calculated for these purposes and tied back to a specific TAZ or group of TAZs.

An additional limitation of SCTM is that the extents of the current "windowed" model are not sufficient to adequately capture the full length of trips generated by land uses in Sonoma County as recommended by OPR. SCTM currently captures the portion of trips outside Sonoma County through the incorporation of gateway trip lengths derived from the MTC model. However, as discussed in Chapter 3, Mendocino, Lake, Yolo, and Sacramento counties are not included in the MTC model and trip lengths to other gateway locations was estimated using older information from statewide or regional travel surveys.

As part of the SCTA Model Enhancement effort, Fehr & Peers maintained the current model boundaries but utilized mobile device data to measure the full length of inter-county trips generated by land uses in Sonoma County, which were then compared to the existing model inter-county trip lengths to refine the model vehicle skim matrices used to forecast VMT per the OPR guidance. Below is a bulleted summary of the modifications made to SCTM.

- Mobile device data was analyzed by SCTM Gateway, SCTM Area, and trip purpose to develop three matrices of additional trip lengths to add to the model-generated vehicle skim matrices.
- The additional trip length matrices were incorporated into the VMT summary script "SUMAT00F.S" to more accurately calculate total VMT generated by land uses in Sonoma County.

5.1 Inter-Sonoma County Trip Length Analysis

Mobile device data collected as part of the Sonoma County Travel Behavior Study was analyzed to determine the length of inter-Sonoma County trips by trip purpose between the five SCTM gateways and TAZs within the 15 aggregated areas of Sonoma County shown in **Table 5-1**. The goal of the analysis was to generate matrices of average trips lengths for trips that travel between each of the five SCTM gateways and 15 aggregated areas (20 by 20 matrix) for each of the three trip purposes, capturing the full extent of the trips. This would then be compared to corresponding model-forecasted trip lengths to determine the level of adjustment needed for SCTM to capture the full extent of the trips as recommended by OPR.

Table 5-1: SCTM Gateways, Aggregated Areas, and Trip Purposes

| SCTM Gateway | SCTM Aggregated Area | SCTM Trip Purpose |
|-----------------------|------------------------------|-------------------|
| US 101 @ Marin CL | Cloverdale | Home-Based Work |
| SR 37 @ Napa CL | Cotati | Home-Based Other |
| SR 12 @ Napa CL | Graton Casino | Non-Home-Based |
| PFR @ Napa CL | Healdsburg | |
| US 101 @ Mendocino CL | Petaluma | |
| | Rohnert Park | |
| | Santa Rosa | |
| | SC Alexander Val Winery Zone | |
| | SC Winery Zone Arnold Dr S | |
| | Sears Point | |
| | Sebastopol | |
| | Sonoma | |
| | Sonoma-Skypark | |
| | Unincorporated | |
| | Windsor | |

Source: Fehr & Peers.

The comparison of mobile device data inter-Sonoma County trip lengths for each gateway-to-aggregated area and aggregated area-to-gateway origin-destination pair to corresponding trip length information from the base year (2015) SCTM is provided in the appendix. A comparison for all vehicle trips travelling through each SCTM gateway are presented below due to the size of the comparison matrices, followed by the resulting aggregated area-to-gateway origin-destination pair trip length adjustments.

5.1.1 Inter-Sonoma County Trip Length Comparison

The inter-Sonoma County trip length comparison for all vehicle trips travelling through each SCTM gateway for home-based work trips is provided in **Table 5-2**, for home-based other trips is provided in **Table 5-3**, and for non-home-based trips is provided in **Table 5-4**.

Table 5-2: Home-Based Work Inter-County Trip Length Comparison

| SCTM Gateway | 2015 SCTM | 2017 Mobile Device Data | Average Trip Length Difference |
|-----------------------|-----------|-------------------------|--------------------------------|
| US 101 @ Marin CL | 28 | 40 | 12 |
| SR 37 @ Napa CL | 34 | 53 | 19 |
| SR 12 @ Napa CL | 18 | 31 | 13 |
| PFR @ Napa CL | 18 | 32 | 15 |
| US 101 @ Mendocino CL | 35 | 63 | 28 |

Source: Fehr & Peers.

Table 5-3: Home-Based Other Inter-County Trip Length Comparison

| SCTM Gateway | 2015 SCTM | 2017 Mobile Device Data | Average Trip Length Difference |
|-----------------------|-----------|-------------------------|--------------------------------|
| US 101 @ Marin CL | 35 | 46 | 11 |
| SR 37 @ Napa CL | 50 | 61 | 11 |
| SR 12 @ Napa CL | 22 | 31 | 9 |
| PFR @ Napa CL | 17 | 28 | 11 |
| US 101 @ Mendocino CL | 50 | 64 | 14 |

Source: Fehr & Peers.

Table 5-4: Non-Home-Based Inter-County Trip Length Comparison

| SCTM Gateway | 2015 SCTM | 2017 Mobile Device Data | Average Trip Length Difference |
|-----------------------|-----------|-------------------------|--------------------------------|
| US 101 @ Marin CL | 30 | 45 | 15 |
| SR 37 @ Napa CL | 36 | 64 | 29 |
| SR 12 @ Napa CL | 19 | 32 | 13 |
| PFR @ Napa CL | 16 | 27 | 10 |
| US 101 @ Mendocino CL | 33 | 60 | 26 |

Source: Fehr & Peers.

As shown in **Table 5-2**, the average trip length difference between the 2017 mobile device data and the base year (2015) SCTM for home-based work vehicle trips varies by SCTM gateway and range from 12 miles to 28 miles. For home-based other vehicle trips, the average trip length differences range from 9 miles to 14 miles. For non-home-based vehicle trips, the average trip length differences range from 10 miles to 29 miles.

5.1.2 Inter-Sonoma County Trip Length Adjustments

The resulting Inter-Sonoma County trip length adjustments for each aggregated area-to-gateway origin-destination pair for home-based work trips is provided in **Table 5-5**, for home-based other trips is provided in **Table 5-6**, and for non-home-based trips is provided in **Table 5-7**.

Table 5-5: Additional Home-Based Work Inter-County O-D Trip Lengths

| SCTM Aggregated Area | US 101 @ Marin CL | SR 37 @ Napa CL | SR 12 @ Napa CL | PFR @ Napa CL | US 101 @ Mendocino CL |
|------------------------------|-------------------|-----------------|-----------------|---------------|-----------------------|
| Cloverdale | 36 | | | | 6 |
| Cotati | 1 | 5 | 2 | | |
| Graton Casino | 17 | 7 | 5 | | |
| Healdsburg | 25 | | 8 | 10 | 5 |
| Petaluma | 1 | 10 | 9 | | |
| Rohnert Park | 9 | 4 | 10 | 13 | 6 |
| Santa Rosa | 12 | 16 | 11 | 11 | 10 |
| SC Alexander Val Winery Zone | | | | | |
| SC Winery Zone Arnold Dr S | | | 1 | | |
| Sears Point | | 25 | 4 | | |
| Sebastopol | 34 | | | 12 | |
| Sonoma | -3 | | 6 | | |
| Sonoma-Skypark | | -8 | 3 | | |
| Unincorporated | 15 | 17 | 14 | 24 | 31 |
| Windsor | 16 | | 27 | 24 | 16 |

Source: Fehr & Peers.

Table 5-6: Additional Home-Based Other Inter-County O-D Trip Lengths

| SCTM Aggregated Area | US 101 @ Marin CL | SR 37 @ Napa CL | SR 12 @ Napa CL | PFR @ Napa CL | US 101 @ Mendocino CL |
|------------------------------|-------------------|-----------------|-----------------|---------------|-----------------------|
| Cloverdale | -5 | 30 | -9 | | 7 |
| Cotati | 10 | 26 | 6 | 4 | 3 |
| Graton Casino | 18 | 11 | 17 | 17 | |
| Healdsburg | 10 | 5 | 5 | 44 | 12 |
| Petaluma | 11 | 16 | 17 | 23 | 13 |
| Rohnert Park | 6 | 9 | 18 | 17 | 4 |
| Santa Rosa | 8 | 14 | 14 | 12 | 12 |
| SC Alexander Val Winery Zone | 12 | | | | |
| SC Winery Zone Arnold Dr S | | -6 | 4 | | |
| Sears Point | | 11 | -4 | | |
| Sebastopol | 5 | 22 | 1 | 32 | 9 |
| Sonoma | 10 | 1 | 5 | 4 | 15 |
| Sonoma-Skypark | | | 11 | | |
| Unincorporated | -7 | -7 | 1 | 8 | 12 |
| Windsor | 5 | 14 | 14 | 7 | 13 |

Source: Fehr & Peers.

Table 5-7: Additional Non-Home-Based Inter-County O-D Trip Lengths

| SCTM Aggregated Area | US 101 @ Marin CL | SR 37 @ Napa CL | SR 12 @ Napa CL | PFR @ Napa CL | US 101 @ Mendocino CL |
|------------------------------|-------------------|-----------------|-----------------|---------------|-----------------------|
| Cloverdale | 36 | | | | 8 |
| Cotati | 13 | 26 | 39 | | |
| Graton Casino | 18 | 29 | 3 | | |
| Healdsburg | 20 | | 22 | | 12 |
| Petaluma | 7 | 18 | 10 | 13 | |
| Rohnert Park | 7 | 13 | 12 | 10 | |
| Santa Rosa | 10 | 25 | 13 | 8 | 10 |
| SC Alexander Val Winery Zone | 51 | | | 11 | 36 |
| SC Winery Zone Arnold Dr S | | 0 | 5 | | |
| Sears Point | | 25 | 4 | | |
| Sebastopol | 18 | | 1 | | |
| Sonoma | -2 | 4 | 7 | 4 | |
| Sonoma-Skypark | | | 8 | | |
| Unincorporated | 22 | 30 | 11 | 12 | 21 |
| Windsor | 19 | | 13 | 12 | 12 |

Source: Fehr & Peers.

5.1.3 Trip Length Adjustment Disaggregation

The additional gateway-to-aggregated area and aggregated area-to-gateway origin-destination trip length adjustments (from the 20 by 20 matrices) were then disaggregated to the 900-zone SCTM TAZ system in the form of a new matrix input file called "SCTA_Outside_TripLengths.mat" in the "Global Files" directory. The resulting matrix of trip lengths adjustments contained values for all 900 SCTM TAZs and 18 SCTM gateways with a matrix core for each trip purpose.

The additional trip length matrix input file was then incorporated into the VMT summary script "SUMAT00F.S," which adds the three matrices of additional trip lengths to the model-generated vehicle skim matrices to more accurately measure total VMT generated by land uses in Sonoma County and meet the recommendations provided by OPR.

5.2 Vehicle Miles Travelled

The resulting daily VMT generated by the VMT summary script “SUMAT00F.S” for all vehicle trips generated by Sonoma County land use for base year (2015) conditions is presented in **Table 5-8**, along with the same VMT measurement from 2015 MTC Travel Model One, 2015 MTC Travel Model Two, and the Sonoma County Travel Behavior Study for comparison purposes.

Table 5-8: Sonoma County-Generated VMT Comparison

| VMT Source | 2015 Daily VMT |
|---|----------------|
| 2015 MTC Travel Model One | 13,573,651 |
| 2015 MTC Travel Model Two | 13,729,824 |
| Sonoma County Travel Behavior Study (Spring 2017) | 15,251,198 |
| 2015 SCTA Model (Unmodified) | 13,084,002 |
| 2015 SCTA Model (Trip Length Enhancement) | 14,287,618 |
| Difference | 1,203,216 |
| Percent Difference | 9.2% |

Source: Fehr & Peers.

As shown in **Table 5-8**, the unmodified 2015 SCTA model forecasted approximately 13.1 million daily VMT generated by Sonoma County land uses in 2015, below the approximately 13.6 million forecasted by MTC Travel Model One and the approximately 15.3 million estimated from the Sonoma County Travel Behavior Study.

The resulting SCTA model VMT being lower than MTC Travel Model One and the Sonoma County Travel Behavior Study is likely due to the unmodified SCTA Model capturing the portion of trips outside Sonoma County through the incorporation of gateway trip lengths derived from the MTC model, which as discussed in Chapter 3, does not include Mendocino, Lake, Yolo, and Sacramento counties thereby underestimating VMT for travel to/from these areas. However, as shown in **Table 5-9** with yellow shading, mobile device data collected as part of the Sonoma County Travel Behavior Study indicated that roughly 12% of Sonoma inter-county trips travel between Sonoma County and Mendocino, Lake, Yolo, and Sacramento counties.

With the trip length adjustments discussed in the previous section added to the model-generated vehicle skim matrices, **the refined 2015 SCTA Weekday Model forecasted approximately 14.3 million daily VMT**, within the range of MTC Travel Model One and the Sonoma County Travel Behavior Study.

Table 5-9: Sonoma County Weekday All-Day Inter-County Trips

| Origin of Trips into Sonoma County | | County | Destination of Trips out of Sonoma County | |
|------------------------------------|-------------|---------------|---|-------------|
| Trips | Percent | | Trips | Percent |
| 5,370 | 7% | Mendocino | 5,662 | 7% |
| 1,553 | 2% | Lake | 1,708 | 2% |
| 27,405 | 34% | Marin | 27,201 | 34% |
| 14,301 | 18% | Napa | 14,133 | 18% |
| 7,471 | 9% | Solano | 7,409 | 9% |
| 667 | 1% | Yolo | 820 | 1% |
| 1,494 | 2% | Sacramento | 1,590 | 2% |
| 4,972 | 6% | Contra Costa | 4,552 | 6% |
| 5,262 | 7% | Alameda | 4,904 | 6% |
| 1,206 | 2% | Santa Clara | 1,282 | 2% |
| 2,353 | 3% | San Mateo | 2,622 | 3% |
| 7,678 | 10% | San Francisco | 7,893 | 10% |
| 79,733 | 100% | Total | 79,776 | 100% |

Source: Fehr & Peers.

6. Weekday Model Validation

After implementing the model enhancements discussed above in the base year (2015) SCTA weekday model, the model was statically validated to test the model’s predictive capabilities before it was used to produce 2040 forecasts. The validation process compares outputs from base year model components to observed data to determine if model outputs fall within an acceptable range of error.

The California Transportation Commission established guidelines for determining whether a model is valid and acceptable for forecasting future year traffic volumes. **Table 6-1** presents a comparison of 2015 weekday model volumes to weekday traffic count data provided by SCTA staff using the validation thresholds discussed in 2017 California Regional Transportation Plan Guidelines (California Transportation Commission, January 18, 2017)² for AM peak hour, PM peak hour, and daily conditions. Fehr & Peers uses an internal target validation criteria of plus or minus 10 percent for any categories not included in the Commission guidelines. Green shading indicates the threshold was met, orange shading would indicate the threshold was not met.

Table 6-1: 2015 Weekday Model Validation

| Validation Measure | AM Peak Hour | PM Peak Hour | Daily | Threshold |
|---|--------------|--------------|-------|---------------|
| Volume-to-Count Ratio | 0.97 | 1.00 | 0.97 | +/- 10% |
| Percent of Links Within Deviation Allowance | 76.5% | 80.4% | 82.5% | At Least 75% |
| Percent Root Mean Square Error | 25.7% | 22.1% | 24.4% | Below 40% |
| Correlation Coefficient | 0.96 | 0.98 | 0.99 | At Least 0.88 |
| Number of Validation Locations | 102 | 102 | 314 | |

Source: Fehr & Peers.

As shown in **Table 6-1**, the 2015 SCTA weekday model highway volumes meet all 2017 California RTP model validation standards for AM peak hour, PM peak hour, and daily conditions, a critical step in ensuring a high level of confidence in the weekday model scenario forecasts.

² <https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/f0009312-2017rtpguidelinesformpos-a11y.pdf>

7. Weekend Model Development

After implementing the model enhancements and validation of the base year (2015) SCTA weekday model, the model was refined based on a comparison of weekend and weekday travel pattern data from available traffic counts and mobile device data collected as part of the Sonoma County Travel Behavior Study to develop a base year (2015) SCTA weekend model.

The focus of the refinements were to the trip generation component, specifically the production and attraction rates for the six model trip purposes (including the tourism north and tourism south trip purposes added as part of the weekday model’s enhanced representation of winery uses). Inter-Sonoma County and Sonoma County pass-through trips were also modified based on relative comparisons of external trip making between weekdays and weekends. Model peak hours were also refined to represent the average weekend day peak hour and the average weekend day peak hour during the traditional PM peak period (3 PM to 7 PM).

The model’s trip distribution, mode choice, and assignment procedures remained relatively unchanged. However, the model’s transit line input file was modified by SCTA staff to reflect weekend conditions.

7.1 Weekend vs. Weekday Travel Patterns

This section presents a summary of the comparison between weekend and weekday travel patterns used to develop a base year (2015) SCTA weekend model.

7.1.1 Mobile Device Data

Table 7-1 presents a comparison of Sonoma County to Sonoma County trip making by trip purpose from mobile device data collected as part of the Sonoma County Travel Behavior Study.

Table 7-1: Sonoma County to Sonoma County Trips by Trip Purpose

| Trip Purpose | Mobile Device Data Weekday | Mobile Device Data Weekend | Difference | % Difference |
|------------------------|----------------------------|----------------------------|------------|--------------|
| Home-Based Work Trips | 645,019 | 237,476 | -407,543 | -63% |
| Home-Based Other Trips | 1,255,405 | 1,215,585 | -39,820 | -3% |
| Non-Home-Based Trips | 1,186,210 | 874,796 | -311,414 | -26% |
| Total Trips | 3,086,633 | 2,327,856 | -758,777 | -25% |

Source: Fehr & Peers.

As shown in **Table 7-1**, total Sonoma County to Sonoma County trips are roughly 25% lower on an average weekend day than on an average weekday.

Table 7-2 presents a comparison of trips at Sonoma County gateways from mobile device data collected as part of the Sonoma County Travel Behavior Study.

Table 7-2: Trips at Sonoma County Gateways

| Sonoma County Gateway | Mobile Device Data Weekday | Mobile Device Data Weekend | Difference | % Difference |
|-----------------------------------|----------------------------|----------------------------|------------|--------------|
| US 101 @ Marin County Line | 81,000 | 65,000 | -16,000 | -20% |
| SR 37 @ Marin County Line | 37,000 | 32,000 | -5,000 | -14% |
| SR 37 @ Napa County Line | 35,000 | 35,000 | 0 | 0% |
| SR 12 @ Napa County Line | 31,000 | 24,300 | -6,700 | -22% |
| PFR @ Napa County Line | 11,000 | 9,000 | -2,000 | -18% |
| US 101 @ Mendocino County Line | 13,000 | 15,000 | 2,000 | 15% |
| Highway 1 @ Mendocino County Line | 2,000 | 2,000 | 0 | 0% |
| Total | 210,000 | 182,300 | -27,700 | -13% |

Source: Fehr & Peers.

As shown in **Table 7-2**, total trips at Sonoma County gateways are roughly 13% lower on an average weekend day than on an average weekday.

Table 7-3 presents a comparison of Sonoma County pass-through trips from mobile device data collected as part of the Sonoma County Travel Behavior Study.

Table 7-3: Sonoma County Pass-Through Trips

| Day | Trips |
|----------------------------|--------|
| Mobile Device Data Weekday | 24,633 |
| Mobile Device Data Weekend | 22,774 |
| Difference | -1,859 |
| % Difference | -8% |

Source: Fehr & Peers.

As shown in **Table 7-3**, total Sonoma County pass-through trips are roughly 8% lower on an average weekend day than on an average weekday.

Table 7-4 presents a comparison of trip making in unincorporated Sonoma County from mobile device data collected as part of the Sonoma County Travel Behavior Study.

Table 7-4: Trip Making in Unincorporated Sonoma County

| Day | Trips |
|----------------------------|---------|
| Mobile Device Data Weekday | 214,930 |
| Mobile Device Data Weekend | 173,614 |
| Difference | -41,317 |
| % Difference | -19% |

Source: Fehr & Peers.

As shown in **Table 7-4**, total trip making in unincorporated Sonoma County is roughly 19% lower on an average weekend day than on an average weekday.

Table 7-5 presents a comparison of total Sonoma County vehicle trips from mobile device data collected as part of the Sonoma County Travel Behavior Study.

Table 7-5: Total Sonoma County Vehicle Trips

| Day | Sonoma County to Sonoma County Trips | Trips at Sonoma County Gateways | Sonoma County Pass-Through Trips | Trip Making in Unincorporated Sonoma County | Total Sonoma County Vehicle Trips |
|----------------------------|--------------------------------------|---------------------------------|----------------------------------|---|-----------------------------------|
| Mobile Device Data Weekday | 3,086,633 | 210,000 | 24,633 | 214,930 | 3,321,266 |
| Mobile Device Data Weekend | 2,327,856 | 182,300 | 22,774 | 173,614 | 2,532,930 |
| Difference | -758,777 | -27,700 | -1,859 | -41,317 | -788,336 |
| % Difference | -25% | -13% | -8% | -19% | -24% |

Source: Fehr & Peers.

As shown in **Table 7-5**, total Sonoma County vehicle trips are roughly 24% lower on an average weekend day than on an average weekday.

7.1.2 Traffic Count Data

Table 7-6 presents a comparison of average weekday and average weekend day traffic count data collected from Caltrans' Performance Measurement System (PeMS) in fall 2015.

Table 7-6: Weekend vs. Weekday Traffic Count Data

| Freeway Location | Average Weekday Volume | Average Weekend Day Volume | Difference | % Difference |
|--|------------------------|----------------------------|-----------------|--------------|
| US 101 SB Between Washington St Ramps | 41,545 | 39,858 | -1,687 | -4% |
| US 101 SB Between Old Redwood Highway Ramps | 49,349 | 46,169 | -3,180 | -6% |
| US 101 SB Between W Sierra Ave Ramps | 51,372 | 47,075 | -4,297 | -8% |
| US 101 SB South of Rohnert Park Expwy | 54,501 | 47,443 | -7,058 | -13% |
| US 101 SB Between SR 12 Ramps | 59,518 | 49,255 | -10,263 | -17% |
| US 101 SB Between Guernville Rd Ramps | 54,594 | 45,426 | -9,167 | -17% |
| US 101 SB Between Hopper Ave Ramps | 46,495 | 40,398 | -6,098 | -13% |
| US 101 SB Between Airport Rd Ramps | 39,151 | 34,014 | -5,138 | -13% |
| US 101 SB Between Old Redwood Highway Hook Ramps | 25,396 | 22,904 | -2,491 | -10% |
| US 101 SB South of Geyserville Ave | 14,133 | 13,410 | -722 | -5% |
| US 101 SB South of Asti Post Office Rd | 12,556 | 11,978 | -578 | -5% |
| US 101 SB South of Cloverdale Blvd | 8,037 | 8,312 | 274 | 3% |
| US 101 NB South of Rich Ranch Rd | 12,941 | 11,457 | -1,485 | -11% |
| US 101 NB Between Geyserville Ave Ramps | 12,638 | 11,063 | -1,575 | -12% |
| US 101 NB South of Healdsburg | 26,234 | 22,328 | -3,906 | -15% |
| US 101 NB Between Shiloh Rd Ramps | 35,562 | 29,407 | -6,155 | -17% |
| US 101 NB Between Cleveland Ave Hook Ramps | 68,580 | 54,342 | -14,238 | -21% |
| US 101 NB Between College Ave Ramps | 70,563 | 58,062 | -12,501 | -18% |
| US 101 NB Between Rohnert Park Expwy Ramps | 33,602 | 31,109 | -2,494 | -7% |
| US 101 NB Between Sierra Ave Ramps | 55,865 | 50,473 | -5,392 | -10% |
| US 101 NB Bnorth of Old Redwood Hwy | 57,301 | 51,066 | -6,235 | -11% |
| US 101 NB Between E Washington St Ramps | 44,838 | 42,355 | -2,483 | -6% |
| US 101 NB Between Petaluma Blvd Ramps | 38,258 | 36,054 | -2,205 | -6% |
| SR 37 EB East of Atherton Ave | 18,047 | 16,278 | -1,769 | -10% |
| SR 37 WB East of Atherton Ave | 18,785 | 17,740 | -1,045 | -6% |
| SR 37 WB East of 121 | 18,460 | 18,140 | -320 | -2% |
| SR 37 EB East of 121 | 18,996 | 18,483 | -512 | -3% |
| Total | 987,317 | 874,599 | -112,718 | -11% |

Source: Fehr & Peers.

As shown in **Table 7-6**, total traffic volumes on U.S. 101 and SR 37 are roughly 11% lower on an average weekend day than on an average weekday.

PeMS traffic count data was also used to determine the average weekend day peak hour and the average weekend day peak hour during the traditional PM peak period (3 PM to 7 PM) for weekend model peak hour development. **Table 7-7** presents the sum of hourly traffic volumes for all 27 freeway locations in **Table 7-6**. Green shading indicates the peak hour for an average weekend day, orange shading indicates the peak hour during the traditional PM peak period (3 PM to 7 PM).

Table 7-7: Weekend Traffic Volume Data by Hour of Day

| Hour of Day | Traffic Volume |
|-------------|----------------|
| 0:00 | 11,843 |
| 1:00 | 7,555 |
| 2:00 | 5,782 |
| 3:00 | 4,737 |
| 4:00 | 5,641 |
| 5:00 | 9,306 |
| 6:00 | 15,857 |
| 7:00 | 24,856 |
| 8:00 | 36,243 |
| 9:00 | 49,155 |
| 10:00 | 58,738 |
| 11:00 | 63,835 |
| 12:00 | 64,848 |
| 13:00 | 64,326 |
| 14:00 | 63,876 |
| 15:00 | 63,190 |
| 16:00 | 61,436 |
| 17:00 | 58,274 |
| 18:00 | 51,549 |
| 19:00 | 43,174 |
| 20:00 | 37,428 |
| 21:00 | 31,906 |
| 22:00 | 24,708 |
| 23:00 | 16,335 |

Source: Fehr & Peers.

As shown in **Table 7-7**, the average weekend day peak hour occurs from 12 PM to 1 PM, while the average weekend day peak hour during the traditional PM peak period (3 PM to 7 PM) occurs from 3 PM to 4 PM.

7.1.3 Weekend vs. Weekday Travel Pattern Summary

A comparison of weekend vs. weekday travel pattern data is presented in **Table 7-8**.

Table 7-8: Weekend vs. Weekday Travel Pattern Summary

| Trip Type | Average Weekend Day vs. Average Weekday |
|--|---|
| Sonoma County to Sonoma County Trips | -25% |
| Trips at Sonoma County Gateways | -13% |
| Sonoma County Pass-Through Trips | -8% |
| Trip Making in Unincorporated Sonoma County | -19% |
| Total Sonoma County Vehicle Trips | -24% |
| U.S. 101 and SR 37 Traffic Counts within Sonoma County | -11% |

Source: Fehr & Peers.

As shown in **Table 7-8**, the traffic count and mobile device data analysis indicated that total vehicle trips within Sonoma County were roughly 24% lower on an average weekend day than on an average weekday. Furthermore, Sonoma County to Sonoma County trips were roughly 25% lower while trips at Sonoma County gateways were 13% lower, suggesting trips generated by Sonoma County residents reduce at a greater rate than trips generated by visitors to Sonoma County on a weekend day.

7.2 Weekend Trip Generation Adjustments

Weekend trip generation was adjusted through the addition of weekday to weekend adjustment factors in the production and attraction trip generation formulas. The adjustment factors were based on the Sonoma County to Sonoma County trips analysis in **Table 7-1** and are provided in **Table 7-9** along with the resulting weekend trip generation. Adjustments for the tourism north and tourism south trip purposes are discussed in the next section.

Table 7-9: Initial Weekend Trip Generation Adjustment Factors

| Trip Purpose | SCTM 2015 Weekday Trips | Initial Factor | Resulting Weekend Trips | Difference | % Difference |
|-------------------------|-------------------------|----------------|-------------------------|------------|--------------|
| Home-Based Work Trips | 426,311 | 0.37 | 157,735 | -268,576 | -63% |
| Home-Based School Trips | 305,012 | 0.05 | 15,251 | -289,761 | -95% |
| Home-Based Other Trips | 1,144,677 | 0.97 | 1,110,337 | -34,340 | -3% |
| Non-Home-Based Trips | 896,750 | 0.74 | 663,595 | -233,155 | -26% |
| Total Trips | 2,792,984 | -- | 1,967,151 | -825,833 | -30% |

Source: Fehr & Peers.

As shown in **Table 7-9**, the initial weekday to weekend factors resulted in a 30% reduction in total Sonoma County to Sonoma County trips, compared to the 25% reduction from the mobile device data analysis. A review of the data sources indicated that SCTM includes a separate trip purpose for home-based school trips while the mobile device data likely included school trips in home-based and non-home-based trips. In order to account for this, SCTM home-based school trips, home-based other trips, and non-home-based trips were combined and compared to home-based other and non-home based trips from the mobile device data analysis for a more apples-to-apples comparison. The refined weekend trip generation adjustment factors are provided in **Table 7-10**. Yellow shading indicates refined adjustment factors.

Table 7-10: Refined Weekend Trip Generation Adjustment Factors

| Independent Variable | Average Weekend Day vs. Average Weekday | Average Weekend Day vs. Average Weekday |
|-------------------------|---|---|
| Home-Based Work Trips | 0.37 | 0.37 |
| Home-Based School Trips | 0.05 | 0.05 |
| Home-Based Other Trips | 0.97 | 1.17 |
| Non-Home-Based Trips | 0.74 | 0.88 |

Source: Fehr & Peers.

As shown in **Table 7-10**, the home-based other and non-home-based trip generation adjustment factors were increased to account for the reduction in home-based school trips.

7.3 Weekend Winery Trip Generation

The weekend model uses the same multi-variable linear equations as the weekday model, where the winery characteristic amount (independent variable) from the land use input table is multiplied by the corresponding coefficient (e.g. number of wineries multiplied by the weekend day coefficient of 10). The winery characteristics remained unchanged while the coefficients were adjusted to use the Saturday annual gallons produced coefficient from the 2014 Napa Valley Travel Behavior Study provided in **Table 2-2**. A comparison of weekend vs. weekday winery attraction coefficients is provided in **Table 7-11**.

Table 7-11: Weekend vs. Weekday Winery Regression Coefficients

| Independent Variable | Weekday Coefficient | Weekend Coefficient |
|-------------------------------------|---------------------|---------------------|
| # of Wineries | 10 | 10 |
| Annual Gallons Produced (thousands) | 0.31 | 0.35 |
| # of Annual Events | 2.06 | 2.06 |

Source: Fehr & Peers.

As shown in **Table 7-11**, Sonoma County wineries generate an additional 0.04 vehicle trips per thousand annual gallons produced on an average weekend day compared to an average weekday.

A comparison of weekend vs. weekday winery vehicle attractions is provided in **Table 7-12**.

Table 7-12: Weekend vs. Weekday Winery Vehicle Attractions

| Winery Tourism Area | Weekday Attractions | Weekend Attractions |
|-----------------------|---------------------|---------------------|
| North County Wineries | 14,978 | 16,227 |
| South County Wineries | 4,260 | 4,463 |
| All Wineries | 19,237 | 20,690 |

Source: Fehr & Peers.

As shown in **Table 7-12**, the base year (2015) SCTM forecasts 20,690 daily winery vehicle attractions on an average weekend day compared to 19,237 on an average weekday.

The weekend model also uses the same multi-variable linear equation for winery vehicle productions as the weekday model, where the land use amount (independent variable) from the land use input table is multiplied by the corresponding coefficient (e.g. number of single-family homes multiplied by the weekday coefficient of 0.0174). The land use characteristics remained unchanged as did the coefficients due to the similar level of weekend vs. weekday total winery trips and the fact the model balances to attractions rather than productions. The weekend winery vehicle production coefficients for each winery tourism area are provided in **Table 7-13**.

Table 7-13: Weekend Winery Vehicle Production Coefficients

| Land Use | North County Wineries Weekday Coefficient | South County Wineries Weekday Coefficient |
|----------------------|---|---|
| Single-Family Home | 0.0174 | 0.0029 |
| Multi-Family Home | 0.0174 | 0.0029 |
| Senior Dwelling Unit | 0.0174 | 0.0029 |
| Hotel Room | 0.4913 | 0.0484 |
| General Commercial | 0.4913 | 0.0484 |

Source: Fehr & Peers.

The percentages and resulting winery trips coming from Sonoma County residences, Sonoma County non-residential uses, and outside the model for base year (2015) weekend conditions are shown in **Table 7-14**.

Table 7-14: Weekend Winery Vehicle Productions by Origin Type

| Origin of Winery Trips | North County Wineries | | South County Wineries | | All Wineries | |
|-----------------------------|-----------------------|--------|-----------------------|-------|---------------|--------|
| | Percent | Trips | Percent | Trips | Percent | Trips |
| From County Residences | 22% | 3,570 | 13% | 568 | 20% | 4,138 |
| From County Non-Residential | 76% | 12,332 | 25% | 1,116 | 65% | 13,448 |
| From Outside Model | 2% | 325 | 62% | 2,779 | 15% | 3,103 |
| Total Winery Trips | 16,227 | | 4,463 | | 20,690 | |

Source: Fehr & Peers.

As discussed in Chapter 2, mobile device data indicated distinct differences in inter-county travel patterns between the two winery tourism areas. To account for these differences, modifications were made to the SCTM external production and attraction input trip tables, which provide the trip productions and trip attractions for each SCTM gateway by trip purpose. The weekend external winery trips, which remained unchanged compared to weekday conditions due to similar levels of inter-county winery trips observed in the mobile device data, are shown in **Table 7-15**.

Table 7-15: Weekend External Winery Trips

| SCTM Gateway | Winery Tourism North Productions | Winery Tourism North Attractions | Winery Tourism South Productions | Winery Tourism South Attractions |
|---|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| U.S. 101 at the Marin County Line | 104 | 104 | 200 | 200 |
| SR 37 at the Marin County Line | 0 | 0 | 546 | 546 |
| SR 37 at the Solano County Line | 76 | 76 | 76 | 76 |
| SR 121/12 at the Napa County Line | 36 | 36 | 1234 | 1234 |
| Petrified Forest Road at the Napa County Line | 30 | 30 | 10 | 10 |
| U.S. 101 at the Mendocino County Line | 54 | 54 | 20 | 20 |
| Total | 300 | 300 | 2,086 | 2,086 |

Source: Fehr & Peers.

SCTM relies on time-of-day factors to allocate a percentage of daily trips to the peak hours for each trip purpose. For the SCTA weekend model, peak hour forecasts were developed based on the traffic count analysis presented in **Table 7-7**, which identified the peak hour of an average weekend day as 12 PM to 1 PM and the peak hour during the traditional PM peak period (3 PM to 7 PM) as 3 PM to 4PM. Time-of-day factors were then developed to allocate daily winery trips to these peak hour time periods. It was assumed that 3% of average weekend day winery trips occurred in the peak hour of the day and 3% of average weekend day winery trips occurred in the peak hour of the traditional PM peak period (3 PM to 7 PM) as shown in **Table 7-16**.

Table 7-16: Weekend Winery Time-of-Day Factors

| Winery Tourism Trip Purpose | Peak Hour of the Day (12 PM to 1 PM) | PM Peak Hour (3 PM to 4 PM) |
|---------------------------------------|---|--------------------------------|
| Tourism North (North County Wineries) | 3% | 3% |
| Tourism South (South County Wineries) | 3% | 3% |

Source: Fehr & Peers.

The resulting base year (2015) SCTM-forecasted weekend winery person and vehicle trip generation are summarized in **Table 7-17**, forecasting roughly 20,500 vehicle trips and 54,700 person trips generated by 381 Sonoma County wineries.

Table 7-17: Forecasted Weekend Winery Trip Generation

| Winery Tourism Area | Daily | Peak Hour of the Day (12 PM to 1 PM) | PM Peak Hour (3 PM to 4 PM) |
|-----------------------|--------|---|--------------------------------|
| Vehicle Trips | | | |
| North County Wineries | 14,531 | 436 | 436 |
| South County Wineries | 5,926 | 178 | 178 |
| All Wineries | 20,457 | 614 | 614 |
| Person Trips | | | |
| North County Wineries | 38,870 | 1,166 | 1,166 |
| South County Wineries | 15,853 | 476 | 476 |
| All Wineries | 54,723 | 1,642 | 1,642 |

Note: Winery person trips were estimated by applying the average group size of 2.8 from the Napa Valley Travel Behavior Study winery survey to the vehicle trip forecasts.

Source: Fehr & Peers.

7.4 Weekend Inter-Sonoma County Trips

Inter-Sonoma County trips are provided as a model input in "IX_XI_updated_2015.DBF," which provides trip productions and trip attractions for each SCTM gateway by trip purpose. Adjustments were made to the final validated weekday trip productions and trip attractions based on a comparison of observed weekday and weekend inter-county trips at Sonoma County gateways from the Sonoma County Travel Behavior Study. In addition to the total observed vehicle trips comparison presented in **Table 7-2**, a comparison by direction and trip purpose was also conducted. The observed differences were applied to the final validated weekday base year (2015) trip productions and trip attractions for inter-Sonoma County trips, which are provided in **Table 7-18**.

Table 7-18: Weekday Inter-Sonoma County Trips

| Zone | Gateway | HW_P | SC_P | HO_P | NH_P | HW_A | SC_A | HO_A | NH_A |
|--------------|--------------------------------|---------------|---------------|---------------|---------------|---------------|--------------|---------------|---------------|
| 901 | SR 1 South (Marin) | 108 | 19 | 172 | 137 | 514 | 134 | 396 | 119 |
| 902 | Tomaes Road (Marin) | 302 | 54 | 479 | 381 | 1,433 | 373 | 1,104 | 332 |
| 903 | Chileno Val Road (Marin) | 94 | 17 | 150 | 119 | 448 | 116 | 345 | 104 |
| 904 | D Street (Marin) | 452 | 80 | 718 | 571 | 2,150 | 559 | 1,656 | 498 |
| 905 | Novato (Marin) | 2,847 | 1,659 | 5,907 | 3,195 | 9,670 | 726 | 7,967 | 2,109 |
| 906 | San Rafael (Marin) | 1,248 | 195 | 1,742 | 1,386 | 5,367 | 1,357 | 4,018 | 1,208 |
| 907 | Mill Vall/Saus (Marin) | 460 | 70 | 695 | 858 | 5,092 | 1,531 | 4,805 | 1,253 |
| 908 | Other SF/Alameda Co. (Marin) | 4,327 | 711 | 8,959 | 5,581 | 12,467 | 475 | 10,308 | 3,774 |
| 909 | San Fran. CBD (Marin) | 104 | 0 | 184 | 1,111 | 10,973 | 130 | 5,175 | 526 |
| 910 | SR 37 West (Marin) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 911 | SR 37 East (Solano) | 4,730 | 1,376 | 5,426 | 2,320 | 4,020 | 0 | 3,325 | 2,894 |
| 912 | SR 121/12 (Napa) | 4,399 | 2,532 | 6,892 | 3,266 | 8,153 | 2,217 | 6,351 | 3,266 |
| 913 | Trinity Road (Napa) | 100 | 47 | 148 | 84 | 170 | 41 | 136 | 70 |
| 914 | Calistoga/Pet Forest Rd (Napa) | 2,530 | 717 | 2,261 | 1,287 | 3,485 | 602 | 2,493 | 1,022 |
| 915 | SR 128 East (Napa) | 2,157 | 1,843 | 5,309 | 2,117 | 1,001 | 242 | 803 | 1,485 |
| 916 | US 101 North (Mendocino) | 1,333 | 840 | 1,545 | 1,743 | 1,200 | 800 | 1,500 | 1,729 |
| 917 | SR 128 North (Mendocino) | 308 | 66 | 471 | 1,777 | 0 | 0 | 0 | 1,771 |
| 918 | SR 1 North (Mendocino) | 622 | 134 | 551 | 568 | 1,000 | 0 | 0 | 791 |
| Total | | 26,120 | 10,361 | 41,609 | 26,500 | 67,143 | 9,304 | 50,383 | 22,952 |

Source: Fehr & Peers.

The resulting weekend base year (2015) trip productions and trip attractions for inter-Sonoma County trips are provided in **Table 7-19**.

Table 7-19: Weekend Inter-Sonoma County Trips

| Zone | Gateway | HW_P | SC_P | HO_P | NH_P | HW_A | SC_A | HO_A | NH_A |
|--------------|--------------------------------|--------------|----------|---------------|---------------|---------------|----------|---------------|---------------|
| 901 | SR 1 South (Marin) | 36 | 0 | 256 | 115 | 169 | 0 | 680 | 100 |
| 902 | Tomales Road (Marin) | 99 | 0 | 713 | 319 | 472 | 0 | 1,894 | 278 |
| 903 | Chileno Val Road (Marin) | 31 | 0 | 223 | 100 | 148 | 0 | 591 | 87 |
| 904 | D Street (Marin) | 149 | 0 | 1,069 | 479 | 708 | 0 | 2,840 | 417 |
| 905 | Novato (Marin) | 849 | 0 | 9,512 | 2,386 | 2,885 | 0 | 11,318 | 1,575 |
| 906 | San Rafael (Marin) | 372 | 0 | 2,511 | 1,035 | 1,601 | 0 | 6,699 | 902 |
| 907 | Mill Vall/Saus (Marin) | 137 | 0 | 994 | 640 | 1,519 | 0 | 7,919 | 936 |
| 908 | Other SF/Alameda Co. (Marin) | 1,291 | 0 | 12,622 | 4,167 | 3,720 | 0 | 14,180 | 2,819 |
| 909 | San Fran. CBD (Marin) | 31 | 0 | 245 | 830 | 3,274 | 0 | 7,011 | 393 |
| 910 | SR 37 West (Marin) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 911 | SR 37 East (Solano) | 2,009 | 0 | 10,597 | 2,133 | 1,708 | 0 | 6,250 | 2,661 |
| 912 | SR 121/12 (Napa) | 1,212 | 0 | 10,482 | 2,579 | 2,247 | 0 | 9,543 | 2,579 |
| 913 | Trinity Road (Napa) | 33 | 0 | 251 | 71 | 56 | 0 | 229 | 59 |
| 914 | Calistoga/Pet Forest Rd (Napa) | 466 | 0 | 3,537 | 1,267 | 1,642 | 0 | 3,711 | 1,006 |
| 915 | SR 128 East (Napa) | 711 | 0 | 9,156 | 1,775 | 330 | 0 | 1,348 | 1,245 |
| 916 | US 101 North (Mendocino) | 768 | 0 | 3,722 | 1,750 | 691 | 0 | 3,613 | 1,736 |
| 917 | SR 128 North (Mendocino) | 101 | 0 | 715 | 1,490 | 0 | 0 | 0 | 1,485 |
| 918 | SR 1 North (Mendocino) | 184 | 0 | 1,843 | 567 | 295 | 0 | 0 | 789 |
| Total | | 8,479 | 0 | 68,449 | 21,703 | 21,465 | 0 | 77,827 | 19,067 |

Source: Fehr & Peers.

The differences between the weekday and weekend base year (2015) trip productions and trip attractions for inter-Sonoma County trips are provided in **Table 7-20**.

Table 7-20: Weekend vs. Weekday Inter-Sonoma County Trip Differences

| Zone | Gateway | HW_P | SC_P | HO_P | NH_P | HW_A | SC_A | HO_A | NH_A |
|--------------|--------------------------------|---------------|---------|--------|--------|----------------|--------|--------|--------|
| 901 | SR 1 South (Marin) | -72 | -19 | 84 | -22 | -345 | -134 | 284 | -19 |
| 902 | Tomales Road (Marin) | -203 | -54 | 234 | -62 | -961 | -373 | 790 | -54 |
| 903 | Chileno Val Road (Marin) | -63 | -17 | 73 | -19 | -300 | -116 | 247 | -17 |
| 904 | D Street (Marin) | -303 | -80 | 351 | -92 | -1,442 | -559 | 1,184 | -81 |
| 905 | Novato (Marin) | -1,998 | -1,659 | 3,606 | -809 | -6,785 | -726 | 3,351 | -534 |
| 906 | San Rafael (Marin) | -876 | -195 | 769 | -351 | -3,766 | -1,357 | 2,680 | -306 |
| 907 | Mill Vall/Saus (Marin) | -323 | -70 | 299 | -218 | -3,573 | -1,531 | 3,114 | -317 |
| 908 | Other SF/Alameda Co. (Marin) | -3,036 | -711 | 3,662 | -1,414 | -8,747 | -475 | 3,872 | -955 |
| 909 | San Fran. CBD (Marin) | -73 | 0 | 61 | -281 | -7,699 | -130 | 1,836 | -133 |
| 910 | SR 37 West (Marin) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 911 | SR 37 East (Solano) | -2,721 | -1,376 | 5,171 | -187 | -2,312 | 0 | 2,925 | -233 |
| 912 | SR 121/12 (Napa) | -3,187 | -2,532 | 3,590 | -687 | -5,906 | -2,217 | 3,192 | -687 |
| 913 | Trinity Road (Napa) | -67 | -47 | 103 | -13 | -114 | -41 | 93 | -11 |
| 914 | Calistoga/Pet Forest Rd (Napa) | -2,064 | -717 | 1,276 | -20 | -1,843 | -602 | 1,218 | -16 |
| 915 | SR 128 East (Napa) | -1,446 | -1,843 | 3,847 | -342 | -671 | -242 | 545 | -240 |
| 916 | US 101 North (Mendocino) | -565 | -840 | 2,177 | 7 | -509 | -800 | 2,113 | 7 |
| 917 | SR 128 North (Mendocino) | -207 | -66 | 244 | -287 | 0 | 0 | 0 | -286 |
| 918 | SR 1 North (Mendocino) | -438 | -134 | 1,292 | -1 | -705 | 0 | 0 | -2 |
| Total | | -17,641 | -10,361 | 26,840 | -4,797 | -45,678 | -9,304 | 27,444 | -3,885 |
| | | -5,959 | | | | -31,423 | | | |

Source: Fehr & Peers.

As shown in **Table 7-20**, base year (2015) weekend total productions were decreased by roughly 6,000 trips, with a decrease of roughly 18,000 home-based work productions and an increase of roughly 27,000 home-based other productions, indicating a shift in inter-Sonoma County trips from work trips to social recreation trips. A similar but more pronounced trend is observed with weekend total attractions, with a reduction of roughly 46,000 home-based trip attractions and an increase of roughly 27,000 home-based other attractions.

7.5 Weekend Sonoma County Pass-Through Trips

Sonoma County pass-through trips are provided as a model input in "XX_2015.mat," which provides vehicle trip origin-destination pairs for daily, AM peak hour, and PM peak hour conditions. A similar process to that used for inter-Sonoma County trips was applied, where adjustments were made to the final validated weekday trip origin-destination pairs based on a comparison of observed weekday and weekend Sonoma County pass-through trips from the Sonoma County Travel Behavior Study. The weekday model, weekend model, and weekend adjustments made to pass-through origin-destination pairs for daily conditions are provided in **Table 7-21**, peak hour of the weekend day are provided in **Table 7-22**, and weekend PM peak hour conditions are provided in **Table 7-23**.

Table 7-21: Weekend Daily Sonoma County Pass-Through Trips

| From Zone | From Gateway | To Zone | To Gateway | Weekday Model | Weekend Model | Weekend Adjustment |
|--------------|------------------------------|---------|------------------------------|---------------|---------------|--------------------|
| 908 | Other SF/Alameda Co. (Marin) | 916 | US 101 North (Mendocino) | 1,493 | 1,374 | -119 |
| 908 | Other SF/Alameda Co. (Marin) | 918 | SR 1 North (Mendocino) | 83 | 76 | -7 |
| 910 | SR 37 West (Marin) | 911 | SR 37 East (Solano) | 8,358 | 7,689 | -669 |
| 910 | SR 37 West (Marin) | 912 | SR 121/12 (Napa) | 2,409 | 2,216 | -193 |
| 911 | SR 37 East (Solano) | 910 | SR 37 West (Marin) | 8,358 | 7,689 | -669 |
| 912 | SR 121/12 (Napa) | 910 | SR 37 West (Marin) | 2,409 | 2,216 | -193 |
| 916 | US 101 North (Mendocino) | 908 | Other SF/Alameda Co. (Marin) | 1,493 | 1,374 | -119 |
| 918 | SR 1 North (Mendocino) | 908 | Other SF/Alameda Co. (Marin) | 83 | 76 | -7 |
| Total | | | | 24,686 | 22,710 | -1,976 |

Source: Fehr & Peers.

Table 7-22: Weekend Peak Hour (12pm – 1pm) Sonoma County Pass-Through Trips

| From Zone | From Gateway | To Zone | To Gateway | Weekday Model | Weekend Model | Weekend Adjustment |
|--------------|------------------------------|---------|------------------------------|---------------|---------------|--------------------|
| 908 | Other SF/Alameda Co. (Marin) | 916 | US 101 North (Mendocino) | 259 | 238 | -21 |
| 908 | Other SF/Alameda Co. (Marin) | 918 | SR 1 North (Mendocino) | 30 | 28 | -2 |
| 910 | SR 37 West (Marin) | 911 | SR 37 East (Solano) | 489 | 450 | -39 |
| 910 | SR 37 West (Marin) | 912 | SR 121/12 (Napa) | 269 | 247 | -22 |
| 911 | SR 37 East (Solano) | 910 | SR 37 West (Marin) | 652 | 600 | -52 |
| 912 | SR 121/12 (Napa) | 910 | SR 37 West (Marin) | 200 | 184 | -16 |
| 916 | US 101 North (Mendocino) | 908 | Other SF/Alameda Co. (Marin) | 63 | 58 | -5 |
| 918 | SR 1 North (Mendocino) | 908 | Other SF/Alameda Co. (Marin) | 0 | 0 | 0 |
| Total | | | | 1,962 | 1,805 | -157 |

Source: Fehr & Peers.

Table 7-23: Weekend PM Peak Hour (3pm – 4pm) Sonoma County Pass-Through Trips

| From Zone | From Gateway | To Zone | To Gateway | Weekday Model | Weekend Model | Weekend Adjustment |
|--------------|------------------------------|---------|------------------------------|---------------|---------------|--------------------|
| 908 | Other SF/Alameda Co. (Marin) | 916 | US 101 North (Mendocino) | 144 | 132 | -12 |
| 908 | Other SF/Alameda Co. (Marin) | 918 | SR 1 North (Mendocino) | 3 | 3 | 0 |
| 910 | SR 37 West (Marin) | 911 | SR 37 East (Solano) | 678 | 624 | -54 |
| 910 | SR 37 West (Marin) | 912 | SR 121/12 (Napa) | 365 | 336 | -29 |
| 911 | SR 37 East (Solano) | 910 | SR 37 West (Marin) | 465 | 428 | -37 |
| 912 | SR 121/12 (Napa) | 910 | SR 37 West (Marin) | 330 | 304 | -26 |
| 916 | US 101 North (Mendocino) | 908 | Other SF/Alameda Co. (Marin) | 132 | 121 | -11 |
| 918 | SR 1 North (Mendocino) | 908 | Other SF/Alameda Co. (Marin) | 0 | 0 | 0 |
| Total | | | | 2,117 | 1,948 | -169 |

Source: Fehr & Peers.

7.6 Weekend Land Use Occupancy Factors

Table 7-24 presents a comparison of weekend vs. weekday residential land use occupancy factors that were incorporated into the SCTM trip generation script to more accurately account for dwelling units that are not fully occupied throughout the year. The factors were developed based on a comparison of weekday and weekend activity patterns in residential areas from the Sonoma County Travel Behavior Study.

Table 7-24: Weekend vs. Weekday Unincorporated County Residential Land Use Occupancy Factors

| Area | Model TAZs | Weekday Residential Occupancy Factor | Weekend Residential Occupancy Factor |
|-----------------------------------|---|--------------------------------------|--------------------------------------|
| North County Unincorporated Areas | 10,11,21-33,40-50,53,75-80,87,93,95,100,108,112,120,121,131,137,145-152,158,292-295 | 0.73 | 0.83 |
| South County Unincorporated Areas | 107,129,140,157,161-165,173-178,181-190,211,257,262-265,276 | 0.50 | 0.60 |
| Total | | 0.65 | 0.75 |

Source: Fehr & Peers.

As shown in **Table 7-24**, weekend unincorporated county residential land use occupancy factors are higher than weekday factors, suggesting a higher percentage of occupancy on weekends than on weekdays.

The two additional sets of residential land use occupancy factors were also increased a similar magnitude as shown in **Table 7-25**.

Table 7-25: Weekend vs. Weekday Additional Residential Land Use Occupancy Factors

| Area | Model TAZs | Weekday Factor from Land Use Input File | Weekend Factor |
|------------------------------|------------|---|----------------|
| Coastal Unincorporated Areas | 1-6,12-16 | 0.50 | 0.60 |
| Russian River Area | 61-74 | 0.50 | 0.60 |

Source: Fehr & Peers.

7.7 Weekend Inter-Sonoma County Trip Length Comparison

The weekend vs. weekday inter-Sonoma County trip length comparison for all vehicle trips travelling through each SCTM gateway for home-based work trips is provided in **Table 7-26**, for home-based other trips is provided in **Table 7-27**, and for non-home-based trips is provided in **Table 7-28**.

Table 7-26: Weekend vs. Weekday Home-Based Work Inter-County Trip Length Comparison

| SCTM Gateway | Weekday 2017 Mobile Device Data | Weekend 2017 Mobile Device Data | Average Trip Length Difference |
|-----------------------|---------------------------------|---------------------------------|--------------------------------|
| US 101 @ Marin CL | 40 | 46 | 6 |
| SR 37 @ Napa CL | 53 | 58 | 5 |
| SR 12 @ Napa CL | 31 | 38 | 7 |
| PFR @ Napa CL | 32 | 33 | 1 |
| US 101 @ Mendocino CL | 63 | 68 | 5 |

Source: Fehr & Peers.

Table 7-27: Weekend vs. Weekday Home-Based Other Inter-County Trip Length Comparison

| SCTM Gateway | Weekday 2017 Mobile Device Data | Weekend 2017 Mobile Device Data | Average Trip Length Difference |
|-----------------------|---------------------------------|---------------------------------|--------------------------------|
| US 101 @ Marin CL | 46 | 54 | 8 |
| SR 37 @ Napa CL | 61 | 67 | 6 |
| SR 12 @ Napa CL | 31 | 37 | 6 |
| PFR @ Napa CL | 28 | 28 | 0 |
| US 101 @ Mendocino CL | 64 | 69 | 5 |

Source: Fehr & Peers.

Table 7-28: Weekend vs. Weekday Non-Home-Based Inter-County Trip Length Comparison

| SCTM Gateway | Weekday 2017 Mobile Device Data | Weekend 2017 Mobile Device Data | Average Trip Length Difference |
|-----------------------|---------------------------------|---------------------------------|--------------------------------|
| US 101 @ Marin CL | 45 | 52 | 7 |
| SR 37 @ Napa CL | 64 | 71 | 7 |
| SR 12 @ Napa CL | 32 | 38 | 6 |
| PFR @ Napa CL | 27 | 27 | 0 |
| US 101 @ Mendocino CL | 60 | 65 | 5 |

Source: Fehr & Peers.

As shown in **Table 7-26**, **Table 7-27**, and **Table 7-28**, weekend inter-county trip lengths are generally longer than weekday inter-county trips lengths.

7.8 Weekend Vehicle Miles Travelled

The resulting daily VMT generated by the VMT summary script "SUMAT00F.S" for all vehicle trips generated by Sonoma County land uses for base year (2015) weekend conditions is presented in **Table 7-29**, along with the same VMT measurement from the Sonoma County Travel Behavior Study for comparison purposes. A comparison to base year (2015) weekday conditions is also provided.

Table 7-29: Weekend vs. Weekday Sonoma County-Generated VMT Comparison

| VMT Source | Weekday 2015 Daily VMT | Weekend 2015 Daily VMT |
|---|------------------------|------------------------|
| 2015 MTC Travel Model One | 13,573,651 | Not Available |
| 2015 MTC Travel Model Two | 13,729,824 | Not Available |
| Sonoma County Travel Behavior Study (Spring 2017) | 15,251,198 | 12,760,678 |
| 2015 SCTA Model (Unmodified) | 13,084,002 | 10,847,218 |
| 2015 SCTA Model (Trip Length Enhancement) | 14,287,618 | 12,079,249 |
| Difference | 1,203,216 | 1,232,031 |
| Percent Difference | 9.2% | 11.4% |

Source: Fehr & Peers.

As shown in **Table 7-29**, the unmodified 2015 SCTA weekend model forecasted approximately 10.8 million daily VMT generated by Sonoma County land uses in 2015, below the approximately 12.8 million estimated from the Sonoma County Travel Behavior Study.

As discussed in Chapter 5, the resulting SCTA model VMT being lower than the Sonoma County Travel Behavior Study is likely due to the unmodified SCTA Model capturing the portion of trips outside Sonoma County through the incorporation of gateway trip lengths derived from the MTC model, which as discussed in Chapter 3, does not include Mendocino, Lake, Yolo, and Sacramento counties. With the trip length adjustments discussed in the previous section added to the model-generated vehicle skim matrices, **the refined 2015 SCTA Weekend Model forecasted approximately 12.1 million daily VMT**, a similar absolute magnitude increase over the unmodified model as for weekday conditions but a significantly higher percentage increase.

The higher percentage increase in VMT over weekday conditions is likely due to the higher percentage of trips into and out of Sonoma County observed in the weekend mobile device data collected for the Sonoma County Travel Behavior Study as shown in **Table 7-30**. Average weekday inter-Sonoma County trips comprise roughly 9.6% of total Sonoma County trips, compared to roughly 10.8% on an average weekend day.

Table 7-30: Weekend vs. Weekday Sonoma County Trip Types

| Trip Type | Average Weekday | | Average Weekend Day | |
|----------------------------------|-----------------|---------|---------------------|---------|
| | Trips | Percent | Trips | Percent |
| Sonoma County Pass-Through Trips | 24,633 | 1.5% | 22,774 | 1.8% |
| Trips in to Sonoma County | 79,733 | 4.8% | 67,663 | 5.4% |
| Trips out of Sonoma County | 79,776 | 4.8% | 67,989 | 5.4% |
| Intra-Sonoma County Trips | 1,463,562 | 88.8% | 1,096,105 | 87.4% |
| Total Trips | 1,647,704 | 100% | 1,254,531 | 100% |

Source: Fehr & Peers.

8. Weekend Model Validation

After adjusting the SCTA weekday model to forecast weekend conditions based on mobile device data collected as part of the Sonoma County Travel Behavior Study, the model was statically validated to test the model’s predictive capabilities before it was used to produce 2040 forecasts. The validation process compares outputs from base year model components to observed data to determine if model outputs fall within an acceptable range of error.

Table 8-1 presents a comparison of 2015 weekend model volumes to weekend traffic count data collected from Caltrans’ Performance Measurement System (PeMS) for an average weekend day in Fall 2015 using the validation thresholds discussed in 2017 California Regional Transportation Plan Guidelines (California Transportation Commission, January 18, 2017)³ for mid-day, PM peak hour, and daily conditions. Fehr & Peers uses an internal target validation criteria of plus or minus 10 percent for any categories not included in the Commission guidelines. Green shading indicates the threshold was met, orange shading would indicate the threshold was not met.

Table 8-1: 2015 Weekend Model Validation

| Validation Measure | Mid-Day | PM Peak Hour | Daily | Threshold |
|---|---------|--------------|-------|---------------|
| Volume-to-Count Ratio | 1.04 | 1.05 | 0.92 | +/- 10% |
| Percent of Links Within Deviation Allowance | 86.8% | 86.8% | 92.1% | At Least 75% |
| Percent Root Mean Square Error | 19.2% | 22.3% | 15.6% | Below 40% |
| Correlation Coefficient | 0.98 | 0.97 | 0.98 | At Least 0.88 |
| Number of Validation Locations | 38 | 38 | 38 | |

Source: Fehr & Peers.

As shown in **Table 8-1**, the 2015 SCTA weekend model highway volumes meet all 2017 California RTP model validation standards for mid-day, PM peak hour, and daily conditions, a critical step in ensuring a high level of confidence in the weekend model scenario forecasts.

³ <https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/f0009312-2017rtpguidelinesformpos-a11y.pdf>

9. Conclusions

The SCTA Model Enhancement effort provides SCTA and its member jurisdictions with a refined and enhanced travel model that can serve as the forecasting tool for future planning efforts. The data incorporated into SCTM is intended to increase the accuracy and sensitivity of the model to planned infrastructure and development projects, as well as the confidence planners have in the resulting forecasts.

The SCTM now has the ability to forecast winery trip generation and distribution patterns based on winery characteristics available in the Sonoma County winery database rather than rely on winery trip generation as an input. The model more accurately captures inter-county/visitor travel at county gateways, providing more sensitivity to the effects of adding households and jobs within the county.

Planning efforts in unincorporated areas will benefit from the enhanced representation of land use occupancy, better capturing land uses not fully occupied throughout the year to provide more accurate and reasonable forecasts. VMT and SB 743 efforts will benefit as the full length of all trips generated by land uses in Sonoma County are now captured, complying with the recommendations of the California Governor's Office of Planning and Research. Planning efforts for land uses that primarily generate traffic on weekends will also benefit as they now have a tool to better understand weekend travel patterns and more accurately forecast the effects of the project for weekend condition

