El Dorado County 2020 Traffic Impact Fee Update

Appendix A

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$!4%: September 24, 2019

4/: Rafael Martinez, Director of Transportation

&2/-: John P. Long, P.E., T.E.
Cameron Shew, P.E., T.E.

35"*%#4: TIF Major Update
Technical Memorandum 1A: VMT-Based EDU Rates

Executive Summary

The County's Traffic Impact Fee (TIF) Program allocates the cost of roadway improvements by land use type based on ñequivalent dwelling units" (EDU) – that is the demand placed on the transportation network relative to one single family dwelling unit. EDUs are currently calculated based on the number of new vehicle trips generated by that land use in the PM peak hour. The current methodology does not consider the average trip length for that land use type. Multiplying the vehicle trip generation by trip length results in vehicle-miles of travel (VMT), which is a more appropriate measure of the demand placed on the County's roadway system. Most counties and cities in the region have been using VMT-based EDU rates, and they are considered by many to be a "best practice" for traffic impact fee programs.

If adopted, VMT-based EDU rates for all for residential unit types would remain unchanged, and the rates for office and industrial uses would increase by only two percent. The EDU for typical "general commercial uses" would decrease to half the current EDU rate, while lodging uses would increase by 29 percent over current rates, due to their longer average trip lengths.

County staff and their consultant (DKS Associates) request direction on whether VMT-based EDU rates should be incorporated into the TIF Program Major Update.

Background

Like most development fee programs, the County's TIF Program allocates the cost of roadway improvements by land use type based on the concept of ñequivalent dwelling units" (EDU). An EDU equals the demand placed on the transportation network relative to one single family dwelling unit which is assigned an EDU of 1. Land uses which have greater overall traffic impacts than a typical single-family residential unit are assigned values greater than 1, while land uses with lower overall traffic impacts are assigned values less than 1.

Like many development fee programs, the County's TIF Program bases its EDUs on the number of vehicle trips generated by each land use type. Vehicle trips are derived from studies compiled and vetted by the Institute of Transportation Engineers, which measure the vehicle trips entering and leaving a specific development. Since roadway needs are primarily based on traffic flows and conditions during the PM peak hour on an average weekday, the EDUs reflect the relative trip generation for the evening peak hour.

For non-residential uses, particularly commercial uses, trips entering and leaving a site may have already been on the roadway system and would already be passing by or near that site. Like many development fee programs, the County's TIF Program accounts for the percentage of "pass by" trips, based on studies compiled and vetted by the Institute of Transportation Engineers or other sources. EDUs thus reflect the average number of "new trips" generated by each land use type.

However, the County's TIF Program does not currently account for another important measure of the relative difference of traffic impacts by land use type – average trip lengths. The trips traveling to/from non-residential uses have shorter or longer average trip lengths than trips traveling to/from a typical residential unit. Multiplying the average number of "new" PM peak hour trips generated by a land use type by the average trip length for that land use type would yield the average vehicle-miles of travel (VMT) added to the County's roadway system. This metric best measures the impact that each land use type would have on the County's total roadway system.

VMT is recognized as the best measure of a development's overall transportation impacts – not only on roadway improvement needs but also on air quality and greenhouse gas (GHG) emissions. By July 1, 2020, traffic impacts of new development under the California Environmental Quality Act (CEQA) must be based on VMT.

The use of VMT-based EDU rates is not new. DKS began using VMT-based rates in 1994 with major updates to the traffic impact fee programs for Placer County and the City of Roseville. Currently the following local jurisdictions and agencies use VMT-based EDU Rates:

Counties

- Sacramento County
- Placer County

Cities

- Sacramento
- West Sacramento
- Folsom
- Rancho Cordova
- Elk Grove
- Roseville
- Rocklin

Agencies

- South Placer County Transportation (SPRTA)
- Highway 65 JPA
- I-5 Subregional Corridor Mitigation Program

VMT-based EDUs is used by other jurisdictions around California and is now considered by many as a "best practice" for traffic impact fee programs.

The following analysis section shows how VMT-based EDUs would be calculated and compares potential rates with those in the current TIF Program.

Analysis

Since some of the vehicles attracted to non-residential uses would have been on the roadway system regardless of the presence of the new traffic generator, the County's EDUs are developed by multiplying the trip generation for a land use type "by the percent new" trips. Since the EDU rates in the County's current TIF Program are based on the "new" PM peak hour vehicle trips generated by each land use type, a VMT-based EDU rate would merely multiply the current EDU rates by the average trip length for each land use type. This provides estimates of the "new" vehicle-miles of travel (VMT) generated during the PM peak hour for each general land use type.

The PM peak hour VMT per unit for a land use type is then divided by the VMT per single family unit. EDU factors are expressed per dwelling unit for residential development, per room for hotel/motel/B&B, and per 1,000 square feet for all other nonresidential development.

Table 1 shows how VMT-based EDU rates could be calculated for the County's TIF Update. For the on-going TIF Update, the EDU rates will be adjusted to reflect the latest PM peak hour vehicle trip generation rates from the Institute of Transportation Engineers. However, the trip generation rates used in the current TIF Program were maintained so that the VMT-based EDU rates could be compared directly to the County's current EDU rates. **Table 1** shows the effect of adding trip length to the County's current EDU calculation. As shown in the column "VMT-Based Rate as a Percent of Current EDU Rate." The EDU rates for all for residential unit types would remain unchanged and the rates for office and industrial uses would increase by only two percent. The biggest change would be for commercial uses. The EDU for typical "general commercial uses" would decrease to half the current EDU rate, while lodging uses would increase by 29 percent over current rates due to their longer average trip lengths.

The analysis shows that VMT-based rates have two basic results. First they better reflect the overall traffic impacts of each land use type on the County's roadway system and thus provide a better nexus for fee rates. Second they would decrease the TIF rates substantially for general commercial uses.

Recommended Action: DKS Associates and County Staff recommend the Board consider EDU rates that are based on vehicle-miles of travel (VMT).

Table 1

Potential VMT-Based EDU Rates[1]

The Effect of Adding Trip Length to EDU Calculation in Current TIF Program

Land Use	Institute for Transportation Engineers (ITE) Category	Units	Trip Rate[2]	New Trip Ends	Trip Length (miles)	VMT per Unit[3]	VMT-Based EDU Rate[4]	EDU Rates in Current TIM Fee	Rate as Percent of Current EDU Rate
Residential									
SFD Not Restricted	210: Single Family Detached	Dwelling Units	1.00	100%	5.0	5.00	1.00	1.00	100%
SFD Age Restricted	251: Senior Adult - Detached	Dwelling Units	0.27	100%	5.0	1.35	0.27	0.27	100%
MFD Not Restricted	220: Apartment	Dwelling Units	0.62	100%	5.0	3.10	0.62	0.62	100%
MFD Age Restricted	252: Senior Adult - Attached	Dwelling Units	0.25	100%	5.0	1.25	0.25	0.25	100%
Nonresidential									
Commercial									
General Commercial	820: Shopping Center	1,000 Sq. Ft.	3.71	47%	2.5	4.36	0.87	1.74	50%
Hotel/Motel/B&B	320: Motel	Rooms	0.47	58%	6.4	1.74	0.35	0.27	129%
Church	560: Church	1,000 Sq. Ft.	0.55	64%	3.9	1.37	0.27	0.35	78%
Office									
General Office	710: General Office	1,000 Sq. Ft.	1.49	77%	5.1	5.85	1.17	1.15	102%
Medical	720: Medical-Dental Office	1,000 Sq. Ft.	3.57	60%	5.1	10.92	2.18	2.14	102%
Industrial	110: General Light Industrial	1,000 Sq. Ft.	0.97	79%	5.1	3.91	0.78	0.77	102%

[1] EDU Rates in TIF Update will be adjusted to reflect latest ITE Trip Generation Rates. This table is intended to show effect of adding trip length to calculation of current EDU rates

[2] Evening peak hour trip rate

[3] New VMT per unit = Trip rate per unit x percent new trips x average trip length

[4] The equivalent dwelling unit (EDU) factor is the net new trip rate normalized so one single family unit is one EDU. Residential EDU factors are per dwelling unit. Nonresidential EDU factors are per 1,000 building square feet, except Hotel/Motel/B&B EDU factor is per room.

Source: Institute of Transportation Engineers, *Trip Generation 9th Edition* , 2012; San Diego Association of Governments, *Brief Guide of Vehicular Trip Generation Rates* , April 2002.

MEMORANDUM

DATE: September 24, 2019

TO: Rafael Martinez, Director of Transportation

FROM: John P. Long, P.E., T.E.
Cameron Shew, P.E., T.E.

SUBJECT: TIF Major Update
Technical Memorandum 1B: Fee Rates by Size of Single-Family Unit

Executive Summary

The County's Traffic Impact Fee (TIF) Program currently has one fee rate for new "non-age restricted" single-family dwelling units, regardless of their size. For several other local jurisdictions, DKS Associates (DKS) has established a nexus to justify fee rates that differ by the size of housing units, using data from the U.S. Census and the Sacramento Area Council of Governments (SACOG) household travel surveys.

The data indicates that for housing sizes between about 1,200 and 2,500 square feet, the trip rate for a single-family unit is generally within five percent of the average trip rate for single-family units. Thus, in this range, use of the average trip rate from the Institute of Transportation Engineers (ITE) Trip Generation report is appropriate. For single-family units less than 1,200 square feet (approximately 17 percent of units), a trip rate that is 88 percent of the average rate is warranted. For single-family units more than 2,500 square feet (approximately 17 percent of units), a trip rate that is 117 percent of the average rate is appropriate.

County staff and their consultant (DKS) request direction on whether varying fee rates by size of a single family unit should be incorporated into the TIF Program Major Update.

Background

The County's TIF Program focuses on impacts of new development. Like most fee programs, the current TIF Program has one fee rate for new "non-age restricted" single-family dwelling units, regardless of their size. For example, a new 1,500 square foot residential unit is charged the same fee rate as a 3,200 square foot unit. County staff has asked DKS if data exists to support a nexus between transportation impacts and housing size.

DKS has established a nexus to justify fee rates that differ by the size of housing units in several local jurisdictions using data from the U.S. Census and household travel surveys for the Sacramento region. Fee rates that vary by unit size have been used in this region for a number of years. The nexus for their use has been vetted, and the development community has supported them. Currently the following local jurisdictions have fee rates that vary by housing unit size:

Jurisdiction	Year When Fee Rates by Unit Size were First Implemented
City of West Sacramento	2004
Sacramento County	2008
City of Rancho Cordova	2013

The following section describes the analysis used to establish the nexus between traffic impacts and unit size for those jurisdictions.

Analysis

"Impact Fees & Housing Affordability – A Guidebook for Practitioners,"[1] prepared for the US Department of Housing and Urban Development (HUD), looks at the relationship between various characteristics of a dwelling unit (e.g. square footage, bedrooms, etc.) and its impact on public facilities, including roadways. This research suggests that trip generation can be estimated by categories of the dwelling unit size (i.e. ranges of square footage) using the following relationships:

- The average number of persons per household for square footage categories that were estimated from the American Housing Survey
- The average vehicle trips by household size categories (i.e. persons in the household) from national or regional household travel surveys

The American Housing Survey (AHS), which is conducted by the Bureau of the Census for HUD, collects data on the nation's housing, including apartments, single-family homes, mobile homes, vacant housing units, household characteristics, income, housing and neighborhood quality, housing costs, equipment and fuels, size of housing unit, and recent movers. National data are collected in odd numbered years, and data for each of 47 selected Metropolitan Areas are collected about every six years. The national sample covers an average 55,000 housing units. Each metropolitan area sample covers 4,100 or more housing units.

For the local jurisdictions that currently have fee rates that vary by unit size, DKS used AHS data from the Sacramento metropolitan area to determine the average number of residents in single-family dwelling units by square-footage categories. The AHS does not provide data on square footage for multi-family dwelling units.

SACOG has conducted household travel surveys in its six-county region to collect detailed data on household characteristics and travel behavior. DKS used data from SACOG's 2000 Household Travel Survey, which involved nearly 4,000 households, to estimate the number of vehicle trips by categories of persons in the household. This information was then combined with the estimated average number of residents in single-family dwelling units by square-footage categories (from AHS) to estimate vehicle trips for square footage categories.

The data indicates that for housing sizes between about 1,200 and 2,500 square feet, the trip rate for a single-family unit is generally within five percent of the average trip rate for single-family units. In this range, use of the average trip rate from ITE Trip Generation report is appropriate. For single-family units less than 1,200 square feet, the data indicates that a trip rate that is 88 percent of the average rate is warranted. For single-family units more than 2,500 square feet, a trip rate that is 117 percent of the average rate is appropriate.

Based on AHS data from the Sacramento region, about 17 percent of single-family units are smaller than 1,200 square feet, and about 17 percent are larger than 2,500 square feet.

Recommended Action: DKS Associates and County staff recommend the Board consider fee rates for single-family units that vary by the size of the unit, if the Board wishes to encourage a full range of housing units in the County.

[1] https://www.huduser.gov/portal/publications/impactfees.pdf

MEMORANDUM

DATE: September 24, 2019

TO: Rafael Martinez, Director of Transportation

FROM: John P. Long, P.E., T.E.
Cameron Shew, P.E., T.E.

SUBJECT: TIF Major Update
Technical Memorandum 1C: Age-Restricted Fee Category

Executive Summary

Age-restricted dwelling units currently comprise 13.5% of the total number of dwelling units in the current Traffic Impact Fee (TIF) Program. These age-restricted units are concentrated in Zone 2 (Cameron Park/Shingle Springs), Zone 3 (El Dorado/Diamond Springs), and Zone 8 (El Dorado Hills). The amount of TIF fees paid by development is determined by the number of PM peak hour vehicle trips generated. Because age-restricted units generate 73-75% fewer vehicle trips than non-restricted, single family homes, TIF fees for age-restricted units are 73-75% lower. The reduced trip-making of senior housing is well-supported by industry data, and is accounted for in many other TIF programs in the region, including Sacramento County, Placer County, and the cities of Folsom, Elk Grove, Roseville, and Rocklin.

County staff requested analysis of the potential effects of removing the distinction between "age-restricted" and "non-restricted" housing. Eliminating the age-restricted TIF category would recombine those housing units into the non-restricted categories in Zones 2, 3, and 8. The total cost of the fee program allocated to those zones would not change. The result would be substantial increases in fees for the previously age-restricted units, and modest reductions in fees for the non-restricted and nonresidential units in those zones.

County staff and their consultant (DKS Associates) request direction on whether the age-restricted categories should be maintained in the TIF Program Major Update.

Background

Figure 1 shows growth projections in the current TIF program[1], which estimate a total growth of 16,605 residential units in all zones. Of this total, 1,986 (12.0%) are single family, age restricted units and 256 (1.5%) are multi family, age restricted units. The totals in Zone 2 (Cameron Park/Shingle Springs) and Zone 3 (El Dorado/Diamond Springs) were based on the share allocated under previous updates to the TIF program. The totals in Zone 8 (El Dorado Hills) were estimated from the proposed Carson Creek project.

[1] TIF Nexus Study 2018 Technical Update

	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Total
Residential	*(dwelling units)*								
Single Family									
Not Restricted	210	2,495	1,029	1,266	565	407	278	4,171	10,421
Age Restricted[2]	-	553	333	-	-	-	-	1,100	1,986
Subtotal	210	3,048	1,362	1,266	565	407	278	5,271	12,407
Multi-family									
Not Restricted	63	1,304	1,357	518	228	124	88	260	3,942
Age Restricted[2]	-	97	59	-	-	-	-	100	256
Subtotal	63	1,401	1,416	518	228	124	88	360	4,198
Total	273	4,449	2,778	1,784	793	531	366	5,631	16,605
Nonresidential [1]	*(jobs)*								
Commercial	17	2,960	991	510	255	246	49	1,442	6,470
Office	60	553	229	75	81	60	-	4,578	5,636
Medical	-	260	75	142	160	72	8	883	1,600
Industrial	-	291	157	(6)	30	9	-	680	1,161
Total	77	4,064	1,452	721	526	387	57	7,583	14,867
Nonresidential [1]	*(1,000 sq. ft.)*								
Commercial	9	1,480	496	255	128	123	25	721	3,237
Office	17	152	63	21	22	17	-	1,259	1,551
Medical	-	81	23	44	50	22	2	275	497
Industrial	-	291	157	(6)	30	9	-	680	1,161
Total	26	2,004	739	314	230	171	27	2,935	6,446

[1] Excludes local government growth that is exempt from the TIM Fee.

[2] For zones 2 and 3, age-restricted dwelling unit estimates based on share allocated under current TIM Fee program. For zone 8 estimate based on proposed Carson Creek development project.

Source: El Dorado County Travel Demand Model; Table 1.

Figure 1: Growth Projections
Source: 2018 TIM Fee Program, Table 2

The TIF Program allocates the cost of roadway improvements by land use type based on the concept of “equivalent dwelling units” (EDU). An EDU equals the demand placed on the transportation network relative to one single family (non-restricted) dwelling unit which is assigned an EDU of 1. Land uses which have greater overall traffic impacts than a typical single-family residential unit are assigned values greater than 1, while land uses with lower overall traffic impacts are assigned values less than 1. EDU factors in the current fee program are shown in **Figure 2**.

Vehicle trips for all categories of residential units (single and multi-family, non-restricted and age-restricted) were derived from studies compiled and vetted by the Institute of Transportation Engineers, which measure the vehicle trips entering and leaving a specific development. Since roadway needs are primarily based on traffic flows and conditions during the PM peak hour on an average weekday, the EDUs reflect the relative trip generation for the evening peak hour. The Institute of Transportation Engineers (ITE) data indicates that age-restricted units generate between 25% (multi-family) and 27% (single-family) of the vehicle trips that would be generated by a single family, non-restricted unit. Because age-restricted units generate 73-75% fewer PM peak hour trips than single family, non-restricted units, they currently pay 73-75% lower TIF fees.

Land Use	Institute for Transportation Engineers Category	Units	Trip Rate[1]	New Trip Ends	Net New Trip Rate	Prelim-inary EDU Factor[2]
Residential						
SFD Not Restricted	210: Single Family Detached	Dwelling Units	1.00	100%	1.00	1.00
SFD Age Restricted	251: Senior Adult - Detached	Dwelling Units	0.27	100%	0.27	0.27
MFD Not Restricted	220: Apartment	Dwelling Units	0.62	100%	0.62	0.62
MFD Age Restricted	252: Senior Adult - Attached	Dwelling Units	0.25	100%	0.25	0.25
Nonresidential						
Commercial						
General Commercial	820: Shopping Center	1,000 SqFt	3.71	47%	1.74	1.74
Hotel/Motel/B&B	320: Motel	Rooms	0.47	58%	0.27	0.27
Church	560: Church	1,000 SqFt	0.55	64%	0.35	0.35
Office						
General Office	710: General Office	1,000 SqFt	1.49	77%	1.15	1.15
Medical	720: Medical-Dental Office	1,000 SqFt	3.57	60%	2.14	2.14
Industrial	110: General Light Industrial	1,000 SqFt	0.97	79%	0.77	0.77

[1] Evening peak hour trip rate.

[2] The equivalent dwelling unit (EDU) factor is the net new trip rate normalized so one single family unit is one EDU. Residential EDU factors are per dwelling unit. Nonresidential EDU factors are per 1,000 building square feet except Hotel/Motel/B&B EDU factor is per room.

Source: Institute of Transportation Engineers, *Trip Generation 9th Edition*, 2012; San Diego Association of Governments, *Brief Guide of Vehicular Trip Generation Rates*, April 2002.

Figure 2: Lane Use Categories, Trip Generation Rates, and Preliminary EDU Factors
Source: 2018 TIM Fee Program, Table 3

Analysis

County staff and DKS Associates are commencing the next major update to the TIF program. The question has come up on whether the age-restricted category should be maintained or eliminated. Assuming the age-restricted category remains, **Figure 3** shows the new EDU factors, based on the latest *Trip Generation 10th Edition.*

Land Use	Institute for Transportation Engineers Category	Units	Trip Rate[1]	New Trip Ends	Net New Trip Rate	Prelim-inary EDU Factor[2]
Residential						
SFD Not Restricted	210: Single Family Detached	Dwelling Units	0.99	100%	0.99	1.00
SFD Age Restricted	251: Senior Adult - Detached	Dwelling Units	0.30	100%	0.30	0.30
MFD Not Restricted	220: Apartment	Dwelling Units	0.56	100%	0.56	0.57
MFD Age Restricted	252: Senior Adult - Attached	Dwelling Units	0.26	100%	0.26	0.26

Figure 3: Updated Trip Generation Rates and Preliminary EDU Factors for 2020 Major Update
Source: DKS Associates, 2019.

The latest ITE Trip Generation data indicates that age-restricted units generate between 26% (multi-family) and 30% (single-family) of the net new PM peak hour vehicle trips that would be generated by a single family, non-restricted unit. Under the current calculation methodology, they would continue to pay a proportionately lower TIF fee.

For the on-going TIF Major Update, the growth projections will be revised. However assuming the development in the current TIF Program, eliminating the “age restricted” categories would increase the TIF for both single family age-restricted units (175-225%) and multi-family age-restricted units (75-100%). In Zones 2, 3, and 8 specifically, the TIF would decrease (5-15%) for non-restricted units and nonresidential development.

Recommended Action: DKS Associates and County staff recommend the Board consider maintaining the separate age-restricted and non-restricted TIF categories.

MEMORANDUM

DATE: October 31, 2019

TO: Rafael Martinez, Director of Transportation

FROM: John P. Long, P.E., T.E.
Cameron Shew, P.E., T.E.

SUBJECT: TIF Major Update
Technical Memorandum 2: Daily EDU Rates

Executive Summary

The County's Traffic Impact Fee (TIF) Program allocates the cost of roadway improvements by land use type based on "equivalent dwelling units" (EDU) – that is the demand placed on the transportation network relative to one single family dwelling unit. EDUs are currently calculated based on the number of new vehicle trips generated by that land use in the PM peak hour. Because infrastructure needs are typically governed by roadway capacity during the PM peak hour, this approach is defensible and typical of most TIF programs.

In response to inquiries from some members of the development community, County staff requested analysis of the potential effects of switching from EDUs that are based on a PM peak hour trip rate to a daily trip rate. EDU rates were recomputed for each land use type based on the total weekday trip generation. The result is that, under a daily calculation, uses that typically generate more off-peak traffic (e.g. age-restricted housing and churches) would see increased TIF fees. Uses that are more highly-peaked (e.g. office and industrial) would see decreased TIF fees.

County staff and their consultant (DKS Associates) request direction on whether the PM peak hour rates should be maintained in the TIF Program Major Update.

Background

Like most development fee programs, the County's TIF Program allocates the cost of roadway improvements by land use type based on the concept of "equivalent dwelling units" (EDU). An EDU equals the demand placed on the transportation network relative to one single family dwelling unit which is assigned an EDU of 1.0. Land uses which have greater overall traffic impacts than a typical single-family residential unit are assigned values greater than 1.0, while land uses with lower overall traffic impacts are assigned values less than 1.0.

Like most development fee programs, the County's TIF Program bases its EDUs on the number of vehicle trips generated by a given land use during the PM peak hour. This is because roadway needs are primarily based on traffic flows and conditions during the PM peak hour on a typical weekday. Vehicle trips are derived from studies compiled and vetted by the Institute of Transportation Engineers (ITE), which measure the vehicle trips entering and leaving a specific development.

County staff requested analysis of the potential effects of switching from a PM peak hour trip rate to a daily trip rate (i.e. total number of vehicle trips generated by a land use on a typical weekday). This analysis was requested by some members of the development community, who feel that daily trip generation would more fairly reflect usage of the roadway system.

The vast majority of TIF programs use PM peak hour EDU Rates, including the following list of local jurisdictions and agencies:

Counties

- El Dorado County
- Sacramento County
- Placer County

Cities

- Sacramento
- West Sacramento
- Folsom
- Rancho Cordova
- Roseville
- Rocklin

Agencies

- South Placer County Transportation (SPRTA)
- Highway 65 JPA

The following analysis section shows how daily EDUs would be calculated and compares potential rates with those in the current TIF Program.

Analysis

The EDU factor is currently computed by multiplying the PM peak hour trip generation rate by a reduction factor to account for "pass-by" trips. These are vehicle trips to non-residential uses that would have been on the roadway system, regardless of the presence of the new traffic generator. This "net new" trip rate is then divided by the net new trip rate for a single-family unit, which is coincidentally 1.0 trips per unit in the PM peak hour.

To compute EDU factors based on daily trip rates, DKS started with the weekday trip generation rate, which is from the same data source (ITE) as the PM peak hour trip rates. ITE does not publish pass-by data for weekday trips, so the same pass-by percentage from the PM peak hour data was assumed for the daily analysis. Finally, the net new trip rate for each land use was divided by the net new trip rate for a single family unit, which is 9.44 trips per unit on a typical weekday.

Table 1 shows how daily EDU rates could be calculated for the County's TIF update. Calculations for the PM peak hour rate were kept consistent with the current methodology for ease of comparison.

The analysis shows that under a daily calculation, uses that typically generate more off-peak traffic (e.g. age-restricted housing and churches) would see increased TIF fees. Uses that are more highly-peaked (e.g. office and industrial) would see decreased TIF fees. Regardless of the result, DKS believes that maintaining the PM peak hour methodology provides a more defensible nexus for the TIF Program. Project needs in the current program are primarily a result of PM peak hour traffic growth caused by new development.

Recommended Action: DKS Associates and County Staff recommend the Board consider maintaining PM peak hour rates.

Table 1

Potential Daily EDU Rates[1]

The Effect of Switching from PM Peak Hour to Daily Trip Rates in Current TIF Program

			PM Peak Hour (Current Fee Program)			Daily Trip Rates (Potential Change)			
Land Use	Institute for Transportation Engineers (ITE) Category	Units	Trip Rate[2]	New Trip Ends	EDU[4]	Trip Rate[3]	New Trip Ends	EDU[4]	Daily Rate as Percent of Current EDU Rate
Residential									
SFD Not Restricted	210: Single Family Detached	Dwelling Units	1.00	100%	1.00	9.44	100%	1.00	100%
SFD Age Restricted	251: Senior Adult - Detached	Dwelling Units	0.27	100%	0.27	4.27	100%	0.45	168%
MFD Not Restricted	220: Apartment	Dwelling Units	0.62	100%	0.62	7.32	100%	0.78	125%
MFD Age Restricted	252: Senior Adult - Attached	Dwelling Units	0.25	100%	0.25	3.70	100%	0.39	157%
Nonresidential									
Commercial									
General Commercial	820: Shopping Center	1,000 Sq. Ft.	3.71	47%	1.74	37.75	47%	1.88	108%
Hotel/Motel/B&B	320: Motel	Rooms	0.47	58%	0.27	3.35	58%	0.21	76%
Church	560: Church	1,000 Sq. Ft.	0.55	64%	0.35	6.95	64%	0.47	134%
Office									
General Office	710: General Office	1,000 Sq. Ft.	1.49	77%	1.15	9.74	77%	0.79	69%
Medical	720: Medical-Dental Office	1,000 Sq. Ft.	3.57	60%	2.14	34.80	60%	2.21	103%
Industrial	110: General Light Industrial	1,000 Sq. Ft.	0.97	79%	0.77	4.96	79%	0.42	54%

[1] EDU Rates in TIF Update will be adjusted to reflect latest ITE Trip Generation Rates and trip length (VMT), per recent Board direction. This table is intended to show effect of switching from PM peak hour to daily trip generation rates with the current fee program methodology.

[2] Average PM peak hour trip rate, based on current fee program.

[3] Average weekday trip rate, based on Trip Generation, 10th Edition.

[4] The equivalent dwelling unit (EDU) factor is the net new trip rate normalized so one single family unit is one EDU. Residential EDU factors are per dwelling unit. Nonresidential EDU factors are per 1,000 building square feet, except Hotel/Motel/B&B EDU factor is per room.

Source: Institute of Transportation Engineers, *Trip Generation 9th Edition* , 2012, and *10th Edition* , 2017.

MEMORANDUM

DATE: December 12, 2019

TO: Rafael Martinez, Director of Transportation

FROM: John P. Long, P.E., T.E.
Cameron Shew, P.E., T.E.

SUBJECT: TIF Major Update
Technical Memorandum 3A: Cannabis Production Trip Rates

Executive Summary

The County's Traffic Impact Fee (TIF) Program allocates the cost of roadway improvements based on the number of new vehicle trips generated in the PM peak hour for various land use types. For non-residential development, current land use categories include general commercial, hotel/motel/B&B, church, office/medical, and industrial/warehouse.

Most non-residential development generally falls into one of these above listed categories, although a "per trip" fee may be charged when the County determines that use of the categories is not appropriate. This may be due to an uncommon land use or any other factors that, at the County's sole discretion, render the category unrepresentative of the expected trip generation of the proposed land use.

Cannabis production, including growing and processing cannabis products, is an emerging industry in El Dorado County. Like other industrial uses, cannabis producers generate employment and delivery-related trips that use the County's roadways, and should pay a fair share toward improving those roadways. County staff asked their consultant (DKS Associates) to evaluate whether cannabis production should be considered a unique land use meriting its own category in the TIF Program, or whether it should be considered under an existing category. DKS presents the County with two options that are both justified by engineering data:

- Approach 1: Classify cannabis production as an "industrial/warehouse" use and pay the appropriate TIF for that category.
- Approach 2: Create a new cannabis production category, based on ITE *Trip Generation* data for manufacturing uses and no assumption of pass-by traffic

County staff and DKS request direction on whether Approach 1 or Approach 2 should be applied for cannabis production in the TIF Program Major Update.

Background

Like most development fee programs, the County's TIF Program allocates the cost of roadway improvements by land use type based on the concept of "equivalent dwelling units" (EDU). An EDU equals the demand placed on the transportation network relative to one single family dwelling unit which is assigned an EDU of 1.0. Land uses which have greater overall traffic impacts than a typical single-family residential unit are assigned values greater than 1.0, while land uses with lower overall traffic impacts are assigned values less than 1.0.

Like most development fee programs, the County's TIF Program bases its EDUs on the number of vehicle trips generated by a given land use during the PM peak hour. This is because roadway needs are primarily based on traffic flows and conditions during the PM peak hour on a typical weekday. Vehicle trips are derived from studies compiled and vetted by the Institute of Transportation Engineers (ITE), which measure the vehicle trips entering and leaving a specific development.

The current fee program has the following categories for non-residential development:

- General Commercial
- Hotel/Motel/B&B
- Church
- Office/Medical
- Industrial/Warehouse

One land use of interest that is not listed as a non-residential development of the current TIF Program is cannabis production. ITE has published trip generation data for marijuana dispensaries under ITE Land Use Code 882. However, El Dorado County does not allow dispensaries (i.e. retail sales to consumers) in any unincorporated area. Cannabis production is understood to include the industrial operations of growing/processing cannabis and packaging/storing products for distribution to authorized sellers. While cannabis production is not prohibited in in the County, ITE has not collected or published trip generation data specifically relating to this land use.

Analysis

Whether or not cannabis production has unique trip generation patterns has been a recent topic of discussion in the transportation engineering community. A review of ITE forums (see Appendix) and case studies indicates a general consensus that cannabis production can be considered to be a light industrial use. Gross floor area and number of employees are the most commonly used variables for trip generation of light industrial uses. Given that employment is more difficult to project, the County typically calculates trip generation by gross floor area.

Based on a review of the current state of the practice and descriptions of land use categories provided in ITE's *Trip Generation Manual, 10th Edition*, DKS offers the following two approaches for the County's consideration:

Approach 1: Classify Cannabis Cultivation as an Industrial/Warehouse Use

The County's current Industrial/Warehouse category is based on ITE land use code 110 "General Light Industrial," with gross floor area as the independent variable. ITE describes the category as follows: *"A light industrial facility is a free-standing facility devoted to a single use. The facility has an emphasis on activities other than manufacturing and typically has minimal office space. Typical light industrial activities include printing, material testing, and assembly of data processing equipment."*

The PM peak hour trip rate for general light industrial is 0.63 trips per 1,000 square feet gross floor area in the most recent *Trip Generation Manual, 10th Edition*. The County currently applies a 21% pass-by trip reduction to the industrial/warehouse category, resulting in a preliminary EDU factor of 0.51. Adopting Approach 1 would not change the number of fee categories, but would result in a lower fees than the County could justifiably charge under Approach 2.

Approach 2: Create New Cannabis Production Category, based on Manufacturing Trip Generation

ITE land use code 140 “Manufacturing” is described as follows: *“A manufacturing facility is an area where the primary activity is the conversion of raw materials or parts into finished products. Size and type of activity may vary substantially from one facility to another. In addition to the actual production of goods, manufacturing facilities generally also have office, warehouse, research, and associated functions.”*

The PM peak hour trip rate for manufacturing is 0.67 trips per 1,000 square feet gross floor area in the most recent *Trip Generation Manual, 10th Edition*. Because cannabis production does not allow for retail sales, no pass-by trip reduction is appropriate. A new “cannabis production” category results in a preliminary EDU factor of 0.68. Adopting Approach 2 would add an additional fee category for cannabis production, which would be approximately 33 percent higher, per square foot, than the industrial/warehouse fee.

Recommended Action: DKS Associates and County Staff recommend the Board consider and adopt either Approach 1 or Approach 2 to account for cannabis production in the TIF Program Major Update.

Appendix: ITE Forum Discussion

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Cannabis Cultivation Trip Generation

Follow

Ms. Trisha Munoz E.I.T 11 days ago

Has anyone done trip generation for Cannabis Cultivation Facility? We are searching for trip ge...

1. Cannabis Cultivation Trip Generation

0 Recommend

Ms. Trisha Munoz E.I.T

Actions

Posted 11 days ago

Reply

Has anyone done trip generation for Cannabis Cultivation Facility?

We are searching for trip generation rates (e.g., daily, AM and PM rates, the independent variable is based on something we can measure, etc.).

Trisha Munoz E.I.T.
Engineer II
David Evans and Associates, Inc.
Victorville CA
Tnm@deainc.com

2. RE: Cannabis Cultivation Trip Generation

0 Recommend

PTOE
Mr. Matthew Delich P.E., PTOE
Actions

Posted 10 days ago

Reply

We have used light industrial, with floor area or number of employees as the variable. I would advise negotiating something with the review agency before you start.

Matthew Delich P.E., PTOE
Consulting Engineer

Delich Associates
Loveland CO
matt@delichassoc.com

› Original Message

3. RE: Cannabis Cultivation Trip Generation

0 Recommend

Ms. Trisha Munoz E.I.T

Actions

Posted 9 days ago

Reply

Matthew,

Thank you for replying. This seems to be the consensus on a few studies I have found through a google search.

Trisha Munoz E.I.T.
Engineer II
David Evans and Associates, Inc.

Victorville CA
Tnm@deainc.com

Original Message

4. RE: Cannabis Cultivation Trip Generation

0 Recommend

Mr. Gholamreza Sayyadi

Actions

Posted 10 days ago

Reply

Hi,
First Principle approach can be a solution.
estimate number of employees, workers, maintenance and operation, visitors, etc. try to be accurate as much as you can

----
Gholamreza Sayyadi
Student
York University

reza.sayyd@gmail.com

Original Message

5. RE: Cannabis Cultivation Trip Generation

0 Recommend

Ms. Trisha Munoz E.I.T

Actions

Posted 6 days ago

Reply

Gholamreza,

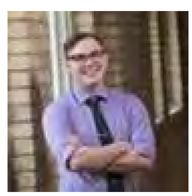
Thank you for your comment.

Trisha Munoz E.I.T.
Engineer II
David Evans and Associates, Inc.
Victorville CA
Tnm@deainc.com

› Original Message

6. RE: Cannabis Cultivation Trip Generation

0 Recommend



MENTEE

Mr. Tyler Krage P.E

Actions ▾

Posted 9 days ago

Edited by Tyler Krage 7 days ago

Reply ▾

[Comment deleted by user - pertained to dispensary trip gen, not cultivation trip gen]

› Original Message

7. RE: Cannabis Cultivation Trip Generation

0 Recommend

Mr. Frank Berry P.Eng

Actions

Posted 7 days ago

Reply

We have done a number of projects throughout Southwestern Ontario, varying in size from 20 employees to over 200. The latest involved a facility producing edible products within an existing grow and production operation. The key variables are number of employees and shift times. You have to get these from the owner. Truck movements are not usually significant.
Frank R. Berry, P.Eng. FellowITE (Life)
F. R. Berry & Associates

Frank Berry P.Eng.
Principal
F. R. Berry & Associates
London ON
fyberry@rogers.com

Original Message

8. RE: Cannabis Cultivation Trip Generation

0 Recommend

Ms. Trisha Munoz E.I.T

Actions

Posted 6 days ago

Reply

Frank,

Thank you.

Trisha Munoz E.I.T.
Engineer II
David Evans and Associates, Inc.
Victorville CA
Tnm@deainc.com

Original Message

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  - Enroll as a Mentor
  - Enroll as a Mentee
  - Find Your Mentor or Mentee
  - Mentor Match FAQs
  - Resources

MEMORANDUM

DATE: December 18, 2019

TO: Rafael Martinez, Director of Transportation

FROM: John P. Long, P.E., T.E.
Cameron Shew, P.E., T.E.

SUBJECT: TIF Major Update
Technical Memorandum 3B: Winery Trip Rates

Executive Summary

The County's Traffic Impact Fee (TIF) Program allocates the cost of roadway improvements based on the number of new vehicle trips generated in the PM peak hour for various land use types. For non-residential development, current land use categories include general commercial, hotel/motel/B&B, church, office/medical, and industrial/warehouse.

Most non-residential development generally falls into one of these above listed categories, although a "per trip" fee may be charged when the County determines that use of the categories is not appropriate. This may be due to an uncommon land use or any other factors that, at the County's sole discretion, render the category unrepresentative of the expected trip generation of the proposed land use.

Wineries and agritourism are growing industries in El Dorado County. Like other industrial and commercial uses, these uses generate employment, commercial/tourism, and delivery-related trips that use the County's roadways, and should pay a fair share toward improving those roadways. Agritourism includes, but is not limited to, pumpkin patches, Christmas tree farms, fruit stands, U-pick orchards, and microbreweries. Sufficient data exists to implement a TIF for wineries, which would be based on gross floor area (GFA) of the tasting room. There is not sufficient data to support a broad agritourism category, due to the different independent variables involved and limited data sources. A per-trip fee, assessed based on a development's traffic impact study, is appropriate for agritourism uses other than wineries.

County staff and their consultant (DKS Associates) request direction on whether wineries should be included as a new category in the TIF Program Major Update, and if local data should be collected to develop trip rates for other agritourism-related uses.

Background

Like most development fee programs, the County's TIF Program allocates the cost of roadway improvements by land use type based on the concept of "equivalent dwelling units" (EDU). An EDU equals the demand placed on the transportation network relative to one single family dwelling unit which is assigned an EDU of 1.0. Land uses which have greater overall traffic impacts than a typical single-family residential unit are assigned values greater than 1.0, while land uses with lower overall traffic impacts are assigned values less than 1.0.

The County's TIF Program bases its EDUs on the number of vehicle trips generated by a given land use during the PM peak hour. This is because roadway needs are primarily based on traffic flows and conditions during the PM peak hour on a typical weekday. Vehicle trips are derived from studies compiled and vetted by the Institute of Transportation Engineers (ITE), which measure the vehicle trips entering and leaving a specific development.

The current fee program has the following categories for non-residential development:

- General Commercial;
- Hotel/Motel/B&B;
- Church;
- Office/Medical; and
- Industrial/Warehouse

Literature Review

DKS conducted a review of available literature and data sources to determine the current state of the practice, regarding trip generation characteristics of wineries and other agritourism uses. This section summarizes the sources reviewed and our findings.

ITE Trip Generation, 10th Edition

ITE has published trip generation data for wineries (Land Use Code 970), which show that an average trip generation rate of 7.31 PM peak hour trips per thousand square feet of gross floor area (GFA) is appropriate. It should be noted that this average is based on four studies, and collection of local trip generation data may be appropriate.

No land use codes appear to be applicable to other agritourism-related uses.

ITE e-Community Forum

Data was not provided on the ITE e-community forums for specific winery-related trip rates. The discussion was mostly related to traffic impact studies, where there was a general consensus that traffic engineers should consider large events frequently held at wineries. Engineers should also consider the number of anticipated attendees and vehicle occupancy ratios to establish parking demand. Other parameters that may be useful include the requirement for special permits and if additional, temporary infrastructure (e.g. seating or tents) is necessary. However, from a typical weekday PM peak hour perspective, large events are not likely to substantially contribute to trip generation.

No discussions were found, related to other agritourism uses, such as pumpkin patches, Christmas tree farms, fruit stands, and U-pick orchards. One discussion was found related to trip generation of brew-pubs, where it was suggested to break out the different on-site uses. For example, the brewery portion may be considered to be manufacturing, and the public-serving portion may be considered to be a drinking place (Land Use Code 925) or quality restaurant (Land Use Code 931).

Winery Trip Generation and Parking Generation Study, Cal Poly San Luis Obispo

In 2015, the Western District of ITE commissioned a study titled *Winery Trip Generation and Parking Generation*, which was carried out by California Polytechnic State University, San Luis Obispo. The study collected data at three wineries in the Edna Valley region of San Luis Obispo County, located on California's Central Coast. Five independent variables for wineries were reviewed: employees, GFA, total acreage, annual production, and varietals. GFA was found to be the variable most correlated with trip generation. The study only collected data on a Saturday, finding a midday peak trip generation of 26 peak hour trips per thousand square feet of GFA. This is noted to be substantially lower than ITE data, which averages 36.5 trips per thousand square feet GFA on the Saturday peak hour of generator. While Saturday data is not directly applicable to the TIF Major Update, it should be noted that wineries' weekday PM peak hour trip generation is substantially lower than their Saturday peak.

Napa County Winery Trip Generation Form

Napa County has published a winery traffic information sheet, which estimates trip generation at different times and for events of varying scale. In addition to typical weekday traffic, the worksheet can be used to estimate typical Saturday traffic, trips during a “crush” Saturday, and additional traffic generated by the winery’s largest marketing event. Daily trip generation is calculated as the sum of:

- Number of full-time employees x 3.05 one-way trips per employee;
- Number of part time employees x 1.90 one-way trips per employee;
- Average number of weekday visitors / 2.6 visitors per vehicle x 2 one-way trips; and
- Wine production x 0.009 trucks/1000 gallons x 2 one-way trips

PM peak hour trips are assumed to be 38% of total daily trips, calculated by summing the above. This method gives a more precise accounting by trip purpose, and may be suitable for application in a traffic impact study. However, many of these variables are not known at the time of a project application. Thus, this methodology is not useful for calculating PM peak hour trips for TIF assessment.

El Dorado County Sustainable Agritourism Mobility Study

The El Dorado County Transportation Commission (EDCTC) commissioned a mobility study, which was completed by Fehr & Peers in 2016. The intent of this study was to identify low-cost, high-impact solutions to address agritourism congestion on county roadways in the Camino (Apple Hill) area. The study noted that congestion is primarily concentrated on four to six weekends from late September to early November (peaking during three weekends in mid-to-late October). However, weekday agritourism is growing, as returning and local visitors attempt to avoid weekend crowds. Data was collected on weekends at key locations, including gateways to the Camino Area, High Hill Ranch and Abel’s Acres. The study analyzed travel patterns and made recommendations, including:

- Parking and circulation improvements: improve driveway access, queue management/ traffic control, wayfinding improvements, parking management
- Traveler information: electronic and paper resources, traveler information, alternate routes, dissemination of real-time information
- Marketing strategies: encourage weekday and off-peak travel, co-marketing, and social media strategies
- Multimodal strategies: dedicated shuttle right-of-way, multi-purpose trail, product delivery alternatives,
- Vehicle circulation improvements: temporary turn restrictions, adaptive signal timing, realigning intersections, temporary one-way circulation, bus-only roadways, shoulder widening, and drainage improvements.

Most of these improvements are temporary and are the responsibility of parties other than the County (i.e. private landowners and Apple Hill Growers Association) to implement. Of the strategies that could be implemented by the County (i.e. intersection realignment, shoulder widening, and drainage improvements), the feasibility is uncertain. Constraints include funding, right-of-way, environmental clearance, topography, public support, and benefit-cost considerations. While significant capital improvements in the Camino area may not be feasible, agritourism-related traffic does substantially contribute to West Slope congestion on US 50, particularly on Sunday afternoons. 64 percent of visitors come from the Sacramento Metropolitan Area and the Bay Area, and another 20 percent from western El Dorado County. Weekend traffic demand peaks at 1,800 vehicles per hour around 11:00 am. While US 50 corridor needs (i.e. auxiliary lanes, carpool lanes, and interchange improvements) in the current TIF program are determined based on weekday PM peak hour traffic, agritourism-related traffic would also benefit from these improvements.

VRTC Agritourism Report

The Virginia Transportation Research Council (VTRC) published a report titled *Trip Generation at Virginia Agritourism Land Uses*. The document noted that the following ITE Land Use Codes may be applicable to the following agritourism cases:

- Land Use Code 480 (Amusement Park): May apply to farms or plantations offering rides (e.g. hayrides, pedal tractors, barrel train), entertainment (e.g. pig races, fun barn, corn maze), refreshment stands (e.g. restaurant/grill and bakery), and picnic tables

- Lane Use Code 817 (Nursery with Garden Center): May apply to farm stands and markets that sell produce

- Land Use Code 925 (Drinking Place) and 931 (Quality Restaurant): May apply to breweries and brewpubs

The report also conducted an extensive literature review of trip generation studies of wineries in California, including San Diego County, Sonoma County, Riverside County, and Napa County. Local (Virginia) data was collected at five winery sites. The author concludes that the square footage of the tasting room and number of employees during peak season are variables which exhibit high correlation with vehicle trip generation.

Analysis

Consistent with the findings from the Cal Poly San Luis Obispo and VRTC studies, it is recommended to base PM peak hour trip generation calculations for wineries on the gross floor area (GFA) of the tasting room. It is recommended to use a trip rate of 7.31 PM peak hour trips per thousand square feet GFA, based on ITE data. While visitors sometimes visit multiple wineries during a trip, insufficient data is available to support a pass-by trip reduction assumption.

El Dorado County is ideally situated for a variety of agritourism-related uses, including breweries, fruit stands, U-pick orchards, pumpkin patches, and Christmas tree farms. The wide variety of businesses makes it difficult to correlate trip generation with a single, measurable independent variable. Additionally, data is currently insufficient to support a defensible trip rate for most agritourism-related uses, with the exception of wineries. The recommended approach is to calculate a per-trip fee, based on the traffic impact study for any proposed development.

If the County wishes to develop local trip generation rates, it is recommended to collect data during the weekday PM peak hour in the peak season (i.e. autumn in Apple Hill or early December for tree farms). The general consensus on the ITE e-Community forums is that very high pass-by rates (80%-90%) should be expected for certain uses, such as roadside stands. While agritourism trip generation is not anticipated to be as high during the weekday PM peak as on the weekend, a substantial portion of the traffic would likely use US 50 facilities that are funded by the TIF program.

Recommended Action: DKS Associates and County Staff recommend the Board consider adding a new TIF Category for wineries, consistent with ITE Trip Generation data. DKS Associates cannot make a recommendation regarding other agritourism uses, as there is not sufficient trip rate information available. DKS Associates and County Staff request Board direction if local data should be collected in 2020, and if so, for what types of agritourism uses.

Appendix A: ITE Forum Discussion

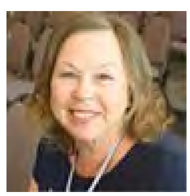
All Member Forum

Winery Trip Generation

Follow

1. Winery Trip Generation

0 Recommend



MENTOR

Ms. Dalene Whitlock P.E., PTOE

Actions

Posted 01-09-2016 02:51 PM | view attached

Reply

Our firm routinely does traffic studies for winery projects in Napa and Sonoma Counties. Both Counties have their own forms for doing the trip generation for wineries to address trips on both weekdays and Saturdays, as well as for special events. Sonoma County uses 2.5 persons per vehicle to determine the number of trips/parking demand for a special event, while Napa County uses 2.8 persons/vehicle. In evaluating potential impacts we use the typical daily trips for the analysis, and only use the trips for an event to look at access issues if there are a sufficient number of events for their impacts to occur during more than 30 hours annually (based on Caltrans' 30th highest hour criterion) as well as for the parking demand. Our firm did counts for one week every month for a year, and determined that 10 percent of weekday daily trips and 13 percent of Saturday trips occur during the p.m. peak hour. We use this ratio for Sonoma County, but Napa County has its own ratio, as indicated on their winery trip generation form (attached).

Dalene Whitlock P.E., PTOE
Principal
W-Trans
Santa Rosa CA
dwhitlock@w-trans.com

Attachment(s)

Napa Winery Trip Generation Form 2015-06.pdf 129K 1 version

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Trip Generation for Vinyard/Winery

Follow

Mr. Martin Percy MS, PE, PTOE 12-23-2015 07:57 AM
I am evaluating a vineyard/winery that typically sees most of its patrons visit on weekends. While...

1. Trip Generation for Vinyard/Winery

0 Recommend

PTOE
Mr. Martin Percy MS, PE, PTOE
Actions

Posted 12-23-2015 07:57 AM

Reply

I am evaluating a vineyard/winery that typically sees most of its patrons visit on weekends. While information has been provided for total weekend trips, our agency requires Peak Hour Trips (PHTs) as a basis on which to decide if a Traffic Impact Study (TIS) will be required. On the other hand, the facility in question routinely hosts larger events, weddings for example, that also typically will take place on weekends.

My question is how to evaluate these larger events relative to the regular weekend PHTs generated by the vineyard/winery. In reality, the larger events will result in trips to and from the facility that surpass the typical PHTs generated for the site, but the larger events may not occur every weekend.

Others must have evaluated similar facilities, and I am looking for feedback on the best way to evaluate the trip generation to this vineyard/winery. The regular weekend PHTs seem to be straightforward and predictable, but what is the best way to consider the special events traffic relative to regular weekend trips generated at this site?

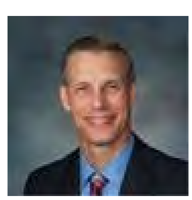
Thank you.

Martin C. Percy PE, PTOE

Martin Percy MS, PE, PTOE
Westminster MD
martincpercy@gmail.com
----

2. RE: Trip Generation for Vinyard/Winery

0 Recommend



PTOE

Mr. Jeffrey Dirk P.E., PTOE

Actions

Posted 12-24-2015 07:13 AM

Reply

Martin:

I would suggest that the traffic and parking demands associated with events be defined based on the number of attendees that are anticipated, with data to be provided for both a typical and peak event. From this information, a reasonable vehicle occupancy ratio can be established and applied to the number of attendees to arrive at approximate traffic volume projections and parking demands. The Applicant could then propose appropriate traffic and parking management strategies that would accommodate the projected demands for such events outside of any measures that may be required to accommodate regular operation of the facility.

Jeffrey Dirk P.E., PTOE
Principal
Vanasse & Associates, Inc.
Andover MA
jdirk@rdva.com

Original Message

3. RE: Trip Generation for Vinyard/Winery

0 Recommend

[Mr. James Garofalo](#)

Actions

Posted 12-24-2015 12:12 PM

Reply

The number of attendees maybe limited by occupancy restrictions, seating restrictions, parking availability, etc. Are outdoor tents to be erected, parking in grass areas? Does the municipality have a requirement for special permits for gatherings over a certain size? Just a few things to be considered.

James Garofalo
Director-Transportation Div.
Tim Miller Associates, Inc.
Cold Spring NY
jamesgarofalo@earthlink.net

Original Message

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Brew-pub Trip Generation Studies

Follow

Mr. James Aton PE 06-20-2018 09:22 AM
I'm looking for any trip generation studies and numbers for a Brew-pub establishment. This is wher...

1. Brew-pub Trip Generation Studies

0 Recommend

Mr. James Aton PE

Actions

Posted 06-20-2018 09:22 AM

Reply

I'm looking for any trip generation studies and numbers for a Brew-pub establishment. This is where a smaller brewery manufactures their beer and has a bar within the same building that is more than just a tasting room. We've had several of these pop up so far in our town and there seems to be more on the way. We have been breaking the business into an assumed square footage of Manufacturing (140) and the remainder Drinking Place (925) but we don't want to open ourselves up to having to do this for other business types. Any numbers available will be helpful.

James Aton, PE
Operations Division Chief
Town of Mount Pleasant
Mount Pleasant, SC
jaton@tompsc.com
----

2. RE: Brew-pub Trip Generation Studies

0 Recommend

Mr. Ali Al-Saudi

Actions

Posted 06-21-2018 02:32 AM

Reply

This consultant provide some Trip Generaon number s, I think you can find what you are looking for at hp://w ww.tripgeneraon.or g/

Ali F. Al-Saudi, EIT, A.M.ASCE

Transportation Engineer

Mobile: 55315413

› Original Message

3. RE: Brew-pub Trip Generation Studies

0 Recommend

Ms. Lisa Fontana Tierney P.E

Actions

Posted 06-25-2018 11:16 AM

Reply

ITE's land use code 925 Drinking Place is defined as follows: A drinking place contains a bar, where alcoholic beverages and food are sold, and possibly some type of entertainment, such as music, television screens, video games, or pool tables. Establishments that specialize in serving food but also have bars are not included in this land use.

This studies included in this land use do not make specific menon as to the presence of on-site micro-brewing facilies. Therefore, we are uncertain as to the impacts of an on-site micro-brewery on the trip generaon rates for drinking places. We encourage users to submit available data on this topic to ITE for possible inclusion in future updates to the *Trip Generaon Manual*. The source of trip generaon data referenced in this discussion (by Spack Consulng) was submied to ITE and was considered and incorporated into the current edion of the ITE *Trip Generaon Manual (10th Edion*).

Lisa Fontana Tierney P.E.
Traffic Engineering Senior Director
Institute of Transportation Engineers
Washington DC
lfontana@ite.org

Original Message

4. RE: Brew-pub Trip Generation Studies

2 Recommend

Mr. Peter Koonce

Actions

Posted 06-27-2018 12:52 PM

Reply

I am a little surprised no one jumped in on this one.

I would like to volunteer to peer review these studies with targeted site visits.

Please let me know if you need me to come to your local brewpub to collect "data". I can insure you that the first hour of data will be reasonably good, but can give no assurances of quality after that point.

Happy Wednesday!
Peter

Peter Koonce, PE
Portland, OR

Original Message

5. RE: Brew-pub Trip Generation Studies

0 Recommend

Mr. Donald Bennett P.E

Actions

Posted 06-28-2018 07:44 AM

Reply

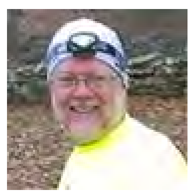
We have one under construction, as soon as completed and the initial "new" period is over, since it has one driveway, it should be reasonably easy to count. Estimated opening: August/September 2018.

Don Bennett, PE
City Traffic Engineer,
Wilmington, NC
910-341-4696
don.bennett@wilmingtonnc.gov

Original Message

6. RE: Brew-pub Trip Generation Studies

0 Recommend



Mr. B Derr

Actions

Posted 07-02-2018 10:18 AM

Reply

A colleague, Ann Hartell, mentioned that one of her grad school colleagues had done a study of wineries that may be helpful. I didn't check to see if they used Peter's study approach.
https://trid.trb.org/view/1392325

Ray Derr
Project Manager, NCHRP
Transportation Research Board
rderr@nas.edu

Original Message

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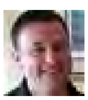
Trip generation banquet facilities and farmstands

Follow

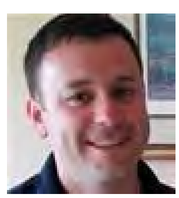


Mr. Alexander Garbe P.E., PTOE 06-28-2016 05:32 PM

Does anyone have any trip generation data they'd be willing to share for banquet facilities or for ...

1. Trip generation banquet facilities and farmstands

0 Recommend



PTOE

Mr. Alexander Garbe P.E., PTOE

Actions

Posted 06-28-2016 05:32 PM

Reply

Does anyone have any trip generation data they'd be willing to share for banquet facilities or for a farmstand? For the farmstand, I'm particularly interested in the type that sells pumpkins, apples, etc. in fall. Saturday data would also be nice, but I'll be happy with whatever anyone is willing to share.

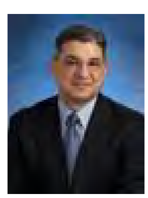
Thanks,

Alex

Alexander Garbe P.E., PTOE
Traffic Engineer
Hampton, Lenzini, & Renwick, Inc.
Elgin IL
agarbe@hlreng.com

2. RE: Trip generation banquet facilities and farmstands

0 Recommend



Mr. Steven Scalici P.E

Actions

Posted 06-29-2016 07:15 AM

Reply

Alex, I can't offer any data, but one thing seems very rational: there has to be a rather large pass-by credit as people eyeball a roadside fruit stand (not a special place like Hickory Farms or Delicious Orchards) and just stop on the fly. 80-90% would seem fair to me.

Steven Scalici P.E.
Senior Associate
STV, Inc.
New York NY
steven.scalici@stvinc.com

Original Message

Home
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How to Get Started
Enroll as a Mentor
Enroll as a Mentee
Find Your Mentor or Mentee
Mentor Match FAQs
Resources

Appendix B: Related Papers and Research

Land Use: 970
Winery

Description

A winery is a property used primarily for the production of wine. Wineries typically include tasting room facilities and may offer special events such as weddings or parties. Wineries often offer complimentary tours and wine tasting. Visitors also may purchase wine or wine-related products.

Additional Data

For the purposes of this land use, the independent variable "1,000 sq. foot gross floor area" refers to the square footage of the building that houses the tasting room.

Time-of-day distribution data for this land use for a weekday, Friday, Saturday, and Sunday are presented in Appendix A. For the sites with weekday, Saturday, and Sunday data, the overall highest vehicle volumes during the PM were counted between 1:45 and 2:45 p.m. For the sites with Friday data, the PM peak hour was between 4:00 and 5:00 p.m. For all four days, the AM peak hour was between 11:45 a.m. and 12:45 p.m.

The sites were surveyed in the 2010s in California, Illinois, and Virginia.

Source Numbers

807, 851, 894

Winery
(970)

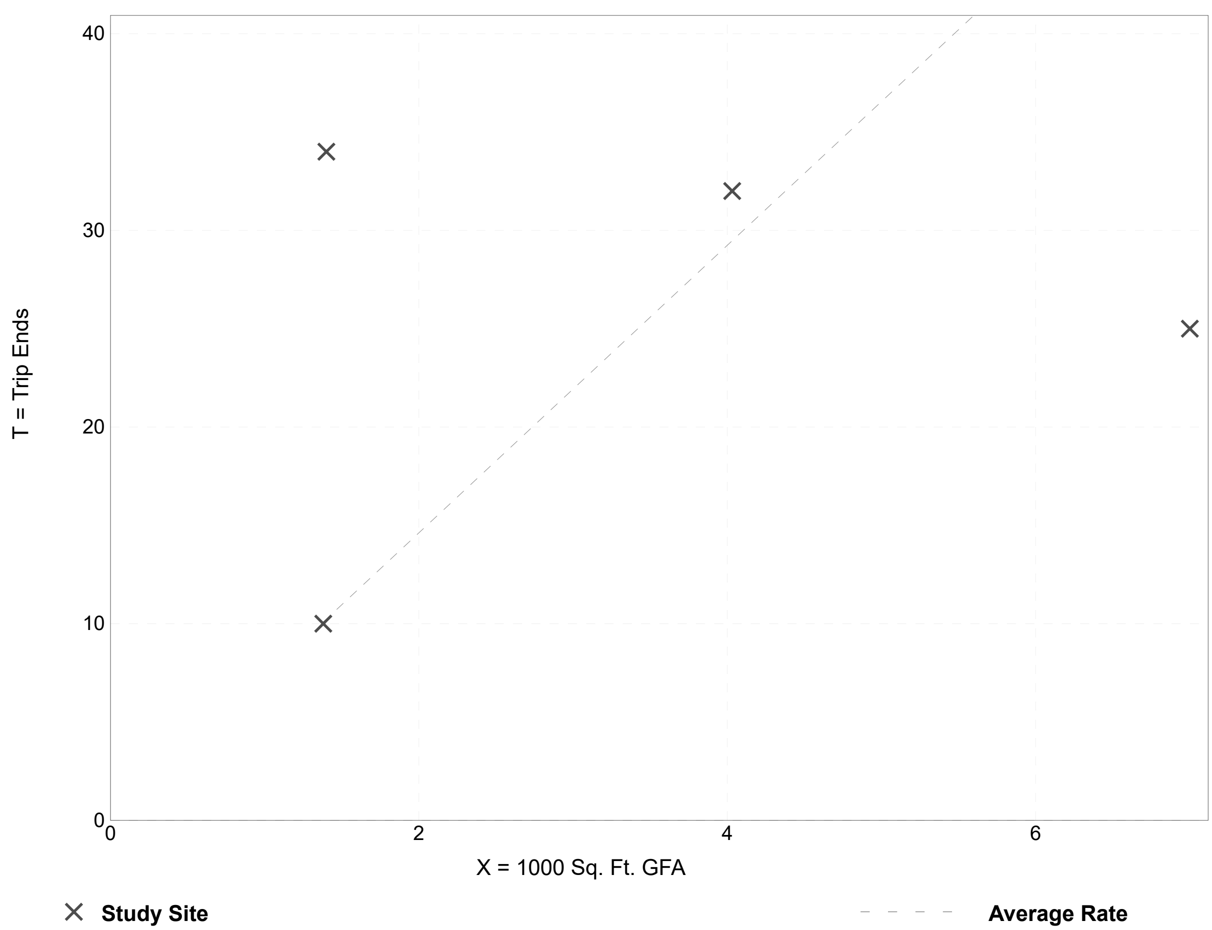
Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**Rural**
Number of Studies:	4
Avg. 1000 Sq. Ft. GFA:	3
Directional Distribution:	50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
7.31	3.57 - 24.29	6.97

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= ****

Trip Generation Manual, 10th Edition • Institute of Transportation Engineers

Winery Trip Generation and Parking Generation

Institute of Transportation Engineers

California Polytechnic State University, San Luis Obispo

Student Chapter

Spring 2015

Table of Contents

Background

The ITE Student Chapter at Cal Poly San Luis Obispo proposed a trip generation and parking demand study at wineries in order to collect data for this underrepresented land use. The Student Chapter entered into an agreement with the San Luis Obispo Wine Country Association (SLOWCA) to perform data collection on multiple wineries. Figure 1 shows a map of all the wineries in SLOWCA. Because there is no land use classification for wineries in the ITE Trip Generation Manual, the independent variables that are most influential are unknown. An initial study was conducted with the help of students enrolled in CE 322, the Fundamentals of Transportation Engineering laboratory class. These students visited the three chosen winery sites, where they collected preliminary data about possible independent variables.

FIGURE 1: MAP OF SLOWCA

All three wineries are located in the Edna Valley in San Luis Obispo County, California. Table 1 describes the relevant independent variables at each of the three winery sites.

TABLE 1: INDEPENDENT VARIABLES FOR EACH WINERY

Winery	Winery A	Winery B	Winery C
Total Employees	25	12	16
Tasting Room GFA	1000 ft^2	444 ft^2	3375 ft^2
Total Acreage	200	6	1200
Annual Production	35,000 Bottles	90,000 Bottles	225,000 Bottles
Varietals	18	17	27

Note: Acreage based upon only the parcel of land on which the tasting room is located.

Data Collection

On Saturday, April 4, 2015, 20 student members of the Cal Poly ITE student chapter volunteered to collect data. To reflect the overall winery category, three wineries were studied on a single day. The single day of study was used to ensure that weather would be the same for all locations, as the industry is heavily impacted by inclement weather. Data was collected continuously from 7:00 AM to 7:00 PM on the following items: vehicle trips, bicycle trips, pedestrian trips, parking occupancy, and adjacent street traffic for vehicles, pedestrians, and cyclists. Transit does not serve the area and therefore not considered an option for trips to take place. In addition truck traffic to the sites is extremely low. Students were instructed to monitor and note any truck trips, however none occurred at any site. Trips to the site and adjacent street traffic were collected for 12 hours and parking occupancy was collected for 12 hours.

The official data collection took place in early April 2015, and the data included in this report is to be considered representative of the wineries' "shoulder season" as opposed to the "peak season" for this industry, which takes place from about May-September. Peak season data could not be collected due to the schedule of the ITE Western District Data Collection process, which requires a final report before the peak season and selects proposals after the peak season ends. Conversations with the individual wineries involved indicates that the peak occurs on Saturdays around midday. The peak hour is variable depending on the frequent tour groups. Figure 2 shows two student members collecting data.

FIGURE 2: STUDENTS COLLECTING DATA

Trip and Parking Generation Results

Trip generation results were broken down to show generation by vehicles and alternative modes of transportation. Figure 3 shows the vehicular trip generation for the day at all wineries. Figure 4 displays the trip generation from walking and cycling.

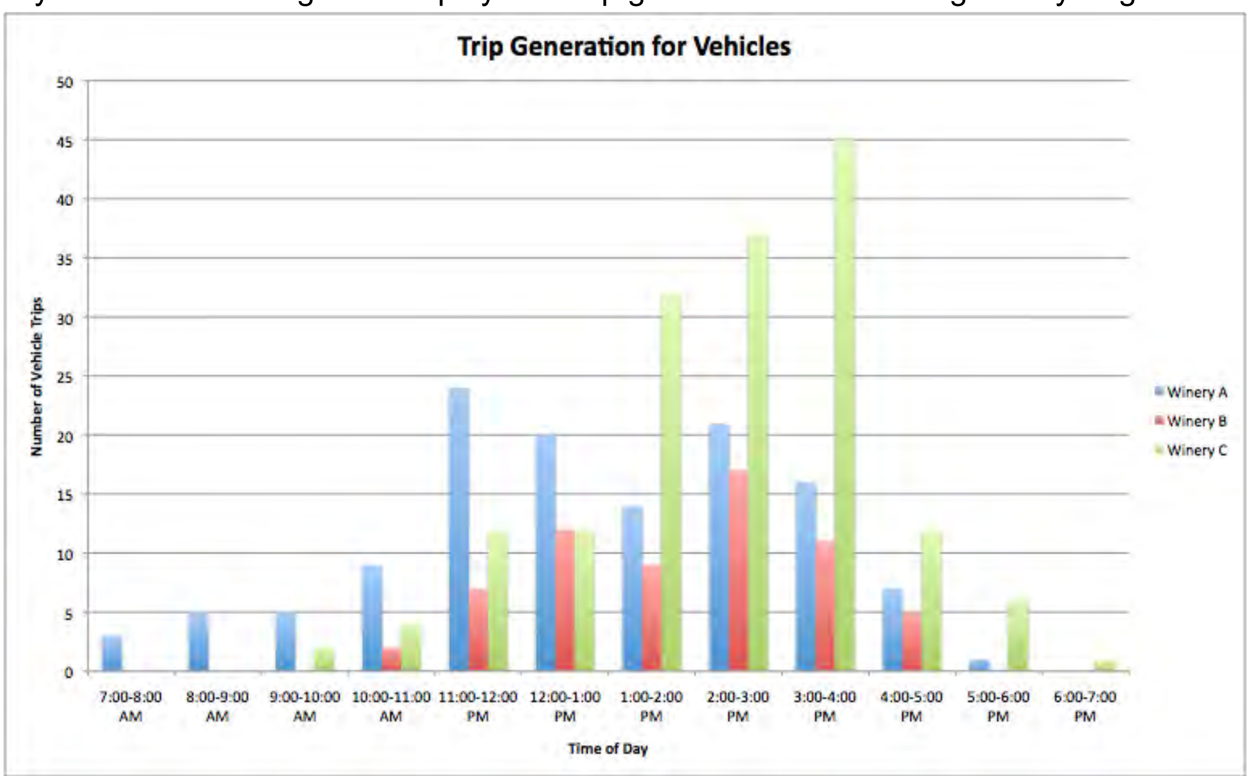


FIGURE 3: TRIP GENERATION FOR VEHICLES

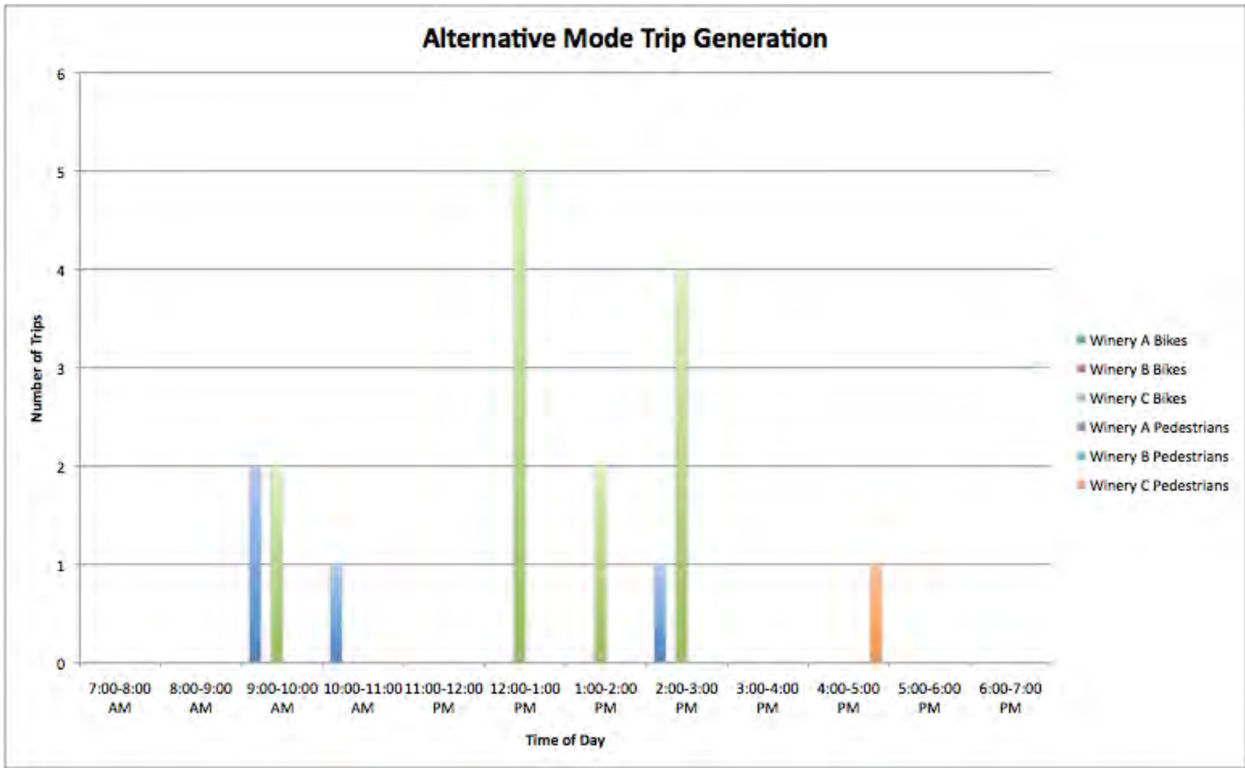


FIGURE 4: TRIP GENERATION FOR ALTERNATIVE MODES

Table 2 shows the peak hour information for each winery. Each winery had a different peak hour and the large majority of trips were generated by vehicles with alternative modes being a small percentages of trips.

TABLE 2: NUMBER OF TRIPS PER MODE DURING THE PEAK HOUR

Winery	Winery A	Winery B	Winery C
Peak Hour	11:00 AM-12:00 PM	2:00 PM-3:00 PM	2:45 PM-3:45 PM
Vehicle Trips	24	17	51
Bicycle Trips	0	0	2
Pedestrian Trips	0	0	0
Total Trips	24	17	53

Parking information was also collected every 15 minutes and compiled. Figure 5 shows the number of parked cars at all 3 wineries for the day. The data follows the expected vehicle trips trend. Table 3 summarizes the peak hour parking information.

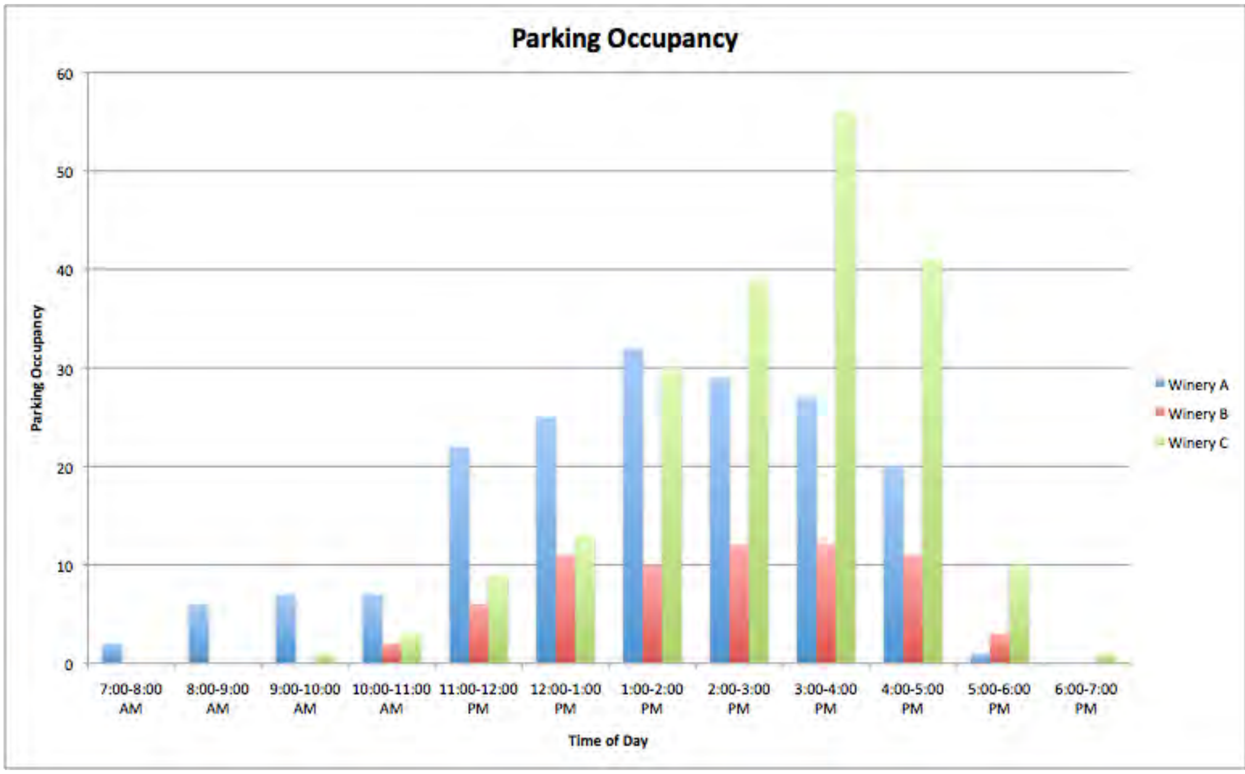


FIGURE 5: PARKING OCCUPANCY

TABLE 3: PEAK HOUR PARKING OCCUPANCY AT EACH WINERY

Winery	Winery A	Winery B	Winery C
Peak Hour	12:45 PM-13:45 PM	2:30 PM-3:30 PM	3:00 PM-4:00 PM
Parked Vehicles	33	14	56

Trip Rate Analysis

Table 4 shows the trip generation rate for each variable from Table 1. The rates are determined by dividing the peak hour vehicle trips by the independent variable. Analysis using adjacent street traffic was not utilized due to the drastic differences between adjacent streets at each site.

TABLE 4: TRIP RATES

Winery	Winery A	Winery B	Winery C	Average
Total Employees	0.96	1.42	3.19	1.86
Tasting Room GFA	24	38	15	26
Total Acreage	0.12	2.83	0.04	1.0
Annual Production	$6.86x10^{-4}$	$1.89x10^{-4}$	$2.27x10^{-4}$	$3.67x10^{-4}$
Varietals	1.33	1.0	1.89	1.41

Note: Trip rates are expressed in trips/employee, trips/1000 square foot, trips/acre, trips/bottle, and trips/varietal.

Conclusions and Recommendations

All of the tested independent variables have high variability and no one factor appears to be the best. Of the variables tested the tasting room gross floor area may be the best option despite also being highly variable. The outside seating areas common at wineries must be taken into consideration for this variable to be accurate. Some variables such as distance to nearby population centers and prestige play an important role in trip generation but are hard to standardize.

Wineries are a unique category of land use that is not yet recognized within the ITE Trip Generation Manual. Along with craft breweries they are a growing recreational facility that should be added. Further study of wineries should be conducted first across multiple wine regions to find the best overall independent variables and account for regional differences.

Appendix

Raw data can be found on the following data collection sheets.

ite Institute of Transportation Engineers

Trip Generation Data Form *(Part 1)*

Land Use/Building Type:[1] Winery	ITE Land Use Code: N/A
Source: Cal Poly ITE Student Chapter	Source No. *(ITE use only)*:
Name of Development: Winery A	Day of the Week: Saturday
City: San Luis Obispo State/Province: California Zip/Postal Code: 93401	Day: 4 Month: April Year: 2015
Country: USA	Metropolitan Area:

1. For fast-food land use, please specify if hamburger- or nonhamburger-based.

Location Within Area:

- ☐ (1) CBD
- ☐ (2) Urban (Non-CBD)
- ☐ (3) Suburban (Non-CBD)
- ☐ (4) Suburban CBD
- ☒ (5) Rural
- ☐ (6) Freeway Interchange Area (Rural)
- ☐ (7) Not Given

Independent Variable: (include data for as many as possible)[2]

Value	Variable	Actual	Estimated
25	(1) Employees (#)	☐	X
____	(2) Persons (#)	☐	☐
____	(3) Total Units (#) (indicate unit: ________)	☐	☐
____	(4) Occupied Units (#) (indicate unit: ________)	☐	☐
1000	(5) Gross Floor Area (gross sq. ft.)* (% of development occupied ________)	☐	X
____	(6) Net Rentable Area (sq. ft.)	☐	☐
____	(7) Gross Leasable Area (sq. ft.) (% of development occupied ________)	☐	☐
200	(8) Total Acres (% developed: ________)	☐	X
____	(9) Parking Spaces (% occupied: ____)	☐	☐
____	(10) Beds (% occupied: ________)	☐	☐
____	(11) Seats (#)	☐	☐
____	(12) Servicing Positions/Vehicle Fueling Positions	☐	☐
____	(13) Shopping Center % Out-parcels/pads	☐	☐
____	(14) A.M. Peak Hour Volume of Adjacent Street Traffic	☐	☐
____	(15) P.M. Peak Hour Volume of Adjacent Street Traffic	☐	☐
35,000	(16) Other Annual Production (Bottles)	☐	X
18	(17) Other Varietals	X	☐

Detailed Description of Development:[3]

2. **Definitions for several independent variables can be found in the *Trip Generation*, Second Edition, *User's Guide* Glossary.**

3. **Please provide all pertinent information to describe the subject project, including the presence of bicycle/pedestrian facilities. To report bicycle/pedestrian volumes, please refer to Part 4 of this data form.**

Other Data:

Vehicle Occupancy (#):
____ A.M. ____ P.M. ____ 24-hour %

Percent by Transit:
____ A.M. % ____ P.M. % ____ 24-hour %

Percent by Carpool/Vanpool:
____ A.M. % ____ P.M. % ____ 24-hour %

Employees by Shift:

Shift	Start Time	End Time	Employees (#)
First Shift	____	____	____
Second Shift	____	____	____
Third Shift	____	____	____

Parking Cost on Site: Hourly ____ Daily ____

Transportation Demand Management (TDM) Information:

At the time of this study, was there a TDM program (that may have impacted the trip generation characteristics of this site) underway?

- ☐ No
- ☐ Yes (If yes, please check appropriate box/boxes, describe the nature of the TDM program(s) and provide a source for any studies that may help quantify this impact. Attach additional sheets if necessary)

- ☐ (1) Transit Service
- ☐ (2) Carpool Programs
- ☐ (3) Vanpool Programs
- ☐ (4) Bicycle/Pedestrian Facilities and Site Improvements
- ☐ (5) Employer Support Measures
- ☐ (6) Preferential HOV Treatments
- ☐ (7) Transit and Ridesharing Incentives
- ☐ (8) Parking Supply and Pricing Management
- ☐ (9) Tolls and Congestion Pricing
- ☐ (10) Variable Work Hours/Compressed Work Weeks
- ☐ (11) Telecommuting
- ☐ (12) Other ________________

* GFA of Tasting Room Only

Please Complete Form on Other Side

ite Institute of Transportation Engineers

Trip Generation Data Form (Part 2)

Summary of Driveway Volumes *(All = All Vehicles Counted, Including Trucks; Trucks = Heavy Duty Trucks and Buses)*

	Average Weekday (M-F)						Saturday						Sunday					
	Enter		Exit		Total		Enter		Exit		Total		Enter		Exit		Total	
	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks
24-Hour Volume																		
A.M. Peak Hour of Adjacent[1] Street Traffic (7 – 9) Time (ex.: 7:15 - 8:15):																		
P.M. Peak Hour of Adjacent[1] Street Traffic (4 – 6) Time:																		
A.M. Peak Hour Generator[2] Time:																		
P.M. Peak Hour Generator[2] Time:																		
Peak Hour Generator[3] Time (Weekend): 11:00-12:00							24	0	7	0	31	0						

[1] Highest hourly volume between 7 a.m. and 9 a.m. (4 p.m. and 6 p.m.). Please specify the peak hour.
[2] Highest hourly volume during the a.m. or p.m. period. Please specify the peak hour.
[3] Highest hourly volume during the entire day. Please specify the peak hour.
Please refer to the *Trip Generation User's Guide* for full definition of terms.

Hourly Driveway Volumes- Average Weekday (M-F)

A.M. Period	Enter		Exit		Total		Mid-Day Period	Enter		Exit		Total		P.M. Period	Enter		Exit		Total	
	All	Trucks	All	Trucks	All	Trucks		All	Trucks	All	Trucks	All	Trucks		All	Trucks	All	Trucks	All	Trucks
6:00-7:00							11:00-12:00							3:00-4:00						
6:15-7:15							11:15-12:15							3:15-4:15						
6:30-7:30							11:30-12:30							3:30-4:30						
6:45-7:45							11:45-12:45							3:45-4:45						
7:00-8:00							12:00-1:00							4:00-5:00						
7:15-8:15							12:15-1:15							4:15-5:15						
7:30-8:30							12:30-1:30							4:30-5:30						
7:45-8:45							12:45-1:45							4:45-5:45						
8:00-9:00							1:00-2:00							5:00-6:00						

☒ **Check if Part 3, 4 and/or additional information is attached.**

Survey conducted by: Name: Alex Chambers
Organization: Cal Poly ITE Student Chapter
Address:
City/State/Zip: San Luis Obispo, CA
Telephone #: (206) 788-5742 Fax #: E-mail: calpolyite@gmail.com

Please return to: Institute of Transportation Engineers
Technical Projects Division
1627 Eye Street, NW, Suite 600
Washington, DC 20006 USA
Telephone: +1 202-785-0060
Fax: +1 202-785-0609
ITE on the Web: www.ite.org

ITE Institute of Transportation Engineers

Trip Generation Data Form (Part 3)

Name/Organization: Cal Poly ITE Student Chapter **City/State:** San Luis Obispo, CA

Telephone Number: (206) 788-5742

Detailed Driveway Volumes: Attach this sheet to Parts 1 and 2 if you are providing additional information.

Day of the week: Saturday ***(All = All Vehicles Counted, Including Trucks; Trucks = Heavy Duty Trucks and Buses)***

A.M. Period	Enter		Exit		Total		P.M. Period	Enter		Exit		Total	
	All	Trucks	All	Trucks	All	Trucks		All	Trucks	All	Trucks	All	Trucks
12:00-12:15							12:00-12:15	4	0	12	0	16	0
12:15-12:30							12:15-12:30	5	0	3	0	8	0
12:30-12:45							12:30-12:45	5	0	1	0	6	0
12:45-1:00							12:45-1:00	6	0	2	0	8	0
1:00-1:15							1:00-1:15	4	0	3	0	7	0
1:15-1:30							1:15-1:30	3	0	0	0	3	0
1:30-1:45							1:30-1:45	6	0	5	0	11	0
1:45-2:00							1:45-2:00	1	0	8	0	9	0
2:00-2:15							2:00-2:15	6	0	8	0	14	0
2:15-2:30							2:15-2:30	6	0	2	0	8	0
2:30-2:45							2:30-2:45	5	0	6	0	11	0
2:45-3:00							2:45-3:00	4	0	4	0	8	0
3:00-3:15							3:00-3:15	0	0	4	0	4	0
3:15-3:30							3:15-3:30	11	0	7	0	18	0
3:30-3:45							3:30-3:45	0	0	4	0	4	0
3:45-4:00							3:45-4:00	5	0	3	0	8	0
4:00-4:15							4:00-4:15	0	0	3	0	3	0
4:15-4:30							4:15-4:30	5	0	6	0	11	0
4:30-4:45							4:30-4:45	2	0	5	0	7	0
4:45-5:00							4:45-5:00	0	0	9	0	9	0
5:00-5:15							5:00-5:15	0	0	6	0	6	0
5:15-5:30							5:15-5:30	1	0	6	0	7	0
5:30-5:45							5:30-5:45	0	0	0	0	0	0
5:45-6:00							5:45-6:00	0	0	0	0	0	0
6:00-6:15							6:00-6:15	0	0	0	0	0	0
6:15-6:30							6:15-6:30	0	0	0	0	0	0
6:30-6:45							6:30-6:45	0	0	0	0	0	0
6:45-7:00							6:45-7:00	0	0	0	0	0	0
7:00-7:15	0	0	0	0	0	0	7:00-7:15						
7:15-7:30	0	0	0	0	0	0	7:15-7:30						
7:30-7:45	2	0	0	0	2	0	7:30-7:45						
7:45-8:00	1	0	0	0	1	0	7:45-8:00						
8:00-8:15	1	0	0	0	1	0	8:00-8:15						
8:15-8:30	0	0	0	0	6	0	8:15-8:30						
8:30-8:45	1	0	0	0	1	0	8:30-8:45						
8:45-9:00	3	0	1	0	4	0	8:45-9:00						
9:00-9:15	0	0	2	0	2	0	9:00-9:15						
9:15-9:30	1	0	0	0	1	0	9:15-9:30						
9:30-9:45	1	0	0	0	1	0	9:30-9:45						
9:45-10:00	3	0	4	0	7	0	9:45-10:00						
10:00-10:15	0	0	1	0	1	0	10:00-10:15						
10:15-10:30	1	0	2	0	3	0	10:15-10:30						
10:30-10:45	2	0	2	0	4	0	10:30-10:45						
10:45-11:00	6	0	0	0	6	0	10:45-11:00						
11:00-11:15	9	0	1	0	10	0	11:00-11:15						
11:15-11:30	2	0	1	0	3	0	11:15-11:30						
11:30-11:45	4	0	2	0	6	0	11:30-11:45						
11:45-12:00	9	0	3	0	12	0	11:45-12:00						

Institute of Transportation Engineers

Trip Generation Data Form (Part 4)

Summary of Bicycle Volumes

	Average Weekday (M-F)			Saturday			Sunday		
	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
24-Hour Volume									
A.M. Peak Hour of Adjacent[1] Street Traffic (7 – 9) Time (ex.: 7:15 - 8:15):									
P.M. Peak Hour of Adjacent[1] Street Traffic (4 – 6) Time:									
A.M. Peak Hour Generator[2] Time:									
P.M. Peak Hour Generator[2] Time:									
Peak Hour Generator[3] Time (Weekend): 9:30-10:30				3	3	6			

[1] Highest hourly volume between 7 a.m. and 9 a.m. (4 p.m. and 6 p.m.) as defined in Trip Generation Data Form (Part 2). Please specify the peak hour.
[2] Highest hourly volume during the a.m. or p.m. period. Please specify the peak hour.
[3] Highest hourly volume during the entire day. Please specify the peak hour. Please attach supplemental hourly volumes.
Please refer to the *Trip Generation User's Guide* for full definition of terms.

Summary of Pedestrian Volumes

	Average Weekday (M-F)			Saturday			Sunday		
	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
24-Hour Volume									
A.M. Peak Hour of Adjacent[1] Street Traffic (7 – 9) Time (ex.: 7:15 - 8:15):									
P.M. Peak Hour of Adjacent[1] Street Traffic (4 – 6) Time:									
A.M. Peak Hour Generator[2] Time:									
P.M. Peak Hour Generator[2] Time:									
Peak Hour Generator[3] Time (Weekend): N/A				0	0	0			

Survey conducted by: Name: Alex Chambers
Organization: Cal Poly ITE Student Chapter
Address:
City/State/Zip: San Luis Obispo, CA
Telephone #: (206) 788-5742 Fax #: E-mail: calpolyite@gmail.com

Please return to: Institute of Transportation Engineers
Technical Projects Division
1627 Eye Street, NW, Suite 600
Washington, DC 20006 USA
Telephone: +1 202-785-0060
Fax: +1 202-785-0609
ITE on the Web: www.ite.org

Parking Demand Survey Form

Institute of Transportation Engineers

*(fill in all highlighted cells - * are required data)*

Land Use Code* N/A

Name of Site Winery A

Brief Description of Site Winery

Transit*

Area*

TMP*

Parking Price* $ 0

City San Luis Obispo

State CA **Country** USA

Daily Rate $ 0 Hourly Rate

Site Size*	25	**Units***	Total Employees	**Occupancy***		**Land Use**
Site Size	1000 ft²	**Units**	Tasting Room GFA	**Occupancy**		
Site Size	200	**Units**	Total Acreage	**Occupancy**		
Site Size	35,000	**Units**	Production (Bottles)	**Occupancy**		
	18		Varietals			

Number of Parking Spaces Provided at Site 90

Highest Observed Parking Demand for the following hours of the day *(hour beginning)**

Date	April 4th, 2015						
Day	Saturday						
12 Mid							
1:00 AM							
2:00 AM							
3:00 AM							
4:00 AM							
5:00 AM							
6:00 AM							
7:00 AM	4						
8:00 AM	8						
9:00 AM	8						
10:00 AM	11						
11:00 AM	28						
12 Noon	30						
1:00 PM	35						
2:00 PM	30						
3:00 PM	29						
4:00 PM	24						
5:00 PM	5						
6:00 PM	0						
7:00 PM							
8:00 PM							
9:00 PM							
10:00 PM							
11:00 PM							

Person Alex Chambers

Organization Cal Poly ITE Student Chapter

Phone (206) 788-5742

Fax

Email calpolyite@gmail.com

Notes

Enter data on the web at www.ite.org

Comments to: ite_staff@ite.org

IF not entered on web site, please mail to:

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Trip Generation Data Form (Part 1)

Land Use/Building Type:[1] Winery	ITE Land Use Code: N/A
Source: Cal Poly ITE Student Chapter	Source No. (ITE use only):
Name of Development: Winery B	Day of the Week: Saturday
City: San Luis Obispo State/Province: CA Zip/Postal Code: 93401	Day: 4 Month: April Year: 2015
Country: USA	Metropolitan Area:

1. For fast-food land use, please specify if hamburger- or nonhamburger-based.

Location Within Area:

- ☐ (1) CBD
- ☐ (2) Urban (Non-CBD)
- ☐ (3) Suburban (Non-CBD)
- ☐ (4) Suburban CBD
- ☐ (5) Rural
- ☐ (6) Freeway Interchange Area (Rural)
- ☐ (7) Not Given

Detailed Description of Development:[3]

Independent Variable: (include data for as many as possible)[2]

Value	Variable	Actual	Estimated
12	(1) Employees (#)	☐	☐
	(2) Persons (#)	☐	☐
	(3) Total Units (#) (indicate unit:)	☐	☐
	(4) Occupied Units (#) (indicate unit:)	☐	☐
444	(5) Gross Floor Area (gross sq. ft.)* (% of development occupied)	☐	☐
	(6) Net Rentable Area (sq. ft.)	☐	☐
	(7) Gross Leasable Area (sq. ft.) (% of development occupied)	☐	☐
6	(8) Total Acres (% developed:)	☐	☐
	(9) Parking Spaces (% occupied:)	☐	☐
	(10) Beds (% occupied:)	☐	☐
	(11) Seats (#)	☐	☐
	(12) Servicing Positions/Vehicle Fueling Positions	☐	☐
	(13) Shopping Center % Out-parcels/pads	☐	☐
	(14) A.M. Peak Hour Volume of Adjacent Street Traffic	☐	☐
	(15) P.M. Peak Hour Volume of Adjacent Street Traffic	☐	☐
90,000	(16) Other Annual Production (bottles)	☐	X
17	(17) Other Varietals	X	☐

2. Definitions for several independent variables can be found in the *Trip Generation*, Second Edition, *User's Guide* Glossary.

3. Please provide all pertinent information to describe the subject project, including the presence of bicycle/pedestrian facilities. To report bicycle/pedestrian volumes, please refer to Part 4 of this data form.

Other Data:

Vehicle Occupancy (#):
____ A.M. ____ P.M. ____ 24-hour %

Percent by Transit:
____ A.M. % ____ P.M. % ____ 24-hour %

Percent by Carpool/Vanpool:
____ A.M. % ____ P.M. % ____ 24-hour %

Employees by Shift:

Shift	Start Time	End Time	Employees (#)
First Shift			
Second Shift			
Third Shift			

Parking Cost on Site: Hourly ____ Daily ____

Transportation Demand Management (TDM) Information:

At the time of this study, was there a TDM program (that may have impacted the trip generation characteristics of this site) underway?

☐ No

☐ Yes (If yes, please check appropriate box/boxes, describe the nature of the TDM program(s) and provide a source for any studies that may help quantify this impact. Attach additional sheets if necessary)

- ☐ (1) Transit Service
- ☐ (2) Carpool Programs
- ☐ (3) Vanpool Programs
- ☐ (4) Bicycle/Pedestrian Facilities and Site Improvements
- ☐ (5) Employer Support Measures
- ☐ (6) Preferential HOV Treatments
- ☐ (7) Transit and Ridesharing Incentives
- ☐ (8) Parking Supply and Pricing Management
- ☐ (9) Tolls and Congestion Pricing
- ☐ (10) Variable Work Hours/Compressed Work Weeks
- ☐ (11) Telecommuting
- ☐ (12) Other ____

* GFA of Tasting Room only

Please Complete Form on Other Side

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Trip Generation Data Form (Part 2)

Summary of Driveway Volumes *(All = All Vehicles Counted, Including Trucks; Trucks = Heavy Duty Trucks and Buses)*

	Average Weekday (M-F)						Saturday						Sunday					
	Enter		Exit		Total		Enter		Exit		Total		Enter		Exit		Total	
	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks
24-Hour Volume																		
A.M. Peak Hour of Adjacent[1] Street Traffic (7 – 9) Time *(ex.: 7:15 - 8:15)*:																		
P.M. Peak Hour of Adjacent[1] Street Traffic (4 – 6) Time:																		
A.M. Peak Hour Generator[2] Time:																		
P.M. Peak Hour Generator[2] Time:																		
Peak Hour Generator[3] Time (Weekend): 14:00-15:00							17	0	9	0	26	0						

[1] Highest hourly volume between 7 a.m. and 9 a.m. (4 p.m. and 6 p.m.). Please specify the peak hour.
[2] Highest hourly volume during the a.m. or p.m. period. Please specify the peak hour.
[3] Highest hourly volume during the entire day. Please specify the peak hour.
Please refer to the *Trip Generation User's Guide* for full definition of terms.

Hourly Driveway Volumes- Average Weekday (M-F)

A.M. Period	Enter		Exit		Total		Mid-Day Period	Enter		Exit		Total		P.M. Period	Enter		Exit		Total	
	All	Trucks	All	Trucks	All	Trucks		All	Trucks	All	Trucks	All	Trucks		All	Trucks	All	Trucks	All	Trucks
6:00-7:00							11:00-12:00							3:00-4:00						
6:15-7:15							11:15-12:15							3:15-4:15						
6:30-7:30							11:30-12:30							3:30-4:30						
6:45-7:45							11:45-12:45							3:45-4:45						
7:00-8:00							12:00-1:00							4:00-5:00						
7:15-8:15							12:15-1:15							4:15-5:15						
7:30-8:30							12:30-1:30							4:30-5:30						
7:45-8:45							12:45-1:45							4:45-5:45						
8:00-9:00							1:00-2:00							5:00-6:00						

X **Check if Part 3, 4 and/or additional information is attached.**

Survey conducted by: Name: Alex Chambers
Organization: Cal Poly ITE Student Chapter
Address:
City/State/Zip:
Telephone #: (206) 788-5742 Fax #: E-mail: calpolyite@gmail.com

Please return to: Institute of Transportation Engineers
Technical Projects Division
1627 Eye Street, NW, Suite 600
Washington, DC 20006 USA
Telephone: +1 202-785-0060
Fax: +1 202-785-0609
ITE on the Web: www.ite.org

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Trip Generation Data Form (Part 3)

Name/Organization: Cal Poly ITE Student Chapter **City/State:** San Luis Obispo, CA
Telephone Number: (206) 788-5742

Detailed Driveway Volumes: Attach this sheet to Parts 1 and 2 if you are providing additional information.

Day of the week: Saturday *(All = All Vehicles Counted, Including Trucks; Trucks = Heavy Duty Trucks and Buses)*

A.M. Period	Enter		Exit		Total		P.M. Period	Enter		Exit		Total	
	All	Trucks	All	Trucks	All	Trucks		All	Trucks	All	Trucks	All	Trucks
12:00-12:15							12:00-12:15	5	0	0	0	5	0
12:15-12:30							12:15-12:30	1	0	1	0	2	0
12:30-12:45							12:30-12:45	2	0	3	0	5	0
12:45-1:00							12:45-1:00	4	0	3	0	7	0
1:00-1:15							1:00-1:15	3	0	1	0	4	0
1:15-1:30							1:15-1:30	2	0	2	0	4	0
1:30-1:45							1:30-1:45	~~4~~ 0	0	5	0	5	0
1:45-2:00							1:45-2:00	4	0	5	0	9	0
2:00-2:15							2:00-2:15	~~2~~ 4	0	1	0	5	0
2:15-2:30							2:15-2:30	~~6~~ 2	0	2	0	4	0
2:30-2:45							2:30-2:45	6	0	2	0	8	0
2:45-3:00							2:45-3:00	5	0	4	0	9	0
3:00-3:15							3:00-3:15	2	0	5	0	7	0
3:15-3:30							3:15-3:30	2	0	1	0	3	0
3:30-3:45							3:30-3:45	2	0	5	0	7	0
3:45-4:00							3:45-4:00	5	0	2	0	7	0
4:00-4:15							4:00-4:15	3	0	2	0	5	0
4:15-4:30							4:15-4:30	2	0	3	0	5	0
4:30-4:45							4:30-4:45	0	0	4	0	4	0
4:45-5:00							4:45-5:00	0	0	2	0	2	0
5:00-5:15							5:00-5:15	0	0	1	0	1	0
5:15-5:30							5:15-5:30	0	0	3	0	3	0
5:30-5:45							5:30-5:45	0	0	3	0	3	0
5:45-6:00							5:45-6:00	0	0	0	0	0	0
6:00-6:15							6:00-6:15	0	0	0	0	0	0
6:15-6:30							6:15-6:30	0	0	0	0	0	0
6:30-6:45							6:30-6:45	0	0	0	0	0	0
6:45-7:00							6:45-7:00	0	0	0	0	0	0
7:00-7:15	0	0	0	0	0	0	7:00-7:15						
7:15-7:30	0	0	0	0	0	0	7:15-7:30						
7:30-7:45	0	0	0	0	0	0	7:30-7:45						
7:45-8:00	0	0	0	0	0	0	7:45-8:00						
8:00-8:15	0	0	0	0	0	0	8:00-8:15						
8:15-8:30	0	0	0	0	0	0	8:15-8:30						
8:30-8:45	0	0	0	0	0	0	8:30-8:45						
8:45-9:00	0	0	0	0	0	0	8:45-9:00						
9:00-9:15	0	0	0	0	0	0	9:00-9:15						
9:15-9:30	0	0	0	0	0	0	9:15-9:30						
9:30-9:45	0	0	0	0	0	0	9:30-9:45						
9:45-10:00	0	0	0	0	0	0	9:45-10:00						
10:00-10:15	1	0	0	0	1	0	10:00-10:15						
10:15-10:30	0	0	0	0	0	0	10:15-10:30						
10:30-10:45	1	0	0	0	1	0	10:30-10:45						
10:45-11:00	0	0	0	0	0	0	10:45-11:00						
11:00-11:15	1	0	0	0	1	0	11:00-11:15						
11:15-11:30	5	0	0	0	5	0	11:15-11:30						
11:30-11:45	0	0	2	0	2	0	11:30-11:45						
11:45-12:00	~~8~~ 1	0	1	0	2	0	11:45-12:00						

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Trip Generation Data Form *(Part 4)*

Summary of Bicycle Volumes

	Average Weekday (M-F)			Saturday			Sunday		
	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
24-Hour Volume									
A.M. Peak Hour of Adjacent[1] Street Traffic (7 – 9) Time *(ex.: 7:15 - 8:15)*:									
P.M. Peak Hour of Adjacent[1] Street Traffic (4 – 6) Time:									
A.M. Peak Hour Generator[2] Time:									
P.M. Peak Hour Generator[2] Time:									
Peak Hour Generator[3] Time (Weekend): N/A				0	0	0			

[1] Highest hourly volume between 7 a.m. and 9 a.m. (4 p.m. and 6 p.m.) as defined in Trip Generation Data Form (Part 2). Please specify the peak hour.
[2] Highest hourly volume during the a.m. or p.m. period. Please specify the peak hour.
[3] Highest hourly volume during the entire day. Please specify the peak hour. Please attach supplemental hourly volumes.
Please refer to the *Trip Generation User's Guide* for full definition of terms.

Summary of Pedestrian Volumes

	Average Weekday (M-F)			Saturday			Sunday		
	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
24-Hour Volume									
A.M. Peak Hour of Adjacent[1] Street Traffic (7 – 9) Time *(ex.: 7:15 - 8:15)*:									
P.M. Peak Hour of Adjacent[1] Street Traffic (4 – 6) Time:									
A.M. Peak Hour Generator[2] Time:									
P.M. Peak Hour Generator[2] Time:									
Peak Hour Generator[3] Time (Weekend): N/A				0	0	0			

Survey conducted by: Name: Alex Chambers
Organization: Cal Poly ITE Student Chapter
Address:
City/State/Zip: San Luis Obispo, CA 93401
Telephone #: (206) 788 - 5742 Fax #: E-mail: calpolyite@gmail.com

Please return to: Institute of Transportation Engineers
Technical Projects Division
1627 Eye Street, NW, Suite 600
Washington, DC 20006 USA
Telephone: +1 202-785-0060
Fax: +1 202-785-0609
ITE on the Web: www.ite.org

Parking Demand Survey Form

Institute of Transportation Engineers

*(fill in all highlighted cells - * are required data)*

Land Use Code*	N/A
Name of Site	Winery B
Brief Description of Site	Winery
City	San Luis Obispo
State	CA
Country	USA

Transit*	
Area*	
TMP*	
Parking Price*	$ 0 Daily Rate
	$ 0 Hourly Rate

Site Size*	12	Units*	Total Employees	Occupancy*	
Site Size	444 ft^2	Units	Tasting Room GFA	Occupancy	
Site Size	6	Units	Total Acreage	Occupancy	
Site Size	90,000	Units	Production (bottles)	Occupancy	
	17		Varietals		

Land Use

Number of Parking Spaces Provided at Site: 42

Highest Observed Parking Demand for the following hours of the day (hour beginning)*

Date	April 4, 2015						
Day	Saturday						
12 Mid							
1:00 AM							
2:00 AM							
3:00 AM							
4:00 AM							
5:00 AM							
6:00 AM							
7:00 AM	0						
8:00 AM	0						
9:00 AM	0						
10:00 AM	2						
11:00 AM	8						
12 Noon	11						
1:00 PM	13						
2:00 PM	15						
3:00 PM	13						
4:00 PM	14						
5:00 PM	6						
6:00 PM	0						
7:00 PM							
8:00 PM							
9:00 PM							
10:00 PM							
11:00 PM							

Person	Alex Chambers
Phone	(206) 788-5742
Fax	
Email	calpolyite@gmail.com
Notes	
Organization	Cal Poly ITE Student Chapter

Enter data on the web at www.ite.org

Comments to: ite_staff@ite.org

IF not entered on web site, please mail to:

Institute of Transportation Engineers, 1627 Eye Street, NW Suite 600; Washington, DC 20006

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Trip Generation Data Form (Part 1)

Land Use/Building Type:[1] Winery	ITE Land Use Code: N/A
Source: Cal Poly ITE Student Chapter	Source No. (ITE use only):
Name of Development: Winery C	Day of the Week: Saturday
City: San Luis Obispo State/Province: California Zip/Postal Code: 93401	Day: 4 Month: April Year: 2015
Country: USA	Metropolitan Area:

1. For fast-food land use, please specify if hamburger- or nonhamburger-based.

Location Within Area:

- ☐ (1) CBD
- ☐ (2) Urban (Non-CBD)
- ☐ (3) Suburban (Non-CBD)
- ☐ (4) Suburban CBD
- ☒ (5) Rural
- ☐ (6) Freeway Interchange Area (Rural)
- ☐ (7) Not Given

Detailed Description of Development:[3]

Independent Variable: (include data for as many as possible)[2]

Value	Variable	Actual	Estimated
16	(1) Employees (#)	☐	☒
	(2) Persons (#)	☐	☐
	(3) Total Units (#) (indicate unit:)	☐	☐
	(4) Occupied Units (#) (indicate unit:)	☐	☐
3375	(5) Gross Floor Area (gross sq. ft.) * (% of development occupied)	☐	☒
	(6) Net Rentable Area (sq. ft.)	☐	☐
	(7) Gross Leasable Area (sq. ft.) (% of development occupied)	☐	☐
200	(8) Total Acres (% developed:)	☐	☒
	(9) Parking Spaces (% occupied:)	☐	☐
	(10) Beds (% occupied:)	☐	☐
	(11) Seats (#)	☐	☐
	(12) Servicing Positions/Vehicle Fueling Positions	☐	☐
	(13) Shopping Center % Out-parcels/pads	☐	☐
	(14) A.M. Peak Hour Volume of Adjacent Street Traffic	☐	☐
	(15) P.M. Peak Hour Volume of Adjacent Street Traffic	☐	☐
225,000	(16) Other Annual Production (Bottles)	☐	☒
27	(17) Other Varietals	☒	☐

2. Definitions for several independent variables can be found in the *Trip Generation*, Second Edition, *User's Guide* Glossary.

3. Please provide all pertinent information to describe the subject project, including the presence of bicycle/pedestrian facilities. To report bicycle/pedestrian volumes, please refer to Part 4 of this data form.

Other Data:

Vehicle Occupancy (#):
____ A.M. ____ P.M. ____ 24-hour %

Percent by Transit:
____ A.M. % ____ P.M. % ____ 24-hour %

Percent by Carpool/Vanpool:
____ A.M. % ____ P.M. % ____ 24-hour %

Employees by Shift

	Start Time	End Time	Employees (#)
First Shift			
Second Shift			
Third Shift			

Parking Cost on Site: Hourly ____ Daily ____

Transportation Demand Management (TDM) Information:

At the time of this study, was there a TDM program (that may have impacted the trip generation characteristics of this site) underway?

☐ No

☐ Yes (If yes, please check appropriate box/boxes, describe the nature of the TDM program(s) and provide a source for any studies that may help quantify this impact. Attach additional sheets if necessary)

- ☐ (1) Transit Service
- ☐ (2) Carpool Programs
- ☐ (3) Vanpool Programs
- ☐ (4) Bicycle/Pedestrian Facilities and Site Improvements
- ☐ (5) Employer Support Measures
- ☐ (6) Preferential HOV Treatments
- ☐ (7) Transit and Ridesharing Incentives
- ☐ (8) Parking Supply and Pricing Management
- ☐ (9) Tolls and Congestion Pricing
- ☐ (10) Variable Work Hours/Compressed Work Weeks
- ☐ (11) Telecommuting
- ☐ (12) Other ____

* GFA of Tasting Room Only

Please Complete Form on Other Side

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Trip Generation Data Form *(Part 2)*

Summary of Driveway Volumes **(*All = All Vehicles Counted, Including Trucks; Trucks = Heavy Duty Trucks and Buses*)**

	Average Weekday (M-F)						*Saturday*						*Sunday*					
	Enter		*Exit*		*Total*		*Enter*		*Exit*		*Total*		*Enter*		*Exit*		*Total*	
	All	*Trucks*	*All*	*Trucks*	*All*	*Trucks*	*All*	*Trucks*	*All*	*Trucks*	*All*	*Trucks*	*All*	*Trucks*	*All*	*Trucks*	*All*	*Trucks*
24-Hour Volume																		
A.M. Peak Hour of Adjacent[1] Street Traffic (7 – 9) Time *(ex.: 7:15 - 8:15)*:																		
P.M. Peak Hour of Adjacent[1] Street Traffic (4 – 6) Time:																		
A.M. Peak Hour Generator[2] Time:																		
P.M. Peak Hour Generator[2] Time:																		
Peak Hour Generator[3] Time (Weekend): 14:45-15:45							51	0	27	0	78	0						

[1] **Highest hourly volume between 7 a.m. and 9 a.m. (4 p.m. and 6 p.m.). Please specify the peak hour.**
[2] **Highest hourly volume during the a.m. or p.m. period. Please specify the peak hour.**
[3] **Highest hourly volume during the entire day. Please specify the peak hour.**
Please refer to the *Trip Generation User's Guide* for full definition of terms.

Hourly Driveway Volumes- Average Weekday (M-F)

A.M. Period	*Enter*		*Exit*		*Total*	
	All	*Trucks*	*All*	*Trucks*	*All*	*Trucks*
6:00-7:00						
6:15-7:15						
6:30-7:30						
6:45-7:45						
7:00-8:00						
7:15-8:15						
7:30-8:30						
7:45-8:45						
8:00-9:00						

Mid-Day Period	*Enter*		*Exit*		*Total*	
	All	*Trucks*	*All*	*Trucks*	*All*	*Trucks*
11:00-12:00						
11:15-12:15						
11:30-12:30						
11:45-12:45						
12:00-1:00						
12:15-1:15						
12:30-1:30						
12:45-1:45						
1:00-2:00						

P.M. Period	*Enter*		*Exit*		*Total*	
	All	*Trucks*	*All*	*Trucks*	*All*	*Trucks*
3:00-4:00						
3:15-4:15						
3:30-4:30						
3:45-4:45						
4:00-5:00						
4:15-5:15						
4:30-5:30						
4:45-5:45						
5:00-6:00						

☒ **Check if Part 3, 4 and/or additional information is attached.**

Survey conducted by: Name: Alex Chambers

Organization: Cal Poly ITE Student Chapter

Address:

City/State/Zip: San Luis Obispo, CA, 93401

Telephone #: (206) 788-5742 Fax #: E-mail: calpolyite@gmail.com

Please return to: Institute of Transportation Engineers
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Telephone: +1 202-785-0060
Fax: +1 202-785-0609
ITE on the Web: www.ite.org

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Trip Generation Data Form (Part 3)

Name/Organization: Cal Poly ITE Student Chapter **City/State:** San Luis Obispo, CA
Telephone Number: (206) 788 - 5742

Detailed Driveway Volumes: Attach this sheet to Parts 1 and 2 if you are providing additional information.

Day of the week: Saturday *(All = All Vehicles Counted, Including Trucks; Trucks = Heavy Duty Trucks and Buses)*

A.M. Period	Enter		Exit		Total		P.M. Period	Enter		Exit		Total	
	All	Trucks	All	Trucks	All	Trucks		All	Trucks	All	Trucks	All	Trucks
12:00-12:15							12:00-12:15	4	0	1	0	5	0
12:15-12:30							12:15-12:30	1	0	4	0	5	0
12:30-12:45							12:30-12:45	1	0	0	0	1	0
12:45-1:00							12:45-1:00	6	0	5	0	11	0
1:00-1:15							1:00-1:15	11	0	1	0	12	0
1:15-1:30							1:15-1:30	4	0	2	0	6	0
1:30-1:45							1:30-1:45	11	0	1	0	12	0
1:45-2:00							1:45-2:00	6	0	6	0	12	0
2:00-2:15							2:00-2:15	11	0	8	0	19	0
2:15-2:30							2:15-2:30	10	0	10	0	20	0
2:30-2:45							2:30-2:45	5	0	6	0	11	0
2:45-3:00							2:45-3:00	11	0	7	0	18	0
3:00-3:15							3:00-3:15	15	0	7	0	22	0
3:15-3:30							3:15-3:30	12	0	6	0	18	0
3:30-3:45							3:30-3:45	13	0	7	0	20	0
3:45-4:00							3:45-4:00	5	0	9	0	14	0
4:00-4:15							4:00-4:15	3	0	15	0	18	0
4:15-4:30							4:15-4:30	6	0	7	0	13	0
4:30-4:45							4:30-4:45	3	0	3	0	6	0
4:45-5:00							4:45-5:00	0	0	12	0	12	0
5:00-5:15							5:00-5:15	3	0	13	0	16	0
5:15-5:30							5:15-5:30	2	0	13	0	15	0
5:30-5:45							5:30-5:45	1	0	8	0	9	0
5:45-6:00							5:45-6:00	0	0	2	0	2	0
6:00-6:15							6:00-6:15	0	0	0	0	0	0
6:15-6:30							6:15-6:30	1	0	3	0	4	0
6:30-6:45							6:30-6:45	0	0	0	0	0	0
6:45-7:00							6:45-7:00	0	0	0	0	0	0
7:00-7:15	0	0	0	0	0	0	7:00-7:15						
7:15-7:30	0	0	0	0	0	0	7:15-7:30						
7:30-7:45	0	0	0	0	0	0	7:30-7:45						
7:45-8:00	0	0	0	0	0	0	7:45-8:00						
8:00-8:15	0	0	0	0	0	0	8:00-8:15						
8:15-8:30	0	0	0	0	0	0	8:15-8:30						
8:30-8:45	0	0	0	0	0	0	8:30-8:45						
8:45-9:00	0	0	0	0	0	0	8:45-9:00						
9:00-9:15	0	0	0	0	0	0	9:00-9:15						
9:15-9:30	0	0	0	0	0	0	9:15-9:30						
9:30-9:45	2	0	0	0	2	0	9:30-9:45						
9:45-10:00	0	0	0	0	0	0	9:45-10:00						
10:00-10:15	0	0	0	0	0	0	10:00-10:15						
10:15-10:30	0	0	0	0	0	0	10:15-10:30						
10:30-10:45	1	0	0	0	1	0	10:30-10:45						
10:45-11:00	3	0	1	0	4	0	10:45-11:00						
11:00-11:15	3	0	1	0	4	0	11:00-11:15						
11:15-11:30	3	0	2	0	5	0	11:15-11:30						
11:30-11:45	3	0	2	0	5	0	11:30-11:45						
11:45-12:00	3	0	1	0	4	0	11:45-12:00						

ite Institute of Transportation Engineers

Trip Generation Data Form *(Part 4)*

Summary of Bicycle Volumes

	Average Weekday (M-F)			*Saturday*			*Sunday*		
	Enter	*Exit*	*Total*	*Enter*	*Exit*	*Total*	*Enter*	*Exit*	*Total*
24-Hour Volume									
A.M. Peak Hour of Adjacent[1] Street Traffic (7 – 9) Time *(ex.: 7:15 - 8:15)*:									
P.M. Peak Hour of Adjacent[1] Street Traffic (4 – 6) Time:									
A.M. Peak Hour Generator[2] Time:									
P.M. Peak Hour Generator[2] Time:									
Peak Hour Generator[3] 13:00- Time (Weekend): 14:00				2	6	8			

[1] Highest hourly volume between 7 a.m. and 9 a.m. (4 p.m. and 6 p.m.) as defined in Trip Generation Data Form (Part 2). Please specify the peak hour.
[2] Highest hourly volume during the a.m. or p.m. period. Please specify the peak hour.
[3] Highest hourly volume during the entire day. Please specify the peak hour. Please attach supplemental hourly volumes.
Please refer to the *Trip Generation User's Guide* for full definition of terms.

Summary of Pedestrian Volumes

	Average Weekday (M-F)			*Saturday*			*Sunday*		
	Enter	*Exit*	*Total*	*Enter*	*Exit*	*Total*	*Enter*	*Exit*	*Total*
24-Hour Volume									
A.M. Peak Hour of Adjacent[1] Street Traffic (7 – 9) Time *(ex.: 7:15 - 8:15)*:									
P.M. Peak Hour of Adjacent[1] Street Traffic (4 – 6) Time:									
A.M. Peak Hour Generator[2] Time:									
P.M. Peak Hour Generator[2] Time:									
Peak Hour Generator[3] ~~5:00~~ Time (Weekend): 17:00-18:00				1	0	1			

Survey conducted by: Name: Alex Chambers
Organization: Cal Poly ITE Student Chapter
Address:
City/State/Zip: San Luis Obispo, CA 93401
Telephone #: (206)788-5742 Fax #: E-mail: calpolyite@gmail.com

Please return to: Institute of Transportation Engineers
Technical Projects Division
1627 Eye Street, NW, Suite 600
Washington, DC 20006 USA
Telephone: +1 202-785-0060
Fax: +1 202-785-0609
ITE on the Web: www.ite.org

Parking Demand Survey Form

Institute of Transportation Engineers

*(fill in all highlighted cells - * are required data)*

Land Use Code*	N/A
Name of Site	Winery C
Brief Description of Site	Winery
City	San Luis Obispo
State	CA
Country	USA
Daily Rate	$ 0
Hourly Rate	

Transit*	
Area*	
TMP*	
Parking Price*	$ 0

Site Size*	16	**Units***	Total Employees	**Occupancy***	
Site Size	3375 ft²	**Units**	Tasting Room GFA	**Occupancy**	
Site Size	1200	**Units**	Total Acreage	**Occupancy**	
Site Size	225,000	**Units**	Production (Bottles)	**Occupancy**	
	27		Varietals		

Land Use

Number of Parking Spaces Provided at Site 61

Highest Observed Parking Demand for the following hours of the day *(hour beginning)**

Date	April 4th, 2015						
Day	Saturday						
12 Mid							
1:00 AM							
2:00 AM							
3:00 AM							
4:00 AM							
5:00 AM							
6:00 AM							
7:00 AM	0						
8:00 AM	0						
9:00 AM	2						
10:00 AM	5						
11:00 AM	11						
12 Noon	14						
1:00 PM	35						
2:00 PM	41						
3:00 PM	61						
4:00 PM	45						
5:00 PM	22						
6:00 PM	2						
7:00 PM							
8:00 PM							
9:00 PM							
10:00 PM							
11:00 PM							

Person	Alex Chambers
Phone	(206) 788-5742
Fax	
Email	calpolyite@gmail.com
Notes	

Organization Cal Poly ITE Student Chapter

Enter data on the web at www.ite.org

Comments to: ite_staff@ite.org

IF not entered on web site, please mail to:

Institute of Transportation Engineers, 1627 Eye Street, NW Suite 600; Washington, DC 20006

Form version 1.4

Bicycles and Pedestrians at Winery A				
Time	Bicycles		Pedestrians	
	Enter	Exit	Enter	Exit
7:00	0	0	0	0
8:00	0	0	0	0
9:00	2	2	0	0
10:00	1	1	0	0
11:00	0	0	0	0
12:00	0	0	0	0
13:00	0	0	0	0
14:00	1	1	0	0
15:00	0	0	0	0
16:00	0	0	0	0
17:00	0	0	0	0
18:00	0	0	0	0

Bicycles and Pedestrians at Winery B				
Time	Bicycles		Pedestrians	
	Enter	Exit	Enter	Exit
7:00	0	0	0	0
8:00	0	0	0	0
9:00	0	0	0	0
10:00	0	0	0	0
11:00	0	0	0	0
12:00	0	0	0	0
13:00	0	0	0	0
14:00	0	0	0	0
15:00	0	0	0	0
16:00	0	0	0	0
17:00	0	0	0	0
18:00	0	0	0	0

Bicycles and Pedestrians at Winery C				
Time	Bicycles		Pedestrians	
	Enter	Exit	Enter	Exit
7:00	0	0	0	0
8:00	0	0	0	0
9:00	2	2	0	0
10:00	0	0	0	0
11:00	0	0	0	0
12:00	5	0	0	0
13:00	2	6	0	0
14:00	4	0	0	0
15:00	0	2	0	0
16:00	0	2	0	0
17:00	0	1	1	0
18:00	0	0	0	0

Adjacent Street Traffic - Winery A			
Time	Vehicles	Bikes	Pedestrians
7:00	17	0	0
7:15	11	0	0
7:30	14	2	0
7:45	9	1	0
8:00	23	3	0
8:15	18	1	0
8:30	26	2	0
8:45	27	2	1
9:00	34	1	0
9:15	26	2	0
9:30	23	3	1
9:45	30	3	0
10:00	43	1	0
10:15	27	4	0
10:30	44	1	0
10:45	30	4	0
11:00	45	7	0
11:15	45	3	0
11:30	65	12	0
11:45	43	2	0
12:00	46	1	0
12:15	49	0	0
12:30	37	3	0
12:45	45	2	0
13:00	45	0	0
13:15	41	2	0
13:30	55	2	0
13:45	30	1	0
14:00	45	0	0
14:15	48	1	0
14:30	45	0	0
14:45	48	0	0
15:00	48	2	0
15:15	39	0	0
15:30	23	0	0
15:45	58	0	0
16:00	50	1	0
16:15	45	0	0
16:30	30	0	0
16:45	33	0	0
17:00	34	0	0
17:15	27	0	0
17:30	39	1	0
17:45	36	0	0
18:00	49	0	0
18:15	30	0	0
18:30	29	0	0
18:45	28	0	0

Adjacent Street Traffic - Winery B			
Time	Vehicles	Bikes	Pedestrians
7:00	24	0	0
7:15	28	0	0
7:30	23	0	0
7:45	27	0	0
8:00	27	0	1
8:15	39	0	0
8:30	46	1	0
8:45	61	0	2
9:00	71	0	1
9:15	53	5	0
9:30	57	4	0
9:45	84	3	1
10:00	76	6	0
10:15	67	7	0
10:30	89	2	1
10:45	73	3	0
11:00	86	0	0
11:15	77	3	0
11:30	91	0	0
11:45	91	0	0
12:00	80	0	0
12:15	99	1	0
12:30	87	0	0
12:45	79	3	0
13:00	82	0	0
13:15	81	1	0
13:30	85	0	0
13:45	96	0	0
14:00	91	0	0
14:15	78	3	0
14:30	84	1	0
14:45	114	2	0
15:00	87	2	0
15:15	78	0	0
15:30	67	0	0
15:45	64	2	0
16:00	76	3	0
16:15	64	0	0
16:30	54	1	0
16:45	67	0	0
17:00	65	0	0
17:15	61	0	0
17:30	40	0	0
17:45	58	0	0
18:00	37	0	0
18:15	48	0	0
18:30	52	0	0

Adjacent Street Traffic - Winery C			
Time	Vehicles	Bikes	Pedestrians
7:00	13	0	2
7:15	16	1	1
7:30	21	1	4
7:45	9	2	2
8:00	14	0	0
8:15	12	0	3
8:30	20	13	1
8:45	17	1	3
9:00	33	0	0
9:15	24	0	4
9:30	17	7	2
9:45	19	1	1
10:00	29	9	1
10:15	21	4	0
10:30	28	5	0
10:45	32	9	1
11:00	36	2	0
11:15	35	3	0
11:30	26	3	0
11:45	33	1	0
12:00	38	2	0
12:15	30	0	0
12:30	30	1	0
12:45	30	0	0
13:00	42	6	0
13:15	41	0	0
13:30	29	1	0
13:45	43	3	0
14:00	43	2	0
14:15	39	2	0
14:30	27	2	0
14:45	43	0	0
15:00	36	0	0
15:15	23	0	0
15:30	44	0	0
15:45	45	0	0
16:00	50	0	0
16:15	40	0	0
16:30	43	1	0
16:45	45	0	0
17:00	42	0	0
17:15	33	0	0
17:30	44	0	0
17:45	29	0	0
18:00	25	0	0
18:15	20	0	0
18:30	24	0	0
18:45	17	0	0

Volunteers

Thanks to all of the Cal Poly ITE Student Chapter members who volunteered and participated in the data collection:

Kevin Carstens
Alex Chambers
Keri Chau
Amy Chin
Luis Descanzo
Fabian Gallardo
Mark Howard
Jason Hsia
Ashley Kim
Lance Knox
Kelsey Littell
Erica Madrigal
Patricia Oliveira Braga de Morais
Krista Purser
Simon Qin
Brian Rodriguez
Kaylinn Roseman
Bobby Sidhu
Edward Tang
Ricky Williams

Winery Traffic Information / Trip Generation Sheet

Traffic during a Typical Weekday

Number of FT employees: ____________ x 3.05 one-way trips per employee = ____________ daily trips.

Number of PT employees: ____________ x 1.90 one-way trips per employee = ____________ daily trips.

Average number of weekday visitors: ____________ / 2.6 visitors per vehicle x 2 one-way trips = ____________ daily trips.

Gallons of production: ____________ / 1,000 x .009 truck trips daily[3] x 2 one-way trips = ____________ daily trips.

Total = ____________ **daily trips.**

Number of total weekday trips x .38 = ____________ **PM peak trips.**

Traffic during a Typical Saturday

Number of FT employees (on Saturdays): ____________ x 3.05 one-way trips per employee = ____________ daily trips.

Number of PT employees (on Saturdays): ____________ x 1.90 one-way trips per employee = ____________ daily trips.

Average number of weekend visitors: ____________ / 2.8 visitors per vehicle x 2 one-way trips = ____________ daily trips.

Total = ____________ **daily trips.**

Number of total Saturday trips x .57 = ____________ **PM peak trips.**

Traffic during a Crush Saturday

Number of FT employees (during crush): ____________ x 3.05 one-way trips per employee = ____________ daily trips.

Number of PT employees (during crush): ____________ x 1.90 one-way trips per employee = ____________ daily trips.

Average number of weekend visitors: ____________ / 2.8 visitors per vehicle x 2 one-way trips = ____________ daily trips.

Gallons of production: ____________ / 1,000 x .009 truck trips daily x 2 one-way trips = ____________ daily trips.

Avg. annual tons of grape on-haul: ____________ x .11 truck trips daily [4]x 2 one-way trips = ____________ daily trips.

Total = ____________ **daily trips.**

Number of total Saturday trips x .57 = ____________ **PM peak trips.**

Largest Marketing Event- Additional Traffic

Number of event staff (largest event): ____________ x 2 one-way trips per staff person = ____________ trips.

Number of visitors (largest event): ____________ / 2.8 visitors per vehicle x 2 one-way trips = ____________ trips.

Number of special event truck trips (largest event): ____________ x 2 one-way trips = ____________ trips.

[3] Assumes 1.47 materials & supplies trips + 0.8 case goods trips per 1,000 gallons of production / 250 days per year (see *Traffic Information Sheet Addendum* for reference).
[4] Assumes 4 tons per trip / 36 crush days per year (see *Traffic Information Sheet Addendum* for reference).

Traffic Information Sheet Addendum

Information for Caltrans Review

Application should include:

Project Location

- Site Plan showing all driveway location(s)
- Show detail of Caltrans right-of-way
- Aerial photo at a readable scale

Trip Generation Estimate

- Please provide separate **Winery Traffic Information / Trip Generation Sheets** for existing and proposed operations.

Napa County Winery Traffic Generation Characteristics

Employees

Half-hour lunch: All - 2 trips/day (1 during weekday PM peak)
Hour lunch: Permanent Full-Time – 3.2 trips/day (1 during weekday PM peak)
Permanent Part-Time – 2 trips/day (1 during weekday PM peak)
Seasonal: 2 trips/day (0 during weekday PM peak)—crush
see full time above—bottling
Auto Occupancy: 1.05 employees/auto

Visitors

Auto occupancy:
Weekday = 2.6 visitors/auto
Weekend = 2.8 visitors/auto

Peaking Factors:

Peak Month: 1.65 x average month

Average Weekend: 0.22 x average month

Average Saturday: 0.53 x average weekend
Peak Saturday: 1.65 x average Saturday

Average Sunday: 0.8 x average Saturday
Peak Sunday: 2.0 x average Sunday

Peak Weekend Hour: Winery (3-4 PM) - 0.57 x total for weekend day involved

Average 5-Day Week (Monday-Friday) - 1.3 x average weekend

Average Weekday: 0.2 x average 5-day week

Peak Weekday Hour: Winery (3-4 PM) - 0.57 x total for weekday involved
Roadway PM Peak(4-5 PM?) - 0.38 x total for weekday involved

Service Vehicles

Grapes (36 days (6weeks)/season): 1.52 trips/1000 gals/season (4 ton loads assumed)
Materials/Supplies (250 days/yr): 1.47 trips/1000 gals/yr
Case Goods (250 days/yr): 0.8 trips/1000 gal/yr

EL DORADO COUNTY
SUSTAINABLE AGRITOURISM MOBILITY STUDY

December 2016

FEHR PEERS

Made possible by a
Federal Highway Administration Partnership
Planning for Sustainable Transportation Grant

Prepared for:

el dorado county edctc TRANSPORTATION COMMISSION

El Dorado County
Transportation Commission

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BAKE
SHOP
BAKE
SHOP
OPEN

1 Introduction

BACKGROUND

El Dorado County has a thriving agricultural tourism (or agritourism) industry that brings

community while helping to preserve the county's rural character. Agritourism is a commercial enterprise at a working farm, ranch, or agricultural facility conducted for the enjoyment or education of visitors. Agritourism often generates supplemental income for the owner to support their agricultural operation.[2] This supplemental income makes agricultural operations more economically viable and reduces the pressure for suburban-type development. In addition

eserving the rural character of an area, agritourism also encourages the support of local growers and highlights the growing "farm-to-fork" movement. Supporters of locally-sourced food note that purchasing locally grown food can reduce greenhouse gas (GHG) emissions related to food production and

and nutritional quality of food and fresh produce, and improve the economic vitality of small and local farms.

Examples of agritourism activity in El Dorado County include apple orchards, wineries, Christmas tree farms, pumpkin patches, breweries, and other fruit and vegetable farms.

The Apple Hill^{SM} growers in and around Camino are the primary agritourism attractions in El Dorado County, with local wineries in the Coloma and Fairplay regions of El Dorado County also notable agritourism destinations. While some of the Apple Hill^{SM} ranches, wineries, and breweries operate year-round, the peak visitor season for growers in the area typically occurs between September and November corresponding with the local apple harvest as well as pumpkin patches and other fall produce. In addition, Christmas tree farms in the area attract visitors from Thanksgiving to Christmas. Each fall, Apple Hill^{SM} farms contribute over $30 million annually to the local economy. This revenue provides for the sustained use of the land for agriculture and preserves the area's rural quality of life.

[2] University of California Cooperative Extension, UC Small Farm Program. http://sfp.ucdavis.edu/agritourism/

While the agritourism draw of Apple Hill[SM] growers has r ease in visitors has also come at cost to local and interregional mobility, particularly on fall weekends. Left unaddressed, these mobility challenges are likely to become worse as the popularity of Apple Hill[SM] ranches continue to grow. Since adequate transportation infrastructure and services are vital to support agritourism and the local community, mobility issues could threaten the long-term success of agritourism by degrading the visitor experience and impacting the quality of life for local residents. Furthermore, the increasing success of other agritourism destinations in the county, such as wineries in the Pleasant Valley, Somerset, and Fair Play area, may create similar mobility challenges for those communities in the future.

STUDY PURPOSE

The purpose of this study is to evaluate the

challenges associated with agritourism travel in El Dorado County, and then identify mobility solutions to sustain the success of agritourism in El Dorado County while preserving the county's rural character

low-cost, high-impact solutions that make the best use of existing infrastructure to mitigate the current and potential futur f agritourism travel on local and regional roadways.

STUDY FOCUS

The mobility challenges faced by local Camino residents and visitors to Apple Hill℠ ranches are the primary agritourism travel issue in El Dorado County. However, the study also recognizes that the gr

wineries in southern El Dorado County may be a future concern. Therefore, this study focuses on analyzing the existing agritourism mobility challenges in the Camino area while discussing how the lessons learned can be applied to south county wineries.

, the following goals wer

part of the study:

- Identify the source of operational issues on US 50 and on local roads in the Camino area.
- Work closely with the Apple Hill℠ growers and the South County winery community to develop creative, context-sensitive mobility solutions.
- Identify potential solutions to improve travel conditions and the sustainability of current and future agritourism activity in El Dorado County.

REPORT OUTLINE

This report includes seven chapters that cover the following topics:

1. Introduction to agritourism in El Dorado County and background information for the study
2. Review of relevant studies and projects including:
   - Previously completed planning studies for the area
   - Current and planned transportation projects in the area
3. Summary of community engagement activities during the course of the study
4. Collection of data and observations
5. f key mobility issues and causes
6. Presentation of possible solutions to address the mobility issues
7. f possible funding sources to support the implementation of the proposed solutions

This outline generally follows the process that the project team undertook to complete the study. Appendix A provides a more detailed summary of the study methodology, including timeframes for community engagement and data collection.


APPLE
HILL
SM
Growers

Relevant Plans, Studies & Projects

2

This section summarizes previously completed

transportation projects in the study area that are relevant to this study. This includes studies completed by El Dorado County, the El Dorado County Transportation Commission (EDCTC), the Sacramento Area Council of Governments (SACOG), and Caltrans. The studies reviewed for this effort include:

- EDCTC *Bay to Tahoe Basin Recreation and Tourism Travel Impact Study*
- El Dorado County's *Circulation and Safety Review for the Apple Hill^{SM} Areas including Placerville, Camino, Cedar Grove, and Pollock Pines*
- *Parking Restriction Survey for Gatlin Road*
- *El Dorado County Regional Transportation Plan 2015-2035*
- *SACOG Rural-Urban Connections Strategy (RUCS)*
- Caltrans' *Camino Safety Improvement Project*

PLANS & STUDIES

Bay to Tahoe Basin Recreation and Tourism Travel Impact Study

The *Bay to Tahoe Basin Recreation and Tourism Travel Impact Study* (EDCTC, 2014) examines the characteristics and impacts of regional and interregional tourism travel between Northern California's major urban areas and the "rural areas" of El Dorado, Placer, Amador, and Nevada counties as well as the Lake Tahoe Basin. The study includes an evaluation of tourism-related travel patterns, discusses existing tourist destinations, ecommendations to support future tourism activity.

In its discussion of existing tourist destinations, ^{SM} and winery destinations on the "west slope" among the several tourist attractions in El Dorado County. Apple Hill^{SM} is described as a "well-established regional agritourism attraction" with an increasing pro . The study also compliments the El Dorado American Viticultural Area (AVA) for its unique "high elevation and complex topography, creating a diversity of microclimates and growing condition not found in other regions."

The study states that the active marketing efforts conducted by the Apple Hill℠ Growers Association and the El Dorado Winery Association are expected to have a continued positive impact on tourism market share, with spending predicted to increase at a healthy rate of thr cent per year. The study's economic evaluation of El Dorado County also suggests that enhancing these marketing efforts and the targeting of

Area regions would likely increase the projected rate of gr ecommendations include:

Evolution and Enhancement of Existing Tourism Product

Includes providing appealing accommodations, a diverse range of activities, effective transportation, and a variety of shopping and dining options to appeal to tourist expectations.

Packaging Tourist Offerings

Packaging lodging with selected activities, such as white water rafting and camping with agritourism, reinforces the diversity of a destination, and allows visitors to plan in advance a more memorable, multi-day vacation

Enhance Tourist Transportation and Connectivity

Effective, easy-to-use transportation that provides access to tourism offerings is a key element to the success of a tourism market. Strategies include:

- Providing transit service that is easy to access and use
- Developing pedestrian friendly areas that are conducive to walking and biking and connected to transit service
- Pr es so visitor destinations, parking, and transit service

Traveler/Tourist Information

Well-coordinated strategies and channels for the dissemination of visitor information is key. Today's visitor travel information prior to travel and during travel, with the majority of travelers obtaining information from the Internet via personal computers (prior to travel), smartphones, or tablets. The coordinated marketing effort of the Apple Hill℠ Grower a great example of this strategy.

The study also includes several recommendations to improve the traveler experience. This includes:

- Expanding Intelligent Transportation System (ITS) technologies, including the installation and operation of additional changeable message signs (CMS) and other information improve the traveler experience

- Installing dir
  to guide tourists to recreational and tourism opportunities, and increase awareness of other recreational opportunities and attractions
- Improving roadway conditions, including
- Improving ingress and egress to Study Area communities
- Establishing a regionalized Traveler Information website/application

The Sustainable Agritourism Mobility Study considers these recommendations from the Bay to Tahoe Basin study in the development o mobility strategies.

Circulation and Safety Review for the Apple Hill™ Areas

In 2013, El Dorado County completed a study titled *Circulation and Safety Review for the Apple Hill*[SM] *Areas including Placerville, Camino, Cedar Grove, and Pollock Pines*, which provides a description of travel patterns during the October-November peak agritourism season for apple growers. The study includes a survey of counts taken at select roadway segments in the Camino area during and outside of the peak fall agritourism season in 2007 and 2013. These

weekends is greatest along Carson Road, with increases of 200-300% during the fall agritourism season compared to the non-peak season. Based on the resulting queues and congestion levels,
ee primary
congestion locations:

- Carson Road at Union Ridge Road
- Carson Road at Gatlin Road/High Hill Ranch Road
- Carson Road east of North Canyon Road

The study notes that these three locations are where the majority of motorists are queued,
. It also acknowledges that ingress and egress for the businesses near these locations appear to be the primary cause for these delays.

The study also evaluates the feasibility of potential options to address the delays including:

- "No parking" zones along certain county maintained roadways
- P culation
- Improved circulation and access at ranch sites
- Public transit shuttle service
- Improved pedestrian safety by providing sidewalks and crosswalks
- Temporary signalization of intersections

The study determines that several of these options are either not feasible or warranted, particularly in light of the temporary/seasonal nature of the

The study concludes with the following recommendations:

- Give consideration to one way exits from businesses that will dir om congested areas and prevent cr movements while maintaining access to all orchards and businesses in the area
- Have the Apple Hill[SM] Growers Association work with a consultant to:
  - culation for existing and proposed improvements
  - Identify the number of parking spaces required for each business
  - Allow businesses to submit improvement plans to the county with possible waivers or reduced fees to allow construction of improvements in a timely manner to address on-site issues

- Provide traveler information through update maps, websites, and message boards to show congested routes and suggested alternate routes to access businesses
- Consider installing permanent signage that may
oughout the area mor

Gatlin Road Parking Restriction Survey

Fehr & Peers also reviewed the parking restriction survey for Gatlin Road prepared by El Dorado County in May 2014. Parked cars along the narrow Gatlin Road, which is adjacent to High Hill Ranch, were causing a travel safety issue by unduly interfering with the increased vehicular

pedestrians and motorists using the roadway. The study was initiated in response to a resident living on Gatlin Road who sought a "No Parking" restriction on Gatlin Road. The sur

- Gatlin Road is a local road with marginal shoulders that is not wide enough to accommodate parking vehicles with high volumes o
roadway section.
- The volume o esidents during off-peak months of December through August.
- The high volume o
peak season inhibits accessibility to local residences and may delay emergency response.

The study concluded that a "No Parking" restriction on Gatlin Road during October 1 through December 1 from 10 a.m. to 5 p.m. would address the concerns associated with the high

The request was approved by the El Dorado County T y Committee on May 8, 2014.

El Dorado County Regional Transportation Plan 2015-2035

The El Dorado County Regional Transportation Plan (RTP) 2015-2035 is designed to be a guide for the systematic development of a balanced, comprehensive, multi-modal transportation system for El Dorado County. Adopted on September 3, 2015, the RTP is action-oriented and pragmatic, considering both the short-term (up to 10 year s) and long-term (10 to 20 year) periods. The RTP includes the following three components:

- A P
objectives, and policies of the region
- ograms
and actions to implement the RTP in accordance with the goals, objectives, and

policies set forth in the policy element. This
t-term and
long-term action plans consisting of proposed roadway, transit, aviation, non-motorized, and intelligent transportation systems (ITS) projects, as well as a 2015-2035 action plan for freight movement and transportation systems management (TSM)/transportation demand management (TDM).

- A Financial Element that summarizes the cost of implementing projects in the RTP within a
onment

ojects for the
project study area in the short-term and long-term action plans:

Placerville-Camino Area

- US 50 Camino Corridor Safety Improvements
- Mosquito Road/Clay Street Park & Bus Phase II: Construct an additional 50-car parking lot with lighting and landscaping
- Schnell School Road T
- US 50 Eastbound off ramp to Ray Lawyer Drive, Park-and-Ride, and associated bike/pedestrian and roadway improvements
- Carson Road: Add Class II Bike Lanes on climbing shoulder from Jacquier Road to Larsen Drive
- Carson Road: Add Class III Bike Route from Snows Road to Pony Express Trail Road
- Jacquier Road: Add Class II Bike Lanes from Placerville City Limit to Carson Road
- Pony Express Trail Road: Add Class II Bike Lanes from Carson Road to Sly Park Road
- Schnell School Road: Add Class II Bike Lanes from Broadway to Carson Road

South El Dorado County Winery Area

- Bucks Bar Road Bridge Replacement at North Fork Cosumnes River
- Mt. Aukum Road Bridge Maintenance at North Fork Cosumnes River
- Pleasant Valley Road at Oak Hill Road Improvements
- Pleasant Valley Road Widening from Big Cut Road to Cedar Ravine Road
- Sly Park Road Bridge Replacement at Clear Creek Crossing
- Mt. Aukum Road: Add Class III Bike Route from Blackhawk Lane to Fairplay Road
- Fairplay Road: Add Class III Bike Route from Mt. Aukum Road to Unser Way/Pioneer Park
- Pleasant Valley Road: Add Class II Bike Lanes from Big Cut Road to Sly Park Road

RURAL-URBAN CONNECTIONS STRATEGY

The *Rural-Urban Connections Strategy* (RUCS) is an effort by the Sacramento Area Council of Governments (SACOG) to better understand the challenges and opportunities facing both urban and rural areas, and how policies and strategies impact both urban and rural areas in the Sacramento r , RUCS looks at the region's prosperity and sustainability from both an urban and a rural perspective with a notable increase in attention to agriculture, open space, and rural issues.

RUCS seeks to support the main land use and economic activity in rural areas (agriculture), while also conserving open lands and the ecosystem services they provide. RUCS is built upon the premise that resource conservation is greatly bolstered by strategies that leverage and enhance the value of these assets. Increased revenues can change the perception of open lands from being "undeveloped" or "future urban," to assets that produce income and should therefore remain open.[2]

[2] Sacramento Area Council of Governments, Rural-Urban Connections Strategy. http://www.sacog.org/rural-urban-connections-strategy

As part of SACOG's *2016 Metropolitan Transportation Plan/Sustainable Communities Strategy (MTP/SCS)*, SACOG prepared the *Rural-Urban Connections Strategy (RUCS) – Interim Report 2015*. This report summarizes the work that SACOG had conducted for the RUCS since late 2007. This includes compiling a technical toolkit to improve the region's understanding of possible economic and environmental outcomes associated with the agricultural economy.

The report also provides a brief description of challenges and opportunities facing rural areas in the Sacramento region. Roads are noted as one of the challenges, as rural roads are often serving rural residential, recreational/tourist, and agricultural users. The report

creates trips on roads that were originally designed for

eate

f farm equipment and

access to markets. While road improvements can help farmers, ranchers, and other users, the net effects can be negative if better roads also lead to speeding and more development in rural areas. Reaching an agreement for funding needed improvements to rural roadways can also be challenging.

On the other hand, the report also notes that agritourism is among the opportunities for rural areas in the Sacramento region. The report notes that there is an increasing public interest in "locally grown" products, as shown in the popularity of farmers' markets, Community Supported Agriculture, and value-added local products, such as jams and sauces. This "locally grown" trend is also creating increased interest in farm and ranch tours, winery visits, and produce stands. The repor

popular wine tasting destination and highlights the very popular Apple Hill[SM] district. The report goes on to state that agritourism and other revenue generating opportunities within agricultural areas are one way to improve economic vitality of agriculture in the region since landowners are likely to remain in the business of farming if it's more pro eport also acknowledges that the potential effect of agritourism success is

areas.

TRANSPORTATION PROJECTS

Camino Safety Project

Caltrans is leading the US 50 Camino Safety Project to impr
corridor through Camino. The project proposes to install a concrete median barrier that will restrict left-turn movements at at-grade intersections on US 50 from Still Meadows Road to 0.1 mile east of Upper Carson Road. The project will also widen the outside shoulders to standard width and install several acceleration/deceleration lanes to decr
project limits. In addition, a new undercrossing will be constructed to maintain local and regional access to and from the north and south sides of US 50 while providing safe east-west access on and off the highway.

This project is currently in the process of r oject alternatives and completing the corresponding environmental document. The project is scheduled to begin construction in 2019

The current alternatives include a concrete median barrier that would eliminate left-turn access from US 50 eastbound at 5 Mile Road and Lower Carson Road, with possible closure of left-turn access at Upper Carson Road – three of the key access points to Apple Hill^{SM} ranches north of US 50. To maintain access to the north side of US 50, the project proposes constructing a new eastbound off-ramp and on-ramp near Camino Heights Drive, and an undercrossing near Pondorado Road and Carson Court. Instead of turning left off of US 50 towards Carson Road,
^{SM} ranches would
utilize the new off-ramp and the Pondorado Road undercrossing to access areas north of US 50.

Capital Improvement Program

The El Dorado County Community Development Agency (CDA) prepares the County's Capital Improvement Program (CIP) to address infrastructure development and maintenance.

capital projects and provides a schedule and funding options as a means for the El Dorado County Board of Supervisors to determine capital priorities. These capital improvements are projects that provide tangible long-term improvements or additions o manent nature.

The CIP includes a few minor projects in the study area. In the Camino area, these include constructing the El Dorado Trail from Los Trampas Drive to Halcon Road south of US 50 near Camino Heights as well as a couple of bridge replacement projects at the eastern edge of the Camino study area. The bridge replacement projects are located at Alder Drive at the El Dorado Irrigation District (EID) Canal in Cedar Grove and Blair Road at the EID Canal in Pollock Pines. In southern El Dorado County, the CIP includes a bridge rehabilitation project on Bucks Bar Road at the North Fork of the Cosumnes River.

Community Engagement

3

In addition to reviewing relevant plans, studies, and transportation projects, a robust public outreach effort was performed to gather input and feedback from local residents, businesses, and key stakeholders regarding agritourism in El Dorado County. This outreach effort included a focus group meeting with the Apple Hill℠ Growers Association, visiting South County wineries, engaging local stakeholders through a Stakeholder Advisory Committee, and hosting open house workshops for the community.

STAKEHOLDER GROUPS

A stakeholder database was developed and maintained through the course of this study to ensure key stakeholders were informed during the entire project. Given their key role in the project, the project team hosted a focus group meeting with the Apple Hill℠ Growers Association and traveled to meet with wineries in South County. The focused outr

groups is summarized below. To facilitate discussion with a broad range of stakeholder groups, the project team also formed and met with a Stakeholder Advisory Committee (SAC), as described below.

Apple Hill℠ Growers Association

The Apple Hill℠ Growers Association consists of 57 apple growers, viticulturists, and tree farm owners. The association was formed in an effort to promote common interests and collaborate on marketing ventures. The Apple Hill℠ Growers Association was a key stakeholder throughout the study and provided valuable feedback at many meetings.

A focus group meeting with the Apple Hill℠ Growers Association was held on August 17, 2015 to provide an opportunity for local ranches and wineries to learn more about the study and provide input on the existing conditions experienced in both the Placerville/Camino area and the South County wine region during the peak of the tourism season. Goals of the meeting included:

- Provide a project overview of the study purpose, pr
- Obtain input from Apple Hill℠ growers on existing conditions in the area during the peak season
- Establish a working partnership throughout the study

Following an informational presentation on the project process, project team members facilitated small group discussions. A project team member met with each table of three to four stakeholders to discuss existing conditions and potential improvements around Apple Hill℠ ranches.

Some of the key feedback provided by the attendees included:

- ea is primarily concentrated on four to six weekends from late September to early November, peaking during three weekends in mid-to-late October.
- W than weekends during the fall harvest season, but is growing as returning visitors attempt to avoid weekend crowds.
- K e concentrated along the Carson Road corridor particularly near Abel's Acres (at Union Ridge Road), Boa Vista Orchard (east of North Canyon Road), and High Hill Ranch (at Gatlin Road).
- Congestion at these locations can cause queues of vehicles stretching from Schnell School Road in the west to past Barkley Road and into the town of Camino in the east.
- s along Larsen Drive.
- US 50 through Placerville experiences long delays, particularly on Sunday afternoons as visitors return to the Sacramento area and San Francisco Bay Area.

This feedback was used in combination with previously collected data from earlier studies to determine the most appropriate key locations for subsequent data collection during October 2015. Appendix B provides a summary of the discussion at the Apple Hill℠ Growers Association focus group meeting.

Attendees at the Apple Hill℠ Growers Association Focus Group Meeting

South County Wineries

While the wineries in the South County lack the formal structure of an association similar to the Apple Hill[SM] Growers Association, the project team contacted several South County wineries directly to discuss agritourism activity and mobility in the south county region. During this effort, the project team contacted the following wineries and organizations:

- El Dorado County Winery Association
- Mastroserio Winery
- Shadow Ranch Vineyard
- Skinner Vineyards
- Toogood Estate Winery
- Wineries of Fairplay

All of the vineyards universally shared that mobility ently not an issue in the south county winery area. Since this winery area is not adjacent to US 50, it does not receive the volume of visitors that travel to Apple Hill[SM] growers.

The most commonly used routes to access the wineries in this area are:

- Via Shenandoah Road/Mount Aukum Road (E-16) thr ough Plymouth and the Amador wineries
- US 50 to Missouri Flat Road to Pleasant Valley Road to Bucks Bar Road to Mount Aukum Road (E-16)
- From South Lake Tahoe and Nevada, visitors will take US 50 to Sly Park Road in Pollock Pines to Mount Aukum Road (E-16) in Pleasant Valley

Stakeholder Advisory Committee

each to the Apple Hill℠ Growers Association and South County wineries, the project team formed a Stakeholder Advisory Committee (SAC) consisting of 29 members with unique interests in the outcome of the study. A list of the 29 SAC members is provided at right.

The project team sent out invitations to each SAC organization that provided project background information and asked each organization to identify a representative and alternate to attend SAC meetings. The project team hosted three meetings with the SAC representatives over the course of the study at key milestones. These meetings are summarized below.

SAC Meeting 1: October 15, 2015

st SAC meeting was held on October 15, 2015 at Boeger Winery. This meeting occurred after the project team reviewed relevant planning studies and previously collected data, and befor

vations. The meeting objectives included:

- Provide the study's purpose and objectives
- Outline the project process and timeline
- Present previous studies related to the project
- Discussion on community goals for this project

Stakeholder Advisory Committee Members

- Apple Hill℠ Growers Association
- Apple Mountain Farm and Business Association
- Audubon Hills Association
- California Highway Patrol
- Camino Community Action Committee
- Camino Heights Advisory Committee
- Camino Hills Homeowners Association
- Camino Hills Property Owners Association
- Camino Union School District
- El Dorado Community Foundation
- El Dorado County Cer armers Market Association
- El Dorado County Chamber of Commerce / Visitors Association
- El Dorado County Farm Bureau
- f Emergency Services
- El Dorado County Sheriff
- El Dorado County Winery Association
- El Dorado County Youth Commission
- El Dorado Transit Authority
- El Dorado Union High School District
- El Dorado Wine Grape Growers Association
- Fairplay Winery Association
- Farm Trails
- Friends of El Dorado Trails
- Gold Country Lodging
- Placerville Downtown Association
- Rainbow Orchards
- Sierra Banquet Center
- Sierra P
- Social Service Transportation Advisory Council

- Review the stakeholder engagement process and stakeholder roles and responsibilities
- y current issues during the peak season for Apple Hill[SM] growers, and discuss potential solutions
-

SAC members were presented with an overview of the project process and a review of the feedback received from and data collection. Preliminary om 2014 was presented to demonstrate expected travel behavior within the area. SAC members were able to contribute to a discussion on the mobility challenges in the area and ask questions about the study methodology. Appendix C provides a summary of this meeting along with comments received from SAC members.

SAC Meeting 2: May 17, 2016

The second SAC meeting was held on May 17, 2016 at the Camino Elementary School gymnasium. At this stage in the study, the project team had completed its data collection efforts and began development of possible solutions to discuss with the stakeholders and community. The meeting objectives included:

- Review the study's purpose and goals
- Review the study's previous community outreach efforts
- Pr travel patterns within the Camino area
- Discuss the developed proposed mobility improvement concepts
- Distinguish the study from Caltrans' Camino Safety Improvements Project
- Review the study's next steps

SAC members were presented with a review of the project process, community feedback, and data collection. Overarching trends in the data (documented in subsequent sections of this report) and proposed solutions were presented. SAC members were able to ask questions and provide comments on the proposed solutions. Appendix C provides a summary of this meeting along with comments received from SAC members.

Stakeholders at the Second SAC Meeting

SAC Meeting 3: October 18, 2016

The third SAC meeting was held on October 18, 2016 at the Camino Elementary School gymnasium. At this stage in the study, the project team had incorporated the feedback r

possible funding sources, and were in the process of developing a draft plan for the stakeholders to review. The meeting objectives included:

- Review the study's purpose and goals
- Review the study's previous community outreach efforts
- f the study and review the mobility improvement concepts
- Present background information on available funding sources for implementing the mobility concepts

Appendix C provides a summary of this meeting along with comments received from SAC members.

COMMUNITY WORKSHOPS

EDCTC hosted two community workshops during the course of the project study. Stakeholders and the public wer

both community workshops via emails and press releases to media outlets.

Public Workshop 1

st public workshop for the project was held on Tuesday, November 17, 2015 fr om 6:00 – 8:00 p.m. in the Camino Elementary School upper gym. Community members were invited to learn about the study and share their experiences navigating

year-round. A total of 26 residents and community members attended the workshop.

The public workshop provided community members with an opportunity to hear from the project team about the study's process and learn how the data collected will be used to help

ovement strategies for the area. The workshop provided a forum for residents to engage in discussions with one another and project team members to provide their experiences and share their ideas for improved mobility.

Attendees at the First Public Workshop

Attendees were provided with surveys tailored to residents and visitors, as well as feedback forms. Based on their role in the community, attendees wer f the surveys and provide their additional comments on the feedback forms. An online version of the survey was also provided and distributed to all of the workshop attendees. Appendix D provides a summary of the workshop along with the responses provided by the public.

Public Workshop 2

The second public workshop was held on Wednesday, June 1, 2016 fr om 6:00 – 8:00 p.m. in the Camino Elementary School upper gym. Community members were invited to learn about and provide feedback on the study's proposed solutions to impr

and parking circulation in Camino during peak season for Apple Hill^{SM} growers. More than 20 residents and community members attended the workshop.

The second public workshop provided community members an opportunity to learn about the data collected for the study and the project team's proposed solutions to impr culation. Community members were able to ask questions and discuss ideas with the project team, and provide their comments on the proposed solutions through feedback forms. Appendix D provides a summary of the public feedback received at the second public workshop.

Community Member Reviewing Data Presented at Second Public Workshop

Community Engagement

TECHNICAL ADVISORY COMMITTEE

During the course of the study, the project team also met with a Technical Advisory Committee (TAC) composed of key technical advisory stakeholders. The TAC provided technical guidance on the analysis and methodology of the study. The TAC consisted of representatives from EDCTC, Caltrans, El Dorado Transit, El Dorado County, City of Placerville, and the project team.

The project team met with the full TAC three times during the course of the project, and met with individual TAC members throughout the study. At the project kick-off, the TAC reviewed the project objectives, scope of the study, provided their initial thoughts on the study, and discussed the timeline for future meetings. TAC member r provide to the project team to start the project.

Prior to and during the October 2015 data collection period, the project team met with El Dorado Transit and El Dorado County staff to further r ocess. Following the October 2015 data collection period, the project team met with the TAC to review the data collected effort and pr of the initial analysis. Preliminary operational improvement concepts were presented and then discussed with members of the TAC. The meeting concluded with TAC member feedback on the concepts and thoughts on next steps.

The project team met with El Dorado County staff and EDCTC to r ovement concepts per the feedback from the TAC, as well as discuss newly available GPS and cell phone data capturing travel patterns during the previous fall. The third TAC meeting was held on April 20, 2016 where the project team provided an update on the project status. This included a review of the additional GPS and cell phone data, on-site parking circulation improvement concepts for a couple of the key ranches, and presenting analysis results that eductions in queueing and delay associated with the improvements. The meeting concluded with members of TAC commenting on the concepts and recommending additional solution concepts to explore.

Data Collection

4

The study used a combination o
data to understand travel patterns during the fall agritourism season in the Camino area. This included historical data provided by Caltrans and El Dorado County from 2014 and earlier, as well as a robust data collection effort of new

effort was designed to provide a comprehensive understanding of the mobility challenges within the Camino area by collecting data through multiple means over selected “target” months during which peak travel to the Camino area occurs.

2014 BACKGROUND DATA COLLECTION

t performed
during October 2015, the pr oject team obtained and r
om Caltrans
and El Dorado County to assist with developing a basic understanding of the mobility challenges within the Camino area and help identify areas of highest concern.

Traffic Counts

Caltrans and El Dorado County provided relevant
oject team as a starting point during the project kickoff. Caltrans provided
d Avenue
for the entire year of 2014 and at select US 50 access points in the Camino area for Thursday, October 9, 2014 and Satur day, October 11, 2014.

El Dorado County staff shared data from
f local roadways
throughout the County. In the Camino area, the most recent counts in the database were collected between April and June 2014, which is outside o f the fall agritourism season.

The count data was analyzed to identify how trends in travel patterns during the fall agritourism season compared to the off-peak seasons. Some of the key observations include:

- T e noticeably higher during the fall agritourism season compared to the off-peak season, particularly on weekends
- During the fall agritourism season, up to 40% of ough Placerville is due to the mor f visitors from the west to the Camino ar om the Camino area in the late afternoon
- The closure of the eastbound left-turns into Camino on eastbound US 50 from Five Mile Road to Carson Grove interchange. During these closure periods, the westbound US 50 right-tur ease at these access points indicating that some inbound om the west backtracks on US 50 westbound from Cedar Grove

Appendix E provides a more detailed summary of the

2015 FIELD DATA COLLECTION

A r vation effort was performed in the Camino area on Saturday, October 17, 2015 thr ough coordination between Fehr & Peers, the El Dorado County Transportation Commission (EDCTC), and El Dorado County.

T e collected throughout Camino, including at key access points into and out of the Camino area, intersections adjacent to the most heavily visited ranches, and local roadways between Placerville and Pollock Pines. T counts were collected on the weekend of October 17-18, 2015 to capture travel characteristics during the peak agritourism season. Appendix F provides additional details regar

e used to estimate peak demand entering the Camino area, which is displayed in Figure 1. Demand increases during the morning hours, peaks at around 1,800 vehicles per hour just before 11:00 am, and gradually decreases during the late morning and afternoon.

The Camino-ar e also used

f the

orchards near high levels of congestion. Due to

rate at these orchards, these volumes represent

chards and

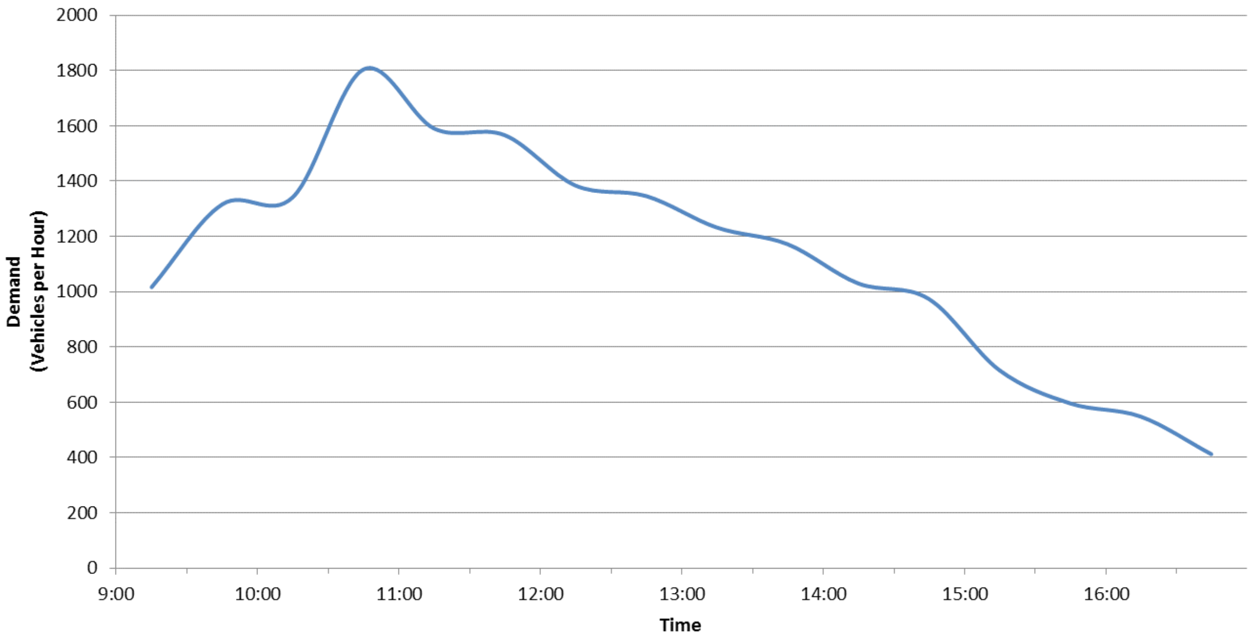
not actual demand. T

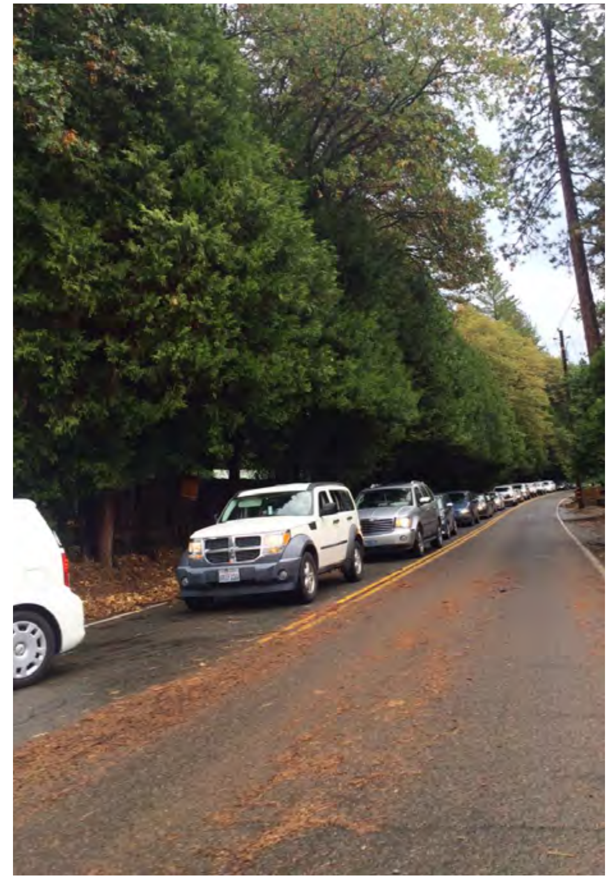
eates queueing on Carson

efor

counts collected upstream of the queuing were

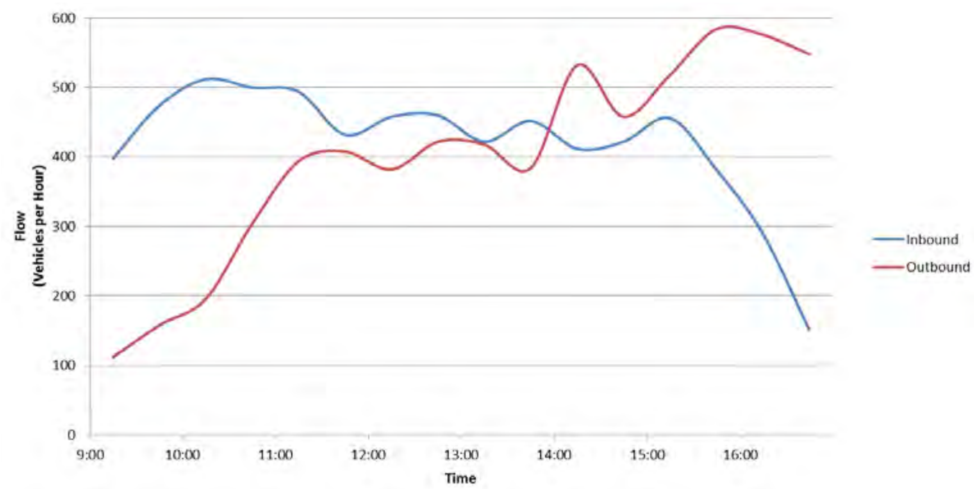
Figure 1: Traffic Demand Entering the Camino Area





Traffic Queueing on Carson Road near High Hill Ranch

Figure 2: High Hill Ranch – Saturation Flow Rates

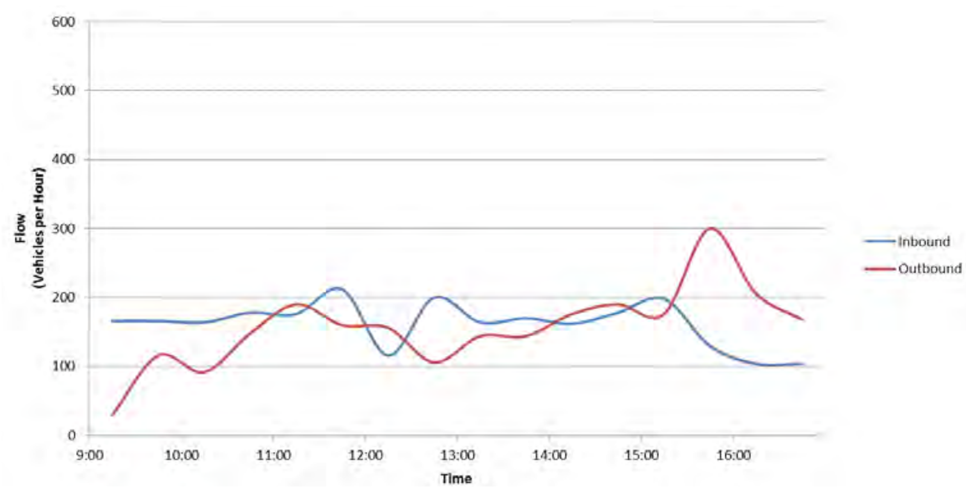


As displayed in Figure 2,

rate for High Hill Ranch is approximately 500 vehicles per hour

rate greatly exceeds the outbound rate during the morning hours and remains above 400 vehicles per hour until around 3:00 pm, at which point the outbound

Figure 3: Abel's Acres Saturation Flow Rates



As displayed in Figure 3,

rate for Abel's Apple Acres is approximately 180 vehicles per hour. Similar to High Hill

is higher than the outbound

ning

hours while the outbound

late afternoon.

AERIAL VIDEOGRAPHY

The project provided unique challenges in obtaining a holistic picture of mobility challenges due to the area's hilly terrain, narrow, curving roads that sometimes present unexpected driving challenges, and severe congestion along certain roadways. To ensure that these factors were accurately understood, aerial videography was

f

the key activity center oject stakeholders. The aerial videos were used to

identifying sources of mobility impairment.

Aerial videos were captured at the three locations listed below.

- Carson Road near High Hill Ranch Road
- Carson Road east of North Canyon Road (close to Boa Vista Orchards)
- Carson Road near Union Ridge Road (close to Abel's Acres)

Three 60-minute time periods of video were recorded at each location with an additional teen minutes to allow for drone takeoff and landing. These time periods were 10:00 am to 11:15 am, 1:00 pm to 2:15 pm, and 3:00 pm to 4:15 pm.

Figure 4: Aerial View of Carson Road/High Hill Ranch Road Area

20-1585 C 121 of 310

Figure 5: Aerial View of Carson Road/Union Ridge Road Area

Ground-Level Field Observations

Project team staff were on location throughout the entire duration of count collection from 9:00 am to 5:00 pm on Saturday, October 17 to conduct gr
observations. The observations recor

were used to verif
is representative of typical weekend conditions during the fall agritourism season and identify any abnormalities that may affect the data.

2015 SUPPLEMENTAL DATA COLLECTION

weekend of October 17-18, 2015, the project team collected additional data over a longer period of time to understand travel patterns during the fall agritourism season.

TRAFFIC COUNTS – US 50

Camino ar d

Avenue in Placerville were obtained from Caltrans to help understand the effect of agritourism on regional travel facilities. Figure 6 and Figure 7

compar

weekday and average Saturday during the months of October and April, with the month of October representing peak agritourism season and the month of April representing non-peak agritourism season. As shown in Figure 6 and Figur

volumes on US 50 ar

October Saturdays than April Saturdays, especially in the eastbound direction during the morning hours.

The differ

Saturday peak and the October Saturday peak is approximately 40%. This supports the study's

Figure 6: US 50 Eastbound Traffic Volumes at Bedford Ave – 2015

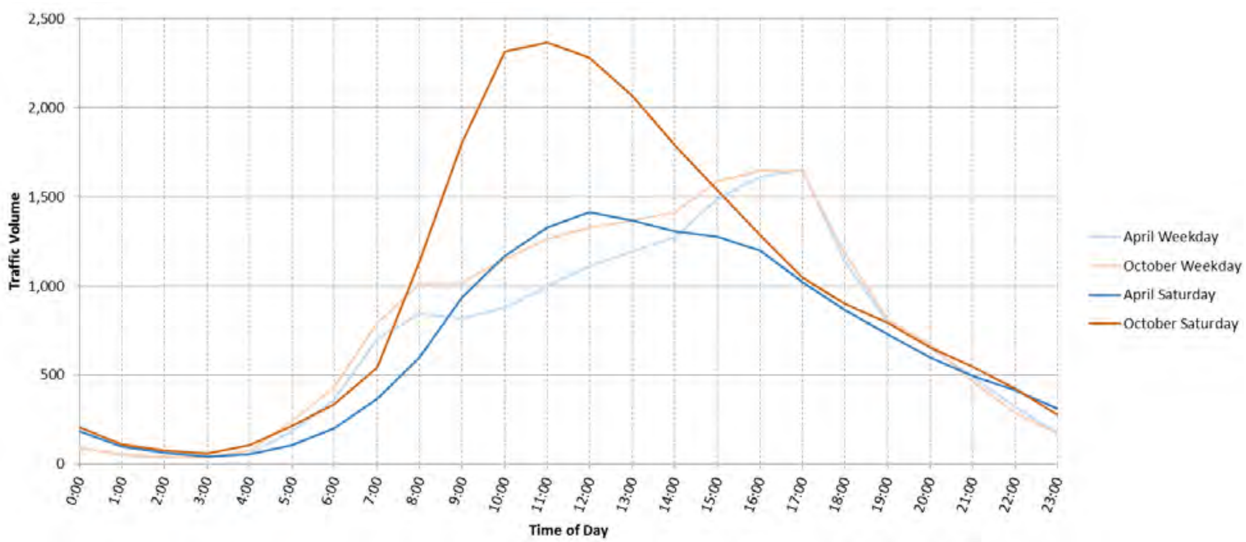
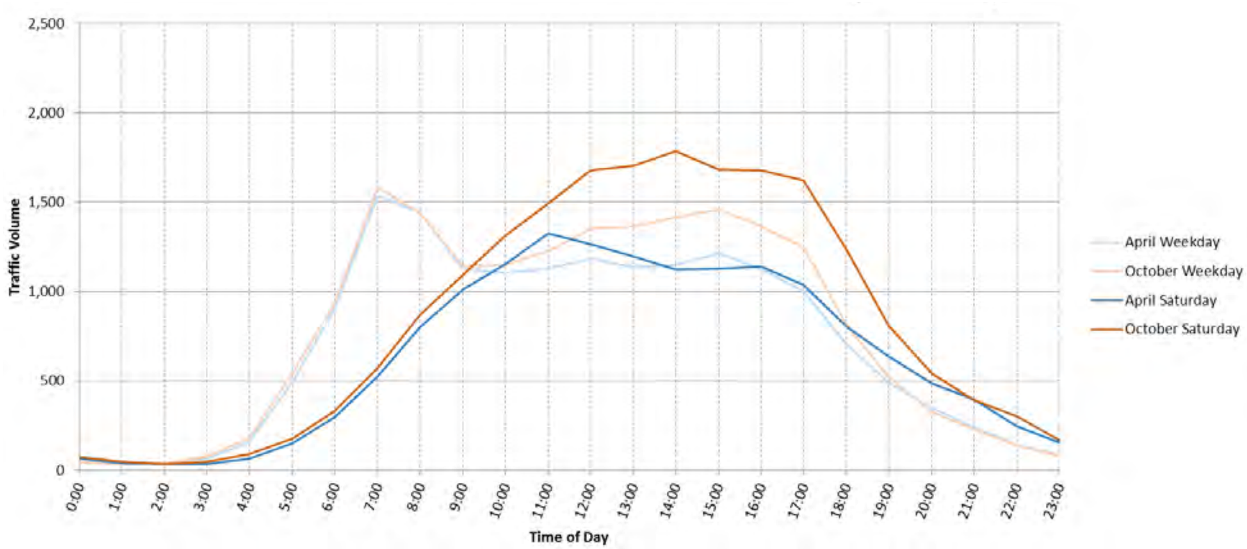


Figure 7: US 50 Westbound Traffic Volumes at Bedford Ave – 2015



earlier statement that 40% o ough Placerville on a peak fall agritourism weekend is bound for the Camino area. It also suggests that the April Saturday volumes are likely the steady backgr on US 50.

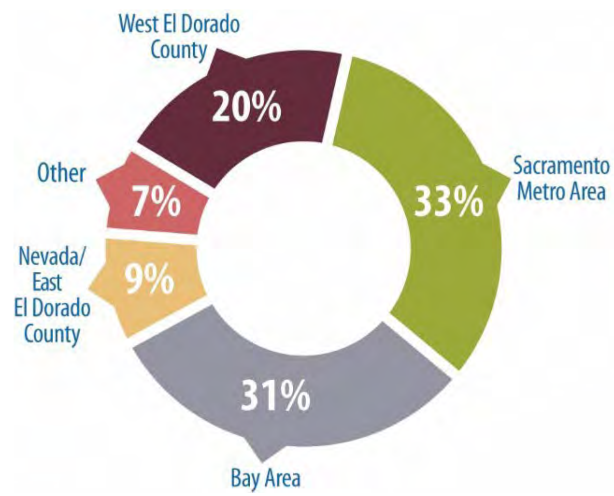
Apple Hill℠ Travel Patterns

To assist with understanding regional travel patterns during the fall agritourism season, GPS and cell phone data was obtained for the months of September, October, and November of 2015. This data was analyzed to help answer three questions about travel behavior within and to the Camino area, as detailed below.

Where are visitors traveling from?

Cell phone data was used to indicate where visitors to the Camino area are traveling from. As shown in Figure 8, the data suggests that approximately 90 percent of trips destined for the Camino area originate from the west while approximately 10 per cent originate from the east. Additionally, the Sacramento Metro Area and the San Francisco Bay Area account for approximately two-thirds of all trips destined for the Camino area.

Figure 8: Camino Visitor Origin



Which routes do visitors use to enter the Camino area?

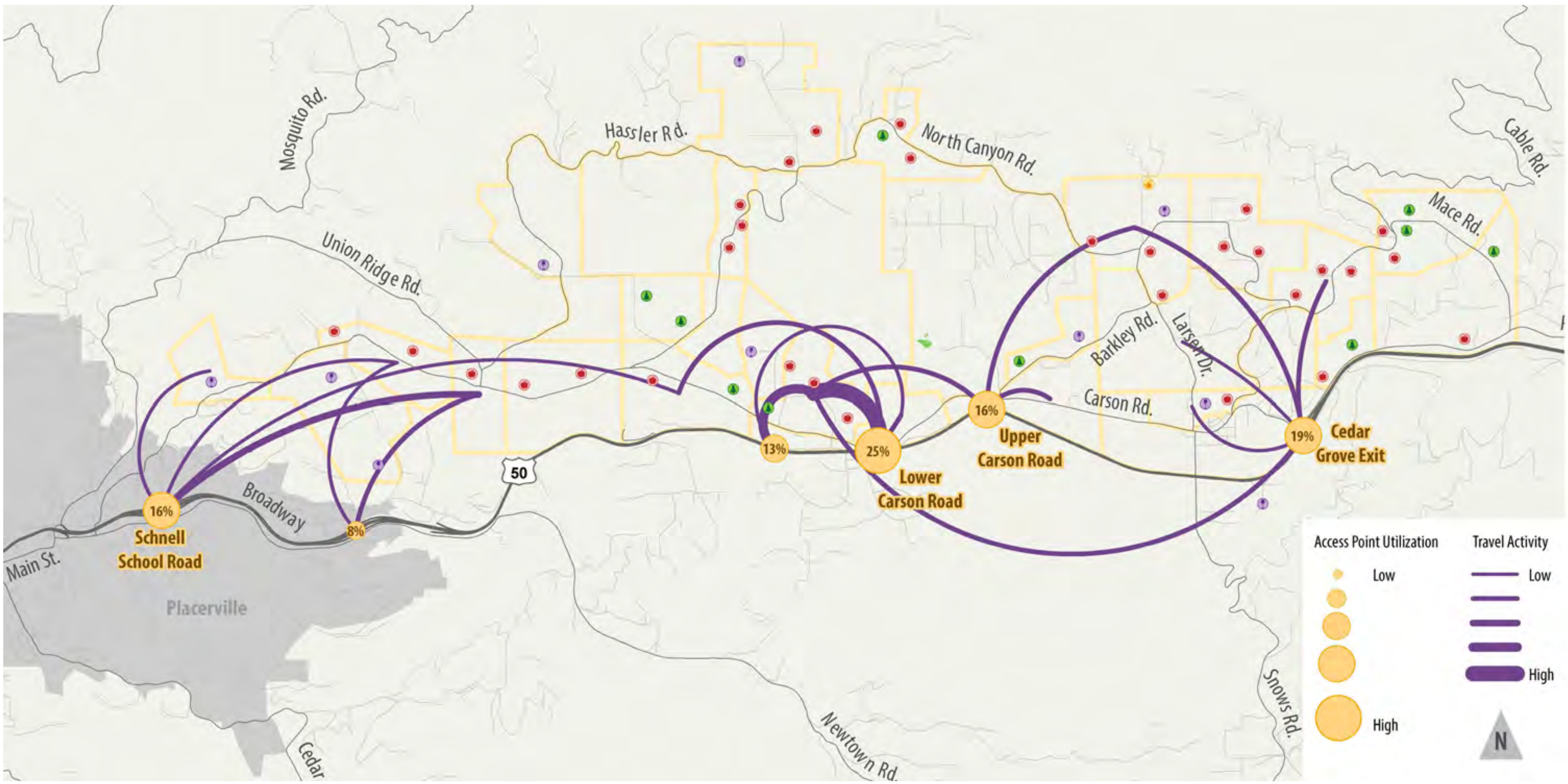
The GPS and cell phone data was also used to determine which access points are most heavily used by visitors. As shown in Figure 9, the data suggests that the Schnell School Road, Lower Carson Road, Upper Carson Road, and Cedar Grove exits off of US 50 are the most heavily used access points in to the Camino area, while the P

The large amount o Grove exit is in par ol employed by the California Highway Patrol (CHP). ol prohibits left-turns at the

US 50 exits at 5 Mile Drive, Lower Carson Road, and Upper Carson Road from 10 a.m. to 3 p.m. on October weekends. As a result, much o on eastbound US 50 headed towards Apple Hill[SM] farms is directed to the Cedar Grove exit. Some of

Upper Carson Road, Lower Carson Road, and 5 Mile Drive exits.

Figure 9: Access Points into the Camino Area



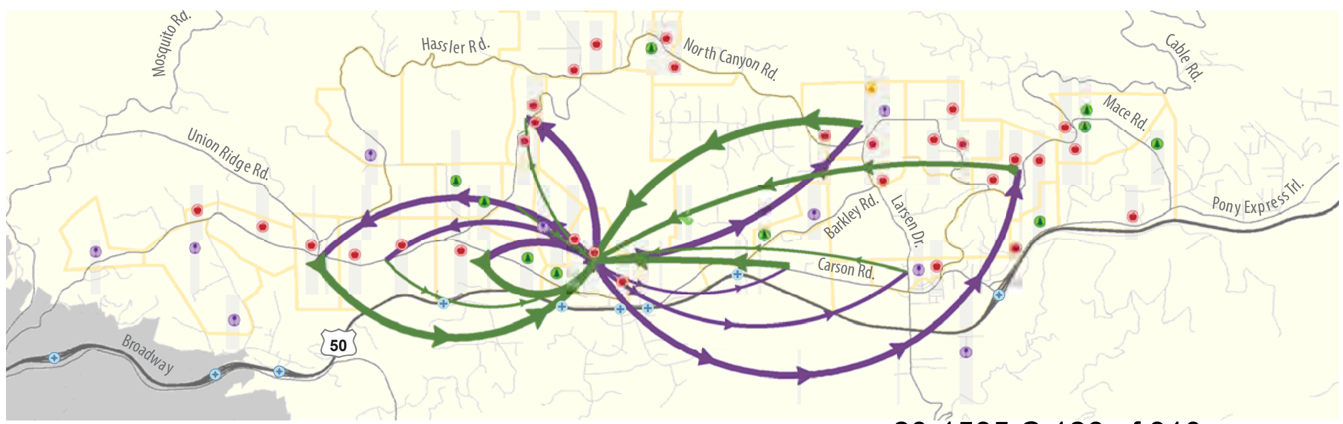
Where within the Camino area are people traveling to?

To understand travel patterns within Camino, the area was divided into 30 zones, roughly grouping orchards that are in close proximity to each other. A GPS travel analysis generated an origin-destination matrix for travel between the 30 zones. Five “hotspots”, or zones that had the highest interaction with the other zones, wer oughly correspond to the following areas of Camino:

- West Carson Road Area near Union Ridge Road
- Carson Road area near North Canyon Road
- Cable Road/Larsen Drive area
- Carson Road area near Gatlin Road
- Larsen Drive/North Canyon Road area

Individual plots were made for each o zones listed above. Overall trends show that the highest amount of interaction occurs between e 10 shows an example of one of these plots for the Carson Road area near Gatlin Road. Appendix G provides a complete set o

Figure 10: Travel Patterns for Carson Road Area near Gatlin Road

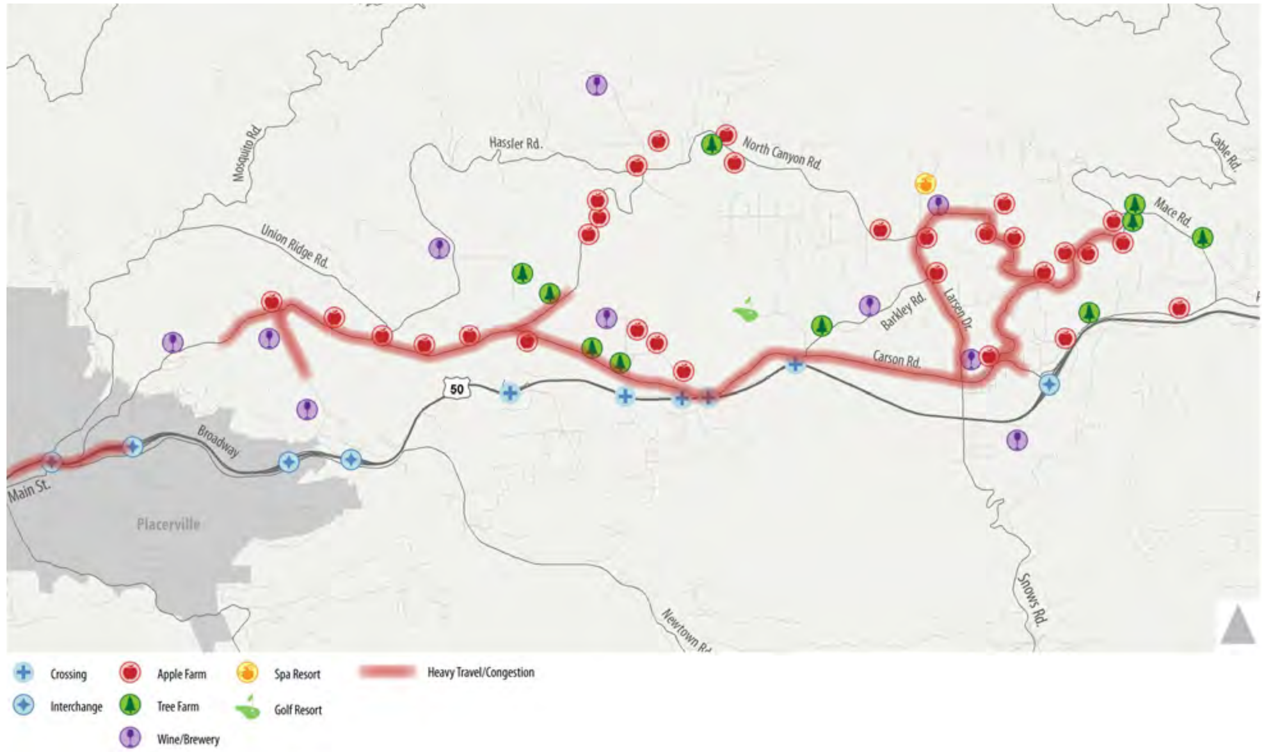


KEY ACTIVITY CENTERS

Through synthesis of the collected data, key activity centers within the Camino area were s are described below.

- **Carson Road/Union Ridge Road area:** a high amount of congestion occurs along Carson Road in the easterly and westerly directions from the intersection of Union Ridge Road near Abel's Acres. A CHP o ol at the Carson Road/Union Ridge Road intersection during October weekend afternoons to allow vehicles to turn onto and off of Union Ridge Road. This has made it easier for vehicles to turn onto and off-of Union Ridge Road but has resulted in higher delays and longer queues on westbound Carson Road.
- **Carson Road west of North Canyon Road:** a moderate amount of congestion occurs along Carson Road in the easterly and westerly directions from the parking areas for Boa Vista Orchards
- **Carson Road/Gatlin Road area:** the heaviest congestion in the area occurs along Carson Road in the easterly and westerly directions from the intersection of Gatlin Road near the High Hill Ranch entrance. The westbound approach at Gatlin Road generates the longest queues and delays, which can extend back to Larsen Drive in Camino and take over an hour to travel through.
- **Eastern Camino area:** a light to moderate amount of congestion occurs along the Larsen Drive/Cable Road loop north of the town of Camino. Key ranches along this loop include Rainbow Orchards, Larsen Apple Barn, Jack Russell Brewery, Denver Dan's, Bolster's Hilltop Ranch, and Apple Ridge Farms.

Figure 11: Activity Centers within the Camino Area



In addition to the congestion centers listed above, US 50 through Placerville experiences congestion in the eastbound direction during the morning hours and the westbound direction during the afternoon hours. Observed congestion generated by these activity centers is illustrated in Figure 11.

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observations, GPS data, dr
observations, and stakeholder feedback, was used to inform and identify mobility challenges facing the region. The mobility challenges vary in size and how they affect various stakeholder groups. For the purposes of the study, they are separated into regional and local challenges.

As described below, the primary agritourism related mobility challenges in El Dorado County include:

- ough Placerville
- A brief but intense peak in agritourism travel during fall weekends
- culation causing queuing and congestion on Carson Road

REGIONAL TRAVEL CHALLENGES

Regional travel to and from the Camino area poses a complex challenge because of Camino's distance and isolation from population centers and the limited access into and out of the region.

Regional Draw

Over recent decades, the Apple Hill[SM] growers have grown to be a major attraction within El Dorado County and now attract regular visitors from all parts of Northern California. Long-distance travel to the area from major population centers in Northern California, such as Sacramento and the San Francisco Bay Area, has created a unique challenge whereby non-local visitors are unfamiliar with the region and therefore mostly only visit those areas that are immediately adjacent to US 50 and Carson Road. This effect is obser
when segments of Carson Road experience severe congestion while roadways farther from US 50 experience minimal congestion. Although marketing efforts have attempted to inform visitors of other Apple Hill[SM] growers, the Carson Road corridor remains the primary activity center.

Regional Traffic on US 50

US 50 serves as the regional connection between the metropolitan populations of Sacramento and San Francisco and attractions in eastern and central El Dorado County, such as the Tahoe Basin and Apple Hill℠ growers near Camino. During peak tourism seasons, including alpine sports, summer, and the fall har f ticularly during Friday and Sunday afternoons. eturning from the Tahoe Basin and Apple Hill℠ growers on Sunday afternoons in the fall, cause a particularly noticeable increase in These activities result in high volumes o travel through the City of Placerville.

Traffic Congestion Through Placerville

Within the City of Placerville, US 50 changes from a freeway to an expressway with three signalized at-grade intersections at local roadways and State Route 49 through downtown Placerville. Caltrans has informed the project team that the thr ville are currently operating with maximum cycle lengths and optimized coordination. Pedestrian bridges currently exist at two locations to help reduce automobile delay, and widening of US 50 through Placerville presents considerable challenges due to right-of-way and funding issues. Therefore, minimal opportunity exists to further optimize travel along the corridor without major capacity enhancements.

US 50 was observed to be especially congested in the westbound direction during the afternoon, which may be due to similar departure times for ahoe Basin and Apple Hill℠ ranches. Eastbound US 50 during the morning hours experienced somewhat less congestion, which may be due to greater variation in arrival ℠ growers and the Tahoe Basin.

Peak Travel Times

A key challenge to recognize and consider in assessing mobility solutions is the peak travel times during which congestion occurs. Due to the nature of the harvest season, congestion in the Camino area primarily occurs on four to six weekends per year, which corresponds to less than four percent of days out of the year can be severe on those weekends, the annual frequency of congestion is minimal compared to more conventional transportation projects in urban areas that experience congestion every non-holiday weekday.

Unreliable Cell Service

The region's hilly terrain provides a challenge for receiving reliable cell service. Cell service was observed to be reliable near the Carson Road/US 50 corridor but less reliable as distance from the corridor increases. The unreliability of cell ser
for areas farther from US 50. Installing a greater number of cell service towers farther from US 50 to improve cell service reliability is costly and likely infeasible for local businesses to fund.

LOCAL TRAVEL CHALLENGES

During the popular apple harvest season between September and November, rural roadways in the Camino ar
congestion. Since that type o
only occurs during a handful of weekends throughout the year and the community prefers to preserve its rural character, conventional methods o oadway widening, are not feasible. Therefor elatively infr esents a unique challenge in identifying solutions that sustain both local and regional agritourism business, improve circulation and mobility, and preserve the rural and natural beauty that makes the region an attractive place to live and visit.

Parking Access & Circulation

The primary factor contributing to local congestion in the Camino ar
parking access and circulation at the most heavily visited orchards, especially ones on Carson Road. At most of these orchar f vehicles were observed waiting to enter despite available parking within the parking areas. Those observations indicate that parking access and circulation is limiting the volume o
the orchards and causing the extensive queuing and congestion on local roadways.

two of the most popular orchards, Abel's Acres and High Hill Ranch, well exceeded the inbound t Abel's Acr
demand to enter the parking area reached 280 vehicles per hour (vph) at its peak, while the elatively consistent 180 vph. A
to enter the parking area peaked at 950 vph,

Appendix H provides a more detailed analysis of s Acres and High Hill Ranch.

represents a portion of the actual demand. The

onto Carson Road, creating delays and impeding mobility for visitors, residents, and emergency responders. During peak weekends, vehicles on westbound Carson Road headed in the direction of High Hill Ranch can wait in queues of up to two miles long for over an hour.

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Access From US 50

Analysis of multiple data sources was used to determine the primary access points used to enter the Camino area. The Cedar Grove exit, Upper and Lower Carson Road intersections, and the Schnell School exit are

ea.

The Upper and Lower Carson Road access points require eastbound vehicles to yield to oncoming westbound

thermore, queues of vehicles waiting to enter High Hill Ranch can often spill back to the Upper and Lower Carson Road access points, limiting the number of vehicles able to exit US 50. This can create queues on the US 50 mainline, creating a safety hazard due to the speed differ

ough

Local Wayfinding

The rural and topographic environment within Camino creates a navigational challenge for visitors unfamiliar with the area. Many visitors choose to remain close to US 50 (i.e. along Carson Road) where cell reception is reliable and allows them to utilize online navigation tools to make route decisions. Unreliable cell reception in other areas of Camino could be a contributing factor to congestion along Carson Road and a barrier to visitors feeling comfortable enough to explore and experience other Apple Hill^{SM} ranches beyond Carson Road.

Short Distance Trip Making

The data collection and outreach effort showed that visitors make many short-distance trips between ranches in the Camino area. This is most notable for the following six key areas around Camino:

- Carson Road at Union Ridge Road
- Carson Road near North Canyon Road
- Carson Road at Gatlin Road
- North Canyon Road north of Carson Road
- Larsen Drive from Barkley Road to Cable Road
- Cable Road near Larsen Drive

In some of those areas, tourists visit multiple ranches within one area, such as the ranches along Larsen Drive. In addition, there are a large number of vehicles traveling between individual areas to visit multiple ranches within each area. The interaction between ranches both within and between those areas indicates that a large number of trips are short distance trips within the Camino area. The cumulative effect of short distance trips is a large number of vehicles on local roadways both within each individual area as well as on the roadways between them.

Major Activity Centers

Assessment o eas where congestion occurs (see Figure 11). Despite high levels of congestion along roadways near US 50, including Carson Road, many roadways further from US 50 exhibit minimal to no congestion, such as Union Ridge Road, Hassler Road, and North Canyon Road.

Emergency Responders

T oadways in the Camino area creates a safety hazard by delaying emergency response time or, in extreme cases, preventing emergency access. Areas along Carson Road are particularly vulnerable to this issue due to high levels of congestion and lack of alternate access routes for emergency response vehicles.

6 Mobility Solutions

The unique mobility challenges presented in the previous section necessitate innovative and context

only occurs during a handful of weekends throughout the year and the community values the area's rural character, conventional methods of

ough roadway widening and adding turn lanes are not practical or warranted. In addition, the area's hilly topography would make roadway widening expensive and possibly infeasible. Therefore, the mobility solutions presented below consider these circumstances while promoting business in the region, improving circulation for visitors and local residents, and enhancing the region's scenic beauty.

PARKING & CIRCULATION IMPROVEMENTS

As noted in the previous chapter

parking access and circulation at the most heavily visited orchards are the primary cause of congestion and queuing on local roadways during peak Apple Hill[SM] weekends. The resulting queues and delays also affect access to the Camino area from US 50 as well as mobility for local residents and emergency responders.

The following parking and circulation improvements represent near-term solutions that

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to impr eas as well as proactively address possible other parking related issues.

Access & Circulation Improvements

Apple Hill[SM] ranches and El Dorado County should evaluate driveway locations and parking lot circulation at individual ranches to determine whether improvements can be made to minimize

out of ranch parking areas. Improvements are particularly important when the demand to enter a ranch parking area causes queuing that spills back onto the public roadway. These access and circulation improvements will impr

on local str

out of ranches as well as increase the amount of visitors that can visit ranches.

Techniques to improve access and parking circulation include extending driveway throats further into a ranch, eliminating parking on entry driveways, employing attendants to dir

circulation within a ranch parking area, designing intuitive parking circulation, and separating vehicle

and pedestrian routes to r
visited ranches, multiple driveways and one-way parking lot circulation should also be considered.

Boa Vista Orchards and Abel's Apple Acres are two examples of ranches that have implemented these types of access strategies and circulation improvements.

Since parking access and circulation is such a critical issue to impr , this study conducted a focused evaluation of conceptual improvements at the ranches near the two most congested areas of Carson Road: Abel's Acres and High Hill Ranch. Conceptual improvements at these two locations showed that improved access to parking areas and more effective internal parking lot circulation can result in substantially
r
reach fr son
Road was greatly reduced. At High Hill Ranch, these improvements are particularly important to implement prior to the completion of the US 50 Camino Safety Project to ensur om the proposed new eastbound off-ramp. Appendix H provides a more detailed summary of this analysis at Abel's Acres and High Hill Ranch.

El Dorado County is responsible for coordinating with ranches regarding the necessity of these improvements during permitting, while individual ranches are responsible for making these improvements to their property. El Dorado County should provide support to facilitate the implementation of improvements, where appropriate.

Parking Lot Wayfinding

Improved signage within the parking areas of the larger ranches will assist with dir
channelizing pedestrians to appropriate crossings. Signs may be augmented with temporary fences or other means to direct and separate pedestrian
e
responsible for these improvements.

Prohibit On-Street Parking

"No Parking" signs along public roadways with minimal or no space for parked vehicles will encourage use of designated parking areas, r

impr . Areas where on-street parking creates safety and operational issues due to sight-distance, vehicle travel speeds, and lack of shoulders are of particular importance. In conjunction with providing an adequate parking supply at ranches, prohibiting on-street parking will improve operations by ensuring

roadways are minimized.

On-street parking is currently prohibited along Union Ridge Road north of Carson Road, Gatlin Road south of Carson Road, and along Cable Road at Grandpa's Cellars. El Dorado County is responsible for enforcing these type of improvements via the Ranch Ordinance Code and the T y Committee.

Adequate Parking Supply

Ranches should evaluate their parking supply during peak visitor times and identif

lots on their property to be used on a temporary basis. Signage o

to direct visitors to them when main parking areas ar

to main ranch buildings and minimize pedestrian

culation. In conjunction with prohibiting on-street parking, an adequate parking supply at ranches will improve operations by ensuring that automobile and pedestrian

oadways are minimized.

Should parking supply need to be expanded, individual ranches are responsible for those improvements with El Dorado County providing support where appropriate through special use permitting and enforcement of the Ranch Ordinance parking requirements.

TRAVELER INFORMATION

As noted in the *Bay to Tahoe Basin Recreation and Tourism Travel Impact Study*, well coordinated strategies and channels for the dissemination of visitor information is key. Today's visitors expect to

mation prior to travel and during travel, with the majority of travelers obtaining information from the Internet via personal computers (prior to travel), smartphones, or tablets. To expand upon this strategy in the Bay to Basin study, this study recommends the following improvements to facilitate the dissemination of information to help visitors plan their visit. These improvements are near-term solutions that can be implemented within the next

s.

Augment "Plan Your Trip" Resources

Easily accessible travel information can assist visitors with planning a visit to their agritourism destination. Recommendations of various types of travel information, from real-time to traditional maps, are provided below. The Apple Hill^{SM} Growers Association already provides some of this information on its website as well as in its Cider Press; however, our review of these existing resources show some room for improvement to ensure visitors are able to mor

resources and tips. The Apple Hill℠ Growers Association and individual ranches are responsible to develop and provide the travel information with El Dorado County, El Dorado County Chamber of Commerce, and the El Dorado Winery Association participating as appropriate.

General Traffic/Travel Information

Ranches should pr f visiting during off

peak times, inform visitors of all destination/ranch options, and share availability of alternative modes once available. Encouraging visits during off-peak times will reduce the concentration of during peak weekends and impr ough the area.

In the 2016-2017 Apple Hill ℠ Cider Press, the Apple Hill℠ Growers Association included a new section called "As Good As Gold" that includes "nuggets" that will help make visits "as Good as Gold" for farms and visitors alike. Within this helpful list of recommendations is the following tip for visitors:

> *To enjoy a leisurely day driving around the hill, the opportunity to interact with the farmers themselves, and the chance for excellent service, plan a trip for September, November, or December or on a weekday, avoiding lines and traffic on busy October weekends.*

While helpful, this tip along with the other recommendations is near the back of the Cider Press and not on the Apple Hill℠ Growers Association website.

Since many visitors now use the Inter travel information prior to and during travel and most do not pick up a Cider Press until reaching an Apple Hill℠ grower, these tips would be more effective if published on the Apple Hill℠ Growers Association website.

The Gatlinburg, Tennessee tourism website presented at right is an example of effectively

information to visitors through the Internet.

General Traffic/Travel Information Example: Gatlinburg, Tennessee

Nestled at the entrance to the Great Smoky Mountains National Park, the most visited national park in the country, Gatlinburg, Tennessee is a mountain resort destination that attracts more than 11 million visitor s a year. As a r ough Gatlinburg can often be a headache. To assist visitors with navigating the area, the "Visit My Smokies" website includes a page of tips titled "How to Avoid T g." Included on this webpage are helpful recommendations including:

- Avoid the main roads and planning alternate routes
- Travel during off-peak hours
- Promotes the Gatlinburg Trolley as an alternative to driving
- Encourages people to walk as an alternative to driving and an opportunity to enjoy the scenery of the area

This helpful set of tips is presented in an understandable and sensitive manner that prepares visitors to oviding recommendations and alternatives, similar to the "As Good As Gold" page of the Cider Press but accessible online. You can view this page at: http://www.visitmysmokies.com/blog/smoky-mountains/travel-infor g/

Informative Guide & Map of Ranches

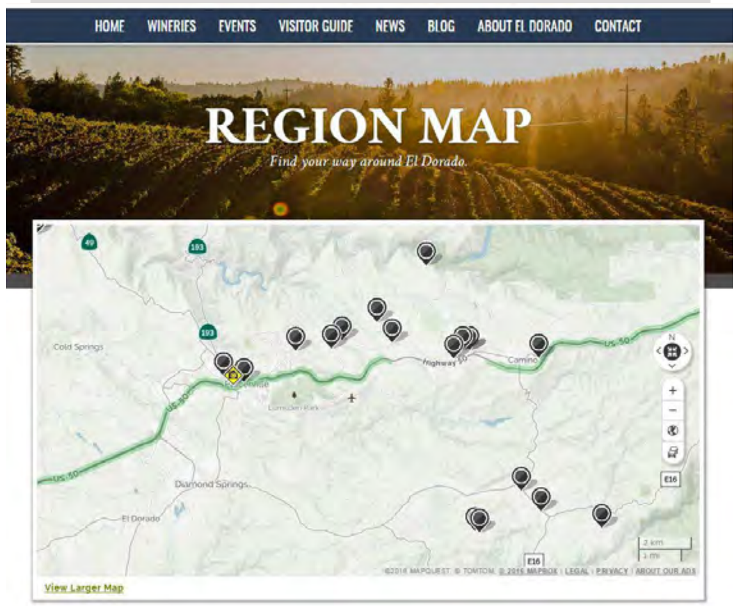
An online, interactive guide and map of the ranches could inform visitors of the many ranches available beyond the Carson Road corridor and encourage them to visit ranches that are off the main road and away from heavily congested areas. While the Apple Hill^{SM} Growers Association Cider Press and website include a full list of the Apple Hill^{SM} ranches, the website's list could be more intuitive to navigate and more clearly articulate the unique attraction or characteristics of individual ranches. For example, the El Dorado County Winery Association website features an interactive online map that effectively communicates the relative locations of wineries along with a description of the particular attributes of each location (see additional details on next page).

Since mobile data access can be a challenge in the rural areas of El Dorado County, it is also recommended that the Apple Hill^{SM} Growers Association should consider including a printable map and brochur tips that addr culation during peak times. These brochures could be made available at individual ranches as well as be available on the "Plan Your Visit" page so visitors can print them out before traveling.

Informative Guide & Map of Ranches Example: El Dorado County Winery Association

The El Dorado County Winery Association website features an interactive online map that shows visitors the locations of wineries and much more. The interactive map allows visitors to click on an individual winery, which immediately brings up a brief description of the winery as well as an intuitive "button" to press to initiate directions. Additional features include a "T s to

webcams," as well as layers for points of interest including hotels, food, gas stations, grocery stores, and more. The El Dorado County Winery Association map can be viewed at:
http://eldoradowines.org/map.php



Identify Alternate Routes

The Apple Hill^{SM} Growers Association as well as individual ranches should review all access routes into the area and identify alternate route options for visitors to consider. In anticipation of

^{SM} Growers

Association website could identify recommended alternate routes to access the Apple Hill^{SM} area in addition to the main directions on its website. Similarly, individual ranches that have websites could post a primary set of directions as well as recommended alternate routes to use during

A coordinated effort by all ranches to do this will help disper educe congestion throughout the agritourism area.

Provide Real-Time Traffic Information

Visitors and r om having access to and being aware of sources for r mation. Below are examples of r mation that represent solutions designed to help visitors make informed choices about travel behavior that will result in reduced congestion during peak periods.

Traffic Web-Cams

cameras at key locations on local roads to provide visitors with access to curr

T eal-time resour ther ahead on a route or as a planning resource to e visit. The Apple Hill[SM] Growers Association and El Dorado County are r

web cams on local roads. Caltrans currently has one webcam located in Placerville at the intersection of State Route 49/Spring Street and US 50.

Mobile Traffic Applications

Google T and Waze, to inform visitors of conditions, estimated time o

incidents. The Apple Hill[SM] Growers Association and individual ranches are responsible for

Ensure Web Access to Mobile Devices

Wi-Fi hotspots can assist with providing web access to mobile users in topographic and rural areas with spotty access to mobile data. Additionally, visitors and residents can be encouraged to download maps to their devices prior to traveling through areas outside mobile data coverage. The Apple Hill[SM] Growers Association and individual ranches are responsible for coordinating with service providers to improve web access for mobile devices.

Changeable Message Signs

Changeable message signs (CMS) can alert drivers to congestion and encourage the use of alternative r f CMS is that they do not require access to a smartphone or GPS and are thus the information they provide is available to all drivers. The Apple Hill[SM] Growers Association would need to coordinate with El Dorado County for the installation of CMS on local roads. Caltrans is responsible for installing CMS on US 50.

Improve Local Wayfinding

Impr ect visitors to access points to the Camino area when arriving or leaving, as well as better navigate the area oved educe the number of vehicles dispersed on local roadways while searching for

with the County's Sign Ordinance. Below are suggestions for ways to impr

Divide Agritourism Area into Districts/Zones

Growers can be grouped into "districts" or "zones" by geographic area to assist with directing travelers to district" should be large enough to include several growers. Collaborative marketing between growers in each district can take advantage of the unique characteristics of a given district to distinguish it from other areas and improve recognition and increase visitors.

Consider Re-implementing the "Golden Apple Trail"

Curr ea consists of "Apple Hill Scenic Drive" signs along with a list of nearby ranches. These signs, while present, can ead while driving around the area. In the 1960s and 1970s, Apple Hill ^{SM} growers used the "Apple Hill Golden Apple Trail" to help visitor ranches. In a similar fashion, a continuously branded loop through the Camino area could help visitors travel through the area, including encouraging visitors to explore less-traveled routes further from US 50. As an example, Fresno County's Blossom Trail guides visitors on a scenic drive through orchards in bloom during the spring.

Local Wayfinding Signs

Tourist-oriented destination (TOD) signage strategically located along Carson Road that corresponds to signage for the "districts" approach s with local

Regional Access Signs

TOD signage along US 50 can be used to direct visitors to primary access points to Camino. TOD signage is commonly found throughout the Napa County winery region provides a good example of the successful implementation of TOD signage in an agritourism area. El Dorado County and Caltrans are responsible for implementing TOD signage.

MARKETING STRATEGIES

The following marketing strategies promote visitation while remaining strategic about impacts to transportation facilities. These improvements represent near-term solutions that can be s. The Apple Hill^{SM} Growers Association and individual ranches are responsible for developing the marketing strategies described below.

Encourage Weekday and Off-Peak Travel

Ranches should encourage off-peak visits through promotions and discounted merchandise.

Co-Market with Other Attractions

Ranches should consider advertising and marketing activities at lodging and tourism destinations in the Tahoe Basin and Reno, as well as local associations such as the El Dorado County Winery Association, El Dorado County Chamber of Commerce, and the City of Placerville. Coordination between the markets can include promotion of off-peak travel days.

Media/Social Media Strategies

Ranches should expand the reach of marketing promotions by making additional efforts to promote through traditional media outlets, such as newspapers and television, as well as social media outlets such as Twitter and Facebook or others as new social media outlets are developed.

MULTIMODAL STRATEGIES

roadways without loss in the number of visitors by providing alternate routes and modes of travel. Implementing multimodal travel options within the area represents a long-term solution that will likely require mor s to implement.

Dedicated Shuttle Facility

Previous transit shuttle service was hindered by eets. To improve reliability and make the service a more attractive alternative to driving, a dedicated facility should be provided for shuttles. The facility could also serve as an emergency vehicle access route under periods of roadway congestion. Examples of successful transit shuttles operating in similar conditions include National Park shuttles, such as those operating at Yosemite and Grand Canyon National Parks. Two types of dedicated shuttle facilities are presented below.

Dedicated Shuttle Lane

A designated travel lane paralleling congested roadways that would exclusively serve shuttles and emergency vehicles should be explored. Implementation of the dedicated shuttle lane with no expansion of existing transportation infrastructure would require temporary one-way circulation. El Dorado County and a transit provider are responsible for these improvements.

Multi-Purpose Trail

A Class I bike path between ranches and activity centers can provide an alternate route to congested roadways. During off-peak times the facility could be a community asset for walking, running, and cycling. During peak visitor weekends the facility could be used as a dedicated shuttle and emergency vehicle facility. To be able to accommodate shuttle and emergency vehicles, this Class I bike path would need to have a minimum paved width of 12 feet.
El Dorado County and private property owners are responsible for these improvements.

Centralized Park-and-Ride Facilities

Park-and-ride facilities make shuttle service more convenient and effective by offering a centralized location to transfer between private automobile and shuttle service. Park-and-ride facilities should be located in easily accessible, central locations that serve as effective hubs.

Possible park-and-ride locations include:

- Schnell School Road
- US 50/Lower Carson Road
- Sierra P son Road/Larsen Drive
- US Forest site at Carson Road/Eight Mile Road

Park-and-ride locations will need to be vetted by shuttle service provider
access and internal parking circulation. It may require the cooperation of private landowners.

Utilize Park and Rides as Hubs

To expand upon the services of park-and-ride facilities, informational kiosks, storage lockers, and areas for possible vendors could also be provided. These amenities will transform park-and-ride facilities into local hubs that provide visitors with information for places to visit and answer questions, create opportunities for smaller ranches to sell their products, and provide a place for purchased items to be stored until visitors leave.

Delivery Alternatives

Multimodal travel necessitates alternative ways for visitors to transport purchased goods. Means of transporting purchased goods can include:

- Having products shipped to homes
- Sending products to the park and ride hubs for storage and pick-up at the end of the day
- Renting portable lockers
- Offering refrigerated storage and transportation for perishable goods

Delivery alternatives may also provide ranches with the opportunity to maintain contact with customers.

Shuttle/Tram Service

A transit service could take the form of buses, trams, or hayrides that replace existing automobile trips and thus reduce roadway congestion. The transit service should operate on a dedicated facility or lane (see above) and could be provided by public transit service, a private service, or electric vehicles.

Expand Public Transit Service in the Area

Public transit service by El Dorado Transit could be expanded in the local Camino area, with more frequent service during the peak agritourism season to handle additional demand. Potential Americans with Disabilities Act (ADA) improvements may be necessary to fully accommodate expanded public transit service in the area.

Contract with El Dorado Transit or Private Operator to Provide Service

Ranches or an organization, such as the Apple Hill[SM] Growers Association, can contract with El Dorado Transit or a private shuttle operator to provide shuttle service during peak agritourism season. A private operator, such as Amador Stage Lines, would address potential regulatory constraints on public transit providers, such as El Dorado Transit. Larger shuttle vehicles may be appropriate on highly traveled corridors, such as Carson Road, while smaller vehicles may be better suited for less-traveled roadways with challenging topography and curves, such as Hassler Road or North Canyon Road.

Dedicated Shuttle Circulation at Ranches

To facilitate shuttle use, large ranches could have dedicated lanes that ensure shuttles/trams are able to pick-up/drop-off rider .

CHARTER TOURS

Charter tours offer the ability for large groups to visit ranches without necessitating multiple vehicles ,

visitors with charter tours would be able to keep purchases with them. To accommodate charter tours, parking areas should offer spaces for longer vehicles and areas for passenger drop off and pick up.

WALKING TRAILS

Ranches in close proximity could be connected by walking trails either along public the public road right-of-way or through mutual agreement among adjacent property owners. Walking trails could enhance visitors' orchard experience while reducing short vehicle trips between ranches and the roadway congestion associated with automobile trips.

BICYCLE OPTIONS

Improved bicycle infrastructure and services will encourage bicycling as a feasible way to travel around the agritourism area, which can reduce trips made by automobile and thus roadway congestion. To encourage bicycling, the following improvements to bicycle facilities and amenities are recommended.

Bike Lanes

On primary roadways through the agritourism area, paved shoulders can be widened to provide on-street bike lanes. Additional pavement width to provide buffered bike lanes or protected bikeways would make these facilities more attractive to novice and amateur cyclists. The 2010 El Dorado County Bicycle Transportation Plan can be referenced as a guide to prioritizing bicycle facility improvements. El Dorado County is responsible for these improvements.

Bike Trails

Bike trails between ranches and activity centers could provide a scenic way to travel through the area. El Dorado County and private property owners are responsible for these improvements.

Bike Rentals

Bike rental locations could offer visitors the spontaneous option to travel to the various growers via bicycle. Bikes should be equipped with baskets or other storage options for small products. Rental locations could be located at park-and-ride hubs with lockers for people with purchased goods.

Vehicle Circulation Improvements

The recommendations below will improve vehicle circulation through Placerville as well as within the agritourism area. Depending on the improvement, Caltrans, El Dorado County, and/or the City of Placerville may be responsible for these improvements.

Traffic Flow Facilitation

At intersections and/or driveways to ranches where

the intersection or roadway, additional measures can be consider

include:

- Use of hir ol, such as CHP o s,

  dir ough on the local roadway when a queue of entering vehicles on

  the local roadway. Ranches in these conditions should consider a secondary entrance point to

  captur

  recommendations in Appendix H as an example.
- Temporarily prohibiting left turn movements and identifying alternate routes for those prohibited movements

Adaptive Signal Timings on US 50 in Placerville

Adaptive signal control technologies should be considered for the signalized at-grade intersections on US 50 through Placerville. Adaptive signal control technologies adjust when green lights start and end to accommodate curr ns to pr

and right-of-way constraints through Placerville,

congestion and delay. However, this concept could provide marginal incr

and would be an incremental improvement over existing conditions.

Realign Intersections

Some intersections within the Camino area exhibit unconventional geometries that have the potential to confuse drivers. As part of general safety and operational improvements to the County roadway network, El Dorado County can geometrically improve these intersections to create better sight distance and more intuitive travel movements. Examples of these intersections include North Canyon Road/Carson Road and Cable Road/ Carson Road.

Temporary One-Way Circulation on Local Roadways

Along existing congested corridors, one-way circulation could be considered during peak times. For example, Carson Road could be temporarily converted to one-way for a short segment approaching High Hill Ranch Road to increase its carrying capacity. This could be as short as from the US 50/Lower Carson Road access point to Gatlin Road, or as long as from Larsen Drive or Barkley Road to North Canyon Road or Union Ridge Road. Depending on the length converted to one-way travel, a corresponding route for the opposing direction of travel will need to be son Road is one-way westbound from Larsen Drive, residents along Barkley Road would need to use Barkley Road to Larsen Drive to travel east.

Implementation of this strategy will need to consider the access needs of local residents, businesses, and emergency response vehicles and the potential impact a temporary one-way conversion may cause. Temporary one-way circulation would also requir and utilization of appr ol o s to ensure compliance.

Limit Access of Private Vehicles on Congested Roadways

In conjunction with a robust shuttle service strategy -and-ride hubs, extensive delivery alternatives, robust shuttle service, etc.), the core of the agritourism area

weekends, with exceptions made for local residents, business operators, deliveries, and emergency vehicles. A detailed implementation plan would need to be developed to ensure adequate access to local residences and businesses, and address potential access concerns.

Similar to the temporary one-way circulation strategy, implementation of this strategy would need to consider the access needs of local residents, businesses, and emergency response vehicles and the potential impact a closure may cause. It will also requir utilization of appr ol o s to ensure compliance.

Widen Roadway Shoulders

Widening roadway shoulders along heavily traveled roadways could pr including:

- Space for cyclists (via a striped bike lane - see Bicycle Options), or pedestrians (via a walking path along the road; see Walking Trails)
- Space for parked vehicles
- Space for disabled vehicles or emergency vehicle access
- Possible use by a shuttle/mass transit service

Drainage Improvements

To facilitate roadway and access improvements at ranches, drainage facilities should be constructed in accordance with industry standards. El Dorado County, in cooperation with property owners when necessary, is responsible for these improvements.

Roadway Widening

As noted in the introduction to this chapter, conventional methods o ough roadway widening and adding turn lanes are not practical or warranted due to the temporary nature o

be detrimental to the area's rural character

congestion only occurs during a handful of weekends throughout the year, adding travel lanes, turn lanes, and two-way left-turn lanes may not be cost effective improvements to address a temporar

In addition, the area's hilly topography would make roadway widening expensive and possibly infeasible.

ess the

main cause o

at the most heavily visited ranches. Adding travel lanes and turn lanes would merely provide additional queuing space without impr essing

the cause o

agritourism weekends of the year.

Lastly, roadway widening could lead to additional

with both community values and the overall focus on environmental sustainability.

SUSTAINABILITY CO-BENEFITS

One of the key objectives of this study is to address the long-term sustainability of agritourism in El Dorado County. This includes the economic sustainability of agritourism business as well as environmental sustainability to preserve the area's rural character and reduce greenhouse gas (GHG) emissions.

Therefore, the mobility solutions presented above not only are aimed at addr

challenges in the near-term, but also consider multimodal and sustainable solutions that can potentially reduce GHG emissions into the future. Table 1 pr esents the proposed solutions above along with a discussion of their potential envir

Table 1:
Mobility Solutions Sustainability Co-Benefits

Type	Solution Concept		Sustainability Co-Benefits
Parking & Circulation Improvements	Access & Circulation Improvements		These strategies would impr roadways and within parking areas, potentially reducing GHG emissions associated with idling vehicles in extensive queues.
	Parking Lot W		
	Prohibit On-Street Parking		
	Adequate Parking Supply		
Traveler Information	Augment "Plan Your Trip" Resources	General T ravel Information	These strategies would encourage people to visit during less congested times, impr peak weekend days which would potentially reducing GHG emissions associated with idling vehicles in extensive queues. Furthermore, improved "plan your trip" information and an informative guide and map of the ranches may impr esult in more dir reducing out-of-way travel.
		Informative Guide & Map of Ranches	
		Identify Possible Alternate Routes	

Type		Solution Concept	Sustainability Co-Benefits
Traveler Information (Continued)	Provide Real-Time Traffic Information	T eb-Cams	Similar to the "Plan Your Trip" solution concept, these resources would help visitors to avoid congested locations and utilize alternative and potentially more direct routes to their destinations. This would result in reduced queues and idling vehicles on congested routes, which could reduce GHG emissions.
		Mobile T	
		Ensure Web-Access to Mobile Devices	
		Changeable Message Signs	
	Improve Local Wayfinding	Divide Agritourism area into "Districts/Zones"	Impr esult in more direct educing out-of- way travel. This would also possibly result in reduced GHG emissions by r .
		Consider Re-implementing the "Golden Apple Trail"	
		Local W	
		Regional Access Signs	
Marketing Strategies		Encourage Weekday and Off-Peak Travel	These strategies would encourage people to visit during less congested times, impr peak weekend days which would potentially reducing GHG emissions associated with idling vehicles in extensive queues.
		Co-market with Other Attractions	
		Outreach & Engagement via Media & Social Media	

Type	Solution Concept		Sustainability Co-Benefits
Multimodal Strategies	Dedicated Shuttle Facility	Dedicated Shuttle Lane	These strategies will make shuttle service a more viable alternative to driving. Replacing existing and future vehicle trips with shuttle and transit trips will reduce VMT in the area and result in reduced GHG emissions.
		Multi-Purpose Trail	
	Centralized Park-and-Ride Facilities		These strategies will make using shuttle service a more convenient and viable alternative to driving. Replacing existing and future vehicle trips with shuttle and transit trips will reduce VMT in the area and result in reduced GHG emissions.
	Delivery Alternatives		This strategy could reduce GHG emissions by eliminating barriers to using shuttle service. However, it could also result in increased GHG emissions if additional cargo travel is incurred as part of the delivery process.
	Shuttle/Tram Service	Dedicated Shuttle Circulation at Ranches	Replacing existing and future vehicle trips with shuttle and transit trips will reduce VMT in the area and result in reduced GHG emissions.
		Contract with El Dorado Transit or Private Operator to Provide Service	
	Charter Tours		By encouraging larger parties to utilize a charter tour service, multiple private vehicles could be replaced by a single charter vehicle. This would reduce VMT and potentially reduce GHG emissions.

Type		Solution Concept	Sustainability Co-Benefits
Multimodal Strategies (Continued)		Walking Trails	Replacing existing and future vehicle trips with walking trips will reduce VMT in the area and result in reduced GHG emissions.
Multimodal Strategies (Continued)	Bicycle Options	Bike Lanes	Replacing existing and future vehicle trips with bicycle trips will reduce VMT in the area and result in reduced GHG emissions.
Multimodal Strategies (Continued)	Bicycle Options	Bike Trails	
Multimodal Strategies (Continued)	Bicycle Options	Bike Rentals	
Multimodal Strategies (Continued)	Vehicle Circulation Improvements	Adaptive Signal Timings on US 50 in Placerville	This strategy would reduce the amount of time vehicles idle in queues, potentially reducing emissions.
Multimodal Strategies (Continued)	Vehicle Circulation Improvements	Realign Intersections	Negligible envir
Multimodal Strategies (Continued)	Vehicle Circulation Improvements	Temporary One-Way Circulation on Local Roadways	Depending on how this solution concept is implemented, it could result in reduced or increased GHG emissions. One-way circulation in the Camino area could result in substantial out-of-way travel, which would increase VMT and GHG emissions. On the other hand, reduced congestion and vehicle idling could result in reduced GHG emissions.
Multimodal Strategies (Continued)	Vehicle Circulation Improvements	Limit Access of Private Vehicles on Congested Roadways	This concept requires a robust park-and-ride and shuttle service strategy for visitors to travel to Apple Hill^{SM} ranches. By greatly reducing personal vehicle travel within the core agritourism area and replacing this vehicle travel with shuttles, this strategy would likely result in reduced GHG emissions.
Multimodal Strategies (Continued)	Vehicle Circulation Improvements	Widen Roadway Shoulders	Negligible envir
Multimodal Strategies (Continued)	Vehicle Circulation Improvements	Drainage Improvements	Negligible envir

APPLYING STRATEGIES TO OTHER AGRITOURISM AREAS

While these strategies were developed to ess the mobility challenges currently existing in the Camino area during the peak fall agritourism season of Apple Hill[SM] ranches, many of these strategies can also be considered for other agritourism areas of El Dorado County. For example, as wineries in southern El Dorado County become more popular destinations and look to either expand or new wineries look to open, the County should ensure that appropriate parking access and circulation improvements are in place to handle the anticipated demand of visitors. Furthermore, a "wine trail" and local can assist travelers with navigating the local roadways to destinations. Lastly, the County, Caltrans, and local growers and communities can possibly collaborate on future park-and-ride locations such that they can serve commuters during the typical weekday while also serving agritourism areas on weekends.

Implementation & Funding Sources

7

This chapter discusses implementation of the proposed mobility solutions presented in the previous chapter. The success of this plan and the proposed mobility solutions depends on the successful implementation of these solutions.

The solutions outlined in this plan have a wide range in scope, scale, cost, and responsible party, and therefore will have differing timeframes for implementation. Some are small-scale actions that can be implemented at individual ranches. The timing for implementing these solutions will be dependent on individual ranches and their ability and willingness to invest in on-site improvements. Others will require collaboration among multiple

from facilitation by public o s may be larger, long-term investments that will require El Dorado County to pursue funding on behalf of the community and could take years before

project. Ultimately, the solutions proposed in this study will be more successful as ranches, stakeholder organizations, local residents, businesses, and El Dorado County o collaboratively work together towards improving mobility in the community. This is vital for the continued success of agritourism in El Dorado County as well as for maintaining quality of life

community.

Table 2 presents a summary of the mobility solutions presented in the previous chapter. T esponsible party for each solution concept as well as possible funding sources for each concept.

Table 2:
Mobility Solutions Implementation Matrix

Type		Solution Concept	Responsible Party	Funding Options
Parking & Circulation Improvements		Access & Circulation Improvements	Ranches (Primary) & El Dorado County (Secondary)	United States Department of Agriculture (USDA): Farmers Market & Local Food Promotion Program (LFPP), Implementation Grant
		Parking Lot W	Ranches	USDA: Farmers Market & Local Food Promotion Program (LFPP), Implementation Grant
		Prohibit On-Street Parking	El Dorado County	Local Funds
		Adequate Parking Supply	Ranches (Primary) & El Dorado County (Secondary)	USDA - LFPP; California Department of Food and Agriculture (CDFA) - Specialty Crop Block Grant
Traveler Information (Continued)	Augment "Plan Your Trip" Resources	General T ravel Information	Apple Hill℠ Growers Association, Ranches	CDFA - Specialty Crop Block Grant
		Informative Guide & Map of Ranches	Apple Hill℠ Growers Association, Ranches	Private Funds and/or Private Grants
		Identify Possible Alternate Routes	Apple Hill℠ Growers Association, Ranches	USDA - FMPP
	Provide Real-Time Traffic Information	T eb-Cams	Apple Hill℠ Growers Association & El Dorado County	USDA - FMPP
		Mobile T	Apple Hill℠ Growers Association, Ranches	Private Funds and/or Private Grants
		Ensure Web-Access to Mobile Devices	Apple Hill℠ Growers Association, Ranches?	Private Funds and/or Private Grants
		Changeable Message Signs	El Dorado County & Caltrans	Caltrans CMS Program

Type	Solution Concept		Responsible Party	Funding Options
Traveler Information (Continued)	Improve Local Wayfinding	Divide Agritourism area into "Districts/Zones"	Apple Hill^{SM} Growers Association, Ranches	Private Funds and/or Private Grants
Traveler Information (Continued)	Improve Local Wayfinding	Consider Re-implementing the "Golden Apple Trail"	Apple Hill^{SM} Growers Association, Ranches	Private Funds and/or Private Grants
Traveler Information (Continued)	Improve Local Wayfinding	Local W	Apple Hill^{SM} Growers Association, Ranches, El Dorado County	Caltrans Tourist Oriented Directional signs (Note: may require statutory
Traveler Information (Continued)	Improve Local Wayfinding	Regional Access Signs	El Dorado County, Caltrans	Caltrans Tourist Oriented Directional signs (Note: may require statutory Possible Caltrans LOGO signs
Marketing Strategies	Encourage Weekday and Off-Peak Travel		Apple Hill^{SM} Growers Association, Ranches	USDA - LFPP; CDFA - Specialty Crop Block Grant
Marketing Strategies	Co-market with Other Attractions		Apple Hill^{SM} Growers Association, Ranches	USDA - LFPP; CDFA - Specialty Crop Block Grant
Marketing Strategies	Outreach & Engagement via Media & Social Media		Apple Hill^{SM} Growers Association, Ranches	USDA - LFPP; CDFA - Specialty Crop Block Grant
Multimodal Strategies	Dedicated Shuttle Facility	Dedicated Shuttle Lane	El Dorado County & Transit Provider	ED County AQMD - Motor Vehicle Emissions Reduction Grant (AB 2766)
Multimodal Strategies	Dedicated Shuttle Facility	Multi-Purpose Trail	El Dorado County, Private Property Owners	Possible Active Transportation Programs (ATP) from State. This is an annual "call for projects" process. Based on mix of Federal funds and state funds, amounting to about $130 million, annually. Congestion Mitigation and Air Quality (CMAQ) Private Funds and/or Private Grants

<table>
<tr><th>Type</th><th colspan="2">Solution Concept</th><th>Responsible Party</th><th>Funding Options</th></tr>
<tr><td rowspan="6">Multimodal Strategies (Continued)</td><td colspan="2">Centralized Park-and-Ride Facilities</td><td>El Dorado County and El Dorado Transit Authority in coordination with Apple Hill℠ Growers Association, Ranches, & owner/operator of park-and-ride sites</td><td>ED County - Highway Users tax

CMAQ</td></tr>
<tr><td colspan="2">Delivery Alternatives</td><td>Apple Hill℠ Growers Association, Ranches</td><td>USDA - LFPP</td></tr>
<tr><td rowspan="2">Shuttle/Tram Service</td><td>Dedicated Shuttle Circulation at Ranches</td><td>Individual Ranches</td><td></td></tr>
<tr><td>Contract with El Dorado Transit or Private Operator to Provide Service</td><td>Apple Hill℠ Growers Association with support from El Dorado Transit</td><td>ED County - TDA LTF

Private Funds and/or Private Grants</td></tr>
<tr><td colspan="2">Charter Tours</td><td>Private operators with support from Apple Hill℠ Growers Association</td><td>Private Funds and/or Private Grants</td></tr>
<tr><td colspan="2">Walking Trails</td><td>Individual Ranches & Private Property Owners OR El Dorado County (if within or adjacent to public right-of-way)</td><td>State ATP Grant (Recreational Trails funding)

Private Funds and/or Private Grants</td></tr>
</table>

Type		Solution Concept	Responsible Party	Funding Options
Multimodal Strategies (Continued)	Bicycle Options	Bike Lanes	El Dorado County	State - ATP Grant ED County - Highway Users Tax CMAQ
		Bike Trails	El Dorado County & Private Property Owners	State - ATP Grant ED County - Highway Users Tax CMAQ
		Bike Rentals	Private operators with support from Apple Hill℠ Growers Association	Private Funds and/or Private Grants
	Vehicle Circulation Improvements	Adaptive Signal Timings on US 50 in Placerville	Caltrans in coordination with City of Placerville and El Dorado County	ED County - Highway Users Tax
		Realign Intersections	El Dorado County	ED County - Highway Users Tax
		Temporary One-Way Circulation on Local Roadways	El Dorado County in coordination with local residents and business owners	ED County - Transient Occupancy Tax
		Limit Access of Private Vehicles on Congested Roadways	El Dorado County in coordination with local residents and business owners	ED County - Transient Occupancy Tax
		Widen Roadway Shoulders	El Dorado County	ED County - Highway Users Tax
		Drainage Improvements	El Dorado County	

FUNDING SOURCES

The following section describes the funding sources
able 2.

Transportation

The majority of public funds for bicycle, pedestrian, and trails projects are derived through a core group of federal and state programs. Additionally, state and federal funding are valued sources for some roadway improvements.

Federal Programs

Federal funding is authorized through the Surface Transportation Block Grant Program (STBGP). STBGP pr
localities for projects on any Federal-aid highway.

The FAST Act continues the Highway Safety Improvement Program (HSIP). These federal funds are allocated by Caltrans and described in further detail below.

The Transportation Alternatives Program (TAP), authorized through MAP-21, pr ovides funding for programs and pr tation alternatives, including on- and off-road pedestrian and bicycle facilities, transit access, mobility, and recreation trails program.

The Congestion Mitigation and Air Quality Improvement Program (CMAQ) also authorizes federal funds, including education programs. FAST maintains the existing CMAQ program from MAP-21.

Federal funds from STBGP, TAP, and CMAQ programs are allocated to El Dorado CTC, and may require coordination with SACOG. Distribution is allocated either competitively or proportionally according to jurisdiction population.

State Programs

There are a number of statewide funding sources and regionally administered funds.

Transportation Development Account (TDA)

This is a long-standing, dedicated local ¼ cent sales tax for urban and rural transit, and rural roadways. The TDA is administered within each county and provides funding in most counties for transit activities. However, in rural areas, some counties may qualify to utilize these funds for roadway improvements, provided there are adequately funded transit systems in a county.

Active Transportation Program (ATP)

The Active Transportation Program was created by SB 99 / Assembly Bill 101 to encourage incr eased use of active modes of transportation such as biking and walking. The pr
state funded programs: Transportation Alternatives Program, Recreational Trails program, Safe Routes to Schools, Environmental Enhancement and Mitigation Program and the Bicycle Transportation Account. It now provides a comprehensive program that improves program planning and

pr
directed to multi-year projects to make greater long-term improvements to active transportation.

The ATP mixes state and federal funds and provides approximately $130 million annually. This program is funded from a combination of federal and state funds from appropriations in the annual state budget act. Forty percent of the funding is dedicated to metropolitan planning organizations in large urban areas. Ten percent of the funds go to small urban and rural regions. The remaining funds will go to the California Transportation Commission for statewide project allocations.

In order to maximize the effectiveness of program funds and to encourage the aggregation of small projects into a comprehensive bundle of projects, the minimum request for statewide Active Transportation Program funds that will be considered is $250,000. This minimum does not apply to non-infrastructure projects, Safe Routes to Schools projects, and recreational trails projects.

Project types allowed under the ATP include: new bikeways serving major transportation corridors, new bikeways to improve bicycle commuting options, bicycle parking at transit and employment center ol devices to improve pedestrian and bicycle safety, improving and maintaining safety on existing bikeways, recreational facilities, education programs, and other improvements to bicycle-transit connections and urban environments.

However, the ATP places rural communities such as Camino and F
competitive disadvantage if they do not qualify

ATP Guidelines. This presents challenges to rural communities that may not be disadvantaged per state guidelines but also do not have the resources necessary to deliver active transportation projects.

Surface Transportation Block Grant Program (STBGP)

The Surface Transportation Block Grant Program (STBGP) provides MAP-21 and FAST funding for transportation projects, including pedestrian and bicycle projects (see above discussion about Federal programs for details). This program is administered by EDCTC, which can prioritize projects for STBGP funding. The total estimated funding available annually for the rural and urban areas of El Dorado County (not including the City of Placerville) is approximately $1 million.

El Dorado County AQMD (AB 2766 Grants)

The County administers this state authorized program which relies on an ongoing vehicle registration fee dedicated to reducing vehicle emissions available to the County's Air Quality Management Board. Recent allocations amounted to $600 thousand over a two-year cycle and the competitive grants are awarded on the cost-effectiveness of the reduction of tons of emissions per dollar. This source has funded shuttle services in and around local agricultural centers in prior years.

Other Programs

The US Department of Agriculture (USDA) offers a series of grant programs some of which are designed to assist the type of agricultural enterprises in El Dorado County.

These include:

Farmer's Market and Local Food Promotion (LFPP)

Grants to improve existing local or regional food business enterprises through such activities as outreach and marketing and non-construction infrastructure.

Specialty Crop Block Grant Program (SCBGP)

These grants are established to fund projects that solely enhance the competitiveness of California specialty crops. This program also involves the state Department of Food and Agriculture, which would be the initial resource for applicants.

Non-Monetary State Programs

Tourist Oriented Directional Signs (TOD)

This is a state authorized, 20+ year-old program intended to guide "out of town" visitors to attractions. Aspects of the program would be desirable for El Dorado County. However, State law may require revisions to put the TOD sign pr .

Changeable Message Signs (CMS)

This is a system of Caltrans electronic boards that have been in use for decades and are intended to be used to alert motorists to travel issues. Caltrans is in the process of upgrading their system of CMS boards, as well as expand their deployment. While best used for non-recurrent incidents along the state's roadways, Caltrans does also employ portable CMS signs and in some cases to highlight for travelers that a " .

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Trip Generation at Virginia Agritourism Land Uses

http://www.virginiadot.org/vtrc/main/online_reports/pdf/16-r18.pdf

PETER B. OHLMS, AICP
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Final Report VTRC 16-R18

VIRGINIA TRANSPORTATION RESEARCH COUNCIL
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16. Abstract:

When new agritourism land uses are initially proposed, a lack of data on how many vehicle trips these uses tend to create (known as trip generation) means that there is limited guidance available for transportation planners and engineers to make appropriate and sound recommendations regarding entrances and other traffic improvements. Agritourism land uses can include farm wineries, breweries, distilleries, orchards allowing visitors to pick fruits and vegetables, and farm stands and markets. This study reviewed existing information about agritourism trip generation rates and conducted data collection and analysis with regard to these rates at five winery and cidery sites in Virginia. In Virginia, localities have the ability, albeit limited, to regulate special events held at agritourism sites, so this study looked at non-event trip volumes.

Engineers and transportation planners typically use trip generation data from the Institute of Transportation Engineers' Trip Generation Manual to determine entrance categories and to recommend street improvements and strategies for safety or capacity. The manual includes trip rates for several uses that could be considered related but that do not exactly represent the range or character of agritourism uses, with the possible exception of breweries serving a full menu approximating the manual's definition of "quality restaurant." The data reported in the manual for most of these agritourism-related uses had a large degree of variability. Recent studies of trip generation at wineries, all from California, were also reviewed.

Data collected for the five Virginia sites had high variability, but certain independent variables had moderately high correlations with trips: (1) number of employees, (2) population within a 60-minute drive, (3) households within a 60-minute drive, and (4) square footage of tasting room. Although based on a small sample size, the results suggest that established retail wineries/cideries are likely to exceed the Virginia Department of Transportation's 50-trips-per-day maximum threshold for a "low volume commercial entrance," falling instead into the "moderate volume commercial entrance" or the "commercial entrance" category.

Based on the findings of this study, it appears that VDOT's practice of assuming low trip volumes for agritourism land uses may result in entrances that are undersized for the amount of traffic they carry. The "moderate volume commercial entrance" category may be appropriate for agritourism land uses in most cases. In addition, weekday peak hour volumes for the agritourism land use sites studied did not occur during the weekday peak hours of adjacent streets. Promising site-based variables for Virginia wineries include square footage of a tasting room and number of employees at peak season, and when no site-based variables are available other than location, Census-derived variables can provide some information. Additional research could clarify the findings of this study.

Recommendations for VDOT's Office of Land Use include (1) providing guidance to VDOT's transportation and land use directors indicating that retail-focused wineries can be assumed to generate well more than 50 vehicle trips per day at peak season and (2) investigating possible adjustments to the traffic volume thresholds for the "moderate volume commercial entrance" category.

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FINAL REPORT

TRIP GENERATION AT VIRGINIA AGRITOURISM LAND USES

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In Cooperation with the U.S. Department of Transportation
Federal Highway Administration

Virginia Transportation Research Council
(A partnership of the Virginia Department of Transportation
and the University of Virginia since 1948)

Charlottesville, Virginia

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DISCLAIMER

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ABSTRACT

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Recommendations for VDOT's Office of Land Use include (1) providing guidance to VDOT's transportation and land use directors indicating that retail-focused wineries can be assumed to generate well more than 50 vehicle trips per day at peak season and (2) investigating possible adjustments to the traffic volume thresholds for the "moderate volume commercial entrance" category.

FINAL REPORT

TRIP GENERATION AT VIRGINIA AGRITOURISM LAND USES

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INTRODUCTION

Agritourism land uses, which can be broadly defined as farm wineries, breweries, distilleries, retail orchards, and farm stands and markets, comprise a growing economic activity in parts of Virginia. Depending on the type of enterprise, visitors can typically pick fruits or vegetables, purchase produce and related products, consume items on premises, and attend events. The Virginia Department of Transportation (VDOT) field offices wanted to understand trip generation for these land uses better, because predicted traffic volumes inform the VDOT processes of approving entrance permits and recommending street improvements. Such information helps planners in their attempts to ensure traffic safety and minimize congestion while ensuring that agritourism land uses are not unfairly burdened. This study was initiated to review existing information about agritourism trip rates and conduct additional information-gathering and analysis for Virginia sites to the extent feasible.

Some wineries host events frequently and rely on them for income, and some agritourism land uses called "event centers" exist solely for events. Because localities, rather than VDOT, can regulate event-related impacts for events that could affect the health, safety, or welfare of the public, this study focused on determining non-event daily trip volumes. VDOT can work with localities in the process of approving special permits for events by using the maximum number of attendees to estimate traffic impacts.

Problem Statement

Unlike with most land uses, when new agritourism land uses are proposed, transportation planners and engineers have limited guidance available to make appropriate and sound recommendations regarding entrances and other traffic improvements. A similar situation exists when existing agritourism operations are to be expanded.

Background

VDOT's involvement in the local land use permitting process includes granting entrance permits for new uses. Two broad categories of entrances, commercial and residential, are typically considered, and each is associated with specific rules and regulations. For example, according to the *Code of Virginia* (hereinafter *Code*), VDOT has the authority to close a commercial entrance if necessary but not a residential one (*Code* §§ 33.2-223, 33.2-241, and

33.2-245). Further, there are several types of commercial entrances, which are classified by traffic volume. Because the proprietor of an agritourism land use often resides on the property, it can be difficult to determine whether an entrance should be designated commercial or residential.

One key factor in the process of granting an entrance permit, as well as in the process of recommending street improvements and strategies for safety or capacity, is trip generation data. These data are available in the Institute of Transportation Engineers' (ITE) *Trip Generation Manual* (hereinafter *ITE Manual*) (ITE, 2012). The data include trip rates for various types of land uses and contexts based on prior studies of traffic entering and leaving specific land uses. The process for collecting trip generation data is described later.

Virginia Law

Virginia law defines an "agritourism activity" as "any activity carried out on a farm or ranch that allows members of the general public, for recreational, entertainment, or educational purposes, to view or enjoy rural activities, including farming, wineries, ranching, historical, cultural, harvest-your-own activities, or natural activities and attractions" (*Code* § 3.2-6400). Breweries are not included in the definition but are defined in *Code* § 4.1-500. Wineries appear in both *Code* sections; farm wineries are specifically defined in *Code* § 4.1-100. For the purposes of this study, rural breweries were considered to be similar to agritourism uses, although the *Code* does not explicitly define them as such. This study is not necessarily concerned with "agricultural operations" as defined in *Code* § 3.2-300 but rather with agritourism activities and land uses, which would in some cases relate to agricultural operations, such as when an agricultural product offered for sale is cultivated on the same property.

Other relevant sections of the *Code* included the following.

- *Code* § 33.2-240 addressed connections to highways from private roads leading to and from private homes. Guidance was limited to a statement that the Commissioner of Highways shall permit connections to provide "safe and convenient means of ingress and egress."

- *Code* § 33.2-241 covered connections to highways for commercial establishments. This section allowed for "access management standards for the location, spacing, and design of entrances" and "minimizing the impact of such ingress and egress on the operation of such highways" in providing the same "safe and convenient means of ingress and egress." It gave requirements for permits and for the person desiring the entrance to pay for its construction meeting VDOT design standards and those of the Land Use Permit Manual, seek joint use with adjacent property owners, and maintain the entrance.

Indirectly relevant was *Code* § 15.2-2288.3 regarding licensed farm wineries, which preempted localities from regulating certain activities of a licensed farm winery. The section did not directly address transportation until 2014, when *Code* § 15.2-2288.3:1, which addressed "limited brewery licenses" for agricultural breweries manufacturing no more than 15,000 barrels of beer annually, was added. The final legislation (SB 430, 2014) stated: "Any locality may exempt any brewery licensed in accordance with subdivision 2 of § 4.1-208 on land zoned agricultural from any local regulation of minimum parking, road access, or road upgrade requirements." (The original legislative proposal had barred localities from imposing minimum parking, road access, or road upgrade requirements without "a substantial impact on the health, safety, or welfare of the public.")

Code § 3.2-300 through 302, among other sections, addressed "right to farm" issues in Virginia, barring localities from requiring special-use permits for protected agritourism activities but not specifically addressing transportation improvements.

Other Considerations

Agritourism land uses have received growing attention in parts of Virginia. Areas that seek to maintain a rural character while encouraging tourism and growing an economic base may find these uses particularly attractive. As these enterprises flourish, challenges can arise.

One example is at farm wineries, many of which host weddings and other events in addition to conducting their daily business of wine tastings and sales. Virginia is home to more than 250 wineries, the fifth highest state count in the United States, and more than 1.6 million tourists visited Virginia wineries in 2013 (Virginia Office of the Governor, 2014). In addition to a major economic impact, the industry has an impact on auto trips. Larger events can lead adjacent residents to express concerns about traffic and noise, and some local governments have sought to limit events as a result. The Virginia legislature expressly limited some local ability to regulate "usual and customary activities and events" of farm wineries, breweries, and agricultural operations (*Code* §§ 15.2-2288.3, 15.2-2288.3.1, and 15.2-2288.6). VDOT's authority regarding entrances was unaffected, and localities remain able to enact reasonable regulations for activities and events where there is a substantial impact on the health, safety, or welfare of the public, although the law did not provide specific guidance or thresholds (Tubbs, 2014b). For example, Albemarle County enacted an ordinance in 2014 requiring an administrative zoning clearance for farm events or sales generating more than 50 vehicle trips per day and a special use permit for farm or farm brewery events with more than 200 attendees; county regulations already required a special use permit for farm winery events exceeding 200 attendees (Tubbs, 2014a, 2014b).

Agritourism land uses have two very different types of trips: non-event and event trips. Non-event trips, i.e., daily trips such as for wine tasting or berry picking, are expected to have low to moderate vehicle volumes and be scattered throughout the day, with seasonal peaks. Event trips, i.e., related to events such as weddings, are more likely to be associated with high vehicle volumes in a small time span, typically in the evenings and on weekends or holidays. As noted, this study focused on determining non-event daily trip volumes.

PURPOSE AND SCOPE

The purpose of the study was to provide VDOT staff with guidance on estimating trip generation for agritourism land uses as accurately as possible. After the determination that clear guidance did not already exist for these specific land uses, additional study and analysis were conducted in order to develop such guidance based on the Virginia experience.

The study addressed two questions:

1. Are trip generation rates for agritourism land uses in Virginia substantially different from rates for related land uses shown in the *ITE Manual* (ITE, 2012)?

2. What amount of variation in trips generated by agritourism land uses in Virginia is explained by observable land use factors (e.g., acres planted or square feet of event space)?

METHODS

To answer the two questions, three tasks were performed:

1. A review of the literature was conducted to establish the state of the practice regarding established methods for trip generation estimation in general and agritourism trip generation in particular.

2. Trip data were collected from selected agritourism land uses in Virginia.

3. The data collected in Task 2 were compiled and analyzed in the manner recommended by ITE (2004) in order to establish local trip generation rates.

Literature Review

The Transport Research International Documentation (TRID) database was used to identify literature published since 1975 on agritourism trip generation rates and the trip generation process in general. The identified literature was reviewed to determine how to collect trip generation data for Task 2 in accordance with established methods for trip generation estimation. Provisions of the *Code* and VDOT's *Road Design Manual* (VDOT, 2005) relating to residential and commercial entrances and agritourism activities were also reviewed.

Data Collection

The data collection procedure was based on recommendations from ITE's *Trip Generation Handbook* (hereinafter *ITE Handbook*) (ITE, 2004). Key considerations included the selection of an independent variable on which to base the data collection and analysis. The independent variable was to be "related to the land use type and not solely to the characteristics of the site tenants" and was to be information that is typically available when a new use is proposed.

Potential independent variables were identified by a review of the literature and consultation with VDOT staff. In addition, inquiries were sent to local planners in the counties of Albemarle and Nelson to find out what information might typically be known or available when land uses are proposed, which is the stage when VDOT typically reviews land use proposals (i.e., when a rezoning or special use permit is requested). These adjacent counties in central Virginia were selected because they each have a relatively high number of farm wineries but have different local review and approval processes. They also represent different contexts that can be found across Virginia: Nelson County (population 15,074) has a few small towns but is primarily rural and has a small planning staff, whereas Albemarle County (population 103,707) has a larger planning department and is a rural area with small towns that surrounds a ring of urban and suburban development adjacent to the City of Charlottesville. (Population estimates are for July 1, 2014, and are from the Weldon Cooper Center for Public Service, 2015).

Selecting Sites

ITE (2004) noted that common practice was to collect data from at least three, and preferably at least five, representative sites to establish a trip generation rate. A representative site was described as having at least 85% occupancy, being at least 2 years old, and having characteristics making data collection safe and easy.

Based on recommendations from five of VDOT's transportation and land use directors, a list of 37 relatively well-established agritourism sites in Virginia, including pick-your-own farms/orchards, wineries, cideries, produce stands, farm markets, and a brewery, was developed.

A subsample of this list was then created based on the following considerations:

- geographic location (given a goal of studying sites from different parts of the state)
- paved vs. unpaved driveway (some automated traffic counters could be used only on paved surfaces)
- dedicated driveway vs. one shared with other land uses and configuration of other driveways or cross streets on adjacent road (to avoid capturing trips not destined for the agritourism land use)
- volume and speed of traffic on adjacent road (to avoid sites where crews would be at a safety risk when placing and removing counting equipment on a major road)
- review of the website of each agritourism site (some sites were removed from consideration because they included other land uses, such as a restaurant, camp, or

lodge; other sites were removed from consideration because they were for sale, under construction, using buildings termed "temporary," or not offering a key element of their usual operation, such as pick-your-own fruit, because of a particular issue).

Representatives of the 20 remaining candidate sites were contacted by telephone with an invitation for their proprietors to answer a questionnaire about the characteristics of the site. The introductory script and questions used in this contact are provided in Appendix A. Representatives of 10 sites (50%) provided responses. A plan to collect data for 3 pick-your-own farms and 3 wineries was amended to include only wineries and cideries because the representatives of the farms either declined to participate or did not respond to the invitation to participate. The revised data collection plan involved 5 winery/cidery sites. In order to obtain permission to collect data, it was necessary to keep the identity of each site confidential, which is consistent with ITE's procedures (2004).

Conducting Traffic Counts

According to ITE (2004), the best time period for conducting counts is when "the combination of site-generated traffic and adjacent street traffic is at its maximum." For automatic counts, a 7-day count was recommended. Because trip volumes generated by agritourism land uses have seasonal variation, "time periods representing the 30th to 50th highest hours of the year may be used." For this study, it was assumed that this time period would correspond to the fifth busiest day of the year.

Permission to place counting equipment was requested of each proprietor, as recommended by ITE (2004). In most cases, the ideal location to place counting equipment to ensure count accuracy and safety for technicians was private property, making permission a necessity. Site contacts were also asked about any events that might affect traffic counts during the count period. All five sites studied were rural wineries/cideries in northern, central, or southern Virginia within a 30-minute drive of a town or urbanized area.

Technicians from VDOT district offices set up and removed automatic traffic counting equipment (pneumatic tubes) at each site. Counts were to be conducted for 7 full 24-hour days to include the day (or one of the days) identified as the fifth busiest day of the year, but technicians deviated from this research plan in some instances (presumably because of other work demands or for efficiency in deploying and retrieving count equipment), as indicated in Table 1. Count increments were not specified in the research plan. Data for Sites 1 and 5 were reported in 1-hour increments, whereas those for adjacent streets were reported in 15-minute increments.

Pneumatic tubes were used to obtain automated traffic counts at entrances and exits to each site. Because the goal was simply to quantify the number of vehicles entering and exiting each site for daily business, there was no need to consider automobile occupancy rates or to separate counts by vehicle classification. After the researcher received the count data set for a site, the data set was sent by e-mail to the site contact for use as desired.

Table 1. Reported Fifth Busiest Days, Dates of Traffic Counts, and Site Comments for Study Sites

Site No.	Reported 5th Busiest Day	Count Dates	Comments
1	Labor Day weekend. Memorial Day weekend is the busiest; all of October is pretty busy.	8/27/14–9/2/14	Data were reported in 1-hr increments.[a]
2	The Saturday of one of these: Memorial Day weekend, Labor Day weekend, the last weekend in September, or any weekend in October	10/9/14–10/16/14	Data were reported in 15-min increments. Counters were activated midday on Day 1 and deactivated midday on Day 8 (both Thursdays); for analysis purposes, these two 12-hr periods were added together to represent 1 full day. No traffic volume data were available for the street adjacent to this site.
3	A weekend in mid-September	10/22/14–10/28/14	Data were reported in 15-min increments. Permission to count was obtained on October 2, 2014; the researcher chose to collect data immediately rather than wait 11 months for a mid-September weekend. A count was completed in early October, but equipment was placed on only one of the site's two driveways, so the count was redone in late October. Counters were activated midday on Day 1 and deactivated at 8 A.M. on Day 7; because these two time periods were on different weekdays and because together they provided only 20 hr of data, both were excluded from the analysis.
4	A Saturday in November	11/5/14–11/11/14	Data were reported in 15-min increments.
5	A Saturday in October	10/24/14–10/26/14	Data were reported in 1-hr increments.[a] Weekday data were based only on a count for a Friday, the only weekday the site was open to visitors. This site was determined to have a substantially different context than the other 4 sites, which were all relatively popular retail or destination wineries/cideries. This site had elements of agritourism such as a tasting room and outdoor space for picnics and events, but its management advised that although it was open to the public for tastings, it did very little retail sales business, with wholesale selling representing the vast majority of its business.

[a] Count increments were not specified in the research plan because the primary time span of interest was a full day and because it was assumed that a consistent counting method was used across VDOT. In fact, data for Sites 1 and 5 were reported in 1-hr increments, whereas those for adjacent streets were provided in 15-min increments, so the hour of site data closest to the street's actual peak hour was used to calculate volumes during street peak hours for Sites 1 and 5.

Trip generation rates have systematic variation (variability based on factors not under statistical control) and random variation (variability attributable to chance). This study attempted to eliminate known sources of systematic variation in the data by identifying factors that might influence rates, such as season of the year, and then by collecting data in a way that controlled for these factors. Standard practices for collecting trip generation data are specified in the *ITE Handbook* (2004), which includes guidance for steps data collectors need to follow in order for ITE to accept their data. These steps help minimize systematic variation.

Unlike systematic variation, random variation cannot be controlled during the data collection process. For example, even if two counts were conducted on summer Saturdays at the same winery, the number of trips generated would be nominally different. Appropriate statistical testing was conducted to address random variation.

Data Compilation and Analysis

Prior to statistical analysis, two Census-related independent variables were constructed with the use of GIS software. Statistical analyses were conducted with the data collected.

GIS Analysis

Two independent variables were constructed with the use of Census data and GIS software: population within a 60-minute drive and number of households within a 60-minute drive. Because these variables are based only on publicly available data and the site location, it was thought that they could be useful for trip estimation in cases where local governments do not require any site data along with land use proposals. The value of 60 minutes was selected arbitrarily; another value could be chosen if desired.

The following basic procedure was used to construct these variables in ArcGIS version 10.0 with the Network Analyst extension; Appendix B shows the full step-by-step procedure.

1. Add the following data to a GIS map:

    - Esri U.S. streets layer or similar street network dataset

    - 2010 Census Block file containing population and household data

    - a point layer containing the location of the agritourism land use to be studied. Locations of existing wineries were extracted from a publicly available shapefile (Virginia Economic Development Partnership, 2011); new locations could be manually digitized.

2. Configure the Network Analyst environment and create a new service area analysis layer. Set the properties of the service area analysis layer to use Minutes as the Impedance and a default break value of 60. This configures the analysis layer to compute the area within a 60-minute drive of the point. Solve the analysis using the point layer representing the site location as a Facility.

3. Select the blocks with centroids within the service area polygon and sum their populations and/or households.

Step 3 of this procedure (Step 8 of the full procedure in Appendix B) is an approximation using the block centroids. This relatively simple method was employed along with finer grained block level data to obtain a planning-level estimation.

Statistical Analysis

For each site, traffic volume information was summarized as follows:

- 24-hour average weekday volume

- 24-hour Saturday volume
- 24-hour Sunday volume
- 1-hour volume during the morning and afternoon peak hour for the adjacent street
- morning and afternoon weekday average peak hour and volume
- weekend average peak hour and volume.

To obtain the 1-hour volume during the adjacent street peak hours, the most recent volume data available as of November 2014 for each site's adjacent street (i.e., the street serving the site's main entrance; see Figure 1) were acquired from VDOT's Traffic Engineering Division. The data were collected in 2011, 2012, or 2014, depending on the site, and no data were available for the street adjacent to Site 2.

Because data collection results indicated that Saturday and Sunday volumes were higher than weekday volumes, additional analysis was performed for these weekend days. In accordance with ITE guidelines (ITE, 2004) for the type of analysis to conduct based on data sample size, weighted average trip generation rates were calculated for independent variables with two or more data points (i.e., where values for the variable existed for two or more of the sampled sites). Where three or more data points were available, a standard deviation was calculated, more precisely defined as the standard deviation of the weighted average trip generation rate for each site. With four or more data points, a linear regression model was created for each variable (ITE reports the equation only if the R^2 is greater than or equal to 0.5).

To quantify the uncertainty that results from use of a trip generation rate that is based on data from a small number of sites, a prediction interval was calculated for the independent variable whose linear regression equation had the highest R^2, i.e., Saturday trips per peak season employee, excluding Site 5, as explained later.

A closer examination of the fit of a regression equation for the Census-derived variable of population within a 60-minute drive led to calculation of a 95% confidence interval of the mean for a cluster of three data points. The normal distribution was also applied to illustrate the probability of a site generating a certain number of trips, given the mean and standard deviation.

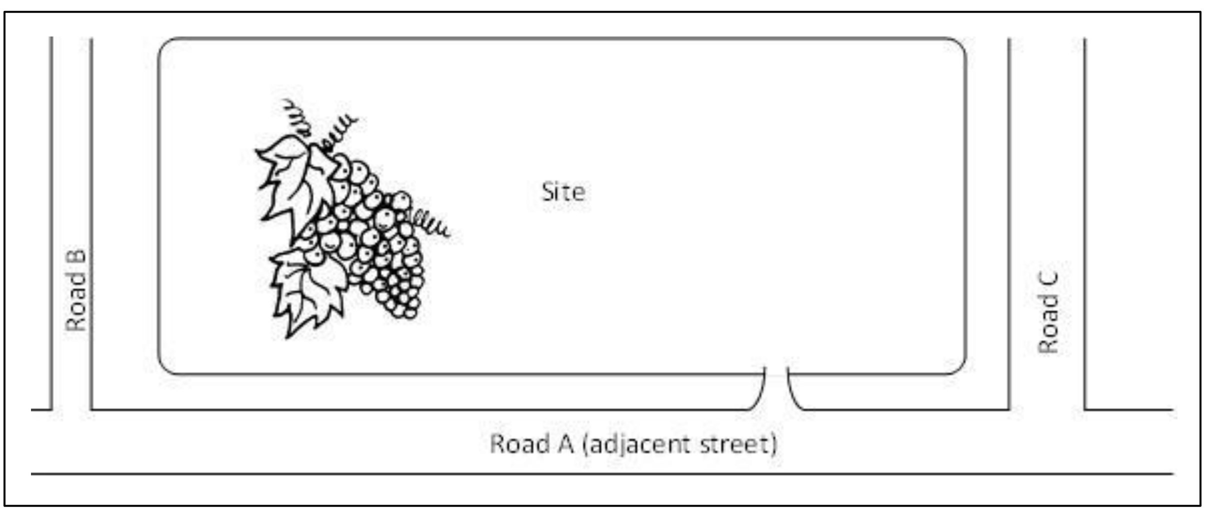


Figure 1. Depiction of Generic Site Showing Adjacent Street (Road A) and Other Streets (Roads B and C)

Use of a hypothesis test (comparison of means or *t*-test) was demonstrated for one ITE land use classification to examine the hypothesis that the average Virginia agritourism trip generation rate differs significantly from the average ITE rate for a related land use.

Multivariate linear regression models were not developed because of the limited number of sites and the uncertainty about which independent variables would be available in a given locality.

RESULTS

Literature Review

Trip Generation Data Collection Process

The *ITE Handbook* (2004) provided details of the trip generation data collection process. The typical process for estimating trip rates is to collect traffic count data at existing sites that are representative of a land use category. For different time periods (e.g., weekend days vs. weekdays), the traffic counts are plotted against site characteristics that serve as independent variables. For ITE's purposes, it is not necessary to prove that an independent variable actually causes changes in trip volumes rather than vice versa; the correlation is the main focus. ITE (2012) assembles the results of multiple studies across the United States for many different land use types, and transportation planners and engineers make generalizations from these data. Several authors have criticized various aspects of the ITE trip generation process, primarily whether it is applicable to sites in mixed-use and/or transit-oriented areas (for example, Lee et al., 2012).

To use existing ITE data when evaluating a new site

> [t]he value of the independent variable for the [new] study site must fall within the range of data included [in ITE's existing data]. . . . The number of trips determined by either the rate or the equation should fall within the cluster of data points (i.e., the range of trip values) found at the study site's independent variable value. Otherwise, additional local data are needed.

Local data collection was also advised when a study site was not compatible with ITE land use code definitions, which appeared to be the case for agritourism land uses in general.

The *ITE Handbook* provided guidelines for executing a local trip generation study, which was recommended when published data did not fit the situation in question. Key considerations included the selection of an independent variable on which to base the data collection and analysis. The independent variable chosen should be "related to the land use type and not solely to the characteristics of the site tenants" and should be information that is typically available when new development is proposed. For some agritourism land uses, then, candidate independent variables might include number of seats, number of tasting stations, size of parking area, acreage planted, or frequency and size of events.

The *ITE Handbook* noted that although there was no simple statistical method to determine the number of sites that should be studied to obtain statistically significant trip generation results, common practice was to collect data from at least three, and preferably at least five, representative sites to establish a trip generation rate. A representative site was defined as being reasonably full, mature, and with characteristics making collecting data easy and safe.

As noted earlier, the best time period for analysis according to the *ITE Handbook* would be when "the combination of site-generated traffic and adjacent street traffic is at its maximum." With automatic counts, a 24-hour period was the minimum, 48 hours were preferred, and 7 days were ideal. Because trip volumes generated by agritourism land uses have seasonal variation, "time periods representing the 30th to 50th highest hours of the year may be used."

Arnold (1984) detailed the process used to develop trip generation rates based on Virginia data for several land uses, including selection of sites, collection of data, and analysis of data.

The Federal Highway Administration's *Traffic Monitoring Guide* (2013) contained typical time-of-day traffic patterns for rural areas and day-of-week traffic patterns for recreational trips. In rural areas, car traffic typically increases throughout the day to a single peak hour in the afternoon and then tapers off, in contrast to the dual peaks (morning and afternoon) typical of urban car travel. Recreational car travel has relatively constant volumes on weekdays with increased traffic on Fridays, Saturdays, and Sundays. These patterns provided useful background for the likely traffic patterns on streets adjacent to rural agritourism land uses.

Examples of Agritourism Trip Generation Rates

ITE Manual

The *ITE Manual* (ITE, 2012) contained no information for agritourism land uses, although some uses it included could be considered related. The general purpose of the *ITE Manual* is to provide the results of traffic counts compared to quantifiable site variables that could serve as proxies for the number of trips generated by a land use, which is typically closely related to business volume. For trip generation methods to be useful, causality need not be demonstrated, only a moderately strong bivariate correlation with traffic volumes.

The *ITE Manual* contained published trip rates for the land use categories of "amusement park," "nursery (garden center)," "specialty retail center," "drinking place," and "quality restaurant," none of which individually can represent exactly the character of all Virginia agritourism uses, although each represents some portion of some agritourism uses.

Table 2 lists ranges of trip rates for the peak hour of the generator (i.e., the land use under study). Table 3 gives the range for weekdays and Sundays instead for the specialty retail center land use, which had no data for the peak hour of the generator. As shown in these two tables, trip rates included in the *ITE Manual* can vary substantially, often by an order of magnitude or more. An example can help explain the values presented in Tables 2 and 3. For the specialty retail center land use, the *ITE Manual* provided several tables. Two tables plotted trips per 1,000 square feet gross leasable area on a weekday; one was for the A.M. peak hour of the generator (i.e., the hour during the morning when the land use generates the most trips), and one was for the P.M. peak hour of the generator. The lowest trip rate (4.59 trips per 1,000 square feet gross leasable area) was observed at one of three sites with data for the P.M. peak hour of the generator. The highest trip rate (14.08 trips per 1,000 square feet gross leasable area) was observed at one of four sites with data for the A.M. peak hour of the generator. Table 2 shows these two values to indicate the variation in the ITE study data for each land use of interest. ITE also provided trip rates per employee for this land use, but these rates were shown for full days rather than for the A.M. and P.M. peak hour of the generator. Thus, Table 3 indicates the lowest (8 trips per employee per day, which was observed at one site on a Sunday) and highest (25.95 trips per employee, which was observed at one site on a Saturday) trip rates that were given.

Each of these land use categories is examined here. In some cases, values are given for R^2, which is a measure of how well a factor accounts for the variation in a dependent variable (trips, in this case). Expressed on a scale of 0 to 1, R^2 values closer to 1 indicate that the relationship is stronger than for lower R^2 values. ITE publishes best fit regression curves and R^2 values only when the R^2 is at least 0.50, there are at least four data points, and the relationship is in the expected direction (i.e., the number of trips increases as the size of the independent variable increases).

Table 2. Range of Rates (Trips per Independent Variable) for A.M. and P.M. Peak Hour of Generator (All Days)

		Independent Variable									
		Employees		1,000 Sq. Ft. Gross Floor Area		Acres		1,000 Sq. Ft. Gross Leasable Area		Seats	
ITE Land Use Name	**Code**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**
Amusement Park	480	0.09	2.55	—	—	0.68	22.92	—	—	—	—
Nursery (Garden Center)	817	0.26	30.14	2.08	45.5	0.6	150.71	—	—	—	—
Specialty Retail Center	826	—	—	—	—	—	—	4.59	14.08	—	—
Drinking Place	925	—	—	3.73	29.98	—	—	—	—	—	—
Quality Restaurant	931	—	—	0.87	15.89	—	—	—	—	0.05	0.5

ITE = Institute of Transportation Engineers; — = *ITE Manual* (ITE, 2012) did not include rates for a particular combination of independent variable and land use.

Table 3. Range of Rates for Weekday and Weekend Days for Land Uses Without Peak Hour Data

		Employees	
ITE Land Use Name	**Code**	Low	High
Specialty Retail Center	826	8	25.95

ITE = Institute of Transportation Engineers.

- *Amusement Park.* The *ITE Manual* defined an amusement park as containing "rides, entertainment, refreshment stands and picnic areas." Belvedere Plantation near Fredericksburg offers rides (hayride, pedal tractors, barrel train); entertainment (pig races, fun barn, corn maze); refreshment stands (restaurant/grill, bakery); and picnic tables in the parking area (Belvedere Plantation, 2013). It is thus an example of an agritourism land use that has characteristics similar to those of a small amusement park.

  The *ITE Manual* trip rates used employees and acres as the independent variables and were based on 1970 and 1987 data from three California and Oklahoma sites with 108, 300, and 600 employees and 697, 2,200, and 3,000 parking spaces, respectively. Charts based on two studies presented weekend data based on (1) Saturday or Sunday and (2) the peak hour of the generator. A table provided weekday data based on a single study. With such a small sample, average rates are not particularly meaningful other than to illustrate some minimum and maximum trip rates; full-day Saturday/Sunday rates ranged from 9.17 to 25.2 trips per employee and from 82.5 to 198.97 trips per acre.

- *Nursery (Garden Center).* Farm stands and markets that sell produce share some characteristics with this ITE land use, defined as "a free-standing building with an outside storage area for planting or landscape stock." The definition noted that trip characteristics at nurseries have seasonal variations, which is also expected for most agritourism land uses. ITE data came from studies in the 1980s in California and were presented at varying temporal levels for the independent variables of employees, gross floor area, and acres. Only the employee variable had data with correlations suitable for publishing fitted curve equations. The time period with the best fit was on a weekday (R^2 of 0.81), when rates ranged from 10.71 to 53.86 trips per employee.

- *Specialty Retail Center.* The ITE definition for this land use ("small strip shopping centers that contain a variety of retail shops") does not appear to encompass any agritourism land use, but some wineries and farm markets do include a mix of retail uses. For example, in addition to its produce, a farm market might sell clothing, dry goods, and prepared foods. The ITE data were based on sites in five states surveyed between the late 1970s and the 2000s and were presented for two independent variables: gross leasable area and employees. For the P.M. peak hour of adjacent street traffic, a reasonable fit for trips per gross leasable area was obtained (R^2 of 0.98) based on five studies, with rates of 2.03 to 5.16 trips per 1,000 square feet gross leasable area. Only three studies were based on the number of employees, with weekday and Saturday rates from 21.96 to 25.95 trips per employee.

- *Drinking Place.* The *ITE Manual* described a drinking place as containing "a bar, where alcoholic beverages and food are sold, and possibly some type of entertainment, such as music, television screens, video games, or pool tables." Restaurants with bars were excluded. Available studies used the gross floor area as the independent variable but did not find a consistent relationship with trips. Two charts based on studies conducted in 1987, 1995, and 1997 in Colorado, Oregon, and South Dakota, respectively, did not meet the conditions to show fitted curve equations. The range of rates was 3.73 to 29.98 trips per 1,000 square feet of gross floor area for a peak hour, which may be too large a range to be considered useful for estimating trips.

- *Quality Restaurant.* With more related published studies than most other land uses summarized here (studies throughout the United States from the 1970s through the 1990s), the *ITE Manual* defined this land use as consisting of “high quality, full-service eating establishments with typical duration of stay of at least one hour,” typically open for dinner only or for lunch and dinner, and that may require reservations, in contrast with those in the “High-Turnover (Sit-Down) Restaurant” category. Some agritourism land uses, such as breweries serving a full menu, appear to fit the definition of a quality restaurant. A VDOT analysis of an on-site brewery with associated restaurant in the Town of Floyd applied this land use type (Johnson, 2013).

  Quality restaurant study data for the weekday P.M. peak hour of the generator (11 studies) ranged from 0.18 to 0.44 trips per seat, with an R^2 of 0.74. Data based on gross floor area had lower R^2 values, when given.

  Agritourism uses often have outdoor seating. As such, a note in the *ITE Manual* for “quality restaurant” was instructive: “The outdoor seating area is not included in the overall gross floor area. Therefore, the number of seats may be a more reliable independent variable on which to establish trip generation rates for facilities having significant outdoor seating.”

Other Studies

One study from the 1970s covered trip generation for scenic areas (Miles and Smith, 1977), not quite matching the desired land uses of agritourism activities.

There were several relevant studies regarding areas of California including San Diego and the counties of Sonoma, Riverside, and Napa.

- *San Diego.* This study used surveys and traffic counts for three types of wineries (County of San Diego, Department of Planning and Land Use, 2010). Data collected at three representative wineries, each with a different geographic classification, found the highest traffic at the “backcountry-destination” site, with the “suburban” site following and the “backcountry-rural” site having the fewest trips. The highest observed traffic for a single winery was 40 weekday average daily traffic and 160 weekend average daily traffic, and the amount of wine produced annually (cases of wine per year, based on a case size of approximately 2.38 gallons) was used as an independent variable. Calculated weekday trip generation rates ranged from 5.9 to 11.8 trips per 1,000 cases per year. Weekend values ranged from 11.8 to 40 trips per 1,000 cases.

- *Sonoma County.* A draft report from 2011 indicated that Sonoma County used a winery trip generation form to estimate traffic volumes. The assumed daily rate used was 3 trips per employee plus 0.8 trip per tasting room visitor. Winery driveway counts showed that 10% of daily trips were in the afternoon peak hour and 13% were during the weekend midday peak hour (Aguayo, 2011).

  Sonoma County also used trip generation curves to determine traffic impact fees based on case production for two categories: "winery only" and "winery with tasting." The curves were created in 1998 based on a few counts, traffic generation estimates, and many assumptions (Kottage, 1998). For wineries that produced 50,000 cases or less per year only, the county used the following fitted curve, where "Cases" is the number of cases produced per year:

  $$\text{One-way trip ends} = -0.00000001(\text{Cases})^2 + 0.0013(\text{Cases}) + 9.5$$

  The application of this curve for wineries that produced 50,000 cases or less per year yields trip generation figures of fewer than 50 trips per day, which is the upper threshold for VDOT's category of low volume commercial entrance.

- *Riverside County.* This study collected driveway traffic counts at five wineries, among other tasks, to create a travel demand model (Pack and Johnson, 2011). The study provided the number of trips generated; the values of explanatory independent variables (restaurant size, parking spots, and number of hotel rooms); and a table of regression coefficients relating the number of trips at each site to the three independent variables. A limitation of the study is that information about statistical significance was not given, which is to be expected because the linear regression equation consisted of four terms (the three independent variables and a constant) and four sites serving as data points (not enough to allow one to test any of the variables for statistical significance).

  However, when the author of the current study used these same data with just one independent variable (the number of hotel rooms), the variable was either statistically significant or approached significance ($p = 0.04$ for the peak weekend coefficient and $p = 0.06$ for the peak weekday coefficient). Further, the equation explained more than 80% of the variation. Thus, the data collected by Pack and Johnson (2011), although based on a limited number of sites, do suggest that activity (in this case, the number of hotel rooms) explains to some extent the number of trips observed at wineries in California. The results may also suggest that some California destination wineries differ from Virginia wineries, which may be seen as the destination for a day trip but which do not typically include hotel rooms.

- *Napa County.* Consultants collected 7-day traffic counts at 22 wineries in October 2014 (Fehr & Peers, 2014). They also surveyed winery patrons in person and gathered cell phone trip-making data for vehicle trips across Napa County. The data analysis report for the Napa County study became available after the researcher had completed data collection for the present study.

The Napa County study used multivariate linear regression to estimate models for average Monday to Wednesday weekday, Thursday, Friday, Saturday, and Sunday trip generation rates for all 434 wineries in the county. The authors noted that wineries' reluctance to participate in the study affected the sample size for data collection. Three independent variables were included in the final analysis:

1. annual gallons produced
2. whether the winery was located on the Napa Valley floor
3. whether the winery required advance appointments.

The resulting models had R^2 values of 0.79 to 0.86. When applied to all 434 wineries, the models estimated that total daily vehicle trip generation from all Napa County wineries exceeded 50,000. Combined with analysis of cell phone and survey data, the study found that winery trips by employees or visitors constituted 34% of all Saturday trips in the county.

Several variables from a preliminary analysis were removed when the final analysis was developed. Variables representing parking supply and employees were removed because of the perception that those variables were caused by demand rather than being predictors of demand. Square footage and approved visitation (the maximum number of visitors per day or week a site is allowed under its local permit) were removed because of a high correlation with the gallons-produced variable that remained in the analysis.

VDOT *Road Design Manual*

VDOT's *Road Design Manual* (VDOT, 2005) included definitions for the following entrance types:

- **Commercial Entrance:** Any entrance serving land uses that generate more than 50 vehicular trips per day or the trip generation equivalent of more than five individual private residences or lots for individual private residences using the methodology in the Institute of Transportation Engineers Trip Generation.

- **Moderate Volume Commercial Entrance**: A commercial entrance along highways with shoulders with certain site and design criteria reduced. Site requirements are: maximum highway vehicles per day: 5,000, maximum entrance vehicles per day: 200, maximum entrance percent truck trips of vehicles per day: 10%.

- **Low Volume Commercial Entrance:** Any entrance, other than a private entrance, serving five or fewer individual residences or lots for individual residences on a privately owned and maintained road or land uses that generate 50 or fewer vehicular trips per day using the methodology in the Institute of Transportation Engineers Trip Generation.

- **Private Subdivision Road or Street Entrance:** A commercial entrance for a road or street that serves more than five individual properties and is privately owned and maintained.

- **Private Entrance:** An entrance that serves up to two private residences and is used for the exclusive benefit of the occupants or an entrance that allows agricultural operations to obtain access to fields or an entrance to civil and communication infrastructure facilities that generate 10 or fewer trips per day such as cell towers, pump stations, and stormwater management basins.

With the exception of a sight distance requirement, the *Road Design Manual's* design for a low volume commercial entrance was identical to that for a private entrance, with a surfaced width of 12 to 24 feet and a minimum graded width of 16 feet. Moderate volume commercial entrances had a required width of 18 to 30 feet, and two-way commercial entrances had a required width of 24 to 40 feet with a minimum of 30 feet if not on a local street. Commercial entrances had additional requirements such as longer throat lengths, curb and gutter or curbing along the entrance, and entry/exit tapers.

Summary of Literature Review

There was not a broad body of quantitative data regarding agritourism trip generation. National guidance from ITE included related uses but not the uses of interest specifically; they were examined only in limited studies and in a California context.

Collected Data

Table 4 lists the results of inquiries sent to local planners in the counties of Albemarle and Nelson about what information on potential independent variables would typically be available (i.e., either required by the locality or likely to be provided at the locality's request) when new development was proposed. (The exact question was: "Which of the following are typically available when agritourism land uses are proposed?") The differing responses from these adjacent counties with different contexts illustrate the difficulty of selecting an independent variable or set of variables that will be useful statewide.

Table 4. Local Availability of Data on Potential Independent Variables at Land Use Proposal Stage

Variable	Albemarle County	Nelson County
Number of seats	Good estimate of indoor seats	Typically not known
Number of tasting stations for wineries	Good estimate	Typically not known
Size of tasting room for wineries	Good estimate	Typically not known
Size of interior space	Good estimate	Sometimes provided/defined
Size of parking area or number of spaces	Good estimate	Typically provided/estimated
Acreage planted	Good estimate	N/A[a]
Frequency and size of events	Often unsure of frequency; depends on how initial events go	Typically not provided/defined, but alluded to as a conceptual element of the plan/design
Production for wineries (cases per year)	Somewhat difficult to know	N/A
Expected number of employees at peak season	Unsure	Typically provided/estimated
Expected number of daily visitors at peak season	Very unsure	Typically not provided/estimated

[a] "N/A" means that based on limited experience, the respondent could not address whether the variable would be known.

Although the planner for the more populous Albemarle County expected to have good estimates of the number of indoor seats; the number of tasting stations; and the size of the tasting room, interior space, and parking area, the planner for the more rural Nelson County expected to know only estimates of parking area, the expected number of employees at peak seasons, and possibly the size of interior space. Neither planner expected to know the frequency and size of events, annual production, or expected number of daily visitors at peak season.

The planners also noted several other items of useful background information:

- Depending on the locality, these land uses might not need more than a building permit, which would not invoke substantial local review requirements. For example, at the time, Albemarle County did not require zoning clearances from wineries that were not planning to host events of more than 200 attendees.

- Proprietors of agritourism land uses tend to introduce products and services slowly and scale up operations incrementally. If and when a site becomes popular, growth pressures and traffic increase rapidly.

- The size of interior space may not be an accurate predictor for land uses that rely on having plenty of outdoor space available.

- Outdoor fields can become overflow parking areas, which are typically not formalized as parking areas if used infrequently.

- Limited data are available initially, often depending mostly on who the applicant retained as a traffic consultant. More information is sometimes made available at various points in the review process, such as at a site review committee meeting, as part of developing a staff report, or at the hearing of the planning commission.

- Some localities do not have a well-defined set of information that is requested or required of applicants but might be able to implement such a checklist in the future.

Site Characteristics and Trip Volumes

The questionnaire response from Site 4 indicated that it had a parking area of 100 square feet. Because this was smaller than a single typical parking space (9 feet by 18 feet), the response was deemed invalid. The distance measurement feature of Google Maps was used to estimate the size of a gravel parking area at the site, visible from Google's aerial imagery. This was roughly 75 feet by 75 feet, or 0.13 acre, so that value was used for Site 4's parking area size. (As with other sites, it is possible that additional parking occurs in fields when this area is at capacity.)

Table 5 summarizes the results for site-specific data (independent variables) including the Census-derived variables. Table 6 provides notes about unique characteristics or circumstances for each site. As noted previously, the data are for a small sample of sites and have substantial variability. Although not by any means a complete picture of agritourism traffic patterns in Virginia, this information can begin to address the previous complete lack of Virginia data on the topic.

Site 5 was determined to have a substantially different context than the other sites, which were all relatively popular retail or destination wineries/cideries. Site 5 has elements of agritourism such as a tasting room and outdoor space for picnics and events, but its management advised that although it is open to the public for tastings, it did very little retail sales, with wholesale representing the vast majority of its business.

Table 7 shows each site's trip volumes (total of entering and exiting vehicles at all driveways) at various scales of analysis. The weekday peak hour volumes for each site were higher than the site's 1-hour volume during the adjacent street's peak hours. That is, the peak hour for the site entrance was at a different time than the A.M. and P.M. peak hours of the adjacent street.

Table 5. Independent Variables for the Five Sites

Independent Variable	Site 1	Site 2	Site 3	Site 4	Site 5
Number of marked parking spaces	40	0	90	0	0
Number of unmarked parking spaces	Unknown	300	Unknown	16	Unknown
Size of parking area (acres)	5	4	1	0.129	0.115
Square feet of total interior space	30,000	16,500	Unknown	1,440	7,500
Square feet of tasting room	4,032	7,000	1,400	1,380	1,500
Number of tasting stations	4	6	25	2	1
Number of acres planted	53	30	26	14	5
Annual production (cases)	14,000	9,000	35,000	Multiple	1,000
Number of employees, peak season	40	90	25	14	2
Population within 60-minute drive	433,922	1,975,753	326,127	346,400	233,880
Households within 60-minute drive	167,198	713,382	122,272	137,047	92,989

Unknown = a respondent said a site had the factor but did not know or did not provide a quantity; Multiple = site produced various products (e.g., fresh fruit and beverages) and provided information for all of them.

Table 6. Site Notes

Site No.	Notes
1	One tasting station on weekdays. Number of employees does not include event staffing.
2	Tasting stations accommodate 120 guests. Seeks to be a destination winery, encouraging people to stay longer and share the day with friends and family.
3	Has additional off-site planted acreage. Can accommodate 150-person events.
4	Combined with an orchard; number of acres planted reflects all fruit trees. Tasting room was expanded from 575 to 1,380 square feet within 6 months before the count dates. Production was 500-1,000 bushels of fruit, 2,500 gallons of fresh juice, and 7,500 gallons of alcoholic beverage. (Because any one of these numbers would not represent the site's total production, the site was excluded from analysis for the production variable.) At peak season, there are 4 full-time and 10 part-time employees. Size of parking area was estimated based on aerial imagery.
5	Does very little retail business; 99% of product is sold wholesale to other wineries for resale.

Table 7. Trip Volumes for the Five Sites

Measure of Trip Volumes	Site 1	Site 2	Site 3	Site 4	Site 5[a]
24-hour average weekday volume	370	192	261	91	4
24-hour Saturday volume	735	1,205	596	509	20
24-hour Sunday volume	878	1,173	431	351	8
1-hour volume during street A.M. weekday peak hour[b]	9	N/A	10	2	0
1-hour volume during street P.M. weekday peak hour[b]	28	N/A	32	5	1
A.M. peak hour volume	27	9	21	13	1
P.M. peak hour volume	51	26	38	14	1
Weekend peak hour volume	148	188	68	83	5

[a] Site 5 was excluded from some analyses because it was a primarily wholesale rather than retail operation.
[b] Data for Sites 1 and 5 were reported in 1-hour increments, and adjacent street data were provided in 15-minute increments, so for those sites, the hour of site data closest to the street's actual peak hour was used.

Results of Data Analysis

Tables 8 and 9 present average trip rates and statistical information based on Saturday data. For the analysis of all five sites and for each independent variable, Table 8 presents the number of cases (i.e., how many sites provided data on the particular variable; see Table 5); the mean trip rates per independent variable (if at least two cases); a standard deviation of the set of individual site trip rates (if at least three cases); and the R^2 value for a bivariate linear regression equation (if at least four cases). Certain variables as noted are shown in units of 1,000 for ease in displaying trip rates. If ITE's guidelines (ITE, 2004) are used, the regression equation or R^2 value of the following four variables with an R^2 value below 0.50 would not be shown: total interior space, tasting stations, acres planted, and annual production.

For example, the independent variable "size of parking area" was an available variable in five cases, i.e., for all five sites (see Table 8). The sites had 5, 4, 1, 0.13, and 0.11 acres, respectively, available for parking (Table 5). Traffic volumes were collected at each site on one Saturday, with results of 735, 1,205, 596, 509, and 20 trips, respectively (Table 7). The mean trip rate is calculated as the sum of these trips (3,065 trips) divided by the sum of the acreage available for parking (10.24 acres). That is, it is the average change in the number of trips per 1 unit change in the independent variable averaged across the five cases.

Table 8. Mean Trip Rates (Average Change in Number of Trips per 1 Unit Change in Independent Variable) and Statistical Information, Saturday Data, All Five Sites

Independent Variable	No. of Cases	Mean Trip Rate	Standard Deviation	R^2
Number of marked parking spaces[a]	2	10.2	—	—
Number of unmarked parking spaces	2	5.42	—	—
Size of parking area (acres)	5	299	1,636	0.54
1,000 square feet of total interior space	4	44.5	163	0.22
1,000 square feet of tasting room	5	200.2	166	0.72
Number of tasting stations	5	80.7	108	0.03
Number of acres planted	5	24.0	15.0	0.39
Annual production (1,000 cases)	4	43.3	54.4	0.04
Number of employees, peak season	5	17.9	10.3	0.89
1,000 people within 60-minute drive	5	0.924	0.755	0.69
1,000 households within 60-minute drive	5	2.49	1.97	0.69

[a] Only the two sites with marked parking spaces were used.

For each site, a value of trips per acre of parking can be calculated (i.e., 147, 301, 596, 3,942, and 174), and the standard deviation is the standard deviation of these five individual trips-per-acre values. The R^2 value reported for this variable in Table 8 is for a bivariate linear regression with size of parking area as the independent variable and number of trips as the dependent variable.

Because of the different context of Site 5, some analyses were performed a second time excluding data from Site 5. Table 9 presents the same information as Table 8 based on analysis without Site 5. The smaller number of data points means there are more empty cells in Table 9, and under ITE's conditions, two variables (size of parking area and number of acres planted) would not have regression equations or R^2 values shown.

As a comparison, Saturday trips vs. size of tasting room and employees are graphed in Figures 2 and 3, respectively, with and without Site 5. Appendix C includes all charts for Saturday and Sunday data with linear regression equations displayed where appropriate.

Table 9. Mean Trip Rates (Average Change in Number of Trips per 1 Unit Change in Independent Variable) and Statistical Information, Saturday Data, Excluding Site 5

Independent Variable	No. of Data Points	Mean Trip Rate	Standard Deviation	R^2
Number of marked parking spaces	2	10.2	—	—
Number of unmarked parking spaces	2	5.42	—	—
Size of parking area (acres)	4	301	1,806	0.44
1,000 square feet of total interior space	3	51.1	178	—
1,000 square feet of tasting room	4	220	129	0.95
Number of tasting stations	4	82.3	99.3	0.04
Number of acres planted	4	24.8	12.2	0.07
Annual production (1,000 cases)	3	43.7	59.9	—
Number of employees, peak season	4	18.0	9.88	0.9995
1,000 people within 60-minute drive	4	0.988	0.547	0.94
1,000 households within 60-minute drive	4	2.67	1.40	0.93

Predicting a Likely Range of Trips

When the number of sites used to determine a trip generation rate is small (i.e., below 30), one appropriate tool for quantifying the uncertainty that results from using the linear regression equation is a prediction interval, which is similar but not identical to a confidence interval. For a given value of the independent variable (such as number of employees), a prediction interval shows the expected range of the dependent variable (number of trips) with a certain probability.

The following expression is used to calculate a prediction interval (Hillier and Lieberman, 2001):

$$Y_c \pm \left(t_{0.025,n-2}\right)\sqrt{1+\frac{1}{n}+\frac{\left(X-\overline{X}\right)^2}{\sum_{i=1}^{n}\left(X_i-\overline{X}\right)^2}}\left(Y_{SE}\right)$$

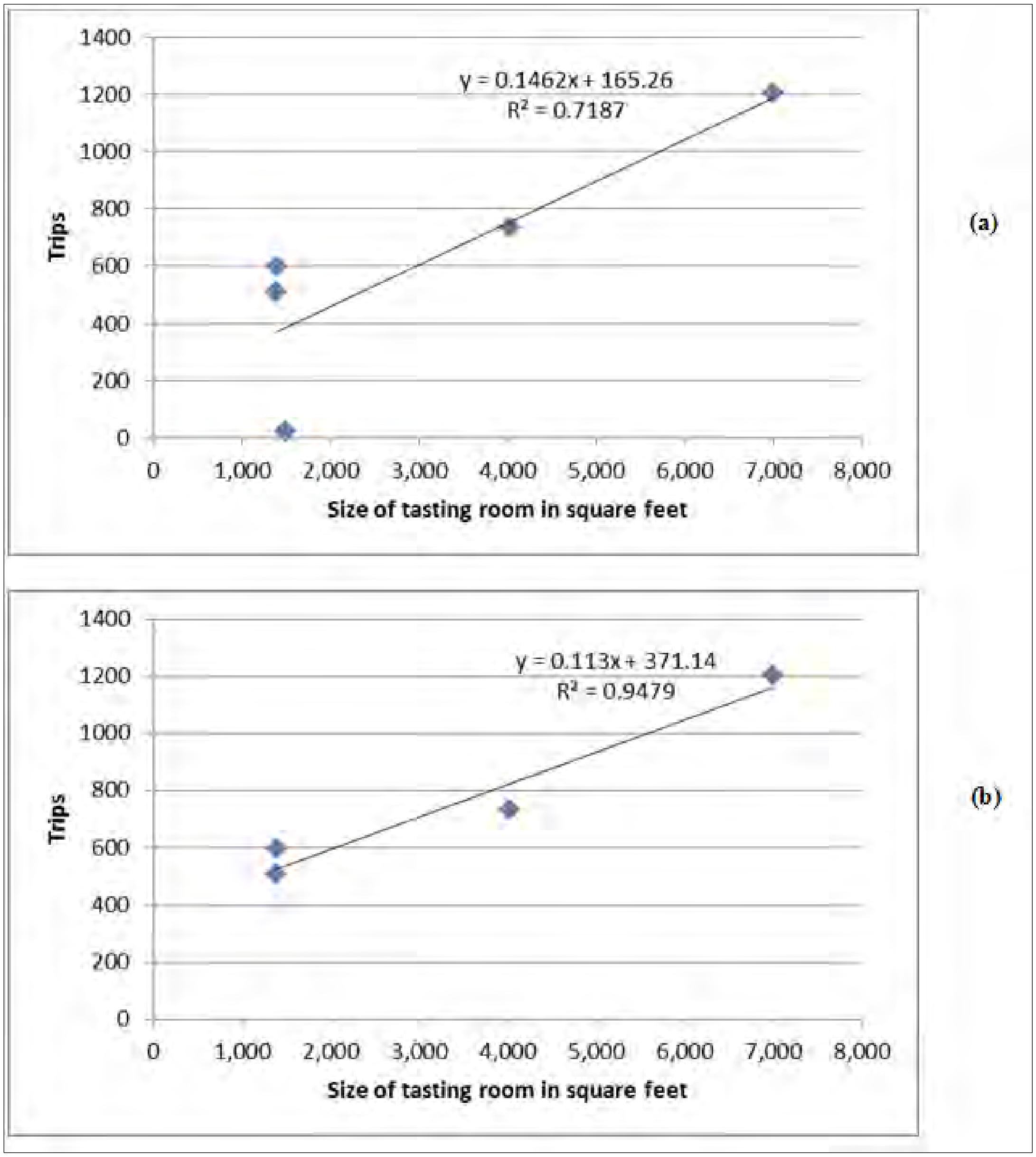


Figure 2. 24-Hour Saturday Scatter Plots for Trips vs. Size of Tasting Room: (a) including Site 5, (b) without Site 5

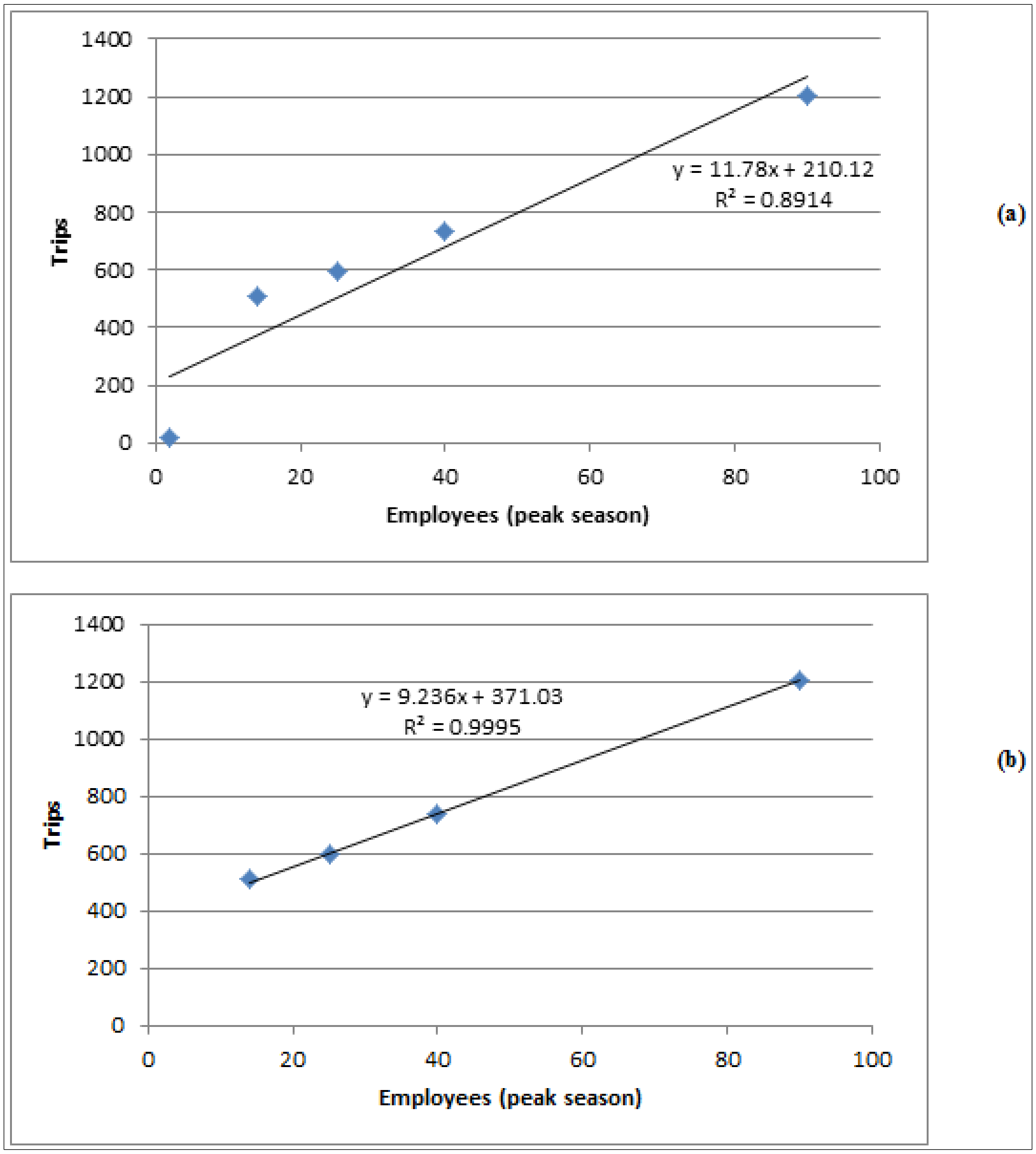


Figure 3. 24-hour Saturday Scatter Plots for Trips vs. Employees: (a) including Site 5, (b) without Site 5

where

Y_c = value of the dependent variable given X, computed with the linear regression equation

$t_{0.025, n-2}$ = a *t*-statistic for a prediction interval called the two-tailed inverse of the Student's *t*-distribution (which captures 95% of the observations)

n = sample size (number of sites used to calibrate the regression model)

X = given value of the independent variable used to compute Y_c

$\bar{X}$ = average value of the independent variable in the regression

X_i = each individual value of the independent variable

Y_{SE} = standard error of the Y estimate, which is calculated from the following equation:

$$Y_{SE} = \sqrt{\frac{\sum_{i=1}^{n}(Y_i - y_i)^2}{n - p - 1}}$$

where

n = sample size (number of sites used to calibrate the regression model)

Y_i = value of the dependent variable for a given value of the independent variable, computed using the linear regression equation for each point in the data underlying the regression

y_i = actual value of the dependent variable for a given value of the independent variable from the data underlying the regression

p = number of independent variables.

The formula for a prediction interval was applied to the linear regression equation for Saturday trips by number of employees at peak season, excluding Site 5 (Figure 2d) with an arbitrarily chosen value of 60 employees, which falls between the data points that were collected. This yields the following values for each variable:

Y_c = 925 trips

$t_{0.025,n-2}$ = T.INV.2T(0.05,2) = 4.3

n = 4 sites

X = 60 employees (given)

$\bar{X}$ = 42.25

X_i values are 14, 25, 40, and 90

Y_{SE} = 8.59 based on Y_i values of 500, 602, 740, and 1,202; y_i values of 509, 596, 735, and 1,205; and p = 1.

The resulting range of predicted Saturday trips is 882 to 968. That is, for an agritourism use with 60 peak employees that is similar in other ways to those surveyed, there is a 95%

probability that it would see between 882 and 968 trips on a Saturday near peak season. The prediction interval concept could be applied to any of the other linear regression equations.

Testing the Fit for Census-Derived Variables

Figure 4 displays the data points and linear regression equations for the Census-derived variables, population within a 60-minute drive and households within a 60-minute drive, on a Saturday without Site 5. Despite relatively high values of R^2, these models do not necessarily demonstrate a good fit, because one of the data points is far away from the other three, which are clustered around a 60-minute population of 325,000 to 450,000. Although it may be the case that additional data collection would fill in other "dots along the line," it may also be the case that the data point outside the cluster represents an outlier that has undue influence on the regression equation. This remains true when Site 5 is included, but for the purposes of this example, it was excluded.

This example reflects only the Saturday equation for population within a 60-minute drive (Figure 4a), but similar results would be expected for households or Sunday data. Three of the four data points are clustered because the 60-minute populations for those sites are in the same range, between 325,000 and 450,000, whereas the fourth data point had a 60-minute population of nearly 2 million. This fourth point greatly influences the regression equation, one of the perils of having so few data points, and the equation no longer fits the data if that point is removed. Although one cannot make predictions using these regression equations, one can investigate the mean value of trips generated by agritourism sites that have a similar population within a 60-minute drive.

Interpreting the Mean Value of Trips Generated

Transportation and land development agencies may be interested in the mean value of trips generated by agritourism sites in order to compare them with other types of land development. For example, to what extent do agritourism sites tend to generate more trips than a coffee shop? In this regard, planners would want to know the extent to which the mean value of trips generated (based on this study) likely represents the mean value of trips generated from all sites comparable to these (in addition to those sites studied). This question can be answered by using inferential statistics, which use data from a sample to make inferences about the entire population.

With regard to the three sites, for example, that had a similar population within a 60-minute drive and that generated 509, 596, and 735 trips, respectively, the mean of these sites is 613 trips and the 95% confidence interval of this mean value can be calculated as

$$\text{Confidence interval} = \bar{Y} \pm \frac{TS}{\sqrt{n}}$$

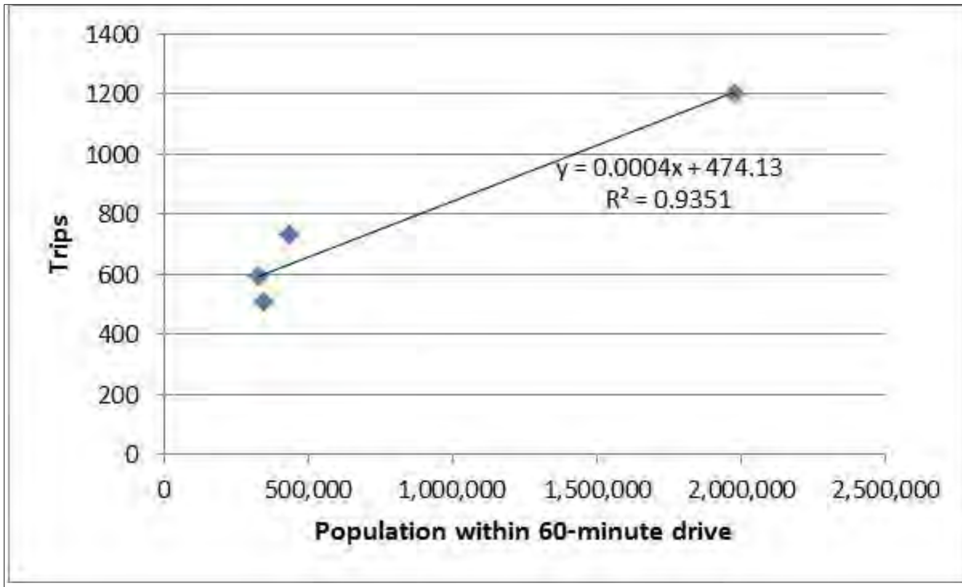
where

$\bar{Y}$ = mean value of trips for the three data points = 613 trips

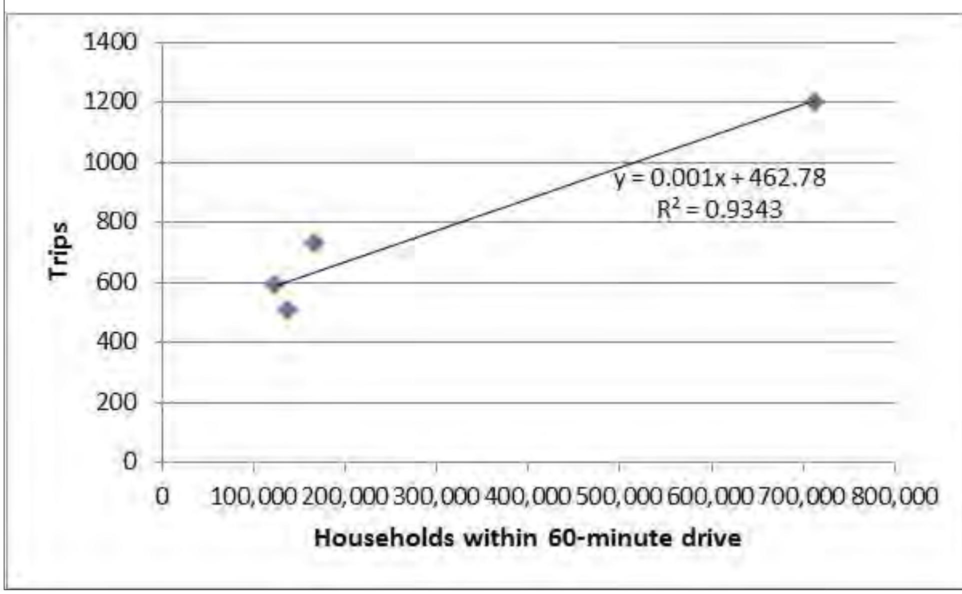
T = *t*-statistic for a confidence interval, calculated in Excel as T.INV.2T(0.05,n-1)

S = standard deviation for the three data points, calculated in Excel as STDEV.S(509,596,735)

n = sample size = 3 sites.



(a)



(b)

Figure 4. 24-Hour Saturday Scatter Plots for Trips vs. (a) Population and (b) Households Within a 60-Minute Drive Without Site 5. Despite the R^2 values greater than 0.9, the regression equations shown are not good fits because of the clustering of some data points far away from another.

Montgomery (2001) explained that if many such intervals are created, where each one is drawn from a random sample of sites (with characteristics similar to those of the three observed in this study), 95% of the confidence intervals will include the true mean. The equation is applied as shown:

$$613 \pm \frac{4.30(114)}{\sqrt{3}} = 330 \text{ to } 897 \text{ trips}$$

Thus, the 95% confidence interval of the mean is 330 to 897 trips. This large interval reflects the small sample size. Although this is a broad range, it nonetheless remains useful if VDOT staff simply need to predict whether anticipated trips will exceed a threshold that is far outside this range, such as 50 trips per day.

Interpreting the Distribution of Trips Generated

A planner looking at a specific future agritourism site is less interested in the mean number of trips generated by all sites and more interested in what will happen at that particular site. Because only three sites that have similar characteristics were studied to develop the confidence interval noted, it is not possible to state precisely which distribution would be followed if all agritourism sites had been examined. However, because ITE (2012) presumed the normal distribution for a variety of other land uses, and because some have argued that the normal distribution can describe a variety of phenomena (for example, Véron and Rohrbasser, 2003), it is appropriate to consider inferences that could be drawn if the random component of the trips generated by a site does follow the normal distribution.

If it is the case that the number of trips for a Virginia agritourism site follows a normal distribution with a mean of 613 and a standard deviation of 114, one can determine the probability of a site generating a certain number of trips. For example, based on Figure 5, there is a 16% probability that a site will generate 500 trips or less but a 95% probability that a site will have 800 trips or less. Thus, if no other information were available, and if planners wanted to be able to be confident that a given site design would handle the number of trips generated by, say, 75% of all agritourism sites, then based on Figure 5 they would want the design to be able to accommodate up to about 700 trips.

Comparison of Average Rates

Another question of interest was whether the average trip rates calculated from the data were significantly different from ITE's rates for related land uses (ITE, 2012). This is illustrated here by a comparison of this study's average rate for trips per employee on a Saturday using the five-site chart (i.e., Figure 2c) and the same rate given by ITE for the specialty retail center land use. For each study, Table 10 shows the sample sizes and standard deviations that were used in this calculation.

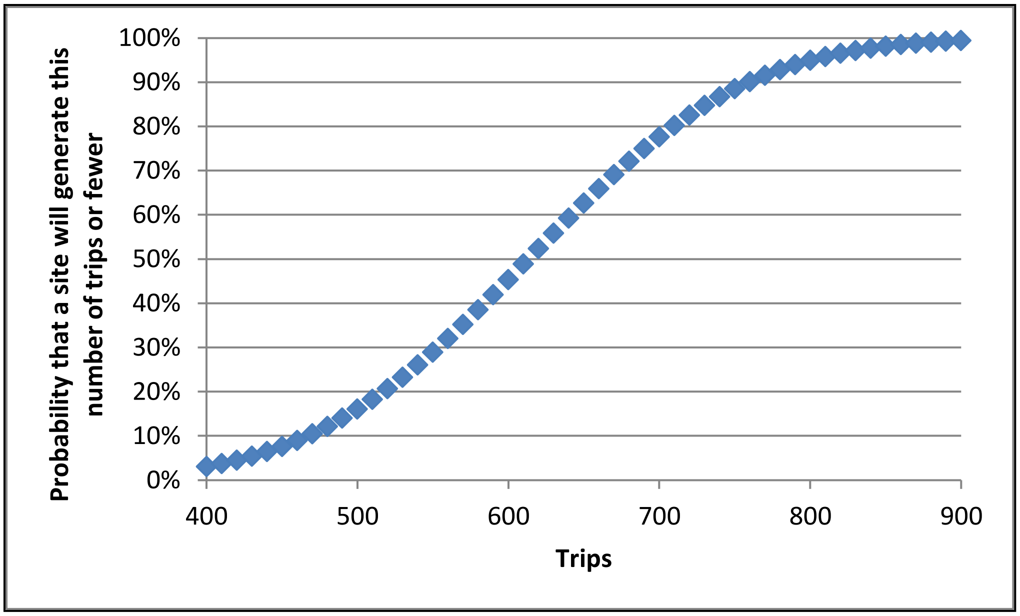


Figure 5. Cumulative Probability Distribution for Trip Generation. A normal distribution with a mean of 613 and a standard deviation of 114 is assumed.

Table 10. Data Used for Comparison of Average Rates From Two Studies

Study 1 (Current study): Virginia wineries (see Figure 2c)	
Sample size (n_1)	5
Standard deviation (S_1)	10.34
Average rate	17.92
Study 2: Specialty Retail Centers (ITE, 2012)	
Sample size (n_2)	3
Standard deviation (S_2)	4.94
Average rate	23.11

The following statistical calculations were used to compare the mean of two study samples. First, the standard deviation of the difference in means was calculated (Garber and Hoel, 2002):

$$\mathrm{Sd} = \sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}$$

where

S_1 and S_2 = standard deviations for Study 1 and Study 2, respectively
n_1 and n_2 = sample sizes for Study 1 and Study 2, respectively.

Sd was calculated to be 5.43.

Second, because the sample sizes were relatively small, a *t*-statistic was calculated based on a 95% confidence level and N, the sum of the sizes of the two samples (8 in this case). The *t*-statistic value was 2.45.

The absolute value of the difference between the two means was compared to the product of Sd and the *t*-statistic. If the absolute value of the difference between the two means (calculated to be 5.19) is greater than the product of Sd and the *t*-statistic (calculated to be 13.30), there is a significant difference between the means at the 95% confidence level.

Therefore, it cannot be concluded that there is a significant difference between these two means. That is, the average trip rate per employee on a Saturday in this study is not significantly different from the average trip rate per employee on a Saturday for ITE's specialty retail center land use. A similar result is obtained by comparing this study's average rate for trips per employee on a Sunday and the same rate given by ITE for the specialty retail center land use: at a 95% confidence level, it cannot be said that there is a significant difference between the average trip rates.

It should be noted that this result does not necessarily imply that it is appropriate to use the specialty retail center land use to evaluate agritourism land uses. This study had a small sample size of five, whereas the ITE rates were based on an even smaller sample size of three. The statistical result might differ with a larger sample of cases.

In fact, a different result was obtained when the weekday average rates were compared. For the five study sites, the average rate for weekday trips per peak employee was 5.36, whereas for ITE's three study sites for the specialty retail center land use, this rate was 22.36. Given the standard deviations for the two study samples, the absolute value of the difference between these means was higher than the product of Sd and the *t*-statistic, so at a 95% confidence level, it can be concluded that the average weekday trip rates per employee for agritourism land uses in this study are different from the weekday rates published by ITE for the specialty retail center land use.

DISCUSSION

For the limited sample of Virginia winery sites studied, variables that appear to have relatively high correlations with trips include square footage of tasting room, number of employees, and the Census-derived variables of population and households within a 60-minute drive.

Any discussion of these results must acknowledge the small sample size of four sites (or five, depending on the analysis presented). Given the hundreds of wineries and cideries in Virginia, the sample is likely not entirely representative. Extrapolating to other agritourism land uses such as farm markets or pick-your-own orchards would introduce additional uncertainty. In addition, the unique nature of agritourism land uses and the limited amount of information on independent variables that localities and VDOT may have at the review stage make it difficult to model these uses without complications. A final caveat is that many of the potential independent variables are in fact correlated (the most obvious example being the two Census-derived variables, which represent essentially the same measure), so any attempt to create a multivariate model would first need to address this multicollinearity.

The high standard deviation for the “size of parking area” variable is due to the small estimated parking area size for Site 4, which saw almost as many trips as Site 3 despite a significantly smaller formalized parking area. Although it may be possible to demonstrate correlation of trips with the parking variable given better data, it is equally possible that the nature of agritourism land uses—which often rely on informal grassy fields for peak season parking—may make it impractical, if not impossible, to collect objective data on parking supply.

Entrance Categories

Even a cursory examination of the results suggests that during relatively busy weekends in the fall, all surveyed sites with the exception of Site 5 (the primarily wholesale winery) had daily traffic volumes of well over 50 trips per day. Weekday traffic was lower but still above this amount. Because 50 trips per day is VDOT’s maximum threshold for a low volume commercial entrance, it appears that established retail-focused wineries/cideries similar to those studied would fall into either the moderate volume commercial entrance category or the commercial entrance category. The statistical analyses that were performed further support this determination.

A rural context is integral to the nature of agritourism land uses, and entrance design can support or detract from this context. It could be argued that VDOT’s standard commercial entrance design requirements detract from a rural context attributable in part to the pavement widths required (24 feet minimum, 30 feet minimum if not on a local street). In recognition of the integral nature of a rural context to the vitality of agritourism land uses and the Commonwealth’s ongoing interest in facilitating these businesses, VDOT could consider requiring a moderate volume commercial entrance for such land uses by default. Guidelines could be developed, or engineering judgment could be used, to determine whether a full-scale commercial entrance would be required instead. One factor in this decision could be information about the anticipated size and frequency of events.

Only one of the surveyed sites represented a non-retail focus, and its very low traffic volumes suggested that it would likely meet VDOT’s requirements for a low volume commercial entrance. It is not possible to generalize this determination for all wholesale-focused agritourism land uses based on this one data point, however.

Usefulness of Certain Variables

Although the “employees” variable may be driven by visitor volume rather than vice versa, its high degree of correlation with trips makes it an attractive independent variable. An estimate of the number of employees at peak season appears likely to relate to the number of trips a site will have. However, this variable is more prone to year-to-year adjustment than semi-permanent site characteristics such as square footage of a tasting room and factors not influenced by the site such as the Census-derived variables. A winery that opens with 10 peak season employees its first year may well have 20 the next year and 50 within a few years, but "10" would be the only number submitted for VDOT's review.

For wineries, square footage of a tasting room may be the most useful site-based variable for predicting a rough estimate of trip volume. Applicants are likely to have at least a good estimate for this quantity at the site plan stage, and it is unlikely to change frequently. However, the tasting room could be expanded as visitor volume grows (as occurred at one of the study sites shortly before data collection), and that expansion might or might not trigger notification to VDOT. Additional data collection could confirm whether a robust relationship with trip volumes exists.

Unlike the California studies cited in the literature review, this study did not find annual production to be a good predictor of trip volume. In fact, number of cases produced per year had one of the lowest correlations with trips of any independent variable, and when Site 5 was excluded, the relationship was in the opposite direction from what would be expected. This may be related to the generally smaller production volumes of Virginia wineries compared to those in Napa County; however, one-half of the 22 Napa County wineries used in developing that study's model had annual production volumes in the same range as those of the Virginia sites in this study (based on each case of wine containing 2.38 gallons).

Other Issues

Other variables not considered in this study could predict vehicle trips at agritourism land uses. One would be a measure of the amenities offered, such as outdoor recreational space or event space. This would not be captured by the variables examined in this study, such as interior space or acreage planted, and it is possible that additional recreational space or programming could affect trip generation rates by imparting a "destination" quality to the venue.

In addition, the predictive power of variables could be misleading. For example, the relationship between trips and population or households within a 60-minute drive of a site may not be linear if, say, people desire to visit certain remote destination wineries precisely because they are located away from developed areas.

The scope of this study did not include reviewing crash data near wineries or after events or addressing expansion of agritourism land uses over time, after an initial VDOT review. As noted earlier, when an agritourism land use begins operating, VDOT might be involved in the local approval process, but over the years, incremental expansion might not trigger re-review. This issue is not necessarily limited to agritourism land uses.

Other strategies could address traffic and safety concerns at other types of agritourism land uses, such as working with localities to allow for centralized farm markets with improved entrances rather than a farm stand in every unimproved driveway.

CONCLUSIONS

- *VDOT's practice of assuming low trip volumes for agritourism land uses in the absence of other data and the rural nature of the businesses may result in entrances that are undersized for the volume of traffic they carry, causing potential safety concerns for the traveling public.* During the peak season, only one site, which was not primarily a retail facility, had trip volumes under the threshold of 50 trips per day for a low volume commercial entrance. The four retail wineries/cideries studied had traffic volumes of 2 to 7 times this threshold on a weekday and 10 to 24 times the threshold on a Saturday.

- *The moderate volume commercial entrance category may be appropriate for agritourism land uses in most cases.* Although it appears that most mature agritourism land uses generate too much traffic to qualify for a low volume commercial entrance, there is interest at the state level in promoting and supporting agritourism land uses, to which a rural context and appearance are integral. Although exact trip volumes may be hard to predict, this entrance category might strike an appropriate balance between improving safety and maintaining a rural context.

- *Weekday peak hour volumes for the agritourism land use sites studied did not occur during the weekday peak hours of adjacent streets.* This was most pronounced for the morning peak hour for the adjacent streets, when the wineries studied all had volumes of 10 vehicles or less, representing less than 4% of their 24-hour average weekday volumes. Winery volumes were higher in the afternoon peak hour for the adjacent street but still lower than in the peak hour for site traffic.

- *Promising site-based variables for Virginia wineries include square footage of a tasting room and number of employees at peak season.* Square footage of a tasting room may be the most promising site-based variable, but additional data would be helpful to confirm this. Although subject to year-to-year fluctuations, an estimate of the number of employees at peak season was a strong correlate of the number of trips to a site. The availability of this information early in the site development process may vary by locality. Unlike previous studies from California, this study did not find annual production to be a good predictor of trip volume, suggesting that local differences may make it difficult to generalize the findings of this study to other states.

- *When no site-based variables are available other than location, Census-derived variables can provide some information.* In some cases, localities may not require applicants to provide site-based variables that VDOT could use to estimate trips. Although a larger or different sample might yield different regression equations, these variables can allow VDOT to assume a broad range of possible trip generation figures if a new site has levels of nearby population or households similar to those of the cluster of sites identified in this analysis.

- *Additional research could clarify the findings of this study.* Additional research could address topics outside the scope of this study, such as analyzing crash data near wineries or considering how to address the incremental expansion of agritourism land uses over time. Additional data collection from various types of well-established agritourism locations across Virginia could refine the results presented in this study, particularly at sites closer to large urbanized areas and with different types of agritourism land uses, such as farm stands.

RECOMMENDATIONS

1. *VDOT's Office of Land Use should provide guidance to VDOT's transportation and land use directors indicating that retail-focused wineries can be assumed to generate well more than 50 vehicle trips per day at peak season.* When determinations about entrance permits are made, this assumption could affect what type of entrance is required and whether safety improvements such as turn lanes are warranted.

2. *VDOT's Office of Land Use should investigate possible adjustments to the traffic volume thresholds for the moderate volume commercial entrance category.* Although peak season trips for retail wineries might exceed this category's maximum threshold of 200 entrance vehicles per day, volumes might be much lower for most of the year. It could also be the case that a higher maximum threshold (such as 500 entrance vehicles per day; alternatively, a threshold could be expressed as a percentage of the adjacent street's daily volume) is appropriate for this entrance type.

BENEFITS AND IMPLEMENTATION

Benefits

The main benefit of this study is in providing guidance that was requested by VDOT's transportation and land use directors. This guidance will allow them to make the soundest decisions possible when reviewing entrance permit requests, which in turn could provide benefits for traveler safety.

The result of a sound decision would be an entrance type that aligns with actual vehicle volumes. The benefit expected from such a decision is the *avoided cost* of making a suboptimal decision (in this case, about an entrance category). Additional benefits to travelers could be realized if safety improvements such as turn lanes are justified and installed.

One example of a decision that is less than ideal would be requiring an entrance that is "too small" or underdesigned; i.e., actual traffic volumes are higher than it can handle. The costs to travelers associated with this error could be expressed in terms of time cost (delays) and crash costs, both resulting from queueing vehicles trying to enter and exit a site driveway that cannot handle the volume. These increasingly frequent conflicts potentially increase the costs attributable to delay and crashes. In addition, costs to proprietors could include (1) property damage attributable to trucks or other large vehicles that cannot navigate the entrance without leaving the pavement and (2) being required to upgrade (reconstruct) the entrance because of safety, use, or maintenance concerns.

On the other hand, requiring an entrance that is "too large" for actual traffic volumes would also be an imperfect decision. This study recommends considering the moderate volume commercial entrance category rather than the commercial entrance category partly because of the much higher construction costs of a commercial entrance to the proprietor. (There could also be aesthetic costs attributed to unnecessary damage to the rural context.) These costs would be based on the design requirements for the three categories of commercial entrances; some of these requirements are highlighted in Table 11, which is based on Figures 4-1, 4-9, and 4-15 in Appendix F of VDOT's *Road Design Manual* (VDOT, 2005).

Table 11. Selected VDOT Design Requirements for Commercial Entrance Categories

Dimensional Requirement	Low Volume Commercial Entrance	Moderate Volume Commercial Entrance	Commercial Entrance
Surfaced width	12-24 ft	18-30 ft	30-40 ft
Graded width	16 ft minimum	Surfaced width	Surfaced width
Entrance radius	20 ft minimum	25 ft minimum	25-50 ft; 12 by 48 ft taper
Distance from edge of pavement that surface requirements apply	Greater of right-of-way line or length disturbed	25ft minimum	35 ft minimum

Implementation

To implement Recommendation 1, VDOT's Office of Land Use plans to provide guidance in the form of a presentation to VDOT's transportation and land use directors at one of the group's quarterly meetings and to post guidance on InsideVDOT. This will be accomplished in Fiscal Year 2017.

To implement Recommendation 2, VDOT's Office of Land Use plans to meet with staff of VDOT's Location and Design Division and initiate a review of the standards and restrictions associated with the "moderate volume commercial entrance" design within a month of the publication of this study.

Additional implementation activities have already been completed. Trip generation results from this study were presented in 2015 at VDOT's Land Development Summit and at the American Planning Association's Virginia Conference. In 2015 and 2016, the researcher submitted the trip generation data from this study to ITE, which considers all new land use data it receives. Coupled with potential future data submittals for wineries in other states, these data could prove useful. Although this study's sample size of four or five sites was small, ITE presents data even for land uses with very few data points. ITE's Traffic Engineering Senior Director responded to the submittals and stated that the data would be considered for inclusion in an upcoming update of the *ITE Manual.*

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APPENDIX A

INVITATION SCRIPT AND SITE QUESTIONNAIRE

Invitation Script

[An earlier version of the script was used for some initial contacts. After some negative feedback was received by the researcher, the script was revised, as seen here, and reviewed by a survey expert.]

If a human answers: Hi, my name is [name]. I'm with the research division of VDOT, the Virginia Department of Transportation. We are studying the variation in traffic patterns at seasonal businesses such as wineries and pick-your-own orchards. We know that everyday traffic volumes for [farm wineries/ pick-your-own orchards] can vary greatly by time of the year. If you have five minutes, I'd like to see if you could answer nine questions for me.

> [If busy:] I'd be glad to call another time, come talk in person, or send the questions by email.

> [If yes:] These questions ask about characteristics of [business name]. We chose your business because it is seen as a well-established example of a [farm winery/pick-your-own orchard]. We are interested in this information to find out whether any of these characteristics can predict traffic volumes.

If a machine answers: Hi, my name is [name]. I'm with the research division of the Virginia Department of Transportation. We are studying the variation in traffic patterns at seasonal businesses such as wineries and pick-your-own orchards. We know that everyday traffic volumes for [farm wineries/ pick-your-own orchards] can vary greatly by time of the year. If you have five minutes, I'd like to set up a time to ask you nine questions about this subject. When you get a chance, please give me a call at [callback number]. I'll also send this in an email so you can reply to that instead. Thanks!

Site Questionnaire

[The following questions were asked of each site. Some questions, as noted, were different for pick-your-own orchards than for wineries.]

1. Number of parking spaces (some respondents noted that spaces were not marked but provided the number of cars they could accommodate)
2. Size of parking area (including unmarked spaces; square feet or acres)
3. Size (square feet of total interior space)
4. *Wineries only:* Size (square feet of tasting room)
5. *Wineries only:* Number of tasting stations
6. Number of acres planted with grapes (*wineries*) or fruit trees (*orchards*)

7. Annual production (*wineries:* gallons or cases) (*orchards:* bushels of fruit)
8. Expected number of employees at peak season
9. *Orchards only:* Number of cash registers at peak operation
10. Thinking about daily business and excluding events, what is your guess as to the 5th busiest day of the year for your facility?
11. Would you be willing to give VDOT permission to place temporary counting equipment across your entry drive to count vehicles entering and exiting? (We would be glad to share the data with you.)

APPENDIX B

GIS ANALYSIS PROCEDURE

What follows is step-by-step ArcGIS guidance for VDOT staff to produce a planning-level estimate of the population within a 1-hour drive of a given site. If this population is within the range of 325,000 to 450,000 people, a likely trip generation range can be stated.

This example was written using ArcMap version 10.0 and assumes basic familiarity with GIS. (As of September 2015, version 10.0 was the standard installation for VDOT employees, who had the option to upgrade to version 10.2.1 if needed, but version 10.2.1 was not compatible with some planning-related VDOT software.)

First, a word about data management. In some cases, performing GIS computations over the VDOT network may be impractical because of the amount of data being transferred. It is preferable to perform the analysis with the data saved locally, i.e., on your computer's hard drive. However, it is still important to save your data on the network in case something happens to your hard drive. Therefore, it is suggested that you save your data as follows:

- *"Pristine" data:* save on the network. The data you begin with, such as downloaded Census files, should be stored on the network in its original form and copied locally for analysis.
- *Working data:* save on your hard drive. This includes any intermediate files produced as part of the analysis as well as copies of pristine and final data.
- *Final data:* save on the network. You will create it locally and then copy it to the network for storage.

1) **Add data to a GIS map.** These data are required in order to complete the service area analysis and include a street network and the location of the site of interest. (Census population data will be added later.)

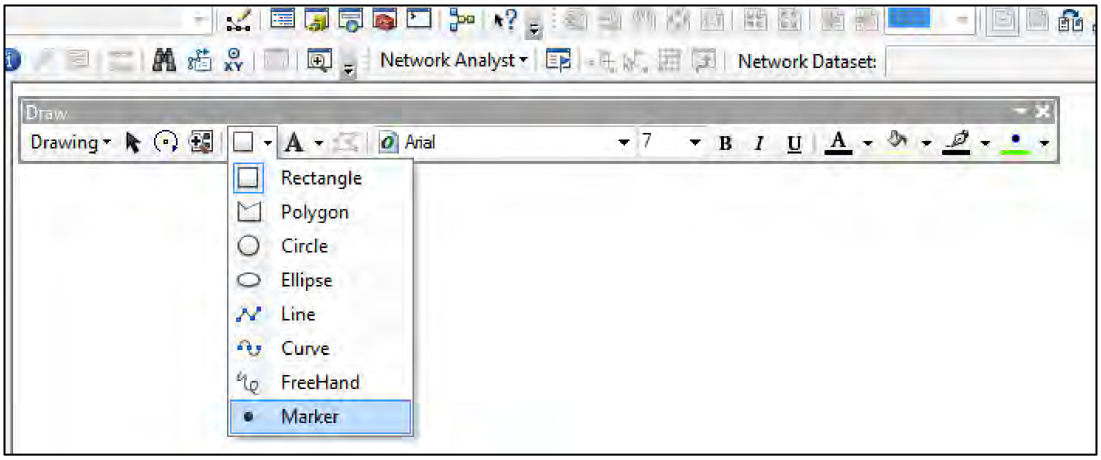
   a) Add a *street network dataset.* For areas not within 1 hour of another state, a Virginia-only file will suffice. For this study, a network dataset called *streets.rsx* that was included with ArcGIS base data was used and is available from the author. (Esri's StreetMap Premium service would also work, although its World Street Map service would not. The Virginia Geographic Information Network [VGIN] provides official street data for Virginia that may be suitable for areas in central Virginia. The VGIN street data do not work for areas near other states, since it does not contain street information for adjacent states. Data files of VDOT roads have the same limitation and the additional problem that city- and town-owned streets are not included.)

      i) Add data to a new map by clicking the *Add Data* button (), navigating to the folder where the file is saved, selecting it, and clicking *Add*. Be sure to select the network dataset, which would have an icon similar to this: 

. In the dialog box that opens, click *Yes* to add the network dataset and all its source feature classes to the map.

ii) Zoom roughly to the area of interest to minimize drawing time, especially if using a U.S.-wide street file.

b) Create a point layer containing the *location of the agritourism site* to be studied.
   i) If you are able to locate the site by zooming in on the streets, the easiest way to do this is by using the *Draw* toolbar. Turn it on from the *Customize* menu.
   ii) Zoom in on the site location so that you will be able to click and place a dot with sufficient precision.
   iii) In the *Draw* toolbar, click the drop-down arrow next to the rectangle and select *Marker*.



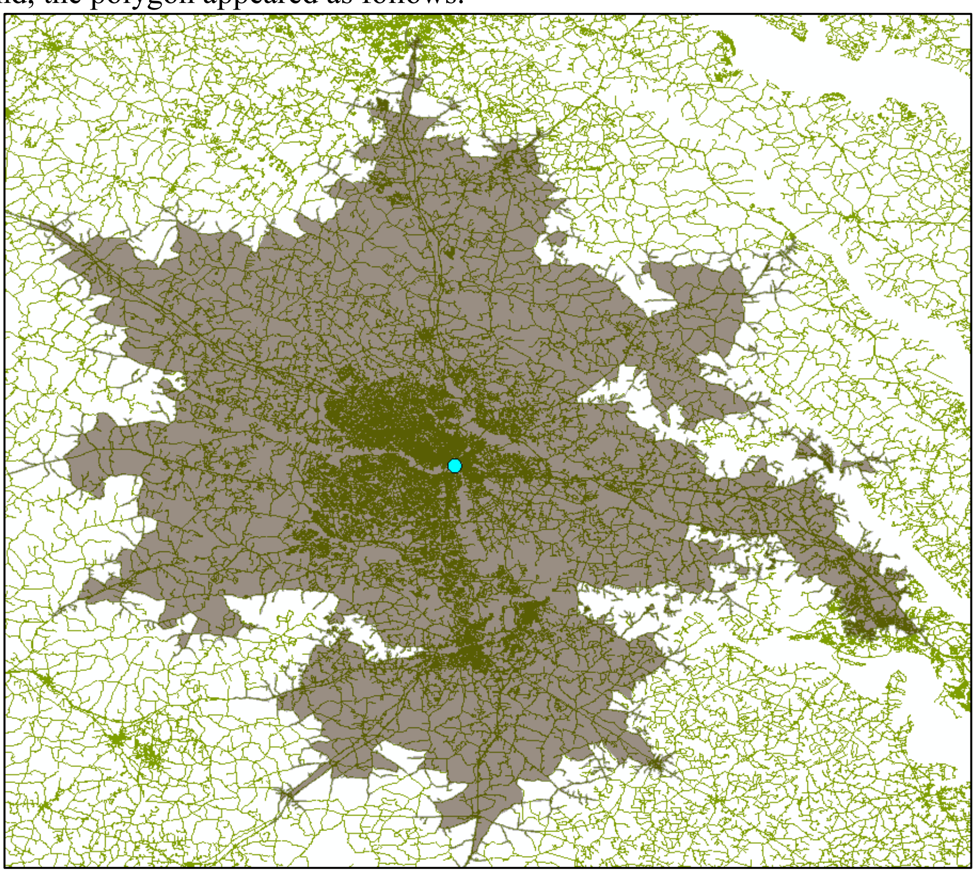
   iv) Click on the map to create a point at the site location. You can move it around with the toolbar's Select arrow if needed.
   v) On the *Draw* toolbar, click *Drawing*, then *Convert Graphics to Features*. In the dialog box, choose where to save the file, name it, check the box next to *Automatically delete graphics after conversion,* and click *OK*. In the subsequent dialog box, click *Yes* to add the data to the map. Close the *Draw* toolbar if desired and save your map.

2) **Configure the Network Analyst environment and create a new service area analysis layer.** (The instructions in Steps 2 through 5 are based on the *Network Analysis Workflow* page within ArcGIS 10 Help and other pages linked from that page.)
   a) General setup and preparation:
      i) Ensure that the Network Analyst extension is enabled: In the *Customize* menu, choose *Extensions* and ensure that the Network Analyst box is checked. Click *Close*.
      ii) Display the Network Analyst toolbar and Network Analyst window: In the *Customize* menu, choose *Toolbars* and ensure that the Network Analyst toolbar is checked.
   b) Create a new service area analysis layer: On the Network Analyst toolbar, the name of your network dataset should appear next to Network Dataset (*streets*, in this case). On the Network Analyst toolbar, click *Network Analyst*, then *New Service Area*.

3) **Load the point layer that represents the site location as a network analysis object.**
   a) In the Network Analyst toolbar, click the icon to display the Network Analyst window.
   b) In the Network Analyst window, right-click on *Facilities (0)* and select *Load Locations.*
   c) In the dialog box that opens, the point layer you created in Step 1(b) should be shown next to *Load From*. Leave other options as they are and click *OK*.

4) **Configure the service area analysis layer to compute the area within a 60-minute drive of the study site.**
   a) In the Network Analyst window, click the icon to display the Layer Properties dialog box. (In ArcMap version 10.2, this dialog box is called Service Area Properties.)
   b) Click the *Analysis Settings* tab.
   c) Next to Impedance, *Time (Minutes)* should be shown.
   d) Next to Default Breaks, type *60*.
   e) Under Restrictions, *OneWay* and *Non-routeable Segments* should be checked.
   f) Click *OK*.

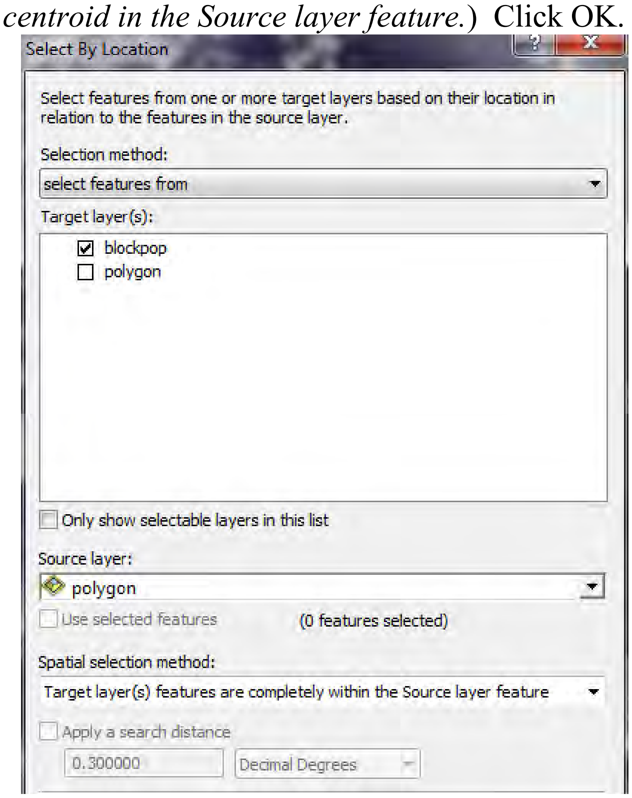
5) **Perform the analysis.** On the Network Analyst toolbar, click the Solve button ( ). The analysis may take some time. When it completes, if everything worked properly, you will see a new polygon representing the 60-minute drive time from your study site. (To see it, you may need to right-click the *Polygons* icon shown in the Table of Contents and click *Zoom to Layer.*) For a dummy site location at the VDOT headquarters in downtown Richmond, the polygon appeared as follows.



6) **Export the service area polygon so you can open it in the future if needed without redoing the analysis.**
   a) In the Table of Contents window, right-click on the polygon within the service area layer, select *Data,* and select *Export Data.*
   b) Select the option to use the same projection as the data frame. Choose a location to save the new file and click OK. After the file is created, click OK to add it to the map; you can turn off or remove the service area and streets layers to reduce drawing time.

7) **Add a file containing population data by census block, optionally clipped to Virginia and contiguous states to reduce computation time.** Click the *Add Data* button (), navigating to the folder where the file is saved, selecting it, and clicking *Add*. For this study, a dataset called *blockpop.sdc* that was included with ArcGIS base data was used and is available from the author. It displays a point at the centroid of each census block and contains population data. Data could instead be downloaded from the National Historical Geographic Information System (NHGIS) or U.S. Census websites (e.g., TIGER files); in those cases, it might be necessary to download both a table of population data and a block geography file and join the two for analysis.

8) **Select the blocks with centroids that are within the polygon.**
   a) In the *Selection* menu, click *Select by Location.*
   b) Configure the window that opens to select features from your block centroid layer (the target layer) that are completely within the polygon (the source layer), as shown. (Note that if you are using a polygon block file with actual boundaries rather than centroids, you may want to choose a different spatial selection method, such as *Target layer(s) features have their centroid in the Source layer feature.*) Click OK.



(Note that blocks with some area within the service area polygon but a centroid outside it will be excluded and blocks with some area outside the polygon but a centroid inside it will be included. A more precise approximation could be obtained by calculating the area of each census block that is within the service area polygon and multiplying the block's population by that proportion, as was done by Schneider et al. (2012) for block groups.)

9) **Export the selected blocks to a new file so you can open it in the future if needed without redoing the analysis.**
   a) Right-click on the block file, select *Data,* and select *Export Data.*
   b) Ensure that the option to export only *Selected features* is selected. Choose a location to save the new file and click OK. After the file is created, click OK to add it to the map; you can turn off or remove the block file.

10) **Open the attribute table of your new blocks file.** Select the column representing population by clicking its heading. Right-click the heading and select *Statistics*. The total population for the collection of blocks is shown next to *Sum*; make a note of it.

As noted in the "Testing the Fit for Census-Derived Variables" section of this report, the small sample size of this study led to regression equations with questionable fit for Census-derived variables. Estimating trip generation based on population within a 1-hour drive of the site is possible only when the population falls in the range of 325,000 to 450,000, the range of 1-hour populations surrounding three of the sites in this study. If your newly calculated total population is in that range, the 95% confidence interval of 330 to 897 Saturday trips provides a likely range of trips. Assuming the normal distribution for the unpredictable component of trips, Figure 5 would give the probability of a site generating a certain number of trips.

If your newly calculated total population is outside that range, additional data collection from sites with 1-hour populations between 450,000 and 2 million would be necessary in order to validate or adjust a regression equation for this variable.

Reference

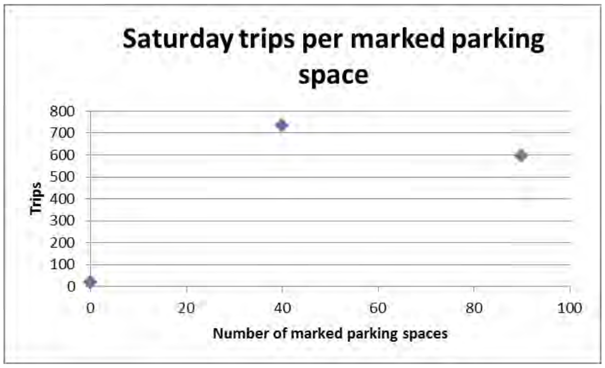
Schneider, R.J., Shafizadeh, K., and Handy, S. *Methodology for Adjusting ITE Trip Generation Estimates for Smart-Growth Projects, California Smart-Growth Trip Generation Rates Study, Final Report, Appendix F*. 2012. http://downloads.ice.ucdavis.edu/ultrans/smartgrowthtripgen/Appendix_F_Adjustment_Method.pdf. Accessed October 15, 2015.

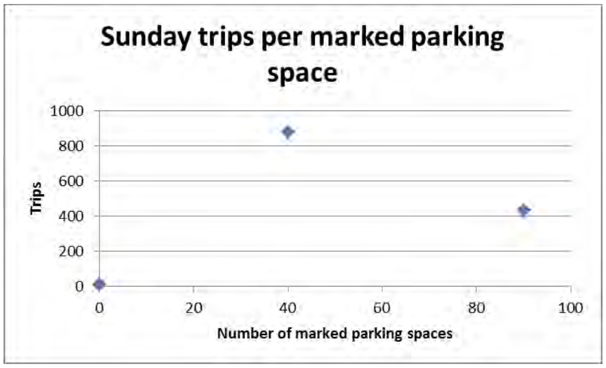
APPENDIX C

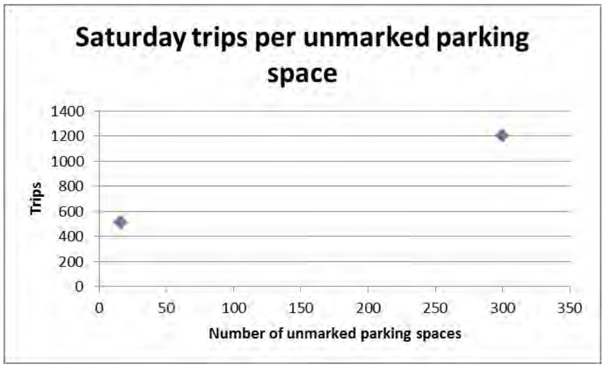
CORRELATION CHARTS

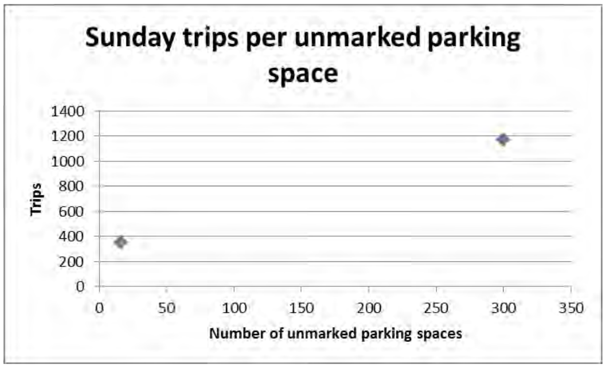
The charts in this appendix display 24-hour Saturday and Sunday scatter plots for each variable analyzed in this study, first for the analysis of all five sites and then again excluding Site 5 because of its different context. For variables with at least four data points, a linear regression equation is shown along with its R^2 value.

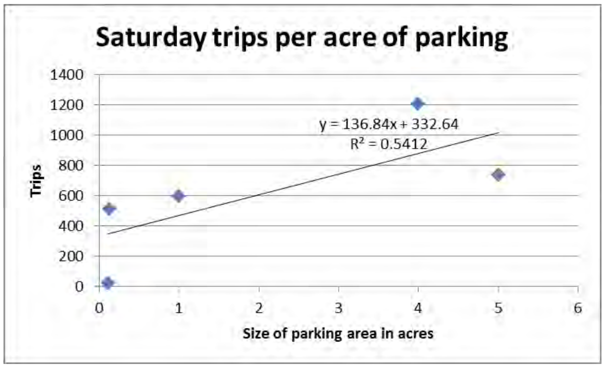
Charts Including Site 5

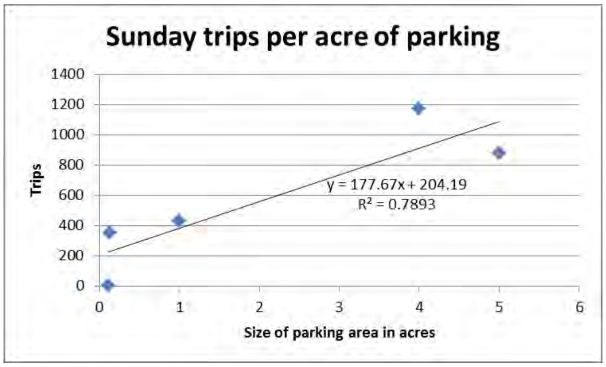


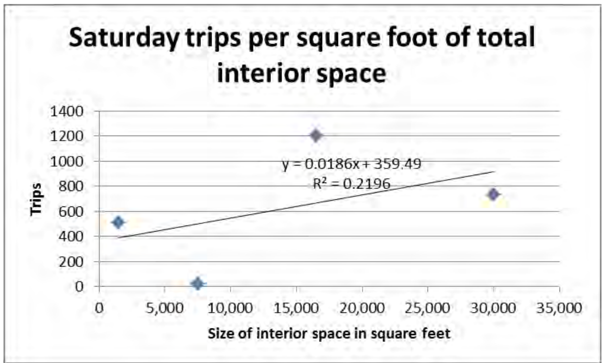


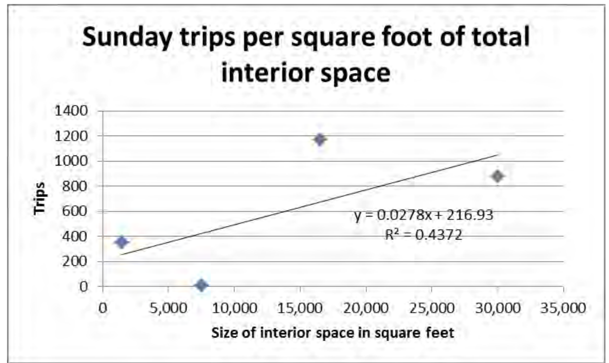




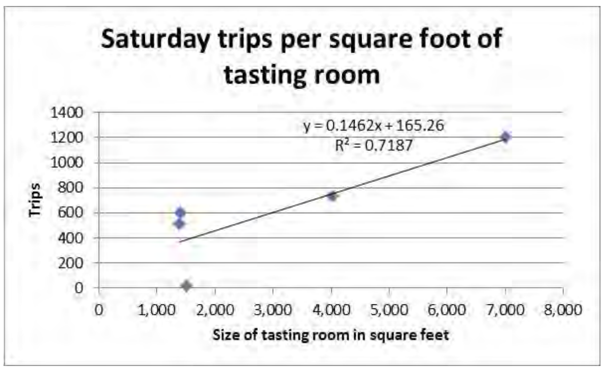


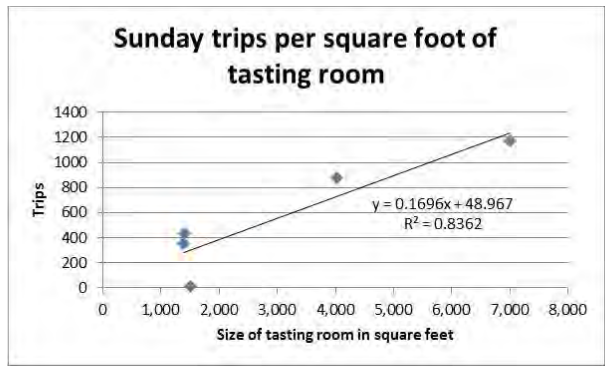


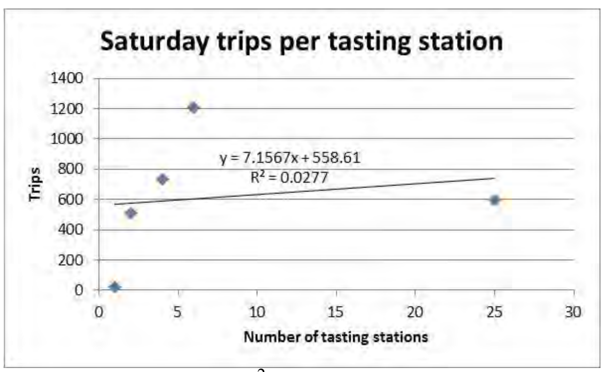


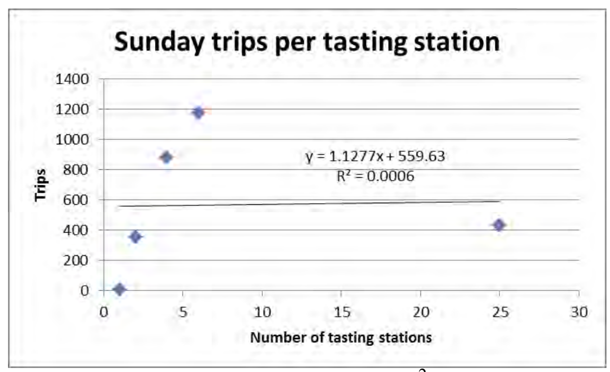


Note: Because of low R^2 values, ITE’s conditions would prohibit display of the equations and R^2 values.

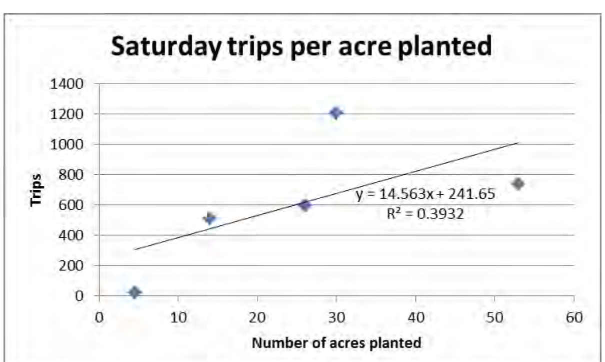


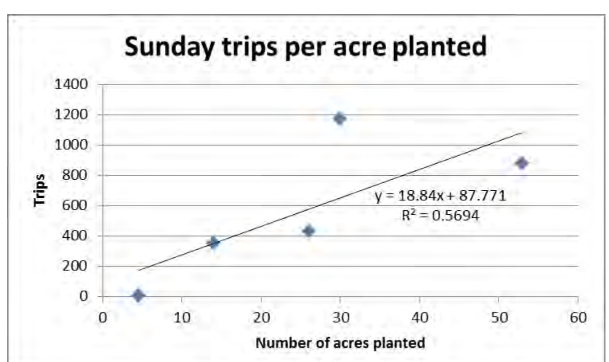






Note: Because of low R^2 values, ITE’s conditions would prohibit display of the equations and R^2 values.





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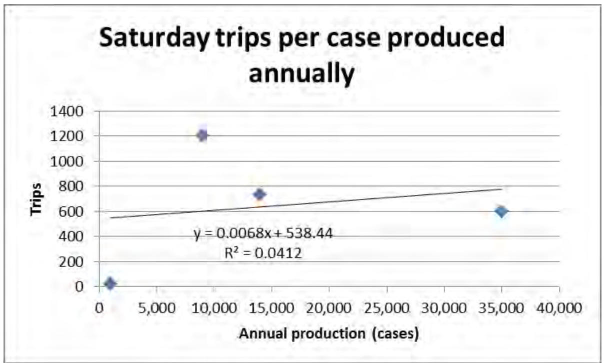
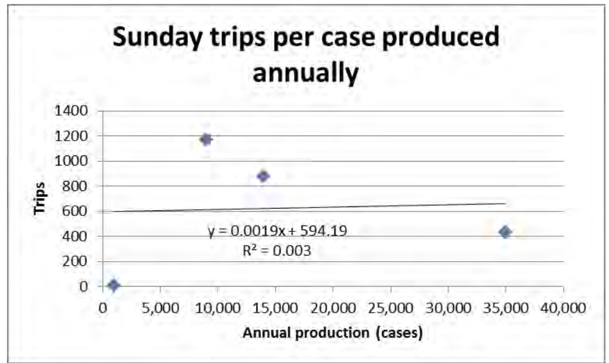
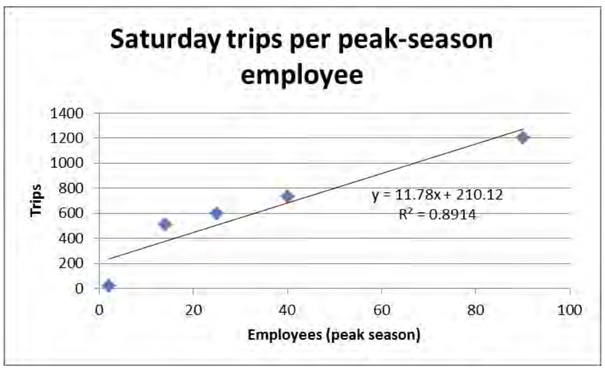
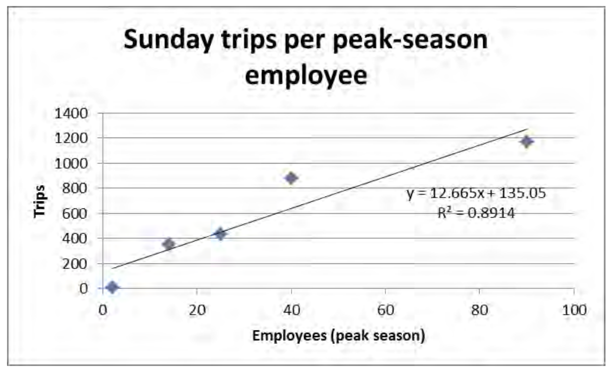
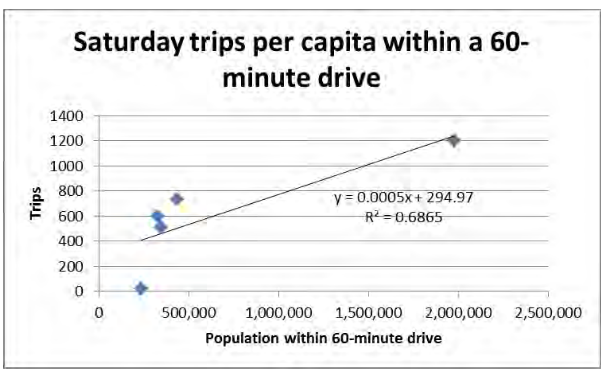


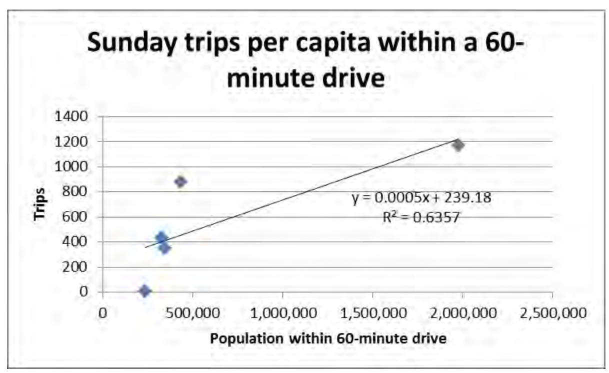


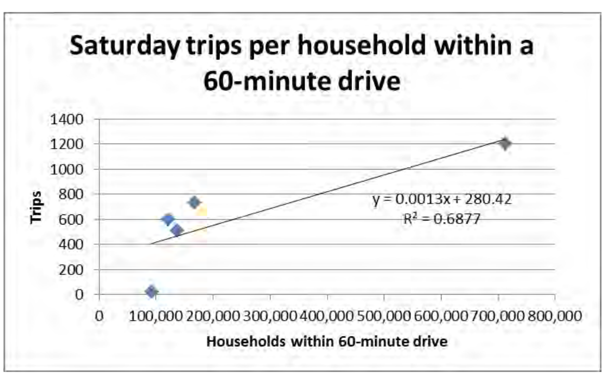
Note: Because of low R^2 values, ITE's conditions would prohibit display of the equations and R^2 values.

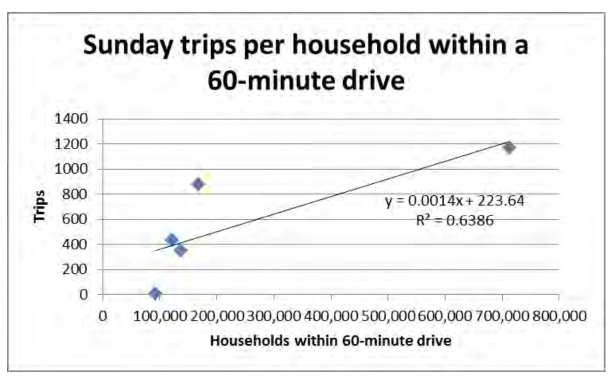




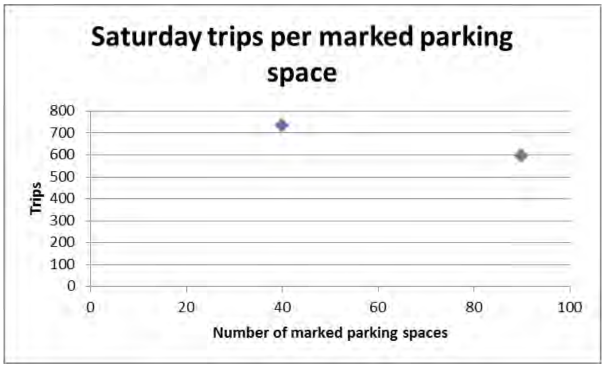


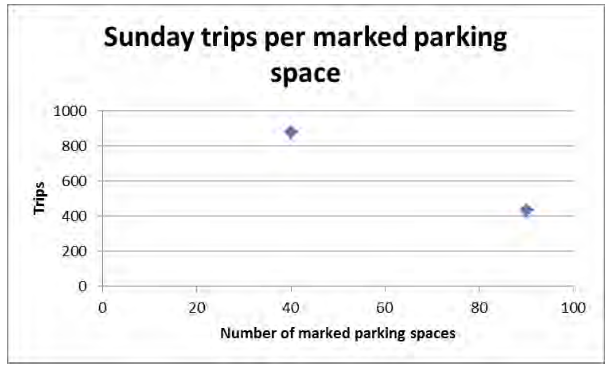


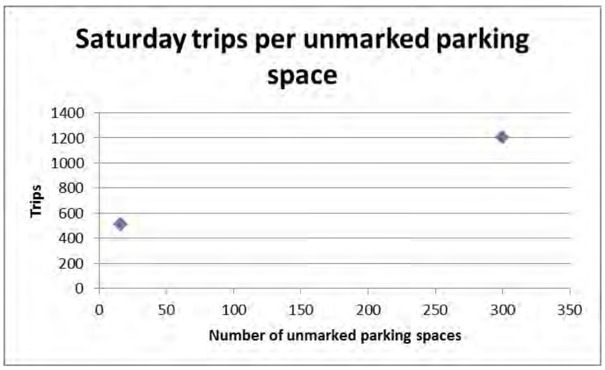


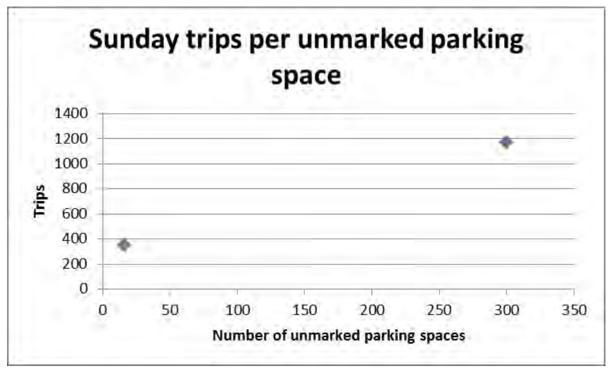


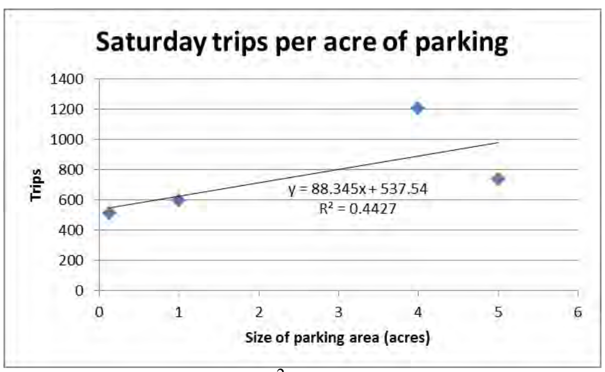
Charts Excluding Site 5

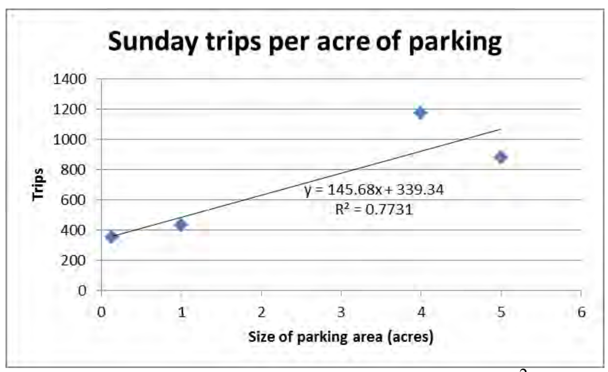




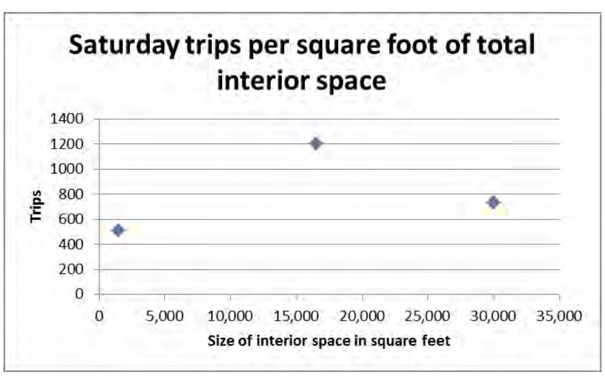


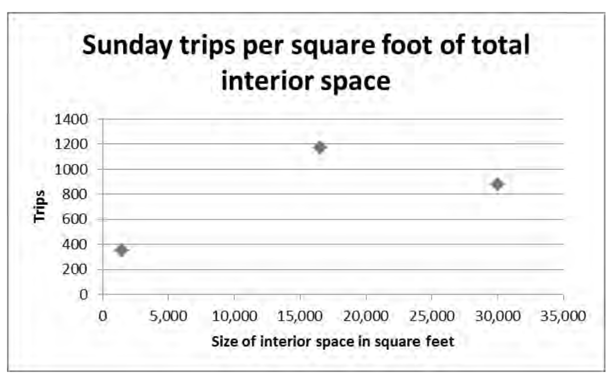


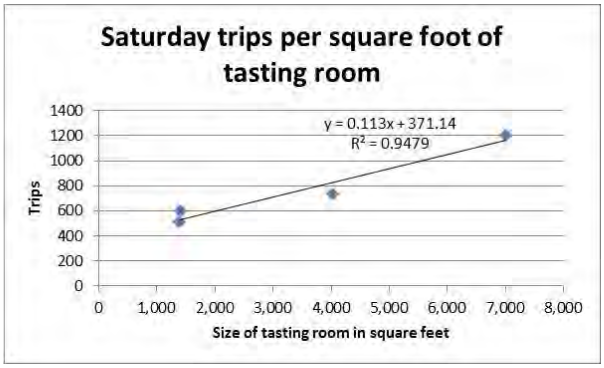


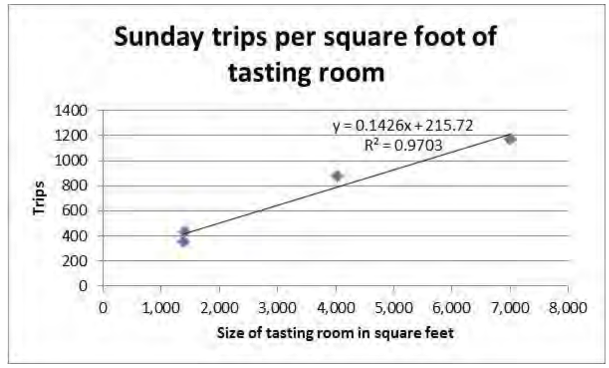


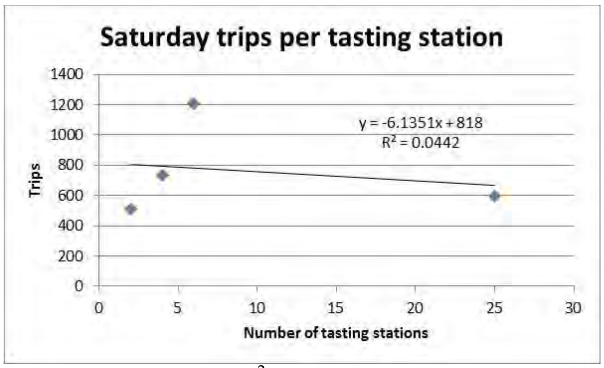
Note: Because of a low R^2 value, ITE's conditions would prohibit display of the Saturday equation and R^2.

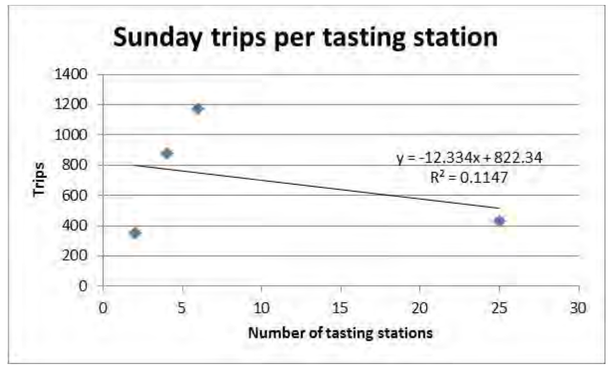




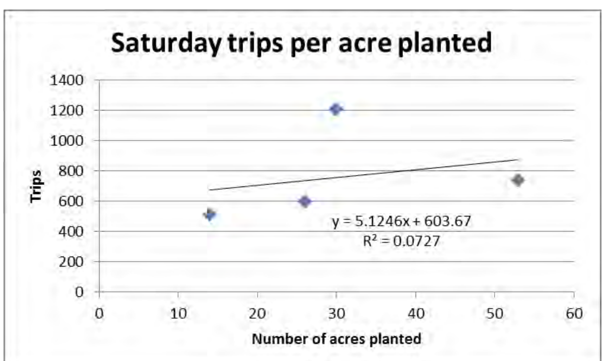


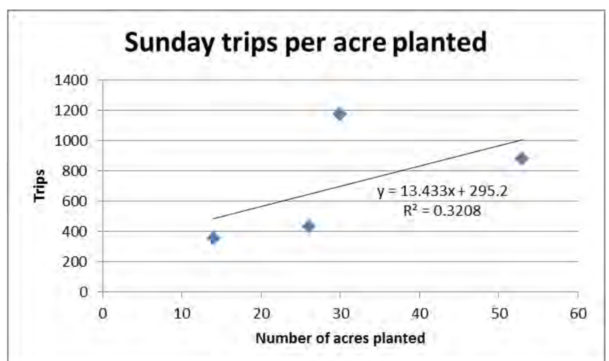




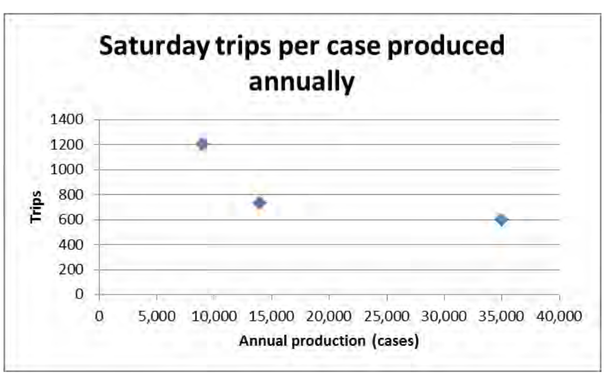


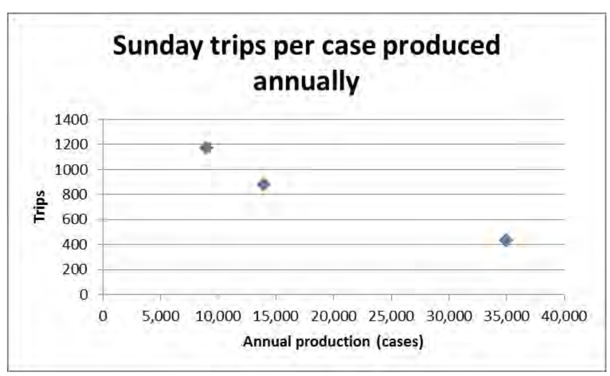
Note: Because of low R^2 values and the downward slopes of the trend lines, ITE's conditions would prohibit display of the equations and R^2 values.

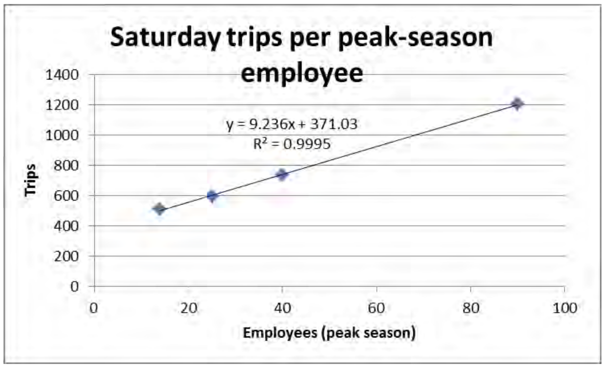


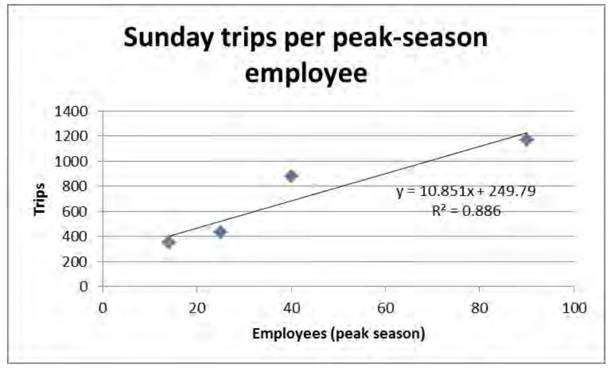


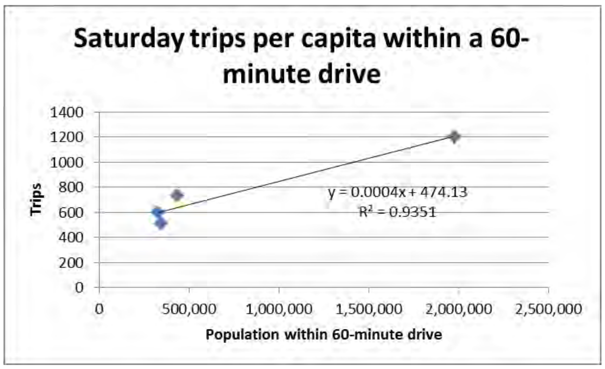
Note: Because of low R^2 values, ITE's conditions would prohibit display of the equations and R^2 values.

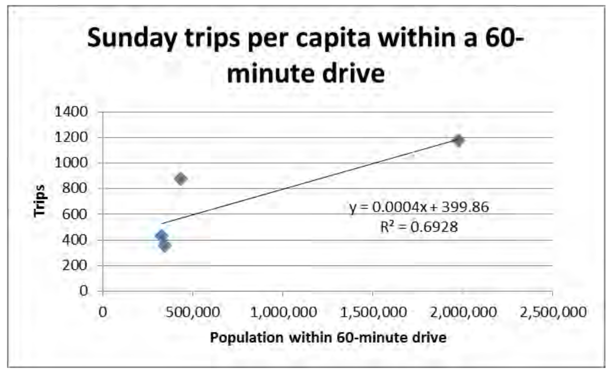


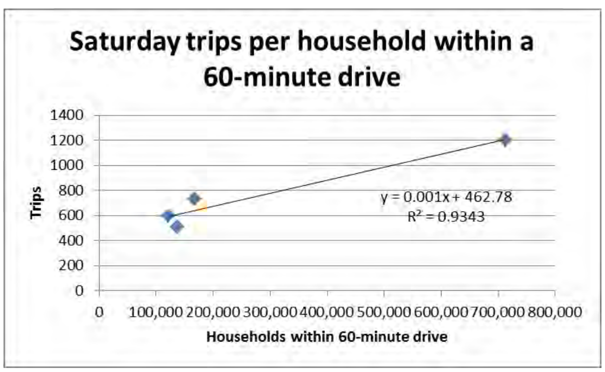


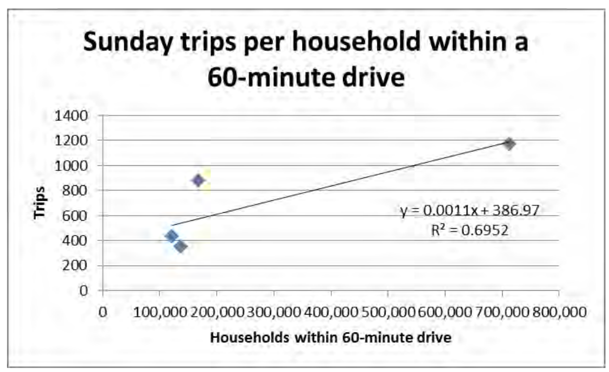

Saturday trips per peak-season employee
y = 9.236x + 371.03
R² = 0.9995
Trips
Employees (peak season)


Sunday trips per peak-season employee
y = 10.851x + 249.79
R² = 0.886
Trips
Employees (peak season)


Saturday trips per capita within a 60-minute drive
y = 0.0004x + 474.13
R² = 0.9351
Trips
Population within 60-minute drive


Sunday trips per capita within a 60-minute drive
y = 0.0004x + 399.86
R² = 0.6928
Trips
Population within 60-minute drive


Saturday trips per household within a 60-minute drive
y = 0.001x + 462.78
R² = 0.9343
Trips
Households within 60-minute drive


Sunday trips per household within a 60-minute drive
y = 0.0011x + 386.97
R² = 0.6952
Trips
Households within 60-minute drive

MEMORANDUM

DATE: July 31, 2020

TO: Rafael Martinez, Director of Transportation

FROM: John P. Long, P.E

SUBJECT: TIF Major Update
Technical Memorandum - Fee Rates by Size of Single-Family Unit

Executive Summary

The County's Traffic Impact Fee (TIM) Program currently has one fee rate for new "non-age restricted" single-family dwelling units, regardless of their size. For several other local jurisdictions, DKS Associates (DKS) has established a nexus to justify fee rates that differ by the size of housing units. On October 8, 2019, DKS made a presentation to the Board of Supervisors on how this type of nexus can be established and on the difference in fee rates by housing size that resulted from an analysis conducted for Sacramento County.

At that meeting, the County staff requested direction on whether varying fee rates by the size of a single-family unit should be incorporated into the TIF Program Major Update and the Board directed staff to do so.

The analysis conducted by DKS for Sacramento County cannot be directly used to establish fee rates by housing size for El Dorado County since the average size of single-family units in El Dorado County is significantly higher than Sacramento County. A new analysis based on data from El Dorado County was conducted. The analysis documented in this technical memo provides a nexus for establishing separate fee rates for six square footage categories of single-family housing units.

Background

The County's TIF Program focuses on impacts of new development. Like most fee programs, the current TIF Program has one fee rate for new "non-age restricted" single-family dwelling units, regardless of their size. For example, a new 1,500 square foot residential unit is charged the same fee rate as a 3,200 square foot unit.

DKS has established a nexus to justify fee rates that differ by the size of housing units in the following local jurisdictions using data from the U.S. Census and household travel surveys for the Sacramento region:

Jurisdiction	Year Fee Rates by Unit Size Implemented
City of West Sacramento	2004
Sacramento County	2008
City of Rancho Cordova	2013

The analysis conducted by DKS for these jurisdictions could not be directly used to establish fee rates by housing size for El Dorado County due to the differences in the average size of single-family units. The following sections describe the new analysis used to establish the nexus between traffic impacts and unit size for El Dorado County.

Analysis Methodology

"Impact Fees & Housing Affordability – A Guidebook for Practitioners" prepared for the US Department of Housing and Urban Development (HUD) in 2007, looks at the relationship between various characteristics of a dwelling unit (e.g. square footage, bedrooms, etc.) and its impact on public facilities, including roadways. This research suggests that trip generation can be estimated by categories of the dwelling unit size (i.e. ranges of square footage) using the following relationships:

- The average vehicle trips by household size categories (i.e. persons in the household) from national or regional household travel surveys
- The number single-family housing units in categories of persons per household and square footage of units that were estimated from the American Housing Survey (AHS)

The analysis for El Dorado County involved combining trip generation information from a new household survey conducted by SACOG in 2018 with number of single-family detached units in cross-tabulated categories of persons per household and square footage of household from the 2017 AHS. This resulted in estimates of vehicle trip rates and "equivalent dwelling units" (EDUs) for each square footage category. Then data on the square footage of housing units built in El Dorado County in 2018 and 2019 was used to ensure that using the estimated EDUs by square footage categories would not impact the overall amount of fees collected from single-family residential units.

<u>SACOG Household Travel Survey</u>

SACOG has periodically conducted household travel surveys in its six-county region to collect detailed data on household characteristics and travel behavior. Data from SACOG's 2018 Household Travel Survey (HTS) was used to estimate the number of vehicle trips by categories of persons in the household.

Region-wide about 4,000 households were surveyed. Ideally, trip generation rates would be estimated from the subset of households surveyed in Eldorado County. However, only 179 of those households were in El Dorado County. To achieve an adequate sample for estimating trip generation rates, surveys from other areas were needed. It was decided to include all sampled households from Placer County since its mix of urban and rural households and average demographics are similar to El Dorado County, as demonstrated in **Table 1**.

Table 1
Selected Characteristics of Households in El Dorado and Placer Counties

Characteristics	El Dorado Co	Placer Co
Population (2019)	192,843	398,329
Average Persons per household	2.67	2.67
Median household income ($2018) 2014-2018	$80,582	$84,357
Median value of owner-occupied units	$437,200	$443,700
Owner occupied rate	76.6%	71.6%
Source: US Census Quick Facts		

Combining the data from the two counties results in 636 households that were surveyed, which provides an adequate "raw" sample for estimating trip generation rates by number of people in the household. Since some types of households were sampled at different rates, SACOG weights its sample to reflect the overall mix of households. **Table 2** shows the samples and trip generation rates for their raw and weighted samples. SACOG recommended that the trip rates from the weighted sample be used for the analysis in El Dorado County.

Table 2
Trip Generation Data
SACOG Household Travel Survey for El Dorado and Placer Counties

	Households				PM Peak Period Home-Based Vehicle Trips			
	Raw Sample		Weighted Sample		Raw Sample		Weighted Sample	
Persons in Household	Households	Percent	Households	Percent	Trips	Trips per Household	Trips	Trips per Household
1	181	28.5%	49,788	25.7%	83	0.46	21,415	0.43
2	289	45.4%	68,942	35.6%	222	0.77	52,765	0.77
3	67	10.5%	30,367	15.7%	74	1.10	36,002	1.19
4	62	9.7%	27,833	14.4%	100	1.61	39,646	1.42
5	28	4.4%	12,439	6.4%	50	1.79	23,049	1.85
6	4	0.6%	2,165	1.1%	5	1.25	2,285	1.06
7+	5	0.8%	1,999	1.0%	8	1.60	4,636	2.32
Total	**636**	**100.0%**	**193,533**	**100.0%**	**551**		**179,807**	
				Average		**0.87**		**0.93**

Source: SACOG 2018 Household Travel Survey

American Housing Survey

The American Housing Survey (AHS), which is conducted by the Bureau of the Census for HUD, collects data on the nation's housing, including data on household characteristics and demographics. The AHS data is collected in odd numbered years. The 2019 AHS enumeration period ended in November 2019 and the Census Bureau is still processing that data. The most recent available survey data is from 2017.

The AHS was designed to include two samples, the National sample and the independent Metropolitan sample. Since 2007 the National and Metropolitan surveys have been conducted together with selected metropolitan areas being “oversampled”. The metropolitan areas that are surveyed and the size of the surveys have changed over recent years. These measures have saved costs but they limit localized data,

The analysis required to define trip generation by square footage categories involves cross-tabulating housing units by three variables: the structure type, square footage and persons in the household. This cross-tabulation requires an adequate sample size for each category. Ideally, adequate data would be available from a survey of the Sacramento metropolitan area. However, the Sacramento metropolitan area has not been surveyed since 2004 and that sample size limits its ability to provide information for all square-footage categories. Tools available from the Census Bureau to create cross-tabulations from the AHS indicate that the only sample adequate enough to provide a statistically relevant sample for the three required variables is the full national sample. Thus it was decided that the national sample from the 2017 AHS should be used to define the number of single-family housing units in cross-tabulation categories of persons in the household and the square footage of the housing unit. This data is summarized in **Table 3.**

Trip Generation by Categories of Square Footage

The estimation of the average trip generation rate for each of the AHS square footage categories are shown in **Table 4** and are estimated from the following steps:

- Multiply the trip generation rate for a category of "persons per household" estimated from SACOG's Household Travel Survey (see Table 2) by the number in single-family units in each AHS square footage category for that same number of persons per household
- Sum the number of trips generated by all households in an AHS square footage category and divide by the total number of households in that square footage category.

The results of these calculations (see bottom row of **Table 4**) show that peak period vehicle trip rates increase from an average of 0.556 for single-family housing units with less than 500 square feet to 1.129 for units with 4,000 square feet or more. These differences in trip rates will be used to establish "equivalent dwelling units" for square footage categories.

Impact of Multiple Single-Family EDU Rates on Fees Collected

The County's TIF Program allocates the cost of roadway improvements by land use type based on the concept of "equivalent dwelling units" (EDU). An EDU equals the demand placed on the transportation network relative to one single-family dwelling unit which is assigned an EDU of 1. Land uses which have greater overall traffic impacts than a typical single-family residential unit are assigned values greater than 1, while land uses with lower overall traffic impacts are assigned values less than 1.

Like many development fee programs, the County's TIF Program bases its EDUs on the number of new vehicle trips generated by each land use type. Vehicle trips are derived from studies compiled and vetted by the Institute of Transportation Engineers, which measure the vehicle trips entering and leaving a specific development. Since roadway needs are primarily based on traffic flows and conditions during the PM peak hour on an average weekday, the EDUs reflect the relative trip generation for the evening peak hour.

The average cost per EDU is based on the estimated total growth in EDUs from the projected growth in development through 2040. The growth in single-family units by areas in the County will be estimated for two categories: "age restricted" and "non-age restricted" single-family units. Estimates will not be made for square footage categories of single-family units. However, when a developer gets a building permit and pays fees, a specific land use is known, such as the square footage of each single-family unit. Thus the number of EDUs for that specific land use will be based on specific EDU rates for that category.

If the County has different EDU rates for square footage categories, it is important to show that their use would not significantly change the estimate of total EDUs for the projected growth in total single-family units in the County. As described below, an analysis of recent housing built in the County was conducted to show how EDUs by housing size categories would impact the total fees collected from future growth in single-family units.

Recent Housing Built in El Dorado County

Table 5 and **Figure 1** show the 508 "non-age-restricted" single-family dwelling units built in El Dorado County in 2018 and 2019 by their square footage. The data indicates the following:

- The average size of the single-family dwelling units built in that two year period was 2,520 square feet.
- There were no single-family units less than 800 square feet built in that two-year period

Table 3
Number of Single Unit Detached Structures by AHS Square Footage Category

Persons per Household	Total	Less than 500	500 to 749	750 to 999	1,000 to 1,499	1,500 to 1,999	2,000 to 2,499	2,500 to 2,999	3,000 to 3,999	4,000 or more	Not Reported
1	15,277	129	420	1,310	4,276	3,458	2,012	857	652	238	1,925
2	28,059	96	244	1,226	5,761	7,069	4,947	2,813	2,610	1,205	2,086
3	12,771	47	83	556	2,641	3,046	2,403	1,307	1,107	528	1,053
4	12,151	0	99	346	2,106	2,737	2,303	1,430	1,512	727	866
5	5,404	0	21	155	913	1,155	965	565	708	372	530
6	2,049	0	0	50	389	427	307	238	280	146	195
7+	1,122	0	0	36	195	257	153	128	108	88	153
Total	76,833	332	872	3,680	16,281	18,149	13,089	7,339	6,977	3,306	6,808
Average Persons per Household	2.68	1.39	1.90	2.22	2.49	2.64	2.76	2.91	3.05	3.19	2.60

Source: 2017 American Housing Survey

Table 4
Total Peak Period Vehicle Trips for All Households in Each AHS Square Footage Category[1]

Persons per Household	PM Peak Period Vehicle Trips per Household[1]	Total	Less than 500	500 to 749	750 to 999	1,000 to 1,499	1,500 to 1,999	2,000 to 2,499	2,500 to 2,999	3,000 to 3,999	4,000 or more	Not Reported
1	0.43	6,571	55	181	563	1,839	1,487	865	369	280	102	828
2	0.77	21,475	73	187	938	4,409	5,410	3,786	2,153	1,998	922	1,597
3	1.19	15,141	56	98	659	3,131	3,611	2,849	1,550	1,312	626	1,248
4	1.42	17,308	0	141	493	3,000	3,899	3,280	2,037	2,154	1,036	1,234
5	1.85	10,013	0	39	287	1,692	2,140	1,788	1,047	1,312	689	982
6	1.06	2,163	0	0	53	411	451	324	251	296	154	206
7+	2.32	2,602	0	0	83	452	596	355	297	250	204	355
Average Trips per Household[2]		**0.980**	**0.556**	**0.741**	**0.836**	**0.917**	**0.969**	**1.012**	**1.050**	**1.090**	**1.129**	**0.947**

[1] Equals "PM Peak Period Vehicle Trips per Household" rate times the number of households in representative cell in Table 3
[2] Equals sum of total peak period vehicle trips in each AHS square footage category divided by the total number of households in that category

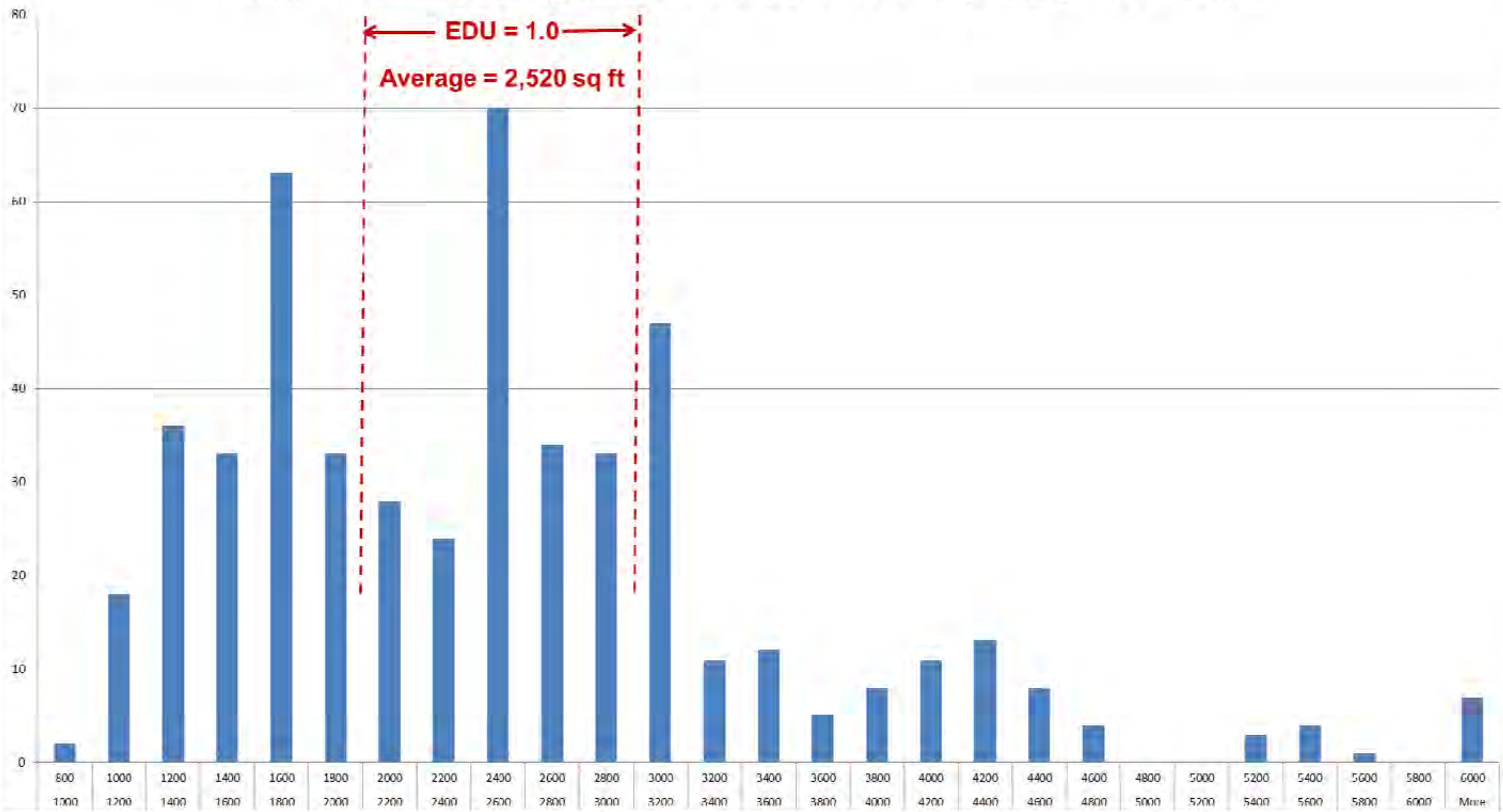
Based on an analysis of this recent local housing data, the following is recommended:

- An EDU of 1.0 should be used for a "middle grouping" of single-family units between 2,000 and 2,999 square feet in size. Single-family units with less than 2,000 square feet will have an EDU of less than 1.0. Units with 3,000 square feet or more will have an EDU of more than 1.0.
- The AHS square footage categories (see Table 3) will be used for units outside the middle grouping, except that there will only be one group for units less than 1,000 square feet and its trip generation rate will be based on the AHS 750 to 999 square foot category.

Table 5
Number of Single-Family Housing Units Built in El Dorado County by Square Footage During 2018 and 2019 (Not including age-restricted units)

Square Feet		Single-family Units		Square Feet		Single-family Units	
From	To	Units	Percent	From	To	Units	Percent
800	900	2	0.39%	3,500	3,600	3	0.59%
900	1,000	0	0.00%	3,600	3,700	1	0.20%
1,000	1,100	1	0.20%	3,700	3,800	4	0.79%
1,100	1,200	17	3.35%	3,800	3,900	7	1.38%
1,200	1,300	26	5.12%	3,900	4,000	1	0.20%
1,300	1,400	10	1.97%	4,000	4,100	9	1.77%
1,400	1,500	28	5.51%	4,100	4,200	2	0.39%
1,500	1,600	5	0.98%	4,200	4,300	8	1.57%
1,600	1,700	22	4.33%	4,300	4,400	5	0.98%
1,700	1,800	41	8.07%	4,400	4,500	3	0.59%
1,800	1,900	24	4.72%	4,500	4,600	5	0.98%
1,900	2,000	9	1.77%	4,600	4,700	0	0.00%
2,000	2,100	21	4.13%	4,700	4,800	4	0.79%
2,100	2,200	7	1.38%	4,800	4,900	0	0.00%
2,200	2,300	17	3.35%	4,900	5,000	0	0.00%
2,300	2,400	7	1.38%	5,000	5,100	0	0.00%
2,400	2,500	27	5.31%	5,100	5,200	0	0.00%
2,500	2,600	43	8.46%	5,200	5,300	0	0.00%
2,600	2,700	8	1.57%	5,300	5,400	3	0.59%
2,700	2,800	26	5.12%	5,400	5,500	1	0.20%
2,800	2,900	20	3.94%	5,500	5,600	3	0.59%
2,900	3,000	13	2.56%	5,600	5,700	0	0.00%
3,000	3,100	36	7.09%	5,700	5,800	1	0.20%
3,100	3,200	11	2.17%	5,800	5,900	0	0.00%
3,200	3,300	5	0.98%	5,900	6,000	0	0.00%
3,300	3,400	6	1.18%	6,000	More	7	1.38%
3,400	3,500	9	1.77%	**Total**		**508**	**100.0%**
Average Square Footage of Single-Family Units						2,520 sf.	
Source: El Dorado County							

Figure 1
Number of New Housing Units Built In El Dorado County during 2018 and 2019



Analysis Results

Table 6 shows the estimated EDUs for six recommended square foot groupings. These EDUs are calculated by dividing the average trips per household for each grouping by the average trips per household for the middle (2,000 to 2,999 square feet) group.

Table 7 shows the calculation of the weighted average EDU for all six groupings, which is estimated by multiplying the EDU for each group by the percentage of households in that group (from the 2018 – 2019 County housing data) and summing those values. This calculation shows that the weighted average EDU for "non-age restricted" single-family dwelling units is 0.9915, which is very close to the EDU of 1.0 that is used in estimating the average cost of an EDU.

In other words, if the mix of new single-family housing units by size that are built over the next 20 years is same as the mix of units built in 2018 and 2019, then the use of separate EDU rates by the recommended six square footage groupings will not impact the average cost per EDU and estimated total amount of fees collected.

Table 6
Estimated EDUs of Single-family Units by Square Footage Groupings

AHS Square Footage Categories	Average Trips per Household	Recommended Square Footage Groupings	Average Trips per Household	EDU[1]
750 to 999	0.836	Less than 1,000	0.836	0.815
1,000 to 1,499	0.917	1,000 to 1,499	0.917	0.894
1,500 to 1,999	0.969	1,500 to 1,999	0.969	0.945
2,000 to 2,499	1.012	2,000 to 2,999	1.026	1.000
2,500 to 2,999	1.050			
3,000 to 3,999	1.090	3,000 to 3,999	1.090	1.062
4,000 or More	1.129	4,000 or More	1.129	1.101

[1] Equals average trips per household for each grouping divided by the average trips per household for the middle group (1.026)

Table 7
Estimated Weighted Average EDU of Single-family Units

Recommended Groupings	SF Units Built 2018-2019		EDU	Weighted Average EDU
	Units	Percent		
Less than 1,000	2	0.4%	0.815	0.0032
1,000 to 1,499	82	16.1%	0.894	0.1442
1,500 to 1,999	101	19.9%	0.945	0.1877
2,000 to 2,999	189	37.3%	1.000	0.3725
3,000 to 3,999	83	16.3%	1.062	0.1734
4,000 or More	51	10.0%	1.101	0.1105
Total	**508**	**100.0%**		
			Weighted Average of All Groups	0.9915

The analysis indicates that the new TIM fee rate for “small” single-family units (those less than 1,000 square feet) would be 81.5% of the fee rate for an “average” single-family unit (2,000 to 2,900 square feet). The largest single-family units (those 4,000 square feet or more) would have a TIM fee rate that is 110.5 % of the “average” single-family unit.

Optional Groupings

The recommendation above includes six square foot groupings. The County may want to consider options that have fewer groupings. **Table 8** shows some optional groupings.

Option A is the recommended six category option described above. The other options have three or four square foot categories. All of the options except Option B are aggregations of the Census Bureau (AHS) size categories. Option B requires a judgment to split the AHS category at 3,500 square feet. Option C has a larger middle category, where the EDU equals 1.0.

Both Options A and C have a "less than 1,000 square foot" category. Based on recent building data, this category will likely have a minimal number of units and thus could be eliminated.

Option A was recommended since it minimizes the change in rates between categories and it does not split an AHS category.

Recommended Action: The Consultants and County staff recommend that the Board consider varying fee rates by the size of a single-family unit, using the recommended square footage grouping, or one of the optional groupings, along with their estimated EDU rates from the nexus analysis.

Table 8
Potential Options for Housing Size Categories

Option A - Recommended (6 sq ft categories)	SF Units Built 2018-2019			Weighted Average
	Units	Percent	EDU	EDU
Less than 1,000	2	0.4%	0.815	0.0032
1,000 to 1,499	82	16.1%	0.894	0.1442
1,500 to 1,999	101	19.9%	0.945	0.1877
2,000 to 2,999	189	37.3%	1.000	0.3725
3,000 to 3,999	83	16.3%	1.062	0.1734
4,000 or More	51	10.0%	1.101	0.1105
Total	508	100.0%		
			Weighted Average of All Groups	0.992

Option B (3 sq ft categories)	SF Units Built 2018-2019			Weighted Average
	Units	Percent	EDU[1]	EDU
Less than 1,500	84	16.5%	0.895	0.1480
1,500 to 3,499	357	70.3%	1.000	0.7028
3,500 or More	67	13.2%	1.102	0.1453
Total	508	100.0%		
			Weighted Average of All Groups	0.996

[1] Using 3,500 sq ft as the boundary between categories requires a judgment interpolation to split the 3,000 to 3,999 AHS catgory

Option C (4 sq ft categories)	SF Units Built 2018-2019			Weighted Average
	Units	Percent	EDU	EDU
Less than 1,000	2	0.4%	0.815	0.0032
1,000 to 2,000	183	36.0%	0.921	0.3318
2,000 to 2,999	189	37.2%	1.000	0.3720
3,000 or More	134	26.4%	1.075	0.2836
Total	508	100.0%		
			Weighted Average of All Groups	0.991

Option D (4 sq ft categories)	SF Units Built 2018-2019			Weighted Average
	Units	Percent	EDU	EDU
Less than 2,000	185	36.4%	0.921	0.3352
2,000 to 2,999	189	37.2%	1.000	0.3720
3,000 to 4,000	83	16.3%	1.062	0.1735
4,000 or More	51	10.0%	1.101	0.1105
Total	508	100.0%		
			Weighted Average of All Groups	0.991

EL DORADO COUNTY TIF SMART GROWTH DISCOUNT

DATE: July 24, 2020

TO: Natalie Porter | Senior Traffic Engineer, El Dorado County

FROM: Jim Damkowitch | DKS

SUBJECT: El Dorado County TIF: Smart Growth Discount Project #19203-002

INTRODUCTION

Pursuant to the Mitigation Fee Act (MFA), El Dorado County adopted a "Smart Growth Discount" as part of the 2016 Traffic Impact Fee (TIF) update. Based on research of the trip reduction benefits of Smart Growth, a fee discount percentage of 15% was adopted. However, given that no area within the unincorporated area of El Dorado County currently meets the MFA criteria for the Smart Growth, the discount has not been applied.

As part of the 2020 TIF update, an examination of the future potential for application of the Smart Growth Discount was performed. The current fee program does address California Code–Section 66005.1 (effective January 1, 2011) that states: housing development projects that satisfy all of the following "Smart Growth" characteristics shall be provided a discounted fee. State statute defines Smart Growth as:

- A housing development located within one-half mile of a transit site and there is direct access between the housing development and the transit site along a barrier-free walkable pathway not exceeding one half mile in length.
- Convenience retail uses, including a store that sells food, are located within one-half mile of the housing development.
- A housing development that provides either the minimum number of parking spaces required by the local ordinance, or no more than one onsite parking space for zero to two bedroom units, and two onsite parking spaces for three or more bedroom units, whichever is less.

BACKGROUND

Based on the *County Line Multi-Modal Transit Center Study (EDCTC, September 2019)*, six candidate sites were evaluated based on multiple criteria to determine the most appropriate location for a proposed County Line Multi-Modal Transit Center. Based on the study's findings, three sites were recommended as the most viable candidate locations for a new transit site in the Town Center of El Dorado Hills. These sites include sites 3, 5, and 6 as identified in **Figure 1** below.

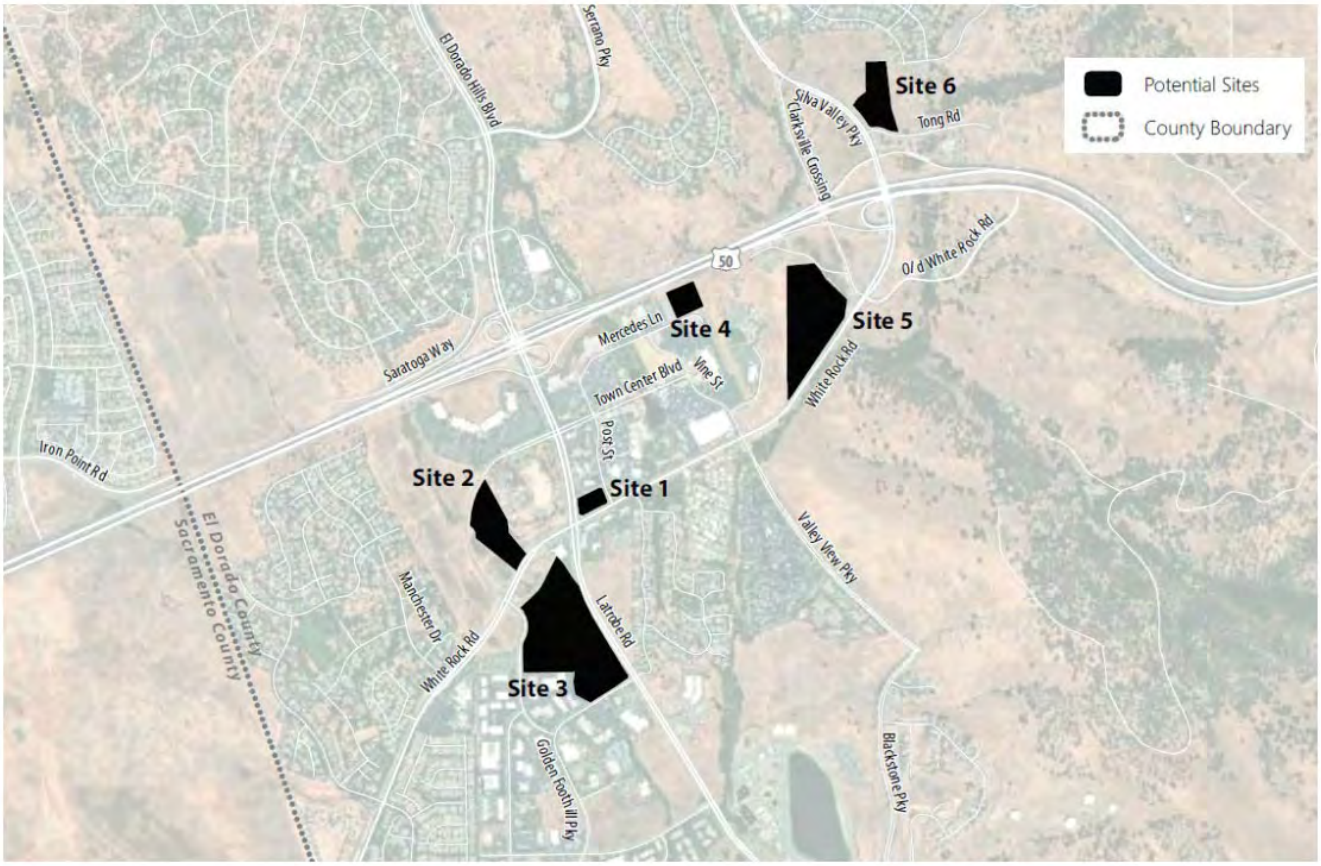


FIGURE 1. TRANSIT CENTER SITE EVALUATION (*County Line Multi-Modal Transit Center Study (EDCTC, September 2019)*

ANALYSIS OF MFA DEFINITION

Based on the three candidate locations selected for the transit site near the Town Center of El Dorado Hills, a half mile buffer was created. This buffer was overlaid with the El Dorado County Travel Demand Model (EDCTDM) Traffic Analysis Zone (TAZ) shape file to determine the TAZs within each buffer. **Figure 2** below shows the buffered areas around the selected sites.

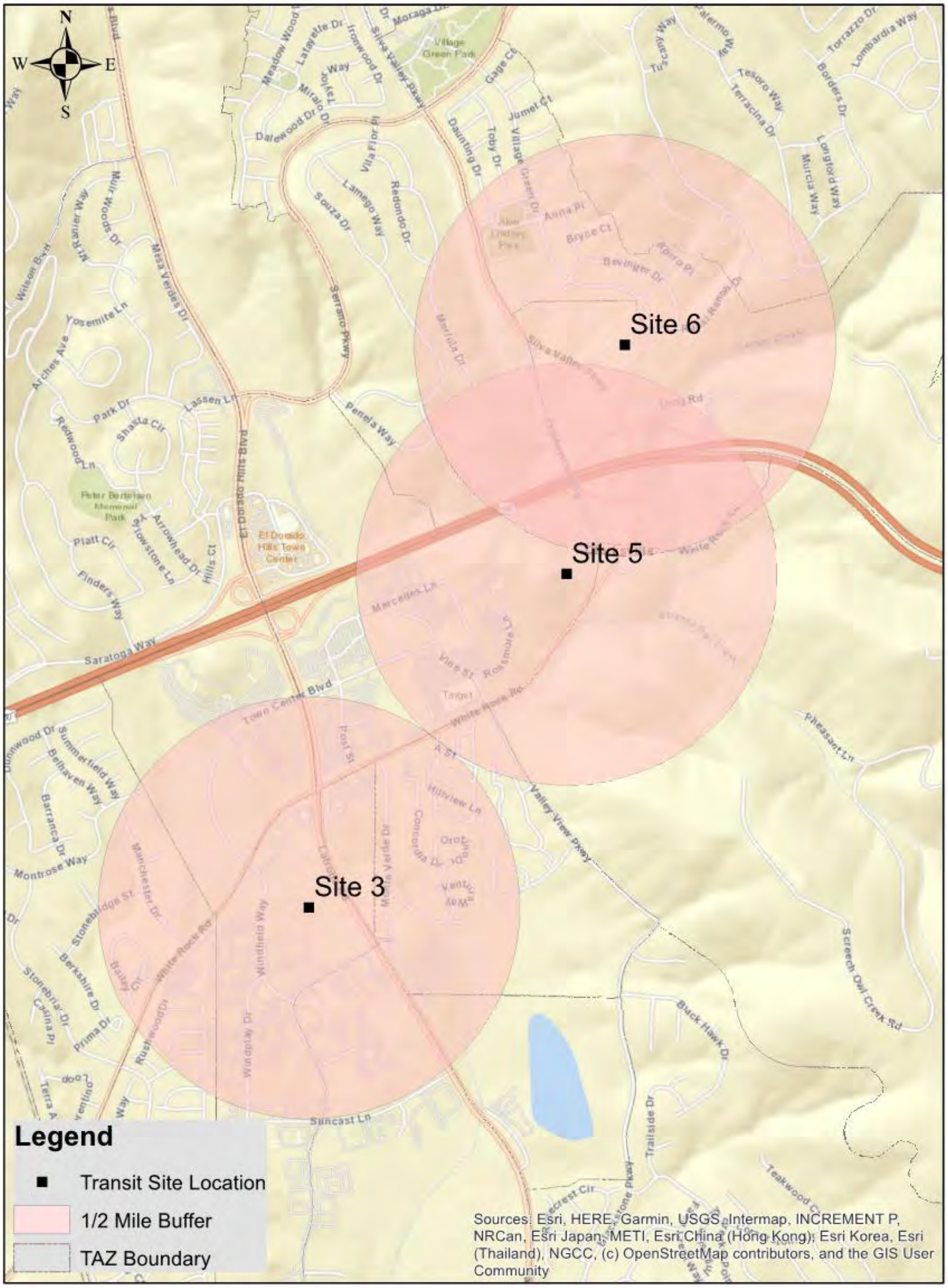


FIGURE 2. TRANSIT CENTER SITE EVALUATION ½ MILE BUFFERS

Once the buffers were created and the TAZ proportions determined, the EDCTDM land use data was used to determine the projected residential growth within each candidate site buffer. The residential growth (expressed as either Single Family Dwelling Unit (SFDU) or Multi-family Dwelling Unit (MFDU)) was based on model land use from 2016 to 2040. **Table 1** below shows the TAZ proportions based on the buffers, the projected SFDU and MFDU growth, and the projected growth based on the TAZ ½ mile buffer proportions for each candidate site.

TABLE 1: TAZ PROPORTIONS AND FUTURE GROWTH

TAZ	PERCENT TAZ IN BUFFER	GROWTH		GROWTH PER TAZ	
		SFDU	MFDU	SFDU	MFDU
		SITE 3			
169	12%	0	0	0	0
165	21%	48	57	10	12
170	56%	26	0	15	0
171	19%	0	0	0	0
168	56%	3	0	2	0
625	12%	0	0	0	0
164	23%	0	0	0	0
610	57%	0	0	0	0
172	100%	0	0	0	0
		SITE 5			
169	69%	0	0	0	0
173	15%	0	0	0	0
163	12%	161	0	20	0
157	27%	0	0	0	0
180	7%	399	0	27	0
168	6%	3	0	0	0
613	95%	2	0	2	0
		SITE 6			
162	11%	0	0	0	0
169	7%	0	0	0	0
163	39%	161	0	62	0
157	39%	0	0	0	0
180	0%	399	0	1	0
613	99%	2	0	2	0
624	68%	1	0	1	0

SFDU = Single Family Dwelling Unit
MFDU = Multi-Family Dwelling Unit

The adopted Smart Growth Discount for the El Dorado County TIF is 15 percent. Therefore, to determine the discounted fee amount, the product of the number of applicable new residential units, existing 2019 residential TIF, and 0.15 was taken. It should be noted that the residential TIF is based on the TIF zone a site is located. In this case, the three sites are located in zone 8 as can be seen in **Figure 3**.

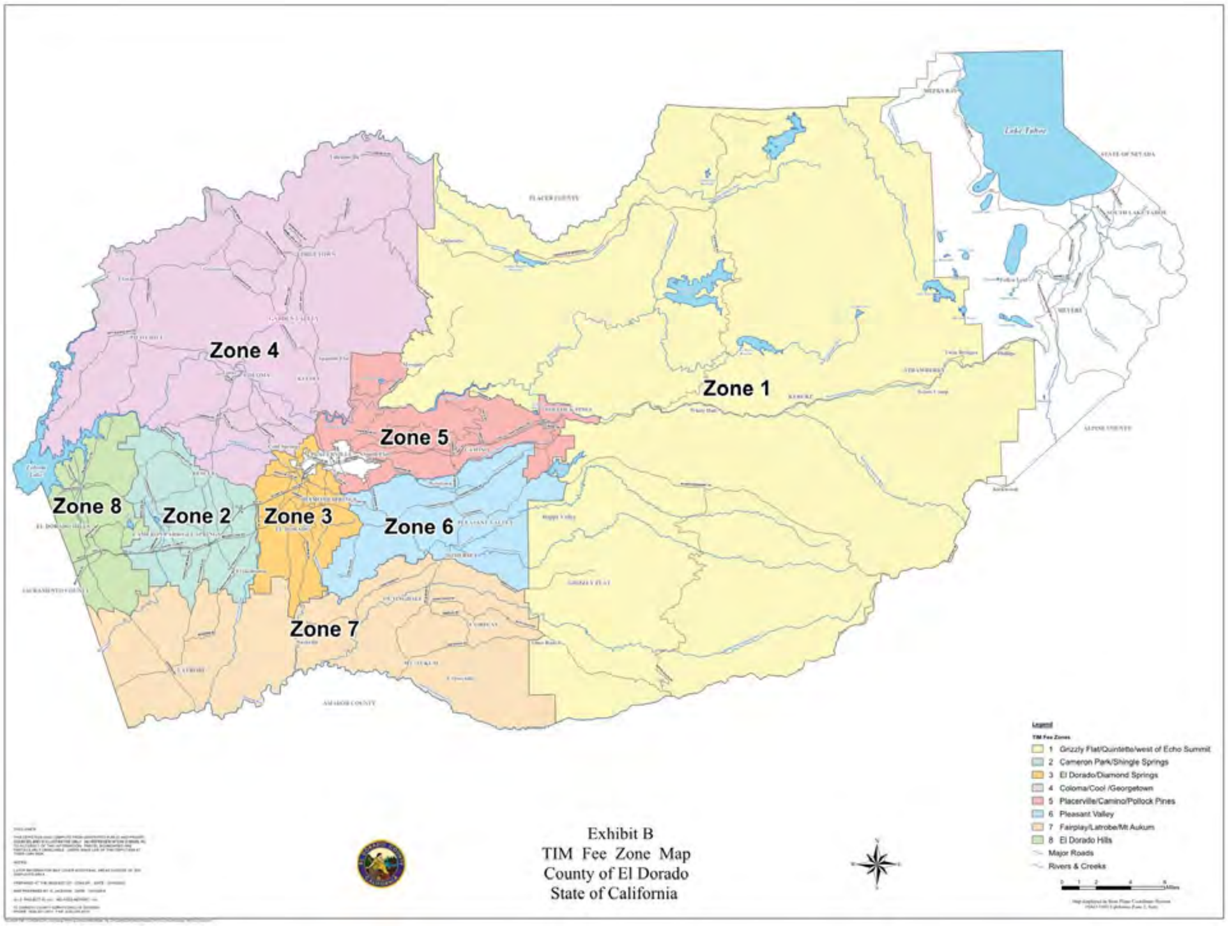


FIGURE 3. TIF ZONE MAP[1]

The discounted fee amount calculations can be seen in **Table 2** below. As shown, Transit Site 6 would yield the greatest discount amount ($302,765) followed by Site 5 and then Site 3. It should be noted that if these discounts were to materialize in the future, the entire discounted fee would need to be made up elsewhere into the fee program to keep it financially constrained.

[1] https://www.edcgov.us/Government/longrangeplanning/Documents/Exhibit%20B%20TIM%20Fee%20Zone%20Map.pdf

TABLE 2: DISCOUNTED FEE AMOUNT

TRANSIT SITE LOCATION	TIF ZONE	COST PER EDU $		DISCOUNTED FEE AMOUNT	
		SFDU	MFDU	SFDU	MFDU
3	8	$30,472	$18,892	$120,117.71	$33,541.01
5	8	$30,472	$18,892	$224,604.23	$ -
6	8	$30,472	$18,892	$302,764.58	$ -

ANALYSIS OF ALTERNATIVE DEFINITION (SB 743 APPLICATION)

Additional criteria established by the State through legislative action (e.g., SB 743) was considered as Smart Growth criteria to ostensibly expand the application of such a TIF discount in El Dorado County. This will serve to increase the potential applicability of a TIF Smart Growth Discount. Based on the established discount percentage, the potential application of a Smart Growth Discount that meets the criteria below, the total fee amount to be discounted was estimated.

Section 15064.3 of the CEQA Guidelines makes CEQA screening provisions for residential development projects within one-half mile of an existing major transit site or stop along an existing high-quality transit corridor. Public Resources Code § 21064.3 defines major transit stops as a site containing an existing rail transit site or the intersection of at least two bus routes with a frequency of service interval of at least 15 minutes during the morning and afternoon peak commute periods. High-quality transit corridors are defined as having fixed route bus service with service intervals no longer than 15 minutes during the peak commute hours.

Within the study area, the only transit line that has the potential to meet the criteria is Line 50x – US 50 Express Service. It should be noted that the transit line currently does not meet the criteria. The transit line runs from the City of Folsom to the City of Placerville. To analyze this transit service line, a similar approach was taken as to the selected sites described above. A half mile buffer was created around each bus stop to determine the TAZs associated with each. It should be noted that bus stops outside of El Dorado County or within Placerville where County fees do not apply were not analyzed. **Figure 4** shows the buffer locations of each transit stop[2] analyzed. Furthermore, **Figure 5** and **Figure 6** show zoomed-in maps of the transit stop locations.[3]

2 https://eldoradotransit.com/routes/50-express/

3 Western El Dorado County 2019 Short- and Long- Range Transit Plan, Adopted November 2019.

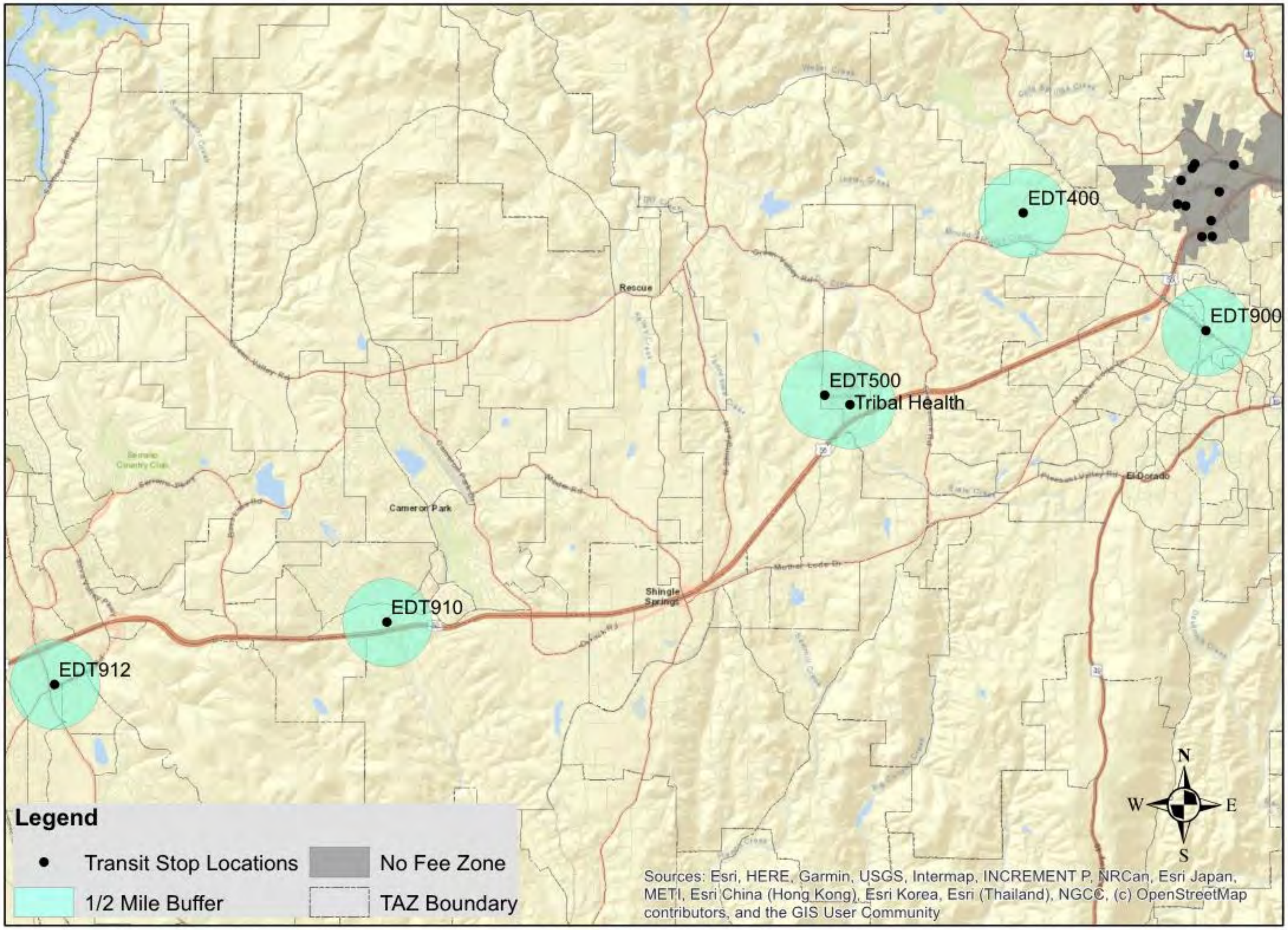


FIGURE 4. TRANSIT STOP BUFFERS

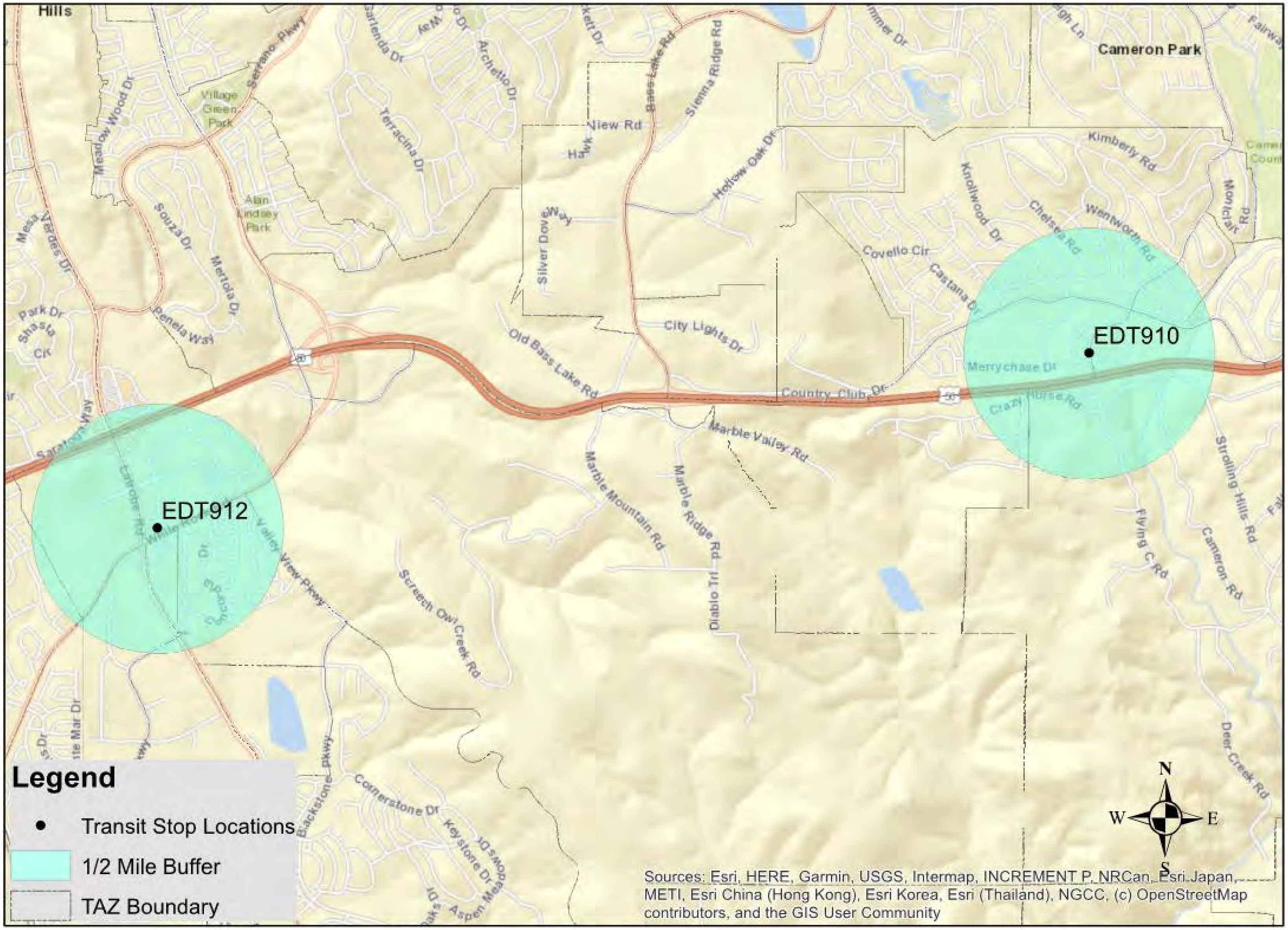


FIGURE 5. TRANSIT STOP BUFFERS – ZOOM 1

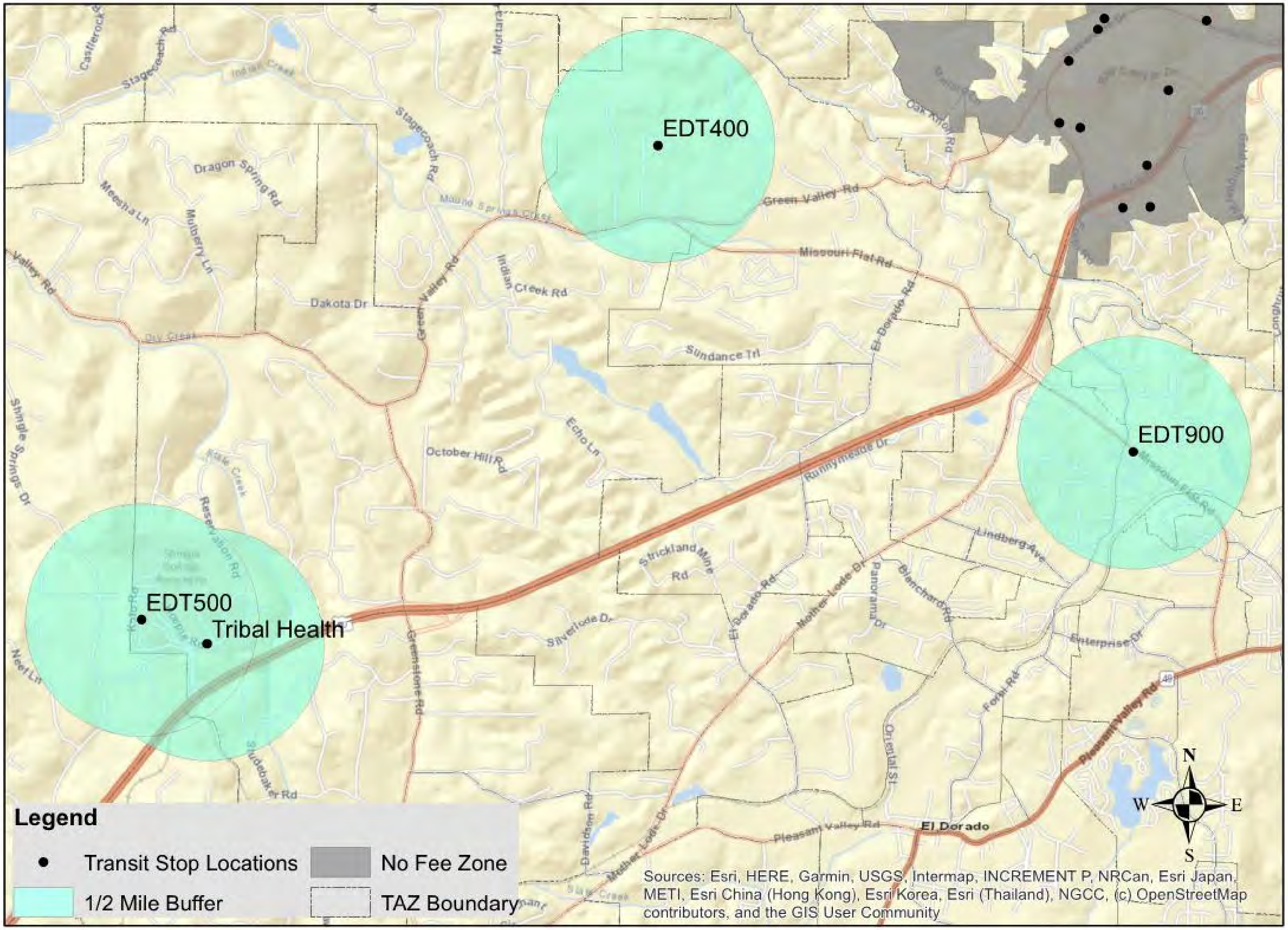


FIGURE 6. TRANSIT STOP BUFFERS – ZOOM 2

Once the buffers were created and the TAZ proportions determined, the EDCTDM land use data was used to determine the projected residential growth within each applicable US 50X transit stop buffers. The residential growth (expressed as either Single Family Dwelling Unit (SFDU) or Multi-family Dwelling Unit (MFDU)) was based on model land use from 2016 to 2040. To not over allocate growth, the same proportion determined for individual TAZs within the buffers was applied. **Table 3** shows the TIF zone each transit stop is located in, the TAZ proportions based on the transit stop buffers, the projected SFDU and MFDU growth, and the projected growth based on the TAZ ½ mile buffer proportions for each transit stop.

TABLE 3: TAZ PROPORTIONS AND FUTURE GROWTH

TAZ	TIF ZONE	PERCENT TAZ IN BUFFER	GROWTH		GROWTH PER TAZ	
			SFDU	MFDU	SFDU	MFDU
616	8	1%	310	1	4	0
182	2	18%	63	0	12	0
154	2	5%	150.1	23.9	8	1
169	8	65%	0	0	0	0
296	2	3%	72	0	2	0
275	2	12%	49.5	9.5	6	1
295	2	30%	0	0	0	0
269	3	1%	10	3	0	0
406	3	75%	0	0	0	0
393	3	63%	5	1	3	1
403	3	60%	1	0	1	0
409	3	0%	10.1	12	0	0
187	2	3%	8	0	0	0
165	8	5%	48	57	2	3
170	8	93%	26	0	24	0
173	8	12%	0	0	0	0
184	2	76%	26	9	20	7
186	2	81%	0	43	0	35
313	3	70%	35	0	24	0
298	2	19%	0	0	0	0
171	8	0%	0	0	0	0
185	2	50%	3	0	2	0
367	3	35%	0	0	0	0
404	3	72%	0	0	0	0
405	3	100%	0	0	0	0
400	3	57%	0	0	0	0

392	3	37%	0	0	0	0
318	3	1%	56	0	1	0
294	3	4%	24.6	7.4	1	0
322	3	1%	81.9	9.1	1	0
319	3	11%	20	0	2	0
183	2	5%	196.2	9.8	9	0
408	3	15%	0	0	0	0
180	8	1%	399	0	2	0
168	8	57%	3	0	2	0
164	8	1%	0	0	0	0
610	8	30%	0	0	0	0
172	8	100%	0	0	0	0

SFDU = Single Family Dwelling Unit
MFDU = Multi-Family Dwelling Unit

To determine the discounted fee amount, the same calculation was used based on the established TIF 15% Smart Growth discount. The residential TIF applied is based on the TIF zone a transit stop is located in. The discounted fee amount calculations is provided in **Table 4** below.

TABLE 4: DISCOUNTED FEE AMOUNT

	TIF ZONE	COST PER EDU		DISCOUNTED FEE AMOUNT	
		SFDU	MFDY	SFDU	MFDU
ALL TRANSIT STOPS	Varies	Varies	Varies	$451,053.63	$ 97,900.20
TOTAL				**$451,053.63**	**$ 97,900.20**

CONCLUSION: TOTAL DISCOUNTED FEE AMOUNT

Figure 7 shows the combined transit site and transit stop locations along with the half mile buffers. The final discounted fee amount calculations can be seen in **Table 5**. These assume the Transit Site is built and the service frequency of Line 50x all meet the two criteria established. Given that the TIF must be financially constrained, these discounted amounts would need to be off-set by increasing other portions of the fee if and when these discounts become effective.

Given that a key trigger for potentially “activating” the El Dorado TIF Smart Growth Discount is the construction of the proposed Transit Center, it is recommended that the County work closely with the Transit Authority and the El Dorado County Transportation Commission to encourage future investments in the Transit Center. This also serves as an incentive to the development community to support investments and TIF allocations for transit improvements to enable the County to qualify for the Smart Growth discounts to applicable residential developments.

TABLE 5: FINAL DISCOUNTED FEE AMOUNT

LOCATION	TIF ZONE	COST PER EDU		DISCOUNTED FEE AMOUNT	
		SFDU	MFDU	SFHH	MFHH
TRANSIT SITE LOCATIONS					
3	8	$30,472	$18,892	$120,117.71	$33,541.01
5	8	$30,472	$18,892	$224,604.23	$ -
6	8	$30,472	$18,892	$302,764.58	$ -
TRANSIT STOP LOCATIONS					
ALL TRANSIT STOPS	Varies	Varies	Varies	$451,053.63	$ 97,900.20
TOTAL					
GRAND TOTAL SITE LOCATION 3					**$ 702,612.55**
GRAND TOTAL SITE LOCATION 5					**$ 773,558.06**
GRAND TOTAL SITE LOCATION 6					**$ 851,718.41**

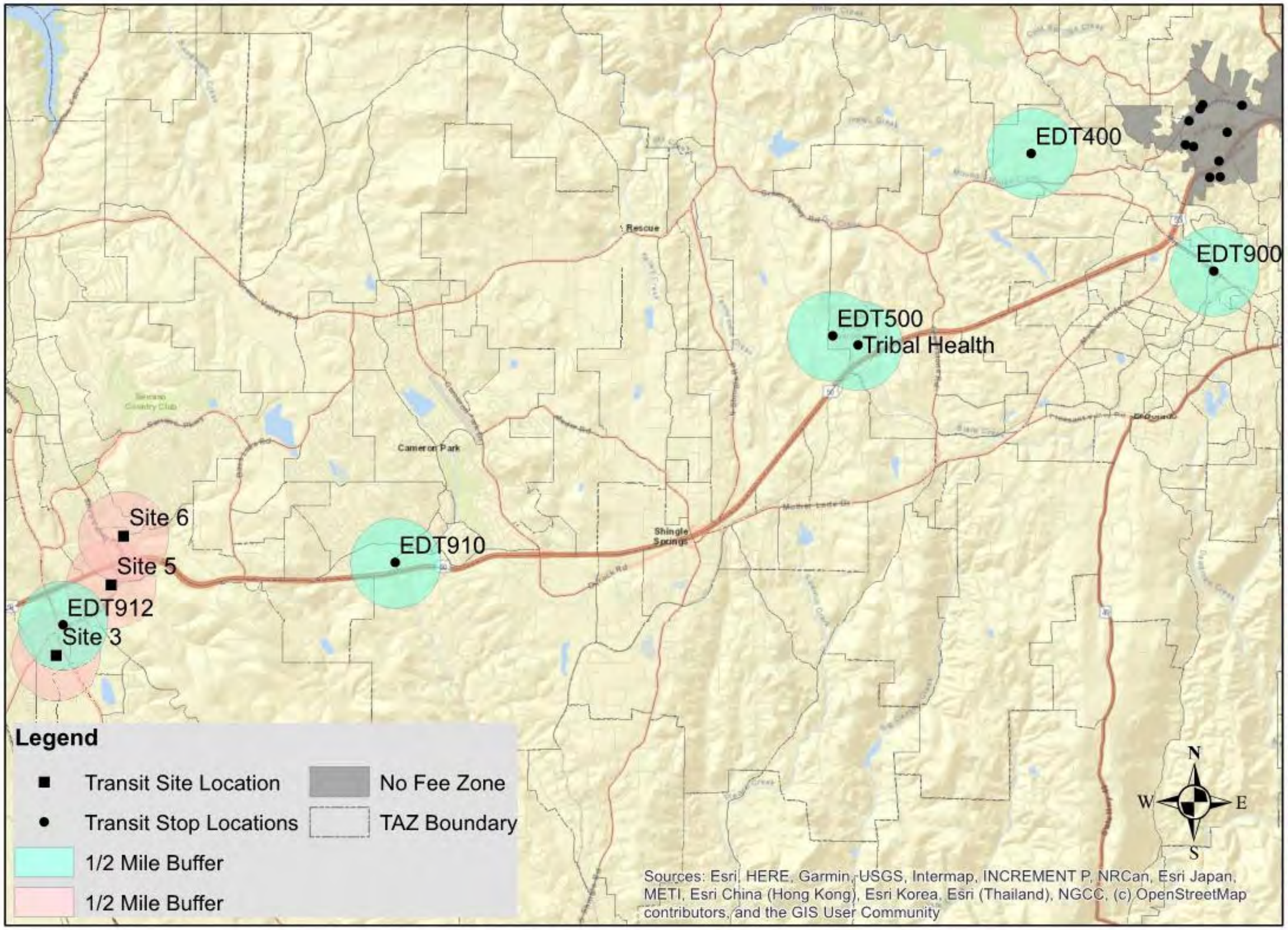


Figure 7. Transit Site and Stop Location Map

METHODOLOGY MEMORANDUM

DATE: November 17, 2020

TO: Natalie Porter, P.E., T.E. Senior Traffic Engineer, El Dorado County DOT

FROM: DKS and Kimley-Horn

SUBJECT: El Dorado County Traffic Impact Fee (TIF) Update: Needs Analysis Methodology Technical Memorandum — Project # 19203-000

EL DORADO COUNTY TIF UPDATE

This memorandum summarizes the methodology, parameters and analysis steps that DKS will use to perform peer review services for the El Dorado County TIF deficiency assessment. The traffic analysis will be performed Kimley-Horn using the approved tools and methods identified in the 2004 El Dorado County General Plan (Amended December 10, 2019) and are consistent with the analysis approach performed as part of the 2016 Western Slope CIP and TIF Update (December, 2016 with minor amendments in 2017 and 2018).

This memorandum includes the following sections. The last section (Analysis Steps) will include the recommended sequencing of peer review tasks.

- Traffic Analysis Methodology
- Traffic Analysis Assumptions
- Level of Service Standards
- Analysis Steps

TRAFFIC ANALYSIS METHODOLOGY

The following sections establish the methodologies used to determine operating conditions on roadways within El Dorado County.

LEVEL OF SERVICE (LOS)

LOS is a scoring system that evaluates traffic conditions at intersections or along roadway segments based on the amount of delay drivers are likely to experience due to congestion. LOS is a qualitative measure of the effect of a number of factors, including speed and travel time, traffic interruptions, freedom to maneuver, driving comfort and convenience. Levels of service are designated "A" through "F" from best to worst, which cover the entire range of traffic operations that might occur. Level of Service (LOS) "A" through "E" generally represents traffic volumes at less than roadway capacity, while LOS "F" represents over capacity and/or forced flow conditions[1].

COUNTY ROADWAYS

Roadway segment LOS will be determined by comparing traffic volumes on the study roadway segments with peak hour LOS capacity thresholds. The planning level capacity thresholds for different roadway classifications are shown in **Table 1**. These capacity thresholds are calculated based on the methodology contained in the Highway Capacity Manual 6th Edition (Transportation Research Board, 2015).

TABLE 1. LOCAL ROADWAYS LEVEL OFF SERVICE LOS CRITERIA

Functional Classification	Number of Lanes	Planning Level Volume Threshold (vehicles per hour)				
		LOS A	LOS B	LOS C	LOS D	LOS E
Arterial, Divided	4	-	-	1,430	2,910	3,180
	6	-	-	2,210	4,480	4,790
Arterial, Undivided	2	-	-	640	1,310	1,510
	3	-	-	890	1,620	1,730
	4	-	-	1,360	2,770	3.030
	5	-	-	1,850	3,220	3,290
Multi-Lane Highway	4	-	1,770	2,540	3,160	3,600

Notes:

Two-lane highway (and arterial 2-lane) thresholds are based on HCM 6th Edition, Exhibit 15-30, Class II Rolling, .09 K-factor, and D-factor of 0.6

Arterial volume thresholds are based on HCM 6th Edition, Exhibit 16-14, K-factor of 0.09, posted speed 45 mi/h

Volumes are for both directions

Volume thresholds for the seven or more arterial lanes will be calculated by linear extrapolation.

STATE HIGHWAYS

State highway LOS will be determined using the methodologies for freeways, multilane highways, and two-lane highways outlined in the HCM 6th Edition, Chapters 11, 14, and 15. For freeways and multilane highways density of the traffic stream determines LOS. Density measures the proximity of vehicles to each other in the traffic stream. Freeways and multilane highways will be evaluated using the HCM 6th Edition compatible spreadsheet models.

[1] SB 743 was signed into law in 2013 and becomes effective Statewide on July 1, 2020. Under SB 743, automobile delay, traditionally measured as level of service (LOS) will no longer be considered an environmental impact under CEQA. Instead, environmental impacts will be determined by changes to VMT. However, SB 743 has no bearing on the use of LOS for impact fee programs under AB1600 and subsequent legislation as codified in Government Code Section 66000 et seq ("Mitigation Fee Act").

For two-lane highways, the LOS calculation is dependent on the class of the roadway. The HCM defines the following two classes of two-lane highways:

- Higher Speed Highways: two-lane highways where the posted speed limit is greater than or equal to 50 mph and motorists expect to travel at high speeds.
- Lower Speed Highways: two-lane highways where the posted speed limit is less than 50 mph typically found along scenic routes, areas of rugged terrain, or moderately developed areas with higher densities of local traffic and roadside access.

All two-lane highway LOS is based on Follower Density expressed as passenger cars per mile per lane (pcpmpl). Two-lane highway analysis will be performed using the Highway Capacity Software (HCS) or HCS compatible Excel worksheets.

Table 2 and **Table 3** show the segment LOS criteria for multilane highways and two-lane highways, respectively, according to the HCM 6th Edition.

TABLE 2. MULTI-LANE STATE HIGHWAYS LOS CRITERIA

LOS	Free Flow Speed (mi/h)	Density (pc/mi/ln)
A	All	>0 -11
B	All	>11-18
C	All	>18-26
D	All	>26-35
E	60	>35-40
	55	>35-41
	50	>35-43
	45	>35-45
F	Demand Exceeds Capacity	
	60	>40
	55	>41
	50	>43
	45	>45
Based on *Highway Capacity Manual 6th Edition,* Transportation Research Board, Washington D.C, Exhibit 14-4		

TABLE 3. TWO-LANE STATE HIGHWAYS LOS CRITERIA

LOS	High-Speed Highways: Follower Density (pc/mi/l) Posted Speed Limit >= 50 mph	Low-Speed Highways: Follower Density (pc/mi/l) Posted Speed Limit < 50 mph
A	<= 2.0	<= 2.5
B	> 2 - 4	> 2.5 - 5
C	> 4 - 8	> 5 - 10
D	> 8 - 12	> 10 - 15
E	> 12	> 15
Based on *Highway Capacity Manual 6th Edition,* Transportation Research Board, Washington D.C., 2019 Supplement		

U.S. HIGHWAY 50

U.S. 50 mainline segments will be evaluated using the methodologies contained in the HCM 6th Edition. The LOS will be reported for each study segment type based on density measures.

Given a limitation of the latest Highway Capacity Software (HCS) for evaluating freeway segments with HOV lanes, freeway mainline segments will be evaluated using the HCM compatible spreadsheets. The freeway LOS criteria are provided in **Table 4**.

TABLE 4. FREEWAY MAINLINE LEVEL OF SERVICE (LOS) CRITERIA

LOS	Density (passenger cars per lane per mile)
A	≤11
B	>11-18
C	>18-26
D	>26-35
E	>35-45
F	>45 or Demand > Capacity
Based on *Highway Capacity Manual 6th Edition,* Transportation Research Board, Washington D.C., 2010, Exhibit 11-5	

TRAFFIC ANALYSIS ASSUMPTIONS

Generalized operational parameters that will be used for the traffic analysis are provided below:

Ideal Saturation Flow Rate:	Freeway General Purpose Lanes: HCM 6th Edition Exhibit 10-5; Multi-lane Highway Lanes: HCM 6th Edition Exhibit 14-4 Freeway HOV Lanes: 1,650[2] vehicles per hour per lane (vphpl); Freeway Auxiliary Lanes > 1 mile: 900[3] vphpl Freeway Auxiliary Lanes < 1 mile: 400 vphpl Intersection Approach Lanes: 1,900
Base Free Flow Speeds:	All: Posted speed limit plus 5 mph
Peak Hour Factor (PHF):	<u>Freeway mainline</u>: Existing: where counts exist: Caltrans Performance Measurement System (PeMS) and Caltrans Published Volumes; where counts do not exist: 0.92; Future: 0.92 <u>State Highways</u>: Existing: where counts exist: PeMs and Caltrans Published Volumes; where counts do not exist: 0.92; Future: 0.92
Peak Hour Directional (D) Factor:	Existing: Caltrans PeMS or Caltrans/County published reports Future: Same as Existing if available – other model D Factor
Peak Hour (K) Factor:	Existing: PeMS or Caltrans/County published reports Future: Same as Existing if available – other model K Factor
Traffic Volumes:	Existing: Freeways/State Highways: Caltrans published reports Existing: Local Roadways: County published data Future: Counts adjusted by model growth per NCHRP 255
Lane Width:	All: 12 feet, or consult Caltrans or County Staff
Driver Population Factor	All: 1.00
Ramp Density (ramps/mi)	Freeway mainline: Aerial measured
Access Density (points/mi)	State Highways/Local Roadways: Aerial measured
Heavy Vehicles:	State Highways– Caltrans published Truck Annual Average Daily Traffic (AADT) Data, or 5 percent default (4% on US 50); State Highways/Local Roadways – 5 percent default, or consult Caltrans or County staff

[2] Caltrans High-Occupancy Vehicle Guidelines, Caltrans 2003.

[3] 900 vphpl is a typical default assumption for auxiliary lanes greater than 1 mile and has been accepted by Caltrans in previous reports. See SC101 HOV Report June 2010.

LEVEL OF SERVICE STANDARDS

The following criteria determine whether vehicular traffic on a given roadway facility exceeds the standard operating conditions.

COUNTY ROADWAYS

Circulation Policy TC-Xd of the El Dorado County General Plan provides LOS standards for County-maintained roads and state highways as follows:

> *Level of Service (LOS) for County-maintained roads and state highways within the unincorporated areas of the county shall not be worse than LOS E in the Community Regions or LOS D in the Rural Centers and Rural Regions except as specified in Table TC-2. The volume to capacity ratio of the roadway segments listed in Table TC-2 shall not exceed the ratio specified in that table.*

Local roadways in the community regions will be evaluated against LOS E standard, while those in the rural regions and rural centers will be analyzed against LOS D. **Figure 1** shows LOS threshold on the local roadways, with exceptions listed in the Table TC-2 of the County's Circulation Element.

STATE FACILITIES

County's Policy TC-Xd is applicable not only to the County roadways, but also to the state facilities. As such, traffic conditions for state facilities within the unincorporated areas of the County shall not be worse than LOS E in the community regions and LOS D in the rural center and rural regions, with the exception of the locations specified in Table TC-3.

U.S. Highway 50

Table 5 presents LOS thresholds used for US 50. These standards are consistent with the concept LOS established by Caltrans, the County, and the Table TC-2 of the El Dorado County General Plan.

TABLE 5. US 50: CALTRANS CONCEPT LEVEL OF SERVICE

Location Description	Begin Post Mile	End Post Mile	Concept LOS
Sacramento/El Dorado County Line to Latrobe Road	0	0.857	LOS E
Latrobe Road to Cambridge Road	0.857	4.962	LOS D
Cambridge Road to Shingle Springs Drive	4.962	8.564	LOS E
Shingle Springs Drive to El Dorado Road	8.564	14.011	LOS D
El Dorado Road to Canal Street	14.011	17.52	LOS E
Canal Street to Mosquito Road	17.52	18.517	LOS F
Mosquito Road to Point View Drive	18.517	20.296	LOS E
Point View Drive to Old Highway, Camino	20.296	23.957	LOS D
Old Highway, Camino to Old Carson Road	23.957	34.219	LOS E
Old Carson Road to Ice House Road	34.219	39.772	LOS D
Ice House Road to Echo Lake Road	39.772	65.619	LOS F

Source: US 50 Transportation Concept Report and Corridor System Management Plan, Caltrans District 3, June 2014, 2004 El Dorado County General Plan, July 2004.

State Route 49

In the SR 49 Transportation Concept Report (Caltrans, 2000), the concept LOS is F south of the community of El Dorado and through the City of Placerville. All other segments have a concept LOS E. Since the County adopted exceptions for this roadway, County's LOS standard for rural community (LOS D) was used as the operational criteria for segments from Amador/El Dorado County Line to Union Mine Road and from SR193 (south) to SR193 (north).

State Route 193

In the SR 193 Transportation Concept Report (Caltrans, 2011), the concept LOS through El Dorado County is LOS D. The concept LOS is consistent with the County standard.

State Route 153

In the SR 153 Transportation Concept Report (Caltrans, 2011) a concept LOS of E is established for SR 153 within El Dorado County. Since the roadway runs through a defined rural community, the County's LOS D standard was used as the operational standard for this analysis.

ANALYSIS STEPS

This section describes the requisite steps required to perform the Needs Assessment for the 2020 Western Slope CIP and TIF Update.

Baseline Deficiency Assessment – Roadway Segments

The following steps are needed to perform the baseline analysis:

State Highways

- Coordinate with County to establish updated traffic volumes for state highways within El Dorado County. This includes the following:
    - State Highway System baseline volumes for US 50, SR 49 and SR 193.
    - Segmentation and volume based on most recently published Caltrans State Highway Volume Report.
    - Compute bi-direction AM/PM peak hour State Highway volumes through application of adjusting AADT by K and D factors (see Traffic Analysis Assumptions on p. 5)
    - Re-confirm HCM Class definitions for two-lane highway segments

- For Freeway and Multilane Highway Segments compute LOS based on HCM 6th Edition Operational Method (HCS or HCM compatible worksheets). For Two-Lane Highway Segments compute LOS based on HCM 6th Edition Operational Method (HCS).

Local County Roadways

- Coordinate with County to establish updated traffic counts for all County roadways analyzed previously (i.e., 2016 Major Update). If additional County roadway segments are considered, selection of roadways and roadway segmentation was based on the following criteria:
    - roadway/segment is currently listed in the County's current Capital Improvement Program;
    - roadway/segment was included as part of the County's Travel Demand Model baseline validation analysis;
    - roadway/segment is a critical high-volume location with known congestion issues;
    - roadway/segment is considered to have future importance for accommodating planned development growth.
    - Given the need for all future traffic projections to be adjusted based on the NCHRP 255 guidance principles, the choice of County roadway segments to analyze was contingent upon the availability of weekday (Tuesday-Thursday) daily and peak hour traffic counts (less than 3 years old).
- Given its geometric and operating characteristics, Green Valley Road segments# 51 and 53-62 will also be analyzed using the HCM 6th Edition Two-Lane Highway operational method.
- Determine baseline LOS and identify deficiencies for all roadway segments based on County standards (see Level of Service Methodology) and criteria (see Traffic Analysis Assumptions).

Future Deficiency Assessment – Roadway Segments

The following EDCTC TDM model runs are required to perform the TIF needs analysis:

- Baseline Model Run (AM/PM and Daily assignments): Baseline Network with Baseline Land Use; 5-D Turned Off.
- Future Baseline Model Run (AM/PM and Daily assignments): Future GP Land Use with Baseline network (no CIP improvements reflected); 5-D Turned Off.

Based on the above travel model output – perform the following analysis steps:

- For the baseline and future baseline model loaded networks, script/pull raw volumes for all state highway segments (AM/PM peak hour bi-directional volumes) and identified County roadways (daily volumes) based on the established model A-Node B-Node IDs developed in 2016. For the added segments and script output for baseline and future model volumes.
- Apply NCHRP workbook to perform post-processing of all "raw" model volumes (AM/PM peak hour bi-directional volumes for state highways segments and daily volumes for County roadway segments). The NCHRP process will include both Difference, Ratio and Average of

Difference and Ratio Methods. Workbook will compute the Annual Average Growth Rate (AAGR) resulting from the NCHRP 255 Method.

- For segments with a AAGR over 4% flag and examine for reasonableness – explanations for AAGR greater than 4% should be documented. If determined to be a ratio method (multiplicative) issue, the Difference Method result will be used in lieu of Average of Difference and Ratio Methods for these segments.

- Based on the finalized volume sets approved by the County - determine LOS and identify deficiencies for all roadway segments based on County standards (see Level of Service Methodology) and criteria (see Traffic Analysis Assumptions) consistent with the Baseline Deficiency Assessment.

- For segments at the cusp of an LOS deficiency, perform 3% Check. For identified "cusp" segments, adjust future post-processed volume by +3%. If segment triggers LOS deficiency identify as deficient[4].

- Finalize list of deficient segments based on future baseline assessment.

- Define logical project limits for identified deficiencies to formalize capital improvement projects (should coordinate this step with County and Civil sub-consultant as needed).

Future Deficiency Assessment – Parallel Capacity Facilities

To ensure that capacity increasing CIP improvements that divert demand from parallel deficient roadways will not obviate the need for direct improvements to these facilities, a Parallel Facility Assessment must be performed.

Based on the prior 2016 update, the following roadway extensions were analyzed.

- Saratoga Way Extension (based on providing parallel capacity to the US 50 segment - County Line to El Dorado Hills Boulevard deficiency)
- Country Club Drive (based on providing parallel capacity to the US 50 segment – El Dorado Hills Boulevard/Silva Valley Parkway to Cambridge Road Interchange deficiency)
- Diamond Springs Parkway (based on providing parallel capacity to Missouri Flat Road)
- Latrobe Connector (based on parallel capacity to the White Rock Road and Latrobe Road deficiencies)
- Headington Road Connector (based on parallel capacity to Missouri Flat Road)

Assuming these and possibly "new" parallel capacity CIP improvements identified in this current analysis are in place, several deficient segments may be shown to operate acceptably due to redistribution of traffic. These facilities would therefore be removed from the TIF CIP list.

[4] This step ensures a conservative margin of error is applied for determining if a given roadway segment will operate acceptably under future year forecast conditions.

The following EDCTC TDM model run is required to perform the Parallel Facility Assessment analysis:

- Future year forecast with Parallel Capacity CIP Improvements Model Run (AM/PM and Daily assignments): Future GP Land Use with Baseline Network plus parallel capacity improvements only.

Based on the above travel model output – perform the following analysis steps:

- Apply the "raw" model volume delta to the finalized AM/PM peak hour and daily volume sets approved by the County for identified parallel capacity roadways.
- Based on the adjusted volumes, re-determine LOS for identified parallel capacity roadway segments based on County standards (see Level of Service Methodology) and criteria (see Traffic Analysis Assumptions) consistent with the Baseline Deficiency Assessment.
- For roadways shown to be deficient under future baseline conditions that now meet County standards with parallel facility capacity improvements – remove from TIF CIP list consideration. Note: local County roadway parallel improvements have CIP priority over state highway facility CIP improvements.

Future Deficiency Assessment – Interchange Facilities

The following 21 interchanges operate along US 50 in El Dorado County:

1. El Dorado Hills Boulevard Interchange
2. Silva Valley Parkway Interchange (under construction)
3. Bass Lake Road Interchange
4. Cambridge Road Interchange
5. Cameron Park Drive Interchange
6. Ponderosa Road Interchange
7. Shingle Springs Drive Interchange
8. Red Hawk Parkway Interchange
9. Greenstone Road Interchange
10. El Dorado Road Interchange
11. Missouri Flat Road Interchange
12. Placerville Drive (West) Interchange
13. Ray Lawyer Drive Interchange
14. Placerville Drive (East) Interchange
15. Mosquito Road Interchange
16. Schnell School Road Interchange
17. Point View Drive Interchange
18. Smith Flat Road Interchange
19. Cedar Grove/Camino Interchange
20. Pollock Pines/Cedar Grove Interchange
21. Sly Park Road Interchange

The prior 2016 analysis determined the operating status of interchanges based on the segment LOS of the under- or over-crossing service roads. However, for the interchange listed below, a more detailed screening assessment was performed. For each interchange (both TIF CIP and non-TIM Fee CIP interchange), ramp and interchange over-crossing link volumes were compared between the previous County model and the 2016 updated County model. If the updated model yielded equal or higher volumes (in absolute terms) or an equal or higher traffic growth rate at one or more ramps and/or overcrossing, the previously identified deficiency was considered reaffirmed.

- El Dorado Hills Boulevard Interchange
- Silva Valley Parkway Interchange
- Bass Lake Road Interchange
- Cambridge Road Interchange
- Cameron Park Drive Interchange
- Ponderosa Road Interchange
- El Dorado Road Interchange
- Missouri Flat Road Interchange

If the above screening assessment holistically lower forecasted volumes at a given interchange, a new operationally based analysis was performed. This was required for the following three interchanges.

Guidance for the analysis of interchanges is flexible but should emulate the operational analyses performed in 2016. Availability of recent AM/PM peak hour turn movement count data (less than 3-years old) and/or collecting new representative data during the COVID-19 pandemic conditions may be challenge. Representative (pre-COVID) turn movements will be provided by the County and/or existing traffic studies.

Capacity Threshold Analysis

The following EDCTC TDM model run is required to perform the Capacity Threshold Analysis:

- Future year forecast with all CIP Improvements (AM/PM and Daily assignments): Future GP Land Use with all CIP improvements reflected)

Based on the above travel model output – perform the following analysis steps:

- Using linear interpolation of projected volumes, re-analyze operations of each deficient segment and interchange to identify when (i.e., analysis year between baseline and 2040) each CIP improvement would be triggered.

- Coordinate with County staff to classify these improvements as short-term – mid-term or long-term improvements.

Memorandum

To: Natalie Porter, P.E., T.E.
El Dorado County

From: Chris Gregerson, P.E., T.E., PTOE, PTP
Mike Schmitt, AICP CTP, PTP, RSP[1]

Re: 2020 Technical TIF Program Update
Study Findings and Summary of Effort

Date: November 23, 2020

The purpose of this technical memorandum is to summarize activities undertaken to update the El Dorado County (EDC) Traffic Impact Fee (TIF) Program (formerly known as the Traffic Impact Mitigation (TIM) Fee Program). Specifically, this memorandum includes the following:

- **Background** discussion regarding the TIM Fee Update
- Overview of **Updates to Travel Demand Model** including land use
- Overview of **Level of Service Standards** updates and methodologies
- Results of the **Deficiency Analysis**
- **TIF Program Improvements and Fair Share Calculations**

Background

The current TIF Program was adopted by Board Resolution 077-2018 on June 26, 2018. The TIF Program is used to fund transportation improvements over the next 20 years in the unincorporated area of the west slope of El Dorado County (generally defined as the unincorporated area of the County west of the Sierra crest as defined by the TIM Fee Zone boundaries in the TIM Fee Program Schedule). Improvements funded by the TIF Program include new roadways, roadway widenings, roadway intersection improvements and, where appropriate, bridge, safety, and transit improvements.

In conjunction with the newly adopted Capital Improvement Program (CIP), EDC has undertaken this update to their TIF Program. The purpose of this update is to re-evaluate the deficiency list based on the most recent version of the Highway Capacity Manual, as required by General Plan Policy TC-Xd. In addition, the following activities were carried out related to the EDC Travel Demand Model: (1) specific land use updates were made as directed by EDC staff; and (2) land use outside of the County was updated to reflect current Sacramento Area Council of Governments (SACOG) control totals.

Updates to Travel Demand Model

El Dorado County provided Kimley-Horn with the version of the County's Travel Demand Model (TDM) that resulted from the 2018 Minor TIM Fee Update, along with accompanying analysis files. Based on direction from County staff, land use updates were completed to bring the model to a base year of 2018, up from 2016, and update the future 2040 land uses to reflect the growth rate adopted by the County Board.

Land use assumptions outside of the County were also updated to reflect current information regarding land use in the area west of the County line. This area of the model is referred to as the "buffer area" and its purpose is to improve model performance by providing land use assumptions that produce traffic assignment for vehicles entering and leaving the County.

These updates in the "buffer area" included recent updates for the City of Folsom, the City of Rancho Cordova, and Sacramento County. The update was performed by aggregating parcel data from SACOG's newest version of the SACSIM model (SACSIM19), developed as part of the SACOG's 2020 MTP/SCS, into the County's TAZ structure using GIS methods. The resultant land use totals by TAZ were tabulated into aggregate totals and matched to current SACOG SACSIM control totals for the "buffer area."

Deficiency Analysis

Level of Service Definitions

Analysis of transportation facility significant deficiencies is based on the concept of Level of Service (LOS). The LOS of a facility is a qualitative measure used to describe operational conditions. LOS ranges from A (best), which represents minimal delay, to F (worst), which represents heavy delay and a facility that is operating at or near its functional capacity. Levels of Service were determined using methods defined in the *Highway Capacity Manual (HCM), 6th Edition*.

Table 1 below displays the segment thresholds by facility type for both HCM 2010 and HCM 6th Edition as well as the differences between the two. The factors used to develop the LOS threshold volumes shown included: K-factor of 0.09, D-factor of 0.60, rolling terrain (where applicable), and urban instead of rural. These factors were developed based on local data and the context of the County as a whole. As is shown in Table 1, the large majority of thresholds found in the HCM 6th Edition are lower than those found in HCM 2010. The few exceptions include freeway thresholds for LOS B through LOS D, and LOS E threshold for 6-lane divided arterials.

El Dorado County guidelines state that the LOS threshold for facilities within the Community Region boundary is LOS E, while the facilities in the rural parts of the County have a LOS threshold of LOS D. The LOS for arterials analyzed as a part of this effort was determined using the thresholds described in Table 1.

Two-Lane Highway Facility Analysis

The HCM procedures for analyzing two-lane roadway segments has been updated recently to reflect new research on how these facilities operate. Using the new analysis methodology, LOS is determined based on the density of followers in the traffic stream. Previously the LOS calculation was dependent on the class of the roadway, but all roadways are now treated equally. Instead, the features of the roadway such as the shoulder width, ability to pass other vehicles, speed, lane width, grade, access points, directional volume split, and percentage of heavy vehicles all help to determine the LOS of the facility. The LOS criteria for two-lane roadway segments is shown in Table 2, below.

Multilane Highway Facility Analysis

For multilane roadways segments, LOS is determined based on the density of the traffic stream. The LOS criteria for multi-lane roadway segments are shown in Table 3, below.

Freeway Facility Analysis

El Dorado County's traffic study guidelines specify the use of vehicle density (passenger cars/mile/lane) as the appropriate measure of effectiveness for freeway facilities. The LOS criteria for basic freeway segments and freeway merge/diverge segments are summarized in Table 4.

Table 1 – HCM 2010 and HCM 6th Edition Roadway Segment Thresholds by Facility Type

CLASS		HCM 2010 LOS					HCM 6th Edition					Delta between HCM 6th Edition and HCM 2010 LOS				
		A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
2R	Minor Two-Lane Highway	-	330	710	1,310	2,480	-	330	710	1,310	2,480	-	0	0	0	0
2U	Major Two-Lane Highway	-	330	710	1,310	2,480	-	330	710	1,310	2,480	-	0	0	0	0
4M	Multilane Four-Lane Highway	-	1,790	2,580	3,290	3,660	-	1,770	2,540	3,160	3,600	-	(20)	(40)	(130)	(60)
2A	Two-Lane Arterial	-	-	850	1,540	1,650	-	-	640	1,310	1,510	-	-	(210)	(230)	(140)
4AU	Four-Lane Arterial, Undivided	-	-	1,760	3,070	3,130	-	-	1,360	2,770	3,030	-	-	(400)	(300)	(100)
4AD	Four-Lane Arterial, Divided	-	-	1,850	3,220	3,290	-	-	1,430	2,910	3,180	-	-	(420)	(310)	(110)
6AD	Six-Lane Arterial, Divided	-	-	2,760	4,680	4,710	-	-	2,210	4,480	4,790	-	-	(550)	(200)	80
2F	Two Freeway Lanes	-	2,070	2,880	3,590	4,150	-	2,150	2,960	3,610	4,100	-	80	80	20	(50)
2FA	Two Freeway Lanes + Auxiliary Lane	-	2,610	3,630	4,520	5,230	-	3,150	3,960	4,610	5,100	-	540	330	90	(130)
3F	Three Freeway Lanes	-	3,100	4,320	5,380	6,230	-	3,230	4,440	5,420	6,150	-	130	120	40	(80)
3FA	Three Freeway Lanes + Auxiliary Lane	-	3,640	5,070	6,320	7,310	-	4,230	5,440	6,420	7,150	-	590	370	100	(160)
4F	Four Freeway Lanes	-	4,140	5,760	7,180	8,310	-	4,300	5,930	7,220	8,200	-	160	170	40	(110)
W22	Minor Two-Lane Highway	-	330	710	1,310	2,480	-	330	710	1,310	2,480	-	0	0	0	0
W20	Minor Two-Lane Highway	-	330	710	1,310	2,480	-	330	710	1,310	2,480	-	0	0	0	0
W18	Minor Two-Lane Highway	-	330	710	1,310	2,480	-	330	710	1,310	2,480	-	0	0	0	0

Notes:

(1) Threshold reductions between HCM 2010 and HCM 6th Edition are shown in red text and highlighted

(2) HCM 2010 Freeway LOS based on Exhibit 10-8, Urban Area, Rolling Terrain, K-factor of 0.09, and D-factor of 0.60

(3) HCM 6th Edition Freeway LOS based on Exhibits 12-39 and 12-40, Urban Area/Rural Area, Rolling Terrain, K-factor of 0.09, and D-factor of 0.60

(4) HCM 2010 Multilane Highway LOS based on Exhibit 14-19, Urban Area/Rural Area, Rolling Terrain, K-factor of 0.09, and D-factor of 0.60

(5) HCM 6th Edition Multilane Highway LOS based on Exhibits 12-41 and 12-42, Urban Area/Rural Area, Rolling Terrain, K-factor of 0.09, and D-factor of 0.60

(6) HCM 2010 2-lane highway LOS based on Exhibit 15-30, Class II Rolling, 0.09 K-factor, and D-factor of 0.60

(7) HCM 6th Edition 2-lane highway LOS based on Exhibit 15-46, Class II Rolling, 0.09 K-factor, and D-factor of 0.60

(8) HCM 2010 Arterial LOS based on Exhibit 16-14, K-factor of 0.09, D-factor of 0.60, posted speed 45 mi/h

(9) HCM 6th Edition Arterial LOS based on Exhibit 16-16, K-factor of 0.09, D-factor of 0.60, posted speed 45 mi/h

Table 2 – Two-Lane Roadway Segment Level of Service Criteria

Level of Service (LOS)	Follower Density (followers/mi/ln)	
	Posted Speed Limit ≥ 50 mph	Posted Speed Limit ≤ 50 mph
A	≤ 2.0	≤ 2.5
B	> 2.0 – 4.0	> 2.5 – 5.0
C	> 4.0 – 8.0	> 5.0 – 10.0
D	> 8.0 – 12.0	> 10.0 – 15.0
E	> 12.0	> 15.0

Source: Highway Capacity Manual, 6th Edition, Version 6.1 (pre-publication)

Table 3 – Multi-Lane Roadway Segment Level of Service Criteria

Level of Service (LOS)	Free Flow Speed (mph)	Density (pc/mi/ln)
A	All	> 0 – 11
B	All	> 11 – 18
C	All	> 18 – 26
D	All	> 26 – 35
E	60 55 50 45	> 35 – 40 > 35 – 41 > 35 – 43 > 35 – 45
F (demand exceeds capacity)	60 55 50 45	> 40 > 41 > 43 > 45

Source: Highway Capacity Manual, 6th Edition

Table 4 – Freeway Facility Level of Service Criteria

Level of Service (LOS)	Basic Segments Density (pc/mi/ln)	Merge/Diverge Segments Density (pc/mi/ln)	Weave Segments Density (pc/mi/ln)
A	≤ 11	≤ 10	≤ 10
B	> 11 – 18	> 10 – 20	> 10 – 20
C	> 18 – 26	> 20 – 28	> 20 – 28
D	> 26 – 35	> 28 – 35	> 28 – 35
E	> 35 – 45	> 35	> 35 – 43
F*	> 45*	*	> 43*

Source: Highway Capacity Manual, 6th Edition

* Demand exceeds capacity

Auxiliary Lane Analysis

The freeway analysis and existing CIP document informed the selection of auxiliary lanes to be analyzed. The methodology for weaving analysis was updated for the HCM 6th Edition, but the determination of LOS is based on density described for freeway facilities as shown in **Table 4**.

The completion of the deficiency analysis included analyzing two different conditions, the 2040 unimproved condition (future land use on existing roadway network) and the future improved condition (future land use on CIP network, the existing roadway network plus the parallel facilities). The County provided all traffic analysis files from the previous TIF Program update effort and operational and planning level traffic analyses, consistent with the 2018 Minor TIM Fee Update, were completed based on the updated model described previously. The traffic analyses included:

1. Roadway Segment Analysis – 57 County roadways spanning nearly 150 segments as well as the entire state highway system located within El Dorado County spanning 60 segments.
2. Interchange Analysis – This analysis methodology was carried forward from 2018 Minor TIM Fee update. Volumes for the PM peak-hour in 2040 for the on- and off-ramps, as well as the overpass, were compared to previous model volumes under the assumption that if model volumes are greater, the same improvements would be necessary. This comparison is shown in **Table 5**, below. Based on the comparison it was determined that additional analyses were required for the Bass Lake Road, Cameron Park Drive, and Ponderosa Road interchanges.
3. Parallel Facility Analysis – Several roadway segments that will be constructed or improved in the future (Saratoga Way extension, Country Club Drive realignment and extension, Diamond Springs Parkway, Headington Road, and the Latrobe Road Connector) were analyzed for the 2040 scenario due to previously identified deficiencies.

Table 5 – Interchange Volume Comparison

Interchange	Previous Model - Future PM Peak							
	Ramps					Overpass		
	EB OFF	EB ON	WB OFF	WB ON	Tot_Ramps	NB	SB	Total Ovrpas
El Dorado Hills Blvd	1368	1073	1086	941	4468	2678	2262	4940
Silva Valley Pkwy	1252	1531	1469	694	4946	1613	1856	3469
Bass Lake Rd	897	376	506	670	2449	878	427	1305
Cambridge Rd	892	154	152	586	1784	873	190	1063
Cameron Park Dr	1523	454	797	1228	4002	1961	849	2810
Ponderosa Rd	1075	640	735	874	3324	1266	826	2092
El Dorado Rd	205	342	305	187	1039	265	425	690
Interchange	Current Model (2020) - Future PM Peak							
	Ramps					Overpass		
	EB OFF	EB ON	WB OFF	WB ON	Tot_Ramps	NB	SB	Total Ovrpas
El Dorado Hills Blvd	2656	934	361	1627	5578	2995	1188	4183
Silva Valley Pkwy	881	249	609	675	2414	1461	795	2256
Bass Lake Rd	977	153	230	612	1972	951	207	1158
Cambridge Rd	673	162	239	250	1324	689	228	917
Cameron Park Dr	737	582	521	725	2565	915	938	1853
Ponderosa Rd	1029	255	278	687	2249	1106	490	1596
El Dorado Rd	147	113	112	69	441	169	162	331
	shows locations where TIM fee CIP project was identified							
	indicates where the current model is greater than the previous model							

Traffic analysis assumptions (D-Factor, K-Factor, PHF, Post-Processing etc.) from the 2018 Minor TIM Fee Update were maintained for this analysis. The results of the deficiency analysis can be seen in **Appendix A**. Those facilities that were found to be deficient are listed below.

- Cameron Park Drive, South of Toronto Road
- Green Valley Road, East of Francisco Drive
- White Rock Road, East of Post Street
- White Rock Road, West of Windfield Way
- Missouri Flat Road, South of China Garden Road
- Pleasant Valley Road, East of SR-49
- Latrobe Road, North of Golden Foothill Parkway (N)
- Westbound US-50, El Dorado Hills Boulevard to the El Dorado County Line

While no two-lane state highways were found to be deficient at this time, several locations would not provide for any feasible mitigations should they be found to be deficient in the future. One possible solution would be the inclusion of passing lanes rather than a complete widening as described in further detail in the memo previously published as part of the 2018 Minor TIM Fee Update[1].

TIF Program Improvements and Fair Share Calculations

As completed previously, for identified TIF Program improvements, the following analyses were completed:

1. Capacity Threshold Analysis – As with the previously completed analyses, a capacity threshold analysis was performed for each identified TIF Program improvement to determine a timeframe at which current County facilities would exceed the County's LOS thresholds. The improvement projects were designated to the 5-Year, 10-Year, and 20-Year CIP Project lists as shown in **Table 6**.
2. Fair Share Percentages – Fair share percentages were completed in order to facilitate the determination of cost sharing for each project by TIF Program zone. This was completed using a select link analysis and categorizing trips by origin and destination.

Capacity Threshold Analysis

To complete the capacity threshold analysis, each identified TIF Program improvement was analyzed year by year to determine in which year between the 2020 and 2040 the facility is required to be constructed. Once this year was determined, the facility was assigned to a corresponding CIP year (2020, 2025, 2030, 2035, or 2040) as shown in **Table 6** below.

Fair Share Calculations

The fair share percentages were determined by using the EDC Travel Demand Model to determine the origins and destinations by TAZ of every vehicle that traveled over each of the roadways associated with the TIF Program improvements. This was completed by conducting a select link run on each of the TIM Fee improvement segments in 2018 and 2040 and calculating the growth between the two. For the Highway 50 auxiliary lane, a select link was performed on the corresponding general-purpose lane and in the case of interchanges, on the ramps and overcrossings comprising that interchange. The daily trip tables associated with the growth of traffic on the roadway segments associated with the TIF Program improvements and produced by the select link model runs, were then used to determine whether the trip origin/destination pair occurred entirely within the County (internal-internal), had one end in the County and one end outside the County or in Placerville (internal-external or external-internal), or both started

[1] *Vehicle Turnout Analysis for SR 193 and SR 49*. Kimley-Horn. February 15, 2018.

and ended outside of the County (external-external). These trips were further segmented by determining in which TIF Program Zone the origin and destination occurred and segmenting it into internal-internal, internal-external, external-internal, and external-external categories based on TIF Program zones rather than County boundaries. A trip occurring entirely within a TIF Program zone was counted as one trip while a trip that only started or ended within the TIF Program zone was counted as half a trip for that zone. The total number of trips associated with each TIF Program zone were then divided by the total number of new trips (difference between 2040 and 2018 conditions) to determine the fair share percentage. In the event that this identified deficiency existed under the 2018 condition, the fair share was calculated based on all trips (not just the new trips). These percentages can be seen in **Appendix B**.

Table 6 – Improvement Projects Priority List

Segment #	Roadway Name	Location	Trigger
R-1	Cameron Park Dr	Palmer Dr to Toronto Rd	By 2020
R-3	Green Valley Rd	Francisco Dr to Loch Way	By 2035
R-4	White Rock Rd	Post St to Silva Valley Pkwy Interchange	By 2025
R-5	Missouri Flat Rd	China Garden Rd to SR-49	By 2020
R-6	Saratoga Way (2 to 4 Lanes)	El Dorado Hills Blvd to Wilson Blvd	By 2040
R-7	Country Club Dr	El Dorado Hills Blvd to Silva Valley Pkwy	By 2040
R-8	Country Club Dr	Silva Valley Pkwy to Tong Rd	By 2025
R-9	Country Club Dr	Tong Rd to Bass Lake Rd	By 2025
R-10	Country Club Dr	Bass Lake Rd to Tierra de Dios Dr	By 2025
R-11	Diamond Springs Pkwy	Missouri Flat Rd to SR-49	By 2025
R-12	Latrobe Connector	White Rock Rd to Golden Foothill Pkwy	By 2030
R-13	Headington Rd	El Dorado Rd to Missouri Flat Rd	By 2040
R-14	Bass Lake Rd	US-50 to Country Club Dr (Realigned)	By 2030
R-16	White Rock Rd	County Line to Windfield Way	By 2030
R-17	Latrobe Rd	Golden Foothill Pkwy (N) to White Rock Rd	By 2040
R-18	Pleasant Valley Rd	SR-49 (N) to Toyan Dr	By 2020
A-1	US-50 Westbound	El Dorado Hills Blvd to County Line	By 2030
I-1	US-50	El Dorado Hills Blvd/Latrobe Rd	By 2030
I-2	US-50	Silva Valley Pkwy	By 2040
I-3	US-50	Bass Lake Rd	By 2025
I-4	US-50	Cambridge Rd	By 2040
I-5	US-50	Cameron Park Dr	By 2040
I-6	US-50	Ponderosa Rd/S Shingle Rd	By 2025
I-7	US-50	El Dorado Rd	By 2040

Appendix A – Level of Service Results

Two-Lane Highway Level of Service Results

Route	Seg	NB/EB Postmile	SB/WB Postmile	Segment Length	North/East of Segment	South/West of Segment	LOS Threshold	Eastbound						Westbound					
								AM Peak			PM Peak			AM Peak			PM Peak		
								Percent Followers (%)	Followers Density	LOS[1]	Percent Followers (%)	Followers Density	LOS[1]	Percent Followers (%)	Followers Density	LOS[1]	Percent Followers (%)	Followers Density	LOS[1]
49	1	0	1.65	1.65	AMADOR/EL DORADO COUNTY LINE	NASHVILLE, SOUTH	D	36.1%	1.5	A	20.4%	0.3	A	16.7%	0.2	A	38.0%	1.7	A
49	2	1.65	8.352	6.702	NASHVILLE, SOUTH	CHINA HILL ROAD	D	46.5%	3.0	B	25.3%	0.6	A	21.0%	0.3	A	48.7%	3.4	B
49	3	8.352	9.494	1.142	CHINA HILL ROAD	EL DORADO, UNION MINE ROAD	D	59.7%	6.6	C	34.7%	1.4	A	29.3%	0.9	A	58.2%	6.1	C
49	4	9.494	9.641	0.147	EL DORADO, UNION MINE ROAD	EL DORADO, PLEASANT VALLEY ROAD	E	60.9%	20.5	E	40.5%	4.9	B	31.0%	1.1	A	64.0%	8.9	D
49	5	9.641	11.239	1.598	EL DORADO, PLEASANT VALLEY ROAD	MISSOURI FLAT ROAD	F	77.9%	23.3	E	54.7%	6.4	C	48.0%	6.8	C	77.6%	43.7	E
49	6	11.239	11.859	0.62	MISSOURI FLAT ROAD	DIAMOND SPRINGS, PLEASANT VALLEY ROAD	F	81.3%	34.1	E	57.0%	8.3	C	50.0%	5.4	C	82.3%	35.8	E
49	7	11.859	14.463	2.604	DIAMOND SPRINGS, PLEASANT VALLEY ROAD	PLACERVILLE, FISKE ROAD	E	68.2%	10.8	D	41.9%	2.3	A	42.1%	2.3	A	69.8%	11.9	D
49	8	14.463	14.597	0.134	PLACERVILLE, FISKE ROAD	PLACERVILLE, PACIFIC/ MAIN STREETS	E	66.8%	24.3	E	46.4%	6.5	C	39.5%	2.9	B	70.7%	21.0	E
49	9	14.597	14.891	0.294	PLACERVILLE, PACIFIC/ MAIN STREETS	PLACERVILLE, JCT. RTE. 50	F	71.5%	30.1	E	50.6%	8.2	C	44.3%	5.1	C	73.4%	32.4	E
49	10	14.891	15.685	0.794	PLACERVILLE, JCT. RTE. 50	JCT. RTE. 193 NORTH	F	59.4%	19.8	E	39.5%	4.7	B	37.6%	4.3	B	62.3%	25.7	E
49	11	15.685	16.44	0.755	JCT. RTE. 193 NORTH	DIANA STREET	D	54.8%	8.4	C	35.4%	2.1	A	30.2%	1.3	A	57.0%	9.1	C
49	12	16.44	19.42	2.98	DIANA STREET	GOLD HILL ROAD	D	56.0%	6.1	C	36.9%	1.5	A	33.2%	1.1	A	57.6%	6.7	C
49	13	19.42	22.865	3.445	GOLD HILL ROAD	COLOMA, JCT. RTE. 153 WEST	D	39.1%	2.5	B	25.1%	0.7	A	21.7%	0.5	A	41.1%	2.9	B
49	14	22.865	24.48	1.615	COLOMA, JCT. RTE. 153 WEST	MARSHALL GRADE ROAD (TO GEORGETOWN)	D	58.3%	8.0	C	37.2%	2.0	A	31.1%	1.2	A	60.3%	8.7	C
49	15	24.48	28.19	3.71	MARSHALL GRADE ROAD (TO GEORGETOWN)	HASTINGS CREEK BRIDGE	D	39.9%	2.8	B	23.8%	0.7	A	23.6%	0.7	A	41.9%	3.2	B
49	16	28.19	34.466	6.276	HASTINGS CREEK BRIDGE	COOL, JCT. RTE. 193 EAST	D	40.7%	2.1	B	23.9%	0.5	A	19.8%	0.3	A	42.4%	2.4	B
49	17	34.466	38.233	3.767	COOL, JCT. RTE. 193 EAST	EL DORADO/PLACER COUNTY LINE	F	66.6%	9.5	D	43.4%	2.4	B	37.9%	1.6	A	69.2%	11.0	D
50	25	31.299	34.219	2.92	SLY PARK ROAD	ICEHOUSE ROAD	E	30.7%	1.4	A	47.4%	4.2	C	42.9%	3.2	B	34.8%	1.9	A
50	27	39.772	46.592	6.82	ICEHOUSE ROAD	W O ALDER RIDGE ROAD	F	50.5%	3.6	B	69.0%	10.2	D	64.7%	8.1	D	55.1%	4.7	C
50	28	46.592	48.952	2.36	W O ALDER RIDGE ROAD	SILVER FORK ROAD	F	42.2%	3.0	B	62.3%	9.0	D	58.0%	7.2	C	46.4%	3.9	B
50	29	48.952	53.732	4.78	SILVER FORK ROAD	WRIGHTS LAKE ROAD	F	42.1%	3.0	B	62.2%	8.8	D	64.8%	8.1	D	54.5%	4.6	C
50	30	53.732	57.892	4.16	WRIGHTS LAKE ROAD	STRAWBERRY LN	F	42.1%	3.0	B	62.2%	8.8	D	58.0%	7.1	C	46.4%	3.8	B
50	31	57.892	60.192	2.3	STRAWBERRY LN	SLIPPERY FORD ROAD	F	42.2%	3.0	B	62.2%	8.9	D	58.0%	7.2	C	46.4%	3.8	B
50	32	60.192	63.522	3.33	SLIPPERY FORD ROAD	SIERRA-AT-TAHOE ROAD	F	42.1%	3.0	B	62.7%	9.1	D	64.8%	8.2	D	54.6%	4.6	C
50	33	63.522	65.619	1.83	SIERRA-AT-TAHOE ROAD	ECHO LAKE ROAD	F	42.1%	3.0	B	62.7%	9.0	D	58.0%	7.1	C	46.4%	3.8	B
153	1	0	0.12	0.12	JCT. RTE. 49	COLD SPRINGS ROAD	D	25.4%	1.0	A	34.8%	2.7	B	33.7%	2.4	A	31.2%	1.9	A
153	2	0.12	0.55	0.43	COLD SPRINGS ROAD	MARSHALL'S MONUMENT	D	15.2%	0.1	A	15.2%	0.1	A	15.2%	0.1	A	15.2%	0.1	A
193	1	0	0.856	0.856	COOL, JCT. RTE. 49	AMERICAN RIVER ROAD	D	29.5%	0.9	A	52.5%	4.4	C	52.9%	4.5	C	35.4%	1.5	A
193	2	0.856	2.169	1.313	AMERICAN RIVER ROAD	AUBURN LAKE TRAIL ROAD	D	26.2%	0.7	A	47.6%	3.4	B	48.0%	3.4	B	31.6%	1.1	A
193	3	2.169	12.19	10.021	AUBURN LAKE TRAIL ROAD	EVERGREEN COURT ROAD	D	31.7%	1.0	A	52.1%	4.4	B	52.5%	4.5	B	36.4%	1.5	A
193	4	12.19	12.699	0.509	EVERGREEN COURT ROAD	GEORGETOWN, LOWER MAIN STREET	D	27.2%	1.0	A	45.4%	4.7	B	43.3%	2.8	B	28.7%	0.9	A
193	5	12.699	16.105	3.406	GEORGETOWN, LOWER MAIN STREET	BLACK OAK MINE ROAD	D	31.1%	1.3	A	15.9%	0.2	A	13.3%	0.2	A	32.1%	1.4	A
193	6	16.105	19.4	3.295	BLACK OAK MINE ROAD	GARDEN VALLEY ROAD	D	21.1%	0.5	A	10.3%	0.1	A	8.6%	0.1	A	21.7%	0.6	A
193	7	19.4	26.95	7.55	GARDEN VALLEY ROAD	JCT. RTE. 49	D	32.5%	1.1	A	17.3%	0.2	A	14.8%	0.1	A	33.0%	1.1	A

[3] Level of service for two-lane highways is based on criteria in Chapter 15, HCM 6th Edition

Indicates deficiency

Multilane Highway Level of Service Results

Route	Seg	EB Postmile	WB Postmile	Segment Length	East of Segment	West of Segment	LOS Threshold	Eastbound AM Peak Average Speed (mph)	Eastbound AM Peak Density[1] (pc/mi/ln)	Eastbound AM Peak LOS[2]	Eastbound PM Peak Average Speed (mph)	Eastbound PM Peak Density[1] (pc/mi/ln)	Eastbound PM Peak LOS[2]	Westbound AM Peak Average Speed (mph)	Westbound AM Peak Density[1] (pc/mi/ln)	Westbound AM Peak LOS[2]	Westbound PM Peak Average Speed (mph)	Westbound PM Peak Density[1] (pc/mi/ln)	Westbound PM Peak LOS[2]
50	13	17.42	17.52	0.1	EB OFF TO MAIN STREET	PLACERVILLE, CANAL STREET	E	45.00	16.64	B	45.00	26.76	D	45.00	24.84	C	45.00	24.44	C
50	14	17.52	17.667	0.147	PLACERVILLE, CANAL STREET	PLACERVILLE, JCT. RTE. 49	F	45.00	9.38	A	45.00	18.18	C	45.00	26.24	D	45.00	21.11	C
50	15	17.667	17.788	0.121	PLACERVILLE, JCT. RTE. 49	PLACERVILLE, COLOMA STREET	F	45.00	8.56	A	45.00	16.60	B	45.00	23.38	C	45.00	19.27	C
50	16	17.788	18.032	0.244	PLACERVILLE, COLOMA STREET	PLACERVILLE, BEDFORD AVENUE	F	45.00	8.64	A	45.00	16.87	B	45.00	23.76	C	45.00	19.64	C
50	17	18.032	18.517	0.485	PLACERVILLE, BEDFORD AVENUE	PLACERVILLE, MOSQUITO ROAD OH (BROADWAY)	F	45.00	7.29	A	45.00	13.98	B	45.00	19.69	C	45.00	16.47	B
50	21	20.741	23.957	3.216	NEW TOWN ROAD	JUNCTION OLD HIGHWAY, CAMINO, WEST	D	60.00	4.67	A	60.00	9.53	A	60.00	9.13	A	60.00	7.28	A
50	22	23.957	25.949	1.992	JUNCTION OLD HIGHWAY, CAMINO, WEST	EAST CAMINO ROAD	E	60.00	2.72	A	60.00	9.13	A	60.00	8.17	A	60.00	6.22	A
50	26	34.219	39.772	5.553	OLD CARSON ROAD	ICEHOUSE ROAD	D	65.00	3.82	A	50.00	7.54	A	50.00	6.26	A	50.00	4.64	A

[1] Density expressed in pc/mi/ln, passenger cars per mile per lane

[2] Level of service for multi-lane highways is based on density as described in Chapter 12, HCM 6th Edition

Indicates deficiency

Freeway Facility Level of Service Results

Route	Seg	EB Postmile	WB Postmile	Segment Length	East of Segment	West of Segment	LOS Threshold	Eastbound AM Peak Average Speed (mph)	Eastbound AM Peak Density[1] (pc/mi/ln)	Eastbound AM Peak LOS[2]	Eastbound PM Peak Average Speed (mph)	Eastbound PM Peak Density[1] (pc/mi/ln)	Eastbound PM Peak LOS[2]	Westbound AM Peak Average Speed (mph)	Westbound AM Peak Density[1] (pc/mi/ln)	Westbound AM Peak LOS[2]	Westbound PM Peak Average Speed (mph)	Westbound PM Peak Density[1] (pc/mi/ln)	Westbound PM Peak LOS[2]
50	1	0	0.857	0.857	SACRAMENTO/EL DORADO COUNTY LINE	LATROBE ROAD	E	65.00	16.98	B	62.58	28.97	D	Unstable	>45	F	65.00	17.77	B
50	2	0.857	3.232	2.375	LATROBE ROAD	BASS LAKE ROAD	D	65.00	7.63	A	65.00	18.15	C	62.62	28.91	D	65.00	19.78	C
50	3	3.232	4.962	1.73	BASS LAKE ROAD	CAMBRIDGE ROAD	D	65.00	13.35	B	63.75	26.62	D	64.95	22.46	C	65.00	17.83	B
50	4	4.962	6.57	1.608	CAMBRIDGE ROAD	CAMERON PARK DRIVE	E	65.00	16.43	B	64.83	23.28	C	65.00	18.45	C	65.00	17.98	B
50	5	6.57	8.564	1.994	CAMERON PARK DRIVE	PONDEROSA ROAD	E	65.00	17.38	B	62.62	28.90	D	64.77	23.58	C	65.00	21.46	C
50	6	8.564	10.295	1.731	PONDEROSA ROAD	SHINGLE SPRINGS	D	65.00	13.48	B	65.00	21.28	C	65.00	18.27	C	65.00	18.98	C
50	7	10.295	12.19	1.895	SHINGLE SPRINGS	GREENSTONE ROAD	D	65.00	13.57	B	64.99	21.90	C	65.00	18.09	C	65.00	16.85	B
50	8	12.19	14.011	1.821	GREENSTONE ROAD	EL DORADO ROAD	D	65.00	11.08	B	65.00	17.20	B	65.00	15.69	B	65.00	16.58	B
50	9	14.011	15.055	1.044	EL DORADO ROAD	MISSOURI FLAT ROAD	E	65.00	10.82	A	65.00	16.85	B	65.00	15.43	B	65.00	16.23	B
50	10	15.055	15.829	0.774	MISSOURI FLAT ROAD	PLACERVILLE, FAIRGROUNDS	E	65.00	8.35	A	65.00	12.71	B	65.00	13.20	B	65.00	12.00	B
50	11	15.829	16.99	1.161	PLACERVILLE, FAIRGROUNDS	WEST PLACERVILLE	E	65.00	8.96	A	65.00	14.28	B	65.00	13.21	B	65.00	13.30	B
50	12	16.99	17.42	0.43	WEST PLACERVILLE	EB OFF TO MAIN STREET	E	65.00	11.00	A	65.00	17.65	B	65.00	16.40	B	65.00	16.14	B
50	18	18.517	18.99	0.473	PLACERVILLE, MOSQUITO ROAD OH (BROADWAY)	PLACERVILLE, SCHNELL SCHOOL ROAD	E	55.00	7.90	A	55.00	15.27	B	55.00	14.43	B	55.00	11.90	B
50	19	18.99	20.296	1.306	PLACERVILLE, SCHNELL SCHOOL ROAD	PLACERVILLE, POINT VIEW DRIVE	E	55.00	6.32	A	55.00	12.01	B	55.00	11.48	B	55.00	9.48	A
50	20	20.296	20.741	0.445	PLACERVILLE, POINT VIEW DRIVE	NEW TOWN ROAD	D	65.00	5.35	A	65.00	9.00	A	65.00	8.29	A	65.00	6.51	A
50	23	25.949	28.842	2.893	EAST CAMINO ROAD	SAWMILL (POLLOCK PINES)	E	65.00	2.60	A	65.00	8.80	A	65.00	7.81	A	65.00	5.93	A
50	24	28.842	31.299	2.457	SAWMILL (POLLOCK PINES)	SLY PARK ROAD	E	65.00	3.58	A	65.00	7.07	A	65.00	6.00	A	65.00	4.30	A

[1] Density expressed in pc/mi/ln, passenger cars per mile per lane

[2] Level of service is based on density as described in Basic Freeway Segment, Chapter 12, HCM 6th Edition

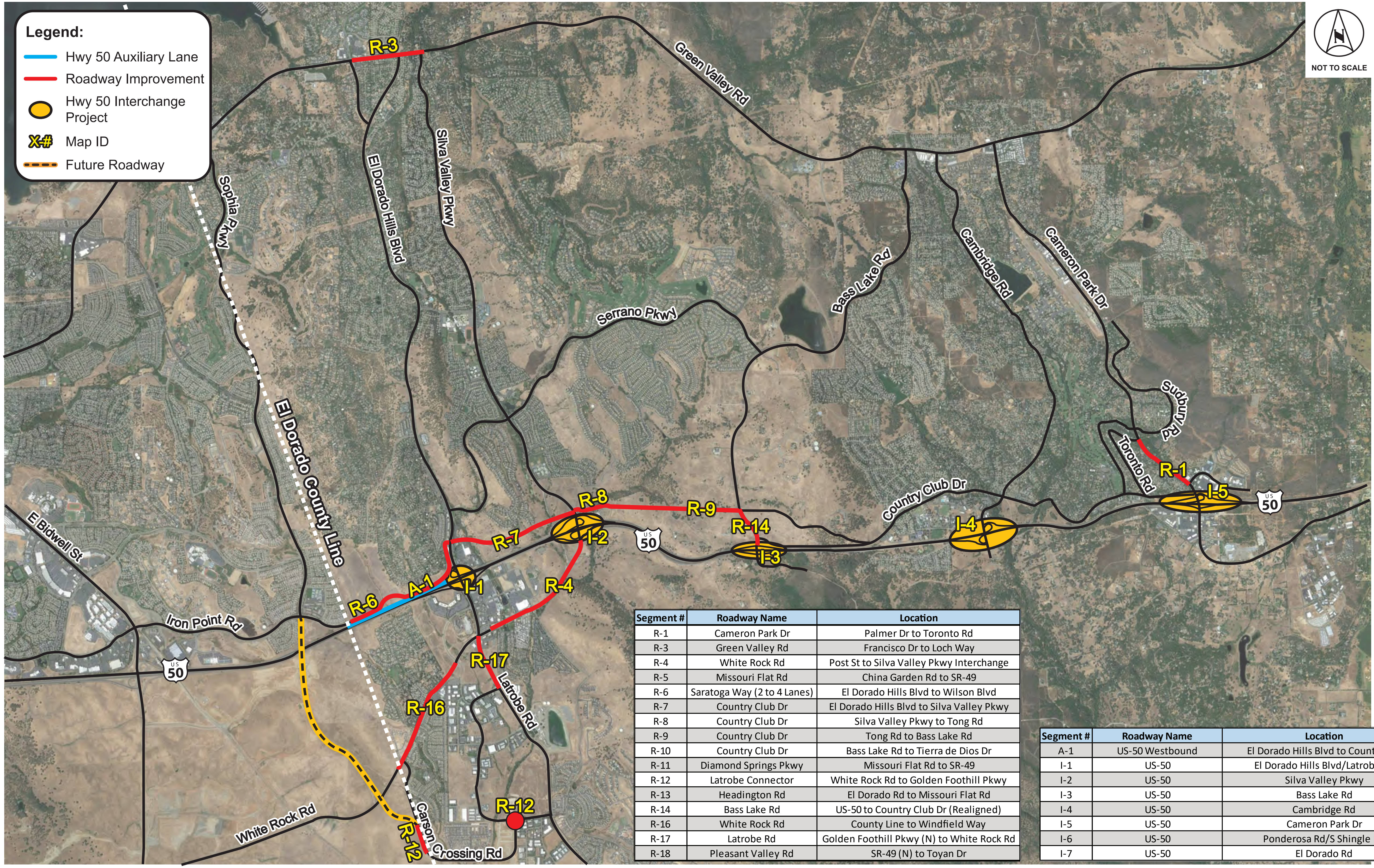
Indicates deficiency

County Roadway Segment Level of Service Results

ID	A	B	Index	Name	Location	Area	Type	LOS Threshold	2040 TGPA2 AM Volume	LOS	PM Volume	LOS
1	2021	2119	2021_2119	Bass Lake Rd	North of Country Club Dr	Rural	2AU	E	1490	E	1450	E
2	2221	2240	2221_2240	Bass Lake Rd	South of Green Valley Rd	Community Region	2AU	E	670	D	650	D
3	2228	2229	2228_2229	Bass Lake Rd	North of Serrano Pkwy	Community Region	2AU	E	910	D	970	D
4	1014	2964	1014_2964	Bassi Rd	West of Lotus Rd	Rural	2AU	D	70	A-C	80	A-C
5	2738	2739	2738_2739	Bedford Ave	At City Limit	Rural	2AU	D	40	A-C	40	A-C
6	2505	2512	2505_2512	Broadway	At City Limit	Community Region	2AU	E	220	A-C	180	A-C
7	2452	2762	2452_2762	Bucks Bar Rd	South Pleasant Valley Rd	Rural	2AU	D	440	A-C	470	A-C
8	2805	2811	2805_2811	Bucks Bar Rd	North of Mt Aukum Rd	Rural	2AU	D	360	A-C	400	A-C
9	2125	2139	2125_2139	Cambridge Rd	North of Country Club Dr	Exception F	2AU	F	710	D	910	D
10	2125	2126	2125_2126	Cambridge Rd	South of Country Club Dr	Community Region	2AU	E	640	D	850	D
11	2133	2134	2133_2134	Cambridge Rd	At US 50 Overcrossing	Community Region	2AU	E	810	D	1090	D
12	2215	2241	2215_2241	Cambridge Rd	South of Green Valley Rd	Community Region	2AU	E	530	A-C	570	A-C
13	2236	2242	2236_2242	Cambridge Rd	North of Oxford Rd	Community Region	2AU	E	330	A-C	480	A-C
14	1970	2273	1970_2273	Cameron Park Dr	North of Coach Ln	Community Region	4AD	E	1640	D	2530	D
15	1975	2277	1975_2277	Cameron Park Dr	South of Hacienda Dr	Community Region	2AU	E	1450	E	1890	**F**
16	2220	2231	2220_2231	Cameron Park Dr	South of Green Valley Rd	Community Region	2AU	E	780	D	980	D
17	2237	2246	2237_2246	Cameron Park Dr	North of Mira Loma Dr	Community Region	2AU	E	1070	D	1380	E
18	2276	2282	2276_2282	Cameron Park Dr	South of Robin Ln	Community Region	2AU	E	710	D	1200	D
19	2279	2282	2279_2282	Cameron Park Dr	North of Robin Ln	Exception F	2AU	F	870	D	1140	D
20	2856	2884	2856_2884	Carson Rd	East of Barkley Rd	Community Region	2AU	E	330	A-C	350	A-C
21	2864	2867	2864_2867	Carson Rd	At Carson Ct	Rural	2AU	D	120	A-C	180	A-C
22	2870	2875	2870_2875	Carson Rd	West of Gatlin Rd	Rural	2AU	D	100	A-C	140	A-C
23	2892	2896	2892_2896	Carson Rd	East of Ponderosa Way	Community Region	2AU	E	190	A-C	250	A-C
24	2583	2930	2583_2930	China Garden Rd	East of Missouri Flat Rd	Community Region	2AU	E	370	A-C	410	A-C
25	2671	2672	2671_2672	China Garden Rd	North of SR 49	Community Region	2AU	E	90	A-C	40	A-C
26	2440	2441	2440_2441	Cold Springs Rd	South of Gold Hill Rd	Rural	2AU	D	200	A-C	320	A-C
27	2445	2447	2445_2447	Cold Springs Rd	South of SR 153	Rural	2AU	D	120	A-C	200	A-C
28	2021	2111	2021_2111	Country Club Dr	East of Bass Lake Rd	Rural	2AU	D	570	A-C	520	A-C
29	2124	2128	2124_2128	Country Club Dr	West of Knollwood Dr	Community Region	2AU	E	590	A-C	440	A-C
30	2125	2136	2125_2136	Country Club Dr	East of Cambridge Rd	Community Region	2AU	E	320	A-C	430	A-C
31	2129	2131	2129_2131	Country Club Dr	East of Merrychase Dr	Community Region	2AU	E	390	A-C	290	A-C
32	2278	2283	2278_2283	Country Club Dr	West of Cameron Park Dr	Community Region	2AU	E	340	A-C	480	A-C
33	2297	2298	2297_2298	Durock Rd	West of S. Shingle Rd	Community Region	2AU	E	480	A-C	730	D
34	1988	1989	1988_1989	El Dorado Hills Blvd	South of Wilson Blvd	Community Region	4AD	E	2040	D	1520	D
35	1989	2199	1989_2199	El Dorado Hills Blvd	North of Wilson Blvd	Community Region	4AD	E	2450	D	2230	D
36	1988	2044	1988_2044	El Dorado Hills Blvd	North of Saratoga Way	Community Region	4AD	E	3400	**F**	3640	**F**
37	2157	2159	2157_2159	El Dorado Hills Blvd	South of Francisco Dr	Community Region	2AU	E	1920	**F**	1830	**F**
38	2161	2184	2161_2184	El Dorado Hills Blvd	South of Green Valley Rd	Community Region	2AU	E	410	A-C	430	A-C
39	2169	3128	2169_3128	El Dorado Hills Blvd	North of Harvard Way	Community Region	4AD	E	2250	D	2260	D
40	1910	2426	1910_2426	El Dorado Rd	South of US 50	Community Region	2AU	E	450	A-C	540	A-C
41	2403	2404	2403_2404	El Dorado Rd	North of Pleasant Valley Rd	Community Region	2AU	E	250	A-C	300	A-C
42	2425	2428	2425_2428	El Dorado Rd	South of Missouri Flat Rd	Community Region	2AU	E	235	A-C	325	A-C
43	2597	2613	2597_2613	Enterprise Dr	East of Forni Rd	Community Region	2AU	E	340	A-C	450	A-C
44	2477	2809	2477_2809	Fairplay Rd	South of Mt Aukum Rd	Rural	2AU	D	160	A-C	210	A-C
45	2599	2600	2599_2600	Forni Rd	North of SR 49	Community Region	2AU	E	380	A-C	290	A-C
46	2625	2634	2625_2634	Forni Rd	West of Arroyo Vista Way	Community Region	2AU	E	120	A-C	160	A-C
47	2192	2193	2192_2193	Francisco Dr	South of Green Valley Rd	Community Region	2AU	E	1290	D	1300	D
48	2255	2289	2255_2289	French Creek Rd	North of Old French Town Rd	Rural	2AU	D	190	A-C	230	A-C
49	2324	2360	2324_2360	Gold Hill Rd	East of Lotus Road	Rural	2AU	D	220	A-C	230	A-C
50	2437	2438	2437_2438	Gold Hill Rd	East of Cold Springs Rd	Rural	2AU	D	90	A-C	70	A-C
51	2440	2443	2440_2443	Gold Hill Rd	West of Cold Springs Rd	Rural	2AU	D	260	A-C	230	A-C
52	1046	2171	1046_2171	Green Valley Rd	West of Sophia Pkwy	Community Region	2AU	E	2360	**F**	2490	**F**
53	1929	1930	1929_1930	Green Valley Rd	West of Weber Creek	Rural	2AU	D	100	A-C	60	A-C
54	2161	2162	2161_2162	Green Valley Rd	West of Silva Valley Rd	Community Region	2AU	E	1460	E	1700	E
55	2176	2182	2176_2182	Green Valley Rd	East of Mormon Island Dr	Community Region	4AD	E	2630	C	3250	C
56	2179	2182	2179_2182	Green Valley Rd	West of Mormon Island Dr	Community Region	4AD	E	2650	C	3270	C
57	2180	2181	2180_2181	Green Valley Rd	East of Sophia Pkwy	Community Region	4AD	E	2650	C	3200	C
58	2185	2189	2185_2189	Green Valley Rd	East of Francisco Dr	Community Region	2AU	E	1570	**F**	1420	E
59	2214	2221	2214_2221	Green Valley Rd	West of Bass Lake Rd	Community Region	2AU	E	1620	E	1280	E
60	2215	2221	2215_2221	Green Valley Rd	East of Bass Lake Rd	Community Region	2AU	E	270	E	90	D
61	2218	2250	2218_2250	Green Valley Rd	East of La Crescenta Dr	Community Region	2AU	E	950	D	1010	E
62	2334	2341	2334_2341	Green Valley Rd	East of Deer Valley Rd	Rural	2AU	D	490	C	610	D
63	2350	2359	2350_2359	Green Valley Rd	West of Lotus Rd	Rural	2AU	D	750	D	820	D
64	2399	2401	2399_2401	Green Valley Rd	West of Greenstone Rd	Rural	2AU	D	470	A-C	540	A-C
65	2420	2423	2420_2423	Green Valley Rd	West of Missouri Flat Rd	Community Region	2AU	E	900	D	750	D
66	2422	2423	2422_2423	Green Valley Rd	West of Campus Dr	Rural	2AU	D	450	A-C	500	A-C
67	2368	2397	2368_2397	Greenstone Rd	North of US 50	Rural	2AU	D	320	A-C	290	A-C
68	2383	2395	2383_2395	Greenstone Rd	North of Mother Lode Dr	Community Region	2AU	E	150	A-C	150	A-C
69	2805	2806	2805_2806	Grizzly Flat Rd	East of Mt Aukum Rd	Rural	2AU	D	110	A-C	170	A-C
70	2169	2201	2169_2201	Harvard Way	East of El Dorado Hills Blvd	Community Region	4AU	E	1410	D	990	A-C
71	2194	2197	2194_2197	Harvard Way	West of Silva Valley Pkwy	Community Region	4AU	E	1140	A-C	760	A-C
72	15612	15613	15612_15613	Ice House Rd	North of US 50	Rural	2AU	D	110	A-C	140	A-C
73	1962	1963	1962_1963	Latrobe Rd	North of County Line	Rural	2AU	D	410	A-C	510	A-C
74	2025	2072	2025_2072	Latrobe Rd	South of Investment Blvd	Community Region	2AU	E	610	A-C	690	D
75	2041	2042	2041_2042	Latrobe Rd	North of Golden Foothill Pkwy South	Community Region	4AD	E	2900	D	3290	**F**
76	2072	2073	2072_2073	Latrobe Rd	North of Investment Blvd	Community Region	2AU	E	820	D	1000	D
77	2076	2085	2076_2085	Latrobe Rd	North of Golden Foothill Pkwy	Community Region	4AD	E	2950	E	3340	**F**
78	2078	2085	2078_2085	Latrobe Rd	North of White Rock Rd	Community Region	6AD	E	4440	D	4570	E
79	2314	2360	2314_2360	Lotus Rd	South of Thompson Hill Rd	Rural	2AU	D	430	A-C	470	A-C
80	2350	2357	2350_2357	Lotus Rd	North Green Valley Rd	Rural	2AU	D	700	D	800	D
81	2984	2987	2984_2987	Lotus Rd	South of SR 49	Rural	2AU	D	410	A-C	490	A-C
82	2360	2362	2360_2362	Luneman Rd	West of Lotus Rd	Rural	2AU	D	380	A-C	300	A-C
83	2968	2985	2968_2985	Marshall Rd	East of SR 49	Rural	2AU	D	300	A-C	340	A-C
84	2992	2994	2992_2994	Marshall Rd	East of Garden Valley Rd	Rural	2AU	D	360	A-C	390	A-C
85	3034	3035	3034_3035	Marshall Rd	South of Lower Main St	Rural	2AU	D	50	A-C	60	A-C
86	2009	2238	2009_2238	Meder Rd	East of Cameron Park Dr	Community Region	2AU	E	700	D	790	D
87	2336	2346	2336_2346	Meder Rd	West of Ponderosa Rd	Community Region	2AU	E	440	A-C	610	A-C
88	1926	1927	1926_1927	Missouri Flat Rd	West of El Dorado Rd	Community Region	2AU	E	900	D	770	D
89	1927	2627	1927_2627	Missouri Flat Rd	East of El Dorado Rd	Community Region	2AU	E	810	D	860	D
90	2570	2672	2570_2672	Missouri Flat Rd	South of China Garden Rd	Community Region	2AU	E	1720	**F**	2110	**F**
91	2618	2620	2618_2620	Missouri Flat Rd	North of SR 49	Community Region	2AU	E	1420	E	1630	F
92	2644	2668	2644_2668	Missouri Flat Rd	North of Forni Rd	Exception F	4AD	F	2490	D	3100	E
93	2668	2670	2668_2670	Missouri Flat Rd	South of Forni Rd	Exception F	4AD	F	1850	D	2100	D
94	3075	3077	3075_3077	Mormon Emigrant Trl	East of Sly Park Rd	Rural	2AU	D	50	A-C	70	A-C
95	2539	2540	2539_2540	Mosquito Rd	At City Limit	Community Region	2AU	E	270	A-C	280	A-C
96	2765	2767	2765_2767	Mosquito Rd	South of American River Bridge	Rural	2AU	D	100	A-C	110	A-C

County Roadway Segment Level of Service Results

ID	A	B	Index	Name	Location	Area	Type	LOS Threshold	2040 TGPA2 AM Volume	LOS	PM Volume	LOS
97	2013	2014	2013_2014	Mother Lode Dr	East of French Creek Rd	Community Region	2AU	E	990	D	910	D
98	2287	2300	2287_2300	Mother Lode Dr	West of Sunset Ln	Community Region	2AU	E	1120	D	1240	D
99	2408	2412	2408_2412	Mother Lode Dr	West of Pleasant Valley Rd	Community Region	2AU	E	920	D	1100	D
100	2409	2412	2409_2412	Mother Lode Dr	East of Pleasant Vally Rd	Community Region	2AU	E	290	A-C	380	A-C
101	1922	2501	1922_2501	Mt Aukum Rd	North of County Line	Rural	2AU	D	170	A-C	180	A-C
102	2805	2808	2805_2808	Mt Aukum Rd	South of Bucks Bar Rd	Rural	2AU	D	300	A-C	380	A-C
103	2846	2847	2846_2847	Mt Aukum Rd	South of Pleasant Valley Rd	Rural	2AU	D	230	A-C	330	A-C
104	1010	2988	1010_2988	Mt Murphy Rd	North of SR 49	Rural	2AU	D	40	A-C	50	A-C
105	2980	2983	2980_2983	Mt Murphy Rd	South of Marshall Rd	Rural	2AU	D	90	A-C	90	A-C
106	2353	2352	2353_2352	N Shingle Rd	South of Green Valley Rd	Rural	2AU	D	460	A-C	510	A-C
107	2455	2463	2455_2463	Newtown Rd	North of Pioneer Hill Rd	Rural	2AU	D	210	A-C	240	A-C
108	2546	2547	2546_2547	Newtown Rd	East of Broadway Rd	Community Region	2AU	E	290	A-C	340	A-C
109	2831	2843	2831_2843	Newtown Rd	North of Pleasant Valley Rd	Rural	2AU	D	180	A-C	250	A-C
110	2007	2008	2007_2008	Old French Town Rd	South of Mother Lode Dr	Community Region	2AU	E	110	A-C	140	A-C
111	2478	2500	2478_2500	Omo Ranch Rd	East of Mt Aukum Rd	Rural	2AU	D	50	A-C	70	A-C
112	2233	2244	2233_2244	Oxford Rd	East of Salida Way	Community Region	2AU	E	360	A-C	540	A-C
113	2277	2284	2277_2284	Palmer Dr	East of Cameron Park Dr	Community Region	2AU	E	820	D	1130	D
114	2595	2602	2595_2602	Patterson Dr	South of Pleasant Valley Rd	Community Region	2AU	E	350	A-C	440	A-C
115	2405	2412	2405_2412	Pleasant Valley Rd	East of Mother Lode Dr	Community Region	2AU	E	620	A-C	840	D
116	2457	2461	2457_2461	Pleasant Valley Rd	East of Bucks Bar Rd	Community Region	2AU	E	480	A-C	450	A-C
117	2506	2753	2506_2753	Pleasant Valley Rd	West of Oak Hill Rd	Community Region	2AU	E	970	D	1000	D
118	2579	2678	2579_2678	Pleasant Valley Rd	East of SR 49	Community Region	2AU	E	1220	D	1580	**F**
119	2749	2763	2749_2763	Pleasant Valley Rd	East of Cedar Ravine Rd	Community Region	2AU	E	900	D	950	D
120	2839	2843	2839_2843	Pleasant Valley Rd	East of Newtown Rd	Community Region	2AU	E	390	A-C	480	A-C
121	2335	2343	2335_2343	Ponderosa Rd	North of Jackpine Rd	Rural	2AU	D	150	A-C	130	A-C
122	2896	2904	2896_2904	Pony Express Trl	East of Carson Rd	Community Region	2AU	E	190	A-C	280	A-C
123	2917	2918	2917_2918	Pony Express Trl	East of Gilmore Rd	Community Region	2AU	E	300	A-C	440	A-C
124	3102	3104	3102_3104	Pony Express Trl	West of Forebay Rd	Community Region	2AU	E	430	A-C	560	A-C
125	2509	2721	2509_2721	Rock Creek Rd	East of SR 193	Rural	2AU	D	20	A-C	30	A-C
126	2149	2150	2149_2150	Salmon Falls Rd	At New York Creek Bridge	Rural	2AU	D	220	A-C	230	A-C
127	2161	2163	2161_2163	Salmon Falls Rd	South of Malcolm Dixon Rd	Community Region	2AU	E	660	D	600	A-C
128	2943	2948	2943_2948	Salmon Falls Rd	South of Pedro Hill Rd	Rural	2AU	D	130	A-C	140	A-C
129	2946	2947	2946_2947	Salmon Falls Rd	South of Rattlesnake Bar Rd	Rural	2AU	D	40	A-C	50	A-C
130	2006	2195	2006_2195	Serrano Pkwy	East of Silva Valley Pkwy	Community Region	4AD	E	1520	D	1360	A-C
131	2152	2229	2152_2229	Serrano Pkwy	West of Bass Lake Rd	Community Region	2AU	E	620	A-C	640	D
132	2317	2318	2317_2318	Shingle Springs Dr	South of US 50	Rural	2AU	D	400	A-C	420	A-C
133	2005	2006	2005_2006	Silva Valley Pky	North of US 50	Community Region	4AD	E	1750	D	2060	D
134	2162	2207	2162_2207	Silva Valley Pky	South of Green Valley Rd	Community Region	2AU	E	870	D	870	D
135	2196	2197	2196_2197	Silva Valley Pky	North of Havard Way	Community Region	2AU	E	1160	D	970	D
136	2197	2203	2197_2203	Silva Valley Pky	South of Serrano Pkwy	Community Region	4AD	E	2220	D	1930	D
137	2823	2846	2823_2846	Sly Park Rd	East of Mt Aukum Rd	Rural	2AU	D	250	A-C	300	A-C
138	3073	3077	3073_3077	Sly Park Rd	East of Mormon Emigrant Trail	Rural	2AU	D	260	A-C	360	A-C
139	3101	3103	3101_3103	Sly Park Rd	South of Pony Express Trail	Community Region	2AU	E	310	A-C	390	A-C
140	2840	2850	2840_2850	Snows Rd	North of Newtown Rd	Rural	2AU	D	90	A-C	110	A-C
141	2852	2901	2852_2901	Snows Rd	South of Carson Rd	Community Region	2AU	E	340	A-C	270	A-C
142	1980	2109	1980_2109	South Shingle Rd	East of Latrobe Rd	Rural	2AU	D	190	A-C	160	A-C
143	2270	2271	2270_2271	South Shingle Rd	North of Barnett Ranch	Rural	2AU	D	290	A-C	330	A-C
144	2288	2290	2288_2290	South Shingle Rd	South of Sunset Ln	Community Region	2AU	E	560	A-C	670	D
145	2220	2222	2220_2222	Starbuck Rd	North of Green Valley Rd	Community Region	2AU	E	150	A-C	180	A-C
146	2768	2769	2768_2769	Union Ridge Rd	West of Hassler Rd	Rural	2AU	D	40	A-C	40	A-C
147	3016	3047	3016_3047	Wentworth Springs Rd	West of Quintette Rd	Rural	2AU	D	70	A-C	60	A-C
148	2029	2028	2029_2028	White Rock Rd	West of Windfield Way	Community Region	2AU	E	1420	E	1750	**F**
149	2037	2038	2037_2038	White Rock Rd	At County Line	Community Region	2AU	E	1040	D	1670	**F**
150	2085	2088	2085_2088	White Rock Rd	East of Latrobe Rd	Community Region	2AU	E	1260	D	2100	**F**
151	2086	2087	2086_2087	White Rock Rd	West of Latrobe Rd	Community Region	4AD	E	1740	D	2700	D



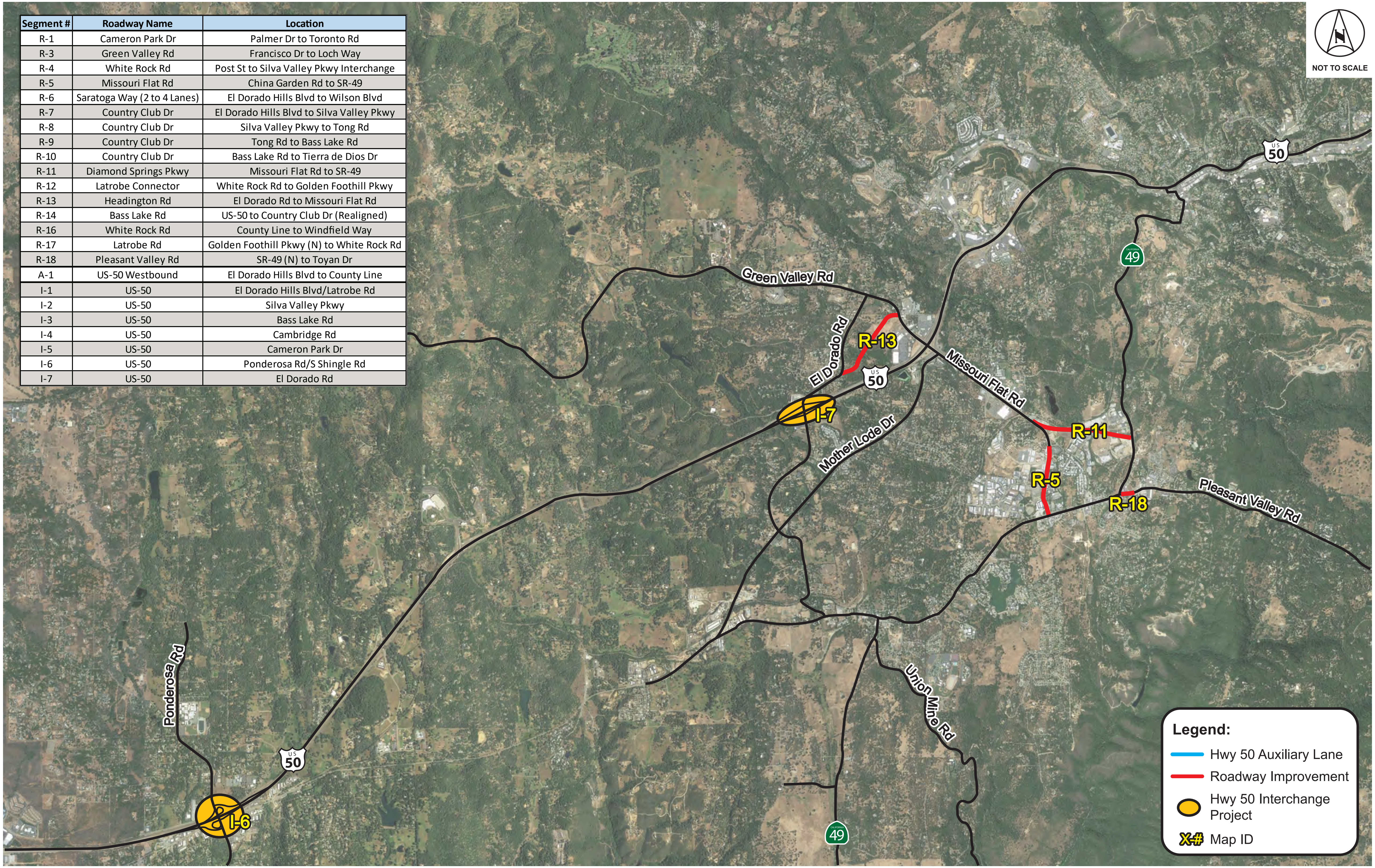
Segment #	Roadway Name	Location
R-1	Cameron Park Dr	Palmer Dr to Toronto Rd
R-3	Green Valley Rd	Francisco Dr to Loch Way
R-4	White Rock Rd	Post St to Silva Valley Pkwy Interchange
R-5	Missouri Flat Rd	China Garden Rd to SR-49
R-6	Saratoga Way (2 to 4 Lanes)	El Dorado Hills Blvd to Wilson Blvd
R-7	Country Club Dr	El Dorado Hills Blvd to Silva Valley Pkwy
R-8	Country Club Dr	Silva Valley Pkwy to Tong Rd
R-9	Country Club Dr	Tong Rd to Bass Lake Rd
R-10	Country Club Dr	Bass Lake Rd to Tierra de Dios Dr
R-11	Diamond Springs Pkwy	Missouri Flat Rd to SR-49
R-12	Latrobe Connector	White Rock Rd to Golden Foothill Pkwy
R-13	Headington Rd	El Dorado Rd to Missouri Flat Rd
R-14	Bass Lake Rd	US-50 to Country Club Dr (Realigned)
R-16	White Rock Rd	County Line to Windfield Way
R-17	Latrobe Rd	Golden Foothill Pkwy (N) to White Rock Rd
R-18	Pleasant Valley Rd	SR-49 (N) to Toyan Dr

Segment #	Roadway Name	Location
A-1	US-50 Westbound	El Dorado Hills Blvd to County Line
I-1	US-50	El Dorado Hills Blvd/Latrobe Rd
I-2	US-50	Silva Valley Pkwy
I-3	US-50	Bass Lake Rd
I-4	US-50	Cambridge Rd
I-5	US-50	Cameron Park Dr
I-6	US-50	Ponderosa Rd/S Shingle Rd
I-7	US-50	El Dorado Rd

Figure 1a

Western El Dorado County, Deficient Segments and Parallel Facilities

Segment #	Roadway Name	Location
R-1	Cameron Park Dr	Palmer Dr to Toronto Rd
R-3	Green Valley Rd	Francisco Dr to Loch Way
R-4	White Rock Rd	Post St to Silva Valley Pkwy Interchange
R-5	Missouri Flat Rd	China Garden Rd to SR-49
R-6	Saratoga Way (2 to 4 Lanes)	El Dorado Hills Blvd to Wilson Blvd
R-7	Country Club Dr	El Dorado Hills Blvd to Silva Valley Pkwy
R-8	Country Club Dr	Silva Valley Pkwy to Tong Rd
R-9	Country Club Dr	Tong Rd to Bass Lake Rd
R-10	Country Club Dr	Bass Lake Rd to Tierra de Dios Dr
R-11	Diamond Springs Pkwy	Missouri Flat Rd to SR-49
R-12	Latrobe Connector	White Rock Rd to Golden Foothill Pkwy
R-13	Headington Rd	El Dorado Rd to Missouri Flat Rd
R-14	Bass Lake Rd	US-50 to Country Club Dr (Realigned)
R-16	White Rock Rd	County Line to Windfield Way
R-17	Latrobe Rd	Golden Foothill Pkwy (N) to White Rock Rd
R-18	Pleasant Valley Rd	SR-49 (N) to Toyan Dr
A-1	US-50 Westbound	El Dorado Hills Blvd to County Line
I-1	US-50	El Dorado Hills Blvd/Latrobe Rd
I-2	US-50	Silva Valley Pkwy
I-3	US-50	Bass Lake Rd
I-4	US-50	Cambridge Rd
I-5	US-50	Cameron Park Dr
I-6	US-50	Ponderosa Rd/S Shingle Rd
I-7	US-50	El Dorado Rd



Kimley»Horn

Figure 1b
Eastern El Dorado County, Deficient Segments and Parallel Facilities

Appendix B – Fair Share Percentages

Auxiliary Lanes:

ID	Roadway Improvement	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	External	Total
A-1	US 50 WB (Aux Lane), El Dorado Hills Blvd to County Line	1%	37%	9%	5%	5%	3%	2%	28%	9%	91%

Interchanges:

ID	Deficient Interchange	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Internal Subtotal	External	Total
I-1	El Dorado Hills Blvd/Latrobe Road	0%	2%	0%	2%	0%	0%	1%	93%	98%	2%	100%
I-2	Silva Valley Parkway	0%	17%	3%	1%	1%	0%	0%	76%	100%	0%	100%
I-3	Bass Lake Road	0%	41%	1%	0%	0%	0%	0%	57%	100%	0%	100%
I-4	Cambridge Road	0%	85%	2%	0%	0%	0%	0%	12%	100%	0%	100%
I-5	Cameron Park Drive	0%	86%	4%	0%	1%	0%	0%	9%	100%	0%	100%
I-6	Ponderosa Road	0%	64%	13%	11%	1%	0%	4%	7%	100%	0%	100%
I-7	El Dorado Road	0%	9%	80%	2%	5%	1%	0%	2%	100%	0%	100%

County Roadways:

ID	Deficient Segment	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	External	Total
R-14	Bass Lake Road, US-50 to Country Club Dr (Realigned)	0%	39%	3%	0%	0%	0%	0%	58%	0%	100%
R-1	Cameron Park Drive, Palmer Dr to Toronto Rd	0%	86%	6%	0%	1%	0%	0%	6%	0%	100%
R-3	Green Valley Road, Francisco Drive to Loch Way	0%	29%	0%	14%	0%	0%	0%	51%	6%	94%
R-17	Latrobe Road, Golden Foothill Pkwy (N) to White Rock Rd	0%	5%	1%	0%	0%	0%	3%	87%	3%	97%
R-5	Missouri Flat Road, China Garden Road to SR 49	1%	6%	70%	1%	1%	10%	6%	2%	3%	97%
R-18	Pleasant Valley Road, SR 49 to Toyan Drive	2%	8%	50%	1%	1%	22%	9%	3%	3%	97%
R-16	White Rock Road, County Line to Windfield Way	0%	3%	1%	1%	0%	0%	4%	86%	6%	94%
R-4	White Rock Road, Post Street to Silva Valley Pkwy	0%	10%	2%	1%	1%	0%	1%	84%	1%	99%

Parallel Facilities:

ID	Roadway Improvement	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	External	Total
R-6	Saratoga Way, Iron Point Rd to El Dorado Hills Blvd	0%	0%	0%	2%	0%	0%	0%	96%	1%	99%
R-7	Country Club Dr, El Dorado Hills Blvd to Silva Valley Pkwy	0%	19%	3%	1%	1%	0%	0%	77%	0%	100%
R-8	Country Club Dr, Silva Valley Pkwy to Tong Rd	0%	34%	0%	0%	0%	0%	0%	65%	0%	100%
R-9	Country Club Dr, Tong Rd to Bass Lake Rd	0%	17%	0%	0%	0%	0%	0%	83%	0%	100%
R-10	Country Club Dr, Bass Lake Rd to Tierre de Dios Dr	0%	72%	0%	0%	0%	0%	0%	28%	0%	100%
R-11	Diamond Springs Pkwy, Missouri Flat Rd to SR 49	2%	9%	59%	1%	1%	13%	8%	4%	3%	97%
R-12	Latrobe Connector, White Rock Rd to Golden Foothill Pkwy	0%	0%	0%	0%	0%	0%	6%	84%	10%	90%
R-13	Headington Rd Extension, El Dorado Rd to Missouri Flat Rd	0%	12%	83%	0%	0%	1%	0%	3%	0%	100%

MEMORANDUM

DATE: November 13, 2020

TO: Rafael Martinez, Director of Transportation

FROM: John P. Long, P.E

SUBJECT: TIF Major Update
Technical Memorandum - New Evaluation of Cameron Park Drive/US 50 Interchange

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Executive Summary

In 2018, an “Alternative Screening Evaluation” was prepared for the Cameron Park Drive/Highway 50 interchange. The intent of that study was to develop more economically viable alternatives for the interchange that meet LOS and operational requirements at a lower cost and reduced impacts than alternatives that were identified in a 2008 Caltrans Project Study Report (PSR). Four alternatives meeting those goals were developed with input from County and Caltrans staff, plus public involvement.

The on-going update of the County’s Traffic Impact Fee (TIF) Program is taking a new look at roadway needs for the County. The TIF Update is based on a 2040 horizon year and a slower development growth rate than the County’s prior Fee Program. The 2018 interchange “Alternative Screening Evaluation” was based on 2045 traffic forecasts - beyond the 2040 TIF horizon year - and it used the higher growth rate from the prior Fee Program. The updated TIF traffic operations analysis of Cameron Park interchange resulted in the following conclusions:

- Key intersections at/near the interchange would operation at an acceptable LOS in 2040
- There would be unacceptable levels of traffic queuing on the eastbound off-ramp causing vehicles to back up onto the eastbound US 50 mainline.

The new TIF analysis found that widening of the eastbound off-ramp would solve its queuing issues through 2040. Yet additional improvements will be needed to maintain acceptable LOS beyond the 2040 horizon. The County recognizes that Caltrans projects have a long lead time to be planned, approved and designed and that right of way should be secured to ensure their viability.

Thus, the recommendations for the funding of improvements to the Cameron Park Drive/US 50 interchange in the 2040 TIF Update involve the following:

- Funding the preparation of Preliminary Engineering and Environmental Document that will allow the County and Caltrans to officially select both interim and long-term improvements for the interchange
- Funding right-of-way purchases to preserve the land needed for long-term improvements
- Funding the widening of eastbound off-ramp

These recommendations allow the County to work with Caltrans on logical steps to the ultimate improvement while providing the benefits of a first phase of construction to happen sooner than waiting on funding/implementing the ultimate design. The County has applied this same logic to define 2040 funding levels for the Ponderosa Road/US 50 Interchange.

Background

In 2008, a Project Study Report (PSR) was completed by El Dorado County on the Cameron Park Drive/Highway 50 Interchange following Caltrans guidelines. The preferred alternative from the 2008 PSR was a compact diamond/partial cloverleaf that had a cost of just over $87 million, when adjusted to 2015 dollars.

In 2018, The Long Range Planning Division of the County retained Dokken Engineering to conduct an “Alternative Screening Evaluation.” The intent of this study was to develop, analyze, and present more economically viable alternatives for the interchange that meet LOS and operational requirements at a lower cost and reduced impacts than the alternatives in the 2008 PSR. Four alternatives meeting this goal were developed with input from County and Caltrans staff. The four alternatives are:

- Alternative 1 – Widening: widens Cameron Park Drive from two to three through lanes in each direction; widens all the ramps.
- Alternative 2 – Rodeo Road Off-Ramp: removes eastbound off-ramp and replaces with new eastbound off-ramp connection to Rodeo Road; adds at Cameron Park Drive a southbound to eastbound loop on-ramp.
- Alternative 3 – East Hook Ramps: adds hook ramps from eastbound US 50 to Coach Lane, east of Cameron Park Drive; adds at Cameron Park Drive a southbound to eastbound loop on-ramp.
- Alternative 4 – Diverging Diamond: replaces the current interchange with a Diverging Diamond Interchange (DDI) configuration.

A significant public outreach effort was conducted to get comments on the four alternative interchange designs.

The estimated total cost including the design, environmental review, right of way acquisition and construction for the four alternatives range between $44 million and $69 million (2018 dollars).

Based on the results of the Alternative Screening Evaluation and discussion with the Long Range Planning Division of the County, Alternative 2 was dropped from the viable alternatives. On July 24, 2018, a motion was approved by the Board of Supervisors to carry forward Alternatives 1, 3, and 4 to preliminary design and environmental studies.

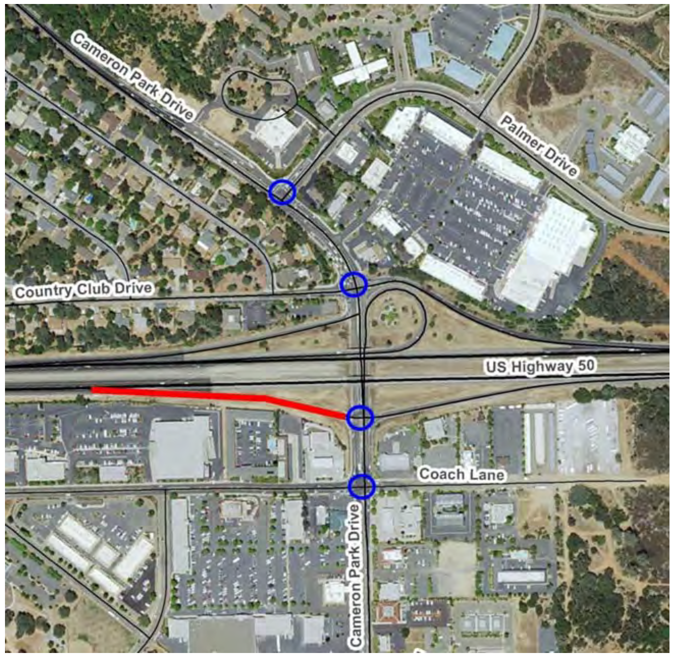
Updated Analysis for the Traffic Impact Fee Program

The on-going update of the County’s CIP and Traffic Impact Fee (TIF) Program is taking a new look at roadway needs for the County. The Update is based on a 2040 horizon year and is using a Board-adopted slower development growth rate than the prior Fee Program.

For the 2018 Alternative Screening Evaluation for the Cameron Park Interchange, it was decided to use 2045 for the traffic forecasts. Not only was the horizon year for Cameron Park Alternative Screening Evaluation beyond the 2040 horizon year that is being used for the on-going update of the TIF Program, the Alternative Screening Evaluation was based on the higher growth rate that was used for the prior Fee Program.

The updated TIF traffic operations analysis of Cameron Park interchange, based on new projected 2040 traffic volumes, resulted in the following conclusions:

- The four key intersections in the interchange area (shown in blue on figure at right) would operation at an acceptable LOS in 2040
- There would be unacceptable levels of traffic queuing on the eastbound off-ramp (shown in red on the figure at right) causing vehicles to back up onto the eastbound US 50 mainline.
- There is an existing sight distance problem on the eastbound off-ramp that prevents vehicles from making right-turns on red.



Cameron Park Interchange Area

Several key factors were defined related to improvements:

- Widening of the Eastbound Off-ramp would solve queuing through 2040
- Additional improvements will be needed to maintain acceptable LOS beyond the 2040 horizon
- Caltrans projects have a long lead time to be planned, approved and designed.
- Right of way should be secured

The widening of the eastbound off-ramp would involve adding a second right-turn lane and a second left-turn lane. However, having two lanes for right-turns almost doubles the number of vehicles that can make right-turns during each green phase and would substantially reduce the delay for right-turn vehicles. The extra left-turn lane does the same thing for left-turning vehicles and together the two new lanes would solve the queuing problem on the EB off-ramp.

This exact ramp widening is an element of the least expensive of the four ultimate interchange alternatives identified in the 2018 Alternative Screening Evaluation. A widening of this off-ramp is also needed for one of the other alternatives. Thus it is a building block for two of the ultimate interchange designs.

The ramp widening does not solve the sight distance issue on the eastbound off-ramp. However, Caltrans' has a planned project involving limited widening under the US 50 bridge. Their project would:

- Solve the sight distance problem, which will allow right-turns on red, thus further reducing delay for right turning vehicles
- Separate bikes and pedestrians along the west side of Cameron Park Drive under the freeway

- Provide a new bike lane along the east side of Cameron Park Drive under the freeway
- Provide a portion of the exact design concept for widening under the bridge envisioned for two of the four ultimate interchange alternatives

No matter what improvements are made to the interchange, Caltrans will require that preliminary engineering and an environmental document be completed. That effort could consider all four of the ultimate alternatives and select both the first improvement phase and the ultimate design. The feasibility of the Rodeo Road Alternative would be discussed further with Caltrans during that effort. This effort will provide the County with an agreement with Caltrans and thus certainty on what it needs to fund and implement. With that agreement, right-of-way could then be preserved for the selected ultimate design.

Thus, the recommendations for the funding of improvements to the Cameron Park Drive/US 50 interchange in the 2040 CIP and TIF involve the following:

- Funding the preparation of Preliminary Engineering and Environmental Document that will allow the County and Caltrans to officially select interim and long-term improvements for the interchange
- Funding right-of-way purchases to preserve the land needed for long-term improvements
- Funding widening of the eastbound off-ramp

The recommendations for TIF funding allow the County to work with Caltrans on logical steps to the ultimate improvement while providing funds for a first phase of construction. That first phase would result in decreases in delays for vehicles using the interchange to happen sooner than waiting for full funding of the ultimate improvement.

Cost Estimate for Recommended Interchange Improvements in the 2020 CIP and TIF

The cost estimate for funding in the TIF Update was based on the following:

- A new cost estimate for widening the eastbound off-ramp for an additional right-turn lane and an additional left-turn lane.
- Averaging the cost estimates of the four ultimate alternatives in the 2018 Alternative Screening Evaluation for the following two elements:
    - The cost of preparing the Preliminary Engineering and Environmental Document (PA&ED) and preparing the final design
    - The cost of right-of-way for the ultimate design

The 2018 cost estimates from the Alternative Screening Evaluation were increased by eight percent to reflect inflation over the last two years.

Application to Other Interchanges

The County has applied the same logic used to define 2040 funding levels for the Cameron Park Drive/US 50 interchange in the TIF Update (i.e. the funding Caltrans required studies, right-of-way preservation and interim improvements) to define the 2040 TIF funding level for the Ponderosa Road/US 50 Interchange.

COUNTY OF EL DORADO
DEPARTMENT OF TRANSPORTATION

INTEROFFICE MEMORANDUM

Date: November 19, 2020

To: File

From: Natalie K. Porter, P.E., T.E.,
Senior Traffic Engineer

Subject: *TIF Major Update*
New Evaluation of Ponderosa Road/U.S. 50 Interchange

Executive Summary

County of El Dorado Department of Transportation (Transportation) staff has been working in conjunction with Caltrans staff on the Ponderosa Road/U.S. Highway 50 Interchange since the mid 2000's. In 2008 Caltrans delegated lead agency status to El Dorado County for purposes of the California Environmental Quality Act (CEQA). Preliminary Engineering studies were conducted by El Dorado County Transportation staff and our consultants. The Draft Project Study Report (PSR) was approved by Caltrans in 2017. The final approval of the document is pending. The Board of Supervisors certified the CEQA document and the National Environmental Policy Act (NEPA) in March 2020. Caltrans has no further comment on the CEQA document with the NEPA approval pending.

The environmental documents analyzed four alternatives. The preferred alternative includes modification of the existing interchange to realign North Shingle Road and Wild Chaparral Drive 400' to the north on Ponderosa Road, realignment of the westbound off-ramp and loom on-ramp to a location opposite Wild Chaparral Drive, cul-de-sac- Wild Chaparral Drive west of Ponderosa Road, and realignment of Durock Road to the south opposite Sunset Lane.

The on-going update of the County's Traffic Impact Fee (TIF) Program is taking a new look at roadway needs for the County. The TIF Update is based on a 2040 horizon year and a slower development growth rate than the County's prior Fee Program. The 2017 CEQA document and Draft PSR/PR was based on traffic forecasts using the higher growth rate from the prior Fee Program. The updated TIF traffic operations analysis of Ponderosa Road interchange resulted in the following conclusions:

- Key intersections at/near the interchange would operation at an acceptable LOS in 2040
- There would be unacceptable levels of traffic queuing on the off-ramps causing vehicles to back up onto the US 50 mainline and local roads.

The new TIF analysis found that implementing the relocation of North Shingle Road, Wild Chaparral Drive and Durock Road would solve queuing issues through 2040 and maintain acceptable LOS through the 2040 horizon. The County recognizes that Caltrans projects have a long lead time to be planned, approved and designed and that right of way should be secured to ensure their viability.

The recommendations for the funding of improvements to the Ponderosa Road/US 50 interchange in the 2040 TIF Update involve the following:

- Funding the completion of the Preliminary Engineering and Environmental Document will allow the County and Caltrans to officially select both interim and long-term improvements for the interchange
- Funding right-of-way purchases to preserve the land needed for long-term improvements
- Funding the first two phases of the interchange

These recommendations allow the County to work with Caltrans on logical steps to the ultimate improvement while providing the benefits of a first phase of construction to happen sooner than waiting on funding/implementing the ultimate design. The County has applied this same logic to define 2040 funding levels for the Cameron Park Drive/U.S. Highway 50 Interchange.

Background

In 2006, El Dorado County Department of Transportation staff began coordinating with Caltrans on an improvement project for the Ponderosa Road/U.S. Highway 50 interchange. The draft Project Study Report (PSR) was completed by El Dorado County on the Ponderosa Road/U.S. Highway 50 Interchange following Caltrans guidelines. Caltrans approved the draft document in 2017, with the final approval pending. The Board of Supervisors adopted the CEQA and the National Environmental Policy Act (NEPA) on March 10, 2020. The Board also approved the Build Alternative 1. Caltrans has reviewed the CEQA document and had no further questions, with the NEPA approval pending.

The environmental document evaluated four alternatives that were being proposed for this project:

- Build Alternative 1 option proposed to widen the existing bridge from three to five lanes. It includes road widening and realignments of North Shingle and Durock Roads. Wild Chaparral Drive remains in the existing condition which allows access to the park and ride lot adjacent to Wild Chaparral Drive and to the businesses and residences using this local road to access Ponderosa Road. Alternative 1 also includes adding turn pockets, providing acceleration/deceleration lanes, HOV bypass lanes and ramp metering, and modifications to loop on- and off-ramps in both east and west directions. Utility relocations will pursue an undergrounding option where feasible. This alternative meets the purpose and need of the project and includes a project design exception approved by Caltrans for additional ingress and egress to the businesses off of Mother Lode Drive in the project area.

- Build Alternative 2 is similar to Build Alternative 1, but it would additionally realign the existing Wild Chaparral Drive connection to the north on Ponderosa Road and would create a new cul-de-sac at the existing connection to Ponderosa Road.

- Build Alternative 3 would widen the existing overpass from 3 to 5 lanes. The U.S 50 ramps and approaches would be widened to the point they conform to the local roads and/or ramp intersections. Local roads would not be widened under this alternative. Build Alternative 3 is characterized as a “minimum impact” build solution because it would require less right-of-way (ROW) impacts compared with Build Alternatives 1 and 2; however, it would only minimally improve the degrading LOS situation in the project area by 2035.

- The fourth alternative was the No-Build Alternative which would maintain the existing facility. The No-Build Alternative does not address the current deficiencies or long-term traffic needs of the U.S. 50 corridor or the Ponderosa Interchange.

A significant public outreach effort was conducted to get comments on the four alternative interchange designs. Transportation staff will proceed with the projects through the NEPA clearance process, final design and construction.

The 2020 Capital Improvement Program identified three separate projects that will implement Build Alternative 1 with updated cost estimates. These are U.S. 50/Ponderosa Road/South Shingle Road Interchange Improvements (#71333/36104010); U.S. 50/Ponderosa Road Interchange – Durock Road Realignment (#71338/36104008); and U.S. 50/Ponderosa Road Interchange – North Shingle Road Realignment (#71339/36104009).

Preferred Build Alternative 1

Updated Analysis for the Traffic Impact Fee Program

The on-going update of the County's CIP and Traffic Impact Fee (TIF) Program is taking a new look at roadway needs for the County. The Update is based on a 2040 horizon year and is using a Board-adopted slower development growth rate than the prior Fee Program.

The Build Alternatives were based on the higher growth rate that was used for the prior Fee Program. It is acknowledged that the traffic studies for the interchange will need to be updated.

The updated TIF traffic operations analysis of the Ponderosa Road interchange, based on new projected 2040 traffic volumes, resulted in the following conclusions:

- The key intersections in the interchange area would operate at an acceptable LOS in 2040
- There would be unacceptable levels of traffic queuing on the local roads and potentially the off-ramps causing vehicles to back up onto the U.S. Highway 50 mainline.

Ponderosa Road Interchange Area

Several key factors were defined related to improvements:

- Implementing the relocation of North Shingle Road and Durock Road as defined in the 2020 CIP would solve queuing through 2040
- Additional improvements may be needed to maintain acceptable LOS beyond the 2040 horizon
- Caltrans projects have a long lead time to be planned, approved and designed.
- Right of way should be secured

No matter what improvements are made to the interchange, Caltrans will require additional preliminary engineering and the NEPA environmental document be completed. This effort will provide the County with an agreement with Caltrans and thus certainty on what it needs to fund and implement. With that agreement, right-of-way could then be preserved for the selected ultimate design.

Thus, the recommendations for the funding of improvements to the Ponderosa Road/U.S. Highway 50 interchange in the 2020 CIP and TIF involve the following:

- Funding the preparation of Preliminary Engineering and Environmental Document that will allow the County and Caltrans to officially select interim and long-term improvements for the interchange
- Funding right-of-way purchases to preserve the land needed for long-term improvements
- Funding the relocation of North Shingle Road and Durock Road projects.

The recommendations for TIF funding allow the County to work with Caltrans on logical steps to the ultimate improvement while providing funds for a first phase of construction. That first phase would result in decreases in delays for vehicles using the interchange to happen sooner than waiting for full funding of the ultimate improvement.

Cost Estimate for Recommended Interchange Improvements in the 2020 CIP and TIF

The cost estimate for funding in the TIF Update was based on the following:

- Incorporating the first two phases of the interchange.

- Incorporating the Preliminary Engineering and Environmental Document costs based on the latest 2020 interchange estimate.

- Incorporating the cost of right-of-way for the ultimate design

El Dorado County 2020 Traffic Impact Fee Update

Appendix B

TIM Fee Capital Improvement Costs

Supporting Documentation

1. **VMT-Based EDU Rates Technical Memorandum**
2. **Fee Rates by Size of Single-Family Unit Technical Memorandum**
3. **New Evaluation of Cameron Park Drive/US 50 Interchange**
4. **New Evaluation of Ponderosa Road/U.S. 50 Interchange**

QUINCY ENGINEERING

Date: September 18, 2020

To: Natalie Porter, PE, TE
Senior Traffic Engineer
El Dorado County - Community Development Services

From: Jason Jurrens, PE
Project Manager
Quincy Engineering

Subject: 2020 El Dorado County Traffic Impact Fee Update Cost Estimate Methodology

Ms. Porter,

This memorandum provides information on the methodology that will be used by Quincy Engineering to prepare project cost estimates in support of the 2020 CIP Traffic Impact Fee Update.

PROJECT ESTIMATING APPROACH

Unit Costs

While unit costs can vary widely from project to project based on market trends, fuel costs, project location, project size, and complexity, best engineering judgement will be used in order to identify common project improvement cost items and to develop associated unit costs that are accurate when compared to recent bid data on CIP projects in El Dorado County.

Quincy has established unit costs that will be applied uniformly to all project estimates (local roads and auxiliary lanes) to be included with the 2020 TIF Update. The unit costs have been developed by utilizing a combination of recently advertised and awarded CIP projects in El Dorado County, as well as the Caltrans Construction Cost Index (CCCI).

Preference in establishing unit costs for the 2020 update will be given to El Dorado County bid data, as that provides a direct comparison with anticipated bid unit costs. For items that do not have a correlating item of work from established bid data, unit costs from the 2016 update will be escalated in accordance with CCCI data from August 2016 and August 2020. The Caltrans Construction Cost Index can be viewed at the following link:

https://www.dgs.ca.gov/RESD/Resources/Page-Content/Real-Estate-Services-Division-Resources-List-Folder/DGS-California-Construction-Cost-Index-CCCI

The escalation rate applied to unit costs will be 12%. The attached Unit Cost Index illustrates the construction items, their 2016 unit costs, an applied cost increase of 12% from the CCI, comparable CIP bid data, and the unit cost being applied to the 2020 TIF Update. The index is color coded to indicate which criteria was used to establish the 2020 unit costs.

Right of Way

Right of way costs for the local road segments will be based on a square foot area for developed or undeveloped areas. Where existing parking will be impacted, costs per parking stall taken will be included. The road segment estimates will include an additional 10% for right of way acquisition support.

Earthwork and Drainage

Earthwork/Grading Factors will be applied to the roadway excavation quantity based on the grading difficulty of the terrain from 1 to 5; 1=5%, 2=30%, 3=90%, 4=150% and 5=220%.

Drainage will be estimated at 15% of the earthwork and structural section quantity totals which is a close approximated average for actual constructed projects.

Supplemental Items (Local Road Estimates Only)

Traffic Management Plan/Traffic Control will be estimated at 4% of the total roadway construction cost.

Construction Contingency will be estimated at 25% of the total roadway construction cost.

Capital Support

Each estimate includes items that were measured or otherwise quantified, however there are other items associated with each project that were not separately measured but nonetheless likely to be required. Therefore, the support costs and contingencies provided in each estimate will represent project components not specifically measured, either due to the preliminary nature of the project, or presently known work items that typically fall within a percentage range of project construction costs. The following support costs and contingency values will be added to the estimated construction as defined below:

- *Project Report/Environmental Document (Preliminary Design, Preliminary Engineering, Project Management)* at 10% of the total construction cost; addresses the project development support costs required to complete the Environmental Document milestone.

- *Final Design- Plans, Specifications & Estimate* at 20% of the total construction cost; addresses the project design phase support costs required to complete construction contract documents.

- *Construction Management* at 15% of the total construction cost; addresses the project construction phase support costs required to administer the construction contract.

Should there be any further information required for approval of our cost estimating methodology, please let us know.

Attachments: Unit Cost Index for El Dorado County 2020 TIF Update

El Dorado County - 2020 TIF Update Unit Cost Index

Item Description	Unit	2016 Unit Cost	CT Cost Index Increase (12%)	EDC Bid Data	Use for 2020 Estimates
Earthwork					
Roadway Excavation	CY	$30.00	$33.60	$60.00	$60.00
Existing Facilities					
Sawcut Existing Asphalt Concrete	LF	$2.50	$2.80		$3.00
Removal of Striping	LF	$1.25	$1.40	$1.50	$1.50
Removal of Pavement Markings	SF	$3.00	$3.36	$3.00	$3.00
Relocate Existing Fence	LF	$20.00	$22.40	$25.00	$25.00
Structural Section					
Hot Mix Asphalt (Type A)	Ton	$110.00	$123.20	$125.00	$125.00
Class 2 Aggregate Base	CY	$60.00	$67.20	$80.00	$80.00
AC Overlay	Ton	$110.00	$123.20	$125.00	$125.00
Drainage & Utilities					
Drainage (15% of Earthwork & Struc Sec total)		15%	-		15%
Relocate Utility Pole	EA	$7,500.00	$8,400.00		$8,500.00
Specialty Items					
Concrete Sidewalk	SF	$10.00	$11.20		$12.00
Curb and Gutter	LF	$30.00	$33.60		$33.00
Median Island Curb	LF	$15.00	$16.80		$17.00
Median Island Flatwork	SF	$8.00	$8.96		$9.00
Driveway	EA	$4,000.00	$4,480.00		$5,000.00
Sidewalk Ramp	EA	$2,500.00	$2,800.00		$3,000.00
Small Retaining Wall (0 to 5')	LF	$200.00	$224.00		$250.00
Medium Retaining Wall (6 to 10')	LF	$400.00	$448.00		$450.00
Large Retaining Wall (11' & up)	LF	$550.00	$616.00		$620.00
Midwest Guardrail System	LF	$200.00	$224.00		$225.00
Railroad Crossing Imp (Type 1)	LS	$500,000.00	$560,000.00		$600,000.00
Railroad Crossing Imp (Type 2)	LS	$650,000.00	$728,000.00		$730,000.00
Railroad Crossing Imp (Type 3)	LS	$800,000.00	$896,000.00		$900,000.00
Landscaping					
Landscaping & Irrigation	SF	$4.50	$5.04		$5.00
Median Treatment	SF	$5.00	$5.60		$6.00
Traffic Items					
Street Lights and Pull Boxes	EA	$4,000.00	$4,480.00		$5,000.00
Street Lights Conduit System	EA	$25.00	$28.00		$30.00
Traffic Signal Modification (low)	LS	$75,000.00	$84,000.00		$100,000.00
Traffic Signal Modification (high)	LS	$170,000.00	$190,400.00		$200,000.00
Traffic Signal New (low)	LS	$190,000.00	$212,800.00		$250,000.00
Traffic Signal New (high)	LS	$290,000.00	$324,800.00		$350,000.00
Striping Imps (6 lanes)	LF	$7.50	$8.40		$8.50
Striping Imps (4 lanes)	LF	$6.00	$6.72		$7.00
Striping Imps (3 lanes)	LF	$4.50	$5.04		$5.00
Pavement Markings	SF	$5.00	$5.60	$6.00	$6.00
Roadside Sign	EA	$300.00	$336.00	$350.00	$350.00
Supplemental Items					
Traffic Management Plan/Traffic Control		4%	-		4%
Construction Contingency		25%	-		25%
Right-of-Way [1]					
Developed (parking)	Stall	$2,500.00	$2,800.00		$3,000.00
Developed (landscaped)	SF	$17.50	$19.60		$20.00
Developed (building)	SF	$200.00	$224.00		$225.00
Undeveloped	SF	$10.00	$11.20		$12.00
Right-of-way Acquisition Support		10%	-		10%
Capital Support (Note, reduced to 45% total for larger/interchange projects)					
PR/ED (PD,PE,PM)		10%	-		10%
PS&E (PS)		20%	-	-	20%
CONSTRUCTION (CM)		15%	-	-	15%

Note: EDC Bid Data utilized bid results from severla projects bid between 2018 and 2020, most notably the Silver Springs Parkway South Segment and Diamond Springs Parkway

Note: Caltrans Construction Cost Index
https://www.dgs.ca.gov/RESD/Resources/Page-Content/Real-Estate-Services-Division-Resources-List-Folder/DGS-California-Construction-Cost-Index-CCCI

El Dorado County - 2020 TIF Update A-1

Prepared By: QUINCY ENGINEERING

PRELIMINARY COST

U.S. 50 Auxiliary Lane Westbound

Project Limits: El Dorado Hills Blvd I/C to Sacramento County Line

TYPE: 1-LANE - Utilizing current drop lane, widening starts where the third merge arrow is currently located

Right-of-Way and proposed improvements are approximate only, information shown is for cost estimating purposes only and is not accurate for determining construction limits.

			PROJECT LENGTH	**1,500**
Item Description	**Quantity**	**Units**	**Unit Cost**	**Total Cost**
Earthwork				
Roadway Excavation	3,667	CY	$60.00	$220,000
Earthwork/Grading Factor			90%	$198,000
Existing Facilities				
Sawcut Existing Asphalt Concrete	1,500	LF	$3.00	$4,500
Removal of Striping	3,000	LF	$1.50	$4,500
Removal of Pavement Markings	135	SF	$3.00	$405
Structural Section				
Hot Mix Asphalt (Type A)	1,755	Ton	$130.00	$228,150
Rubberized Hot Mix Asphalt - Open Graded	270	Ton	$150.00	$40,500
Class 2 Aggregate Base	2,467	CY	$80.00	$197,333
Drainage & Utilities				
Drainage (15% of Earthwork & Struc Sec total)			15%	$132,598
Specialty Items				
Medium Retaining Wall (6 to 10')	300	LF	$450.00	$135,000
Traffic Items				
Street Lights and Pull Boxes	8	EA	$8,000.00	$64,000
Street Lights Conduit System	1,500	LF	$30.00	$45,000
Traffic Signal Modification (low)	1	LS	$75,000.00	$75,000
Pavement Markings	135	SF	$6.00	$810
Signs	6	EA	$350.00	$2,100
Subtotal Roadway Construction Items				**$1,347,896**
Supplemental Items				
Traffic Management Plan/Traffic Control			4%	$53,916
Construction Contingency			25%	$336,974
Subtotal Supplemental Items				**$390,890**
Construction Subtotal				**$1,738,786**
Right-of-Way[1]				
Undeveloped	0	SF	$12.00	$0
Right-of-way Acquisition Support			10%	$0
Subtotal R/W Items				**$0**
Capital Support				
PR/ED (PD,PE,PM)			15%	$260,818
PS&E (PS)			25%	$434,696
CONSTRUCTION (CM)			15%	$260,818
Subtotal Capital Support Items				**$956,332**
Project Subtotal				**$2,695,118**
On-System Cost Increases for Capital Support and Construction			15%	**$404,268**
Project Total				**$3,099,385**
Rounded				**$3,100,000**

1. Pavement Section assumed based on US 50 widening design for Silva Valley Parkway Interchange.
2. Retaining Wall assumed to be needed at large culvert/creek crossing
3. Street Lighting spacing of 200' matches current condition.

El Dorado County - 2020 TIF Update

Segment R-3

Prepared By: QUINCY ENGINEERING

PRELIMINARY COST

Green Valley Road Widening

Project Limits: Francisco Dr to Loch Way

TYPE: 4-LANE (with Concrete Median to match adjacent widened segment, sidewalk, curb and gutter)

Right-of-Way and proposed improvements are approximate only, information shown is for cost estimating purposes only and is not accurate for determining construction limits.

PROJECT LENGTH 4,300

Item Description	Quantity	Units	Unit Cost	Total Cost
Earthwork				
Roadway Excavation	15,431	CY	$60.00	$925,842
Earthwork/Grading Factor			150%	$1,388,762
Existing Facilities				
Sawcut Existing Asphalt Concrete	8,600	LF	$3.00	$25,800
Removal of Striping	12,900	LF	$1.50	$19,350
Removal of Pavement Markings	450	SF	$3.00	$1,350
Structural Section				
Hot Mix Asphalt (Type A)	6,386	Ton	$130.00	$830,115
Class 2 Aggregate Base	8,541	CY	$80.00	$683,286
AC Overlay	1,161	Ton	$125.00	$145,125
Drainage & Utilities				
Drainage (15% of Earthwork & Struc Sec total)			15%	$595,969
Relocate Utility Pole	3	EA	$8,500.00	$25,500
Specialty Items				
Concrete Sidewalk	25,800	SF	$15.00	$387,000
Curb and Gutter	4,300	LF	$50.00	$215,000
Median Island Curb	8,600	LF	$25.00	$215,000
Median Island Flatwork	12,900	SF	$15.00	$193,500
Driveway	1	EA	$5,000.00	$5,000
Sidewalk Ramp	4	EA	$4,000.00	$16,000
Medium Retaining Wall (6 to 10')	1800	LF	$400.00	$720,000
Meidum Sound Wall (6' to 10')	1300	LF	$200.00	$260,000
Traffic Items				
Street Lights and Pull Boxes	4	EA	$8,000.00	$32,000
Street Lights Conduit System	600	LF	$30.00	$18,000
Traffic Signal Modification (high) [2]	2	LS	$200,000.00	$400,000
Striping Imps (4 lanes)	4,300	LF	$7.00	$30,100
Pavement Markings	810	SF	$6.00	$4,860
Signs	18	EA	$350.00	$6,300
Subtotal Roadway Construction Items				**$7,143,859**
Supplemental Items				
Traffic Management Plan/Traffic Control			4%	$285,754
Construction Contingency			25%	$1,785,965
Subtotal Supplemental Items				**$2,071,719**
Construction Subtotal				**$9,215,579**
Right-of-Way[1]				
Undeveloped	86,000	SF	$12.00	$1,032,000
Right-of-way Acquisition Support			10%	$103,200
Subtotal R/W Items				**$1,135,200**
Capital Support				
PR/ED (PD,PE,PM)			10%	$921,558
PS&E (PS)			20%	$1,843,116
CONSTRUCTION (CM)			15%	$1,382,337
Subtotal Capital Support Items				**$4,147,010**
Project Total				**$14,497,789**
Rounded				**$14,498,000**

1. Assuming 10' Swath or ROW needed on both sides to widen road
2. Retaining walls will be needed along both sides of widened Green Valley Road to cut back existing slopes
3. Sidewalk, Curb, and Gutter only on north side (matching existing widened section)
4. Signal at Loch Way to be constructed during separate project
5. Street lights (2) at intersections only (EDH, SVP)

Prepared By: QUINCY ENGINEERING

PRELIMINARY COST

Latrobe Road

Project Limits: Golden Foothill Parkway (N) to White Rock Road

TYPE: 6-LANE

Right-of-Way and proposed improvements are approximate only, information shown is for cost estimating purposes only and is not accurate for determining construction limits.

			PROJECT LENGTH	**2,100**
Item Description	**Quantity**	**Units**	**Unit Cost**	**Total Cost**
Earthwork				
Roadway Excavation	6,397	CY	$60.00	$383,840
Earthwork/Grading Factor			150%	$575,760
Existing Facilities				
Sawcut Existing Asphalt Concrete	4,200	LF	$3.00	$12,600
Removal of Striping	12,600	LF	$1.50	$18,900
Removal of Pavement Markings	675	SF	$3.00	$2,025
Relocate Existing Fence	0	LF	$25.00	$0
Structural Section				
Hot Mix Asphalt (Type A)	3,119	Ton	$130.00	$405,405
Class 2 Aggregate Base	4,279	CY	$80.00	$342,311
AC Overlay	1,654	Ton	$125.00	$206,719
Drainage & Utilities				
Drainage (15% of Earthwork & Struc Sec total)			15%	$287,105
Relocate Utility Pole	2	EA	$8,500.00	$17,000
Specialty Items				
Concrete Sidewalk	18,000	SF	$15.00	$270,000
Curb and Gutter	3,000	LF	$50.00	$150,000
Driveway	1	EA	$6,000.00	$6,000
Sidewalk Ramp	4	EA	$4,000.00	$16,000
Traffic Items				
Traffic Signal Modification (high) [2]	1	LS	$200,000.00	$200,000
Striping Imps (6 lanes)	2,100	LF	$7.50	$15,750
Pavement Markings	675	SF	$6.00	$4,050
Signs	6	EA	$350.00	$2,100
Subtotal Roadway Construction Items				**$2,915,565**
Supplemental Items				
Traffic Management Plan/Traffic Control			4%	$116,623
Construction Contingency			25%	$728,891
Subtotal Supplemental Items				**$845,514**
Construction Subtotal				**$3,761,079**
Right-of-Way [1]				
Undeveloped	31,100	SF	$12.00	$373,200
Right-of-way Acquisition Support			10%	$37,320
Subtotal R/W Items				**$410,520**
Capital Support				
PR/ED (PD,PE,PM)			10%	$376,108
PS&E (PS)			20%	$752,216
CONSTRUCTION (CM)			15%	$564,162
Subtotal Capital Support Items				**$1,692,486**
Project Total				**$5,864,085**
Rounded				**$5,865,000**

El Dorado County - 2020 TIF Update

Segment R-5

Prepared By:

QUINCY ENGINEERING

PRELIMINARY COST

Missouri Flat Road Widening

Project Limits: China Garded Road to SR 49

TYPE: 4-LANE, Sidewalk, Curb and Gutter

Right-of-Way and proposed improvements are approximate only, information shown is for cost estimating purposes only and is not accurate for determining construction limits.

PROJECT LENGTH **2,680**

Item Description	Quantity	Units	Unit Cost	Total Cost
Earthwork				
Roadway Excavation	7,739	CY	$60.00	$464,310
Earthwork/Grading Factor			150%	$696,465
Existing Facilities				
Sawcut Existing Asphalt Concrete	5,360	LF	$3.00	$16,080
Removal of Striping	6,700	LF	$1.50	$10,050
Removal of Pavement Markings	990	SF	$3.00	$2,970
Structural Section				
Hot Mix Asphalt (Type A)	3,683	Ton	$130.00	$478,764
Class 2 Aggregate Base	5,222	CY	$80.00	$417,720
AC Overlay	1,085	Ton	$125.00	$135,675
Drainage & Utilities				
Drainage (15% of Earthwork & Struc Sec total)			15%	$328,940
Relocate Utility Pole	30	EA	$8,500.00	$255,000
Specialty Items				
Concrete Sidewalk	29,700	SF	$15.00	$445,500
Curb and Gutter	4,950	LF	$50.00	$247,500
Driveway	25	EA	$6,000.00	$150,000
Sidewalk Ramp	8	EA	$4,000.00	$32,000
Traffic Items				
Striping Imps (4 lanes)	2,680	LF	$7.00	$18,760
Signs	14	EA	$350.00	$4,900
Subtotal Roadway Construction Items				**$3,704,634**
Supplemental Items				
Traffic Management Plan/Traffic Control			4%	$148,185
Construction Contingency			25%	$926,159
Subtotal Supplemental Items				**$1,074,344**
Construction Subtotal				**$4,778,978**
Right-of-Way				
Developed (parking)	8	Stall	$2,500.00	$20,000
Developed (landscaped)	32,160	SF	$17.50	$562,800
Right-of-way Acquisition Support			20%	$116,560
Subtotal R/W Items				**$699,360**
Capital Support				
PR/ED (PD,PE,PM)			10%	$477,898
PS&E (PS)			20%	$955,796
CONSTRUCTION (CM)			15%	$716,847
Subtotal Capital Support Items				**$2,150,540**
Project Total				**$7,628,878**
Rounded				**$7,629,000**

1. Keeping TWLTL in middle, adding one lane, shoulder, and CGSW to the outside
2. Heavy OH Utility relocation required
3 ROW Acquisition on East side needed throughout project limits (approximately additional 12')
4. Increased ROW Acquisition Support to 20% for this project, several properties impacted

El Dorado County - 2020 TIF Update

Segment R-18

Prepared By:

QUINCY ENGINEERING

PRELIMINARY COST

Pleasant Valley Road

Project Limits: SR 49 (that heads north) to Toyan Drive

TYPE: 4-LANE (with two-way left turn lane)

Right-of-Way and proposed improvements are approximate only, information shown is for cost estimating purposes only and is not accurate for determining construction limits.

			PROJECT LENGTH	450
Item Description	**Quantity**	**Units**	**Unit Cost**	**Total Cost**
Existing Facilities				
Removal of Striping	2,250	LF	$1.50	$3,375
Removal of Pavement Markings	270	SF	$3.00	$810
Drainage & Utilities				
Drainage (15% of Earthwork & Struc Sec total)			15%	$0
Specialty Items				
Sidewalk Ramp	2	EA	$4,000.00	$8,000
Traffic Items				
Traffic Signal Modification (high) [2]	1	LS	$200,000.00	$200,000
Striping Imps (4 lanes)	450	LF	$7.00	$3,150
Pavement Markings	360	SF	$6.00	$2,160
Signs	2	EA	$350.00	$630
Subtotal Roadway Construction Items				**$218,125**
Supplemental Items				
Traffic Management Plan/Traffic Control			4%	$8,725
Construction Contingency			25%	$54,531
Subtotal Supplemental Items				**$63,256**
Construction Subtotal				**$281,381**
Right-of-Way[1]				
Undeveloped	0	SF	$12.00	$0
Right-of-way Acquisition Support			10%	$0
Subtotal R/W Items				**$0**
Capital Support				
PR/ED (PD,PE,PM)			10%	$28,138
PS&E (PS)			20%	$56,276
CONSTRUCTION (CM)			15%	$42,207
Subtotal Capital Support Items				**$126,622**
Project Total				**$408,003**
Rounded				**$409,000**

1. Restriping project only, pavement width is currently adequate for 4 lanes.

El Dorado County - 2020 TIF Update

Segment R-16

Prepared By: QUINCY ENGINEERING

PRELIMINARY COST

White Rock Road Widening (2 to 4 lanes)

Project Limits: Windfield Way to Sacramento County Line

TYPE: 4-LANE (with two-way left turn lane)

Right-of-Way and proposed improvements are approximate only, information shown is for cost estimating purposes only and is not accurate for determining construction limits.

PROJECT LENGTH **4,700**

Item Description	Quantity	Units	Unit Cost	Total Cost
Earthwork				
Roadway Excavation	13,103	CY	$60.00	$786,151
Earthwork/Grading Factor			150%	$1,179,226
Existing Facilities				
Sawcut Existing Asphalt Concrete	9,400	LF	$3.00	$28,200
Removal of Striping	21,150	LF	$1.50	$31,725
Removal of Pavement Markings	1,800	SF	$3.00	$5,400
Structural Section				
Hot Mix Asphalt (Type A)	6,435	Ton	$130.00	$836,550
Class 2 Aggregate Base	8,696	CY	$80.00	$695,713
AC Overlay	3,116	Ton	$125.00	$389,531
Drainage & Utilities				
Drainage (15% of Earthwork & Struc Sec total)			15%	$583,076
Specialty Items				
Concrete Sidewalk	14,100	SF	$15.00	$211,500
Curb and Gutter	9,400	LF	$50.00	$470,000
Median Island Curb	3,600	LF	$25.00	$90,000
Driveway	1	EA	$6,000.00	$6,000
Sidewalk Ramp	3	EA	$4,000.00	$12,000
Metal Beam Guard Railing	300	LF	$200.00	$60,000
Landscaping				
Landscaping & Irrigation	21,600	SF	$4.50	$97,200
Median Treatment	10,800	SF	$5.00	$54,000
Traffic Items				
Traffic Signal Modification (high) [2]	2	LS	$200,000.00	$400,000
Striping Imps (4 lanes)	4,700	LF	$7.00	$32,900
Pavement Markings	1800	SF	$6.00	$10,800
Signs	38	EA	$350.00	$13,300
Subtotal Roadway Construction Items				**$5,993,271**
Supplemental Items				
Traffic Management Plan/Traffic Control			4%	$239,731
Construction Contingency			25%	$1,498,318
Subtotal Supplemental Items				**$1,738,049**
Construction Subtotal				**$7,731,320**
Right-of-Way [1]				
Undeveloped	42,000	SF	$12.00	$504,000
Right-of-way Acquisition Support			10%	$50,400
Subtotal R/W Items				**$554,400**
Capital Support				
PR/ED (PD,PE,PM)			10%	$773,132
PS&E (PS)			20%	$1,546,264
CONSTRUCTION (CM)			15%	$1,159,698
Subtotal Capital Support Items				**$3,479,094**
Project Total				**$11,764,814**
Rounded				**$11,765,000**

1. Right of way acquisition needed south of Stonebriar Drive on the west side
2. Signal modifications at intersections with El Dorado Hills Blvd and Silva Valley Rd.

El Dorado County - TIF Update

Segment R-4

Prepared By:
QUINCY ENGINEERING

PRELIMINARY COST

White Rock Road Widening

Project Limits: Post Street to south of Silva Valley Parkway

TYPE: 4-LANE (sidewalk, curb and gutter)

Right-of-Way and proposed improvements are approximate only, information shown is for cost estimating purposes only and is not accurate for determining construction limits.

			PROJECT LENGTH	3,560
Item Description	**Quantity**	**Units**	**Unit Cost**	**Total Cost**
Earthwork				
Roadway Excavation	9,431	CY	$60.00	$565,883
Earthwork/Grading Factor			90%	$509,294
Existing Facilities				
Sawcut Existing Asphalt Concrete	7,120	LF	$3.00	$21,360
Removal of Striping	8,900	LF	$1.50	$13,350
Removal of Pavement Markings	540	SF	$3.00	$1,620
Structural Section				
Hot Mix Asphalt (Type A)	4,482	Ton	$130.00	$582,689
Class 2 Aggregate Base	6,371	CY	$80.00	$509,704
AC Overlay	1,181	Ton	$125.00	$147,572
Drainage & Utilities				
Drainage (15% of Earthwork & Struc Sec total)			15%	$347,271
Relocate Utility Pole	7	EA	$8,500.00	$59,500
Specialty Items				
Concrete Sidewalk	38,640	SF	$15.00	$579,600
Curb and Gutter	5,720	LF	$50.00	$286,000
Driveway	11	EA	$6,000.00	$66,000
Sidewalk Ramp	14	EA	$4,000.00	$56,000
Traffic Items				
Traffic Signal Modification (low)	1	LS	$75,000.00	$75,000
Traffic Signal Modification (medium)	1	LS	$125,000.00	$125,000
Traffic Signal Modification (high)	1	LS	$170,000.00	$170,000
Striping Imps (4 lanes)	3,560	LF	$7.00	$24,920
Signs	14	EA	$350.00	$4,900
Subtotal Roadway Construction Items				**$4,145,664**
Supplemental Items				
Traffic Management Plan/Traffic Control			4%	$165,827
Construction Contingency			25%	$1,036,416
Subtotal Supplemental Items				**$1,202,242**
Structure Items				
Box Culvert Extension	25	LF	$3,000.00	$75,000
Subtotal Structure Construction Items				**$75,000**
Construction Subtotal				**$5,422,906**
Right-of-Way				
Developed (landscaped)	49,000	SF	$17.50	$857,500
Developed (building)	3,000	SF	$200.00	$600,000
Right-of-way Acquisition Support			10%	$145,750
Subtotal R/W Items				**$1,603,250**
Capital Support				
PR/ED (PD,PE,PM)			10%	$542,291
PS&E (PS)			20%	$1,084,581
CONSTRUCTION (CM)			15%	$813,436
Subtotal Capital Support Items				**$2,440,308**
Project Total				**$9,466,464**
Rounded				**$9,467,000**
1. ROW Acquisition for buidling near Keagles Lane				

El Dorado County - 2020 TIF Update

Segment R-14

Prepared By:
QUINCY ENGINEERING

PRELIMINARY COST

Bass Lake Road Widening

Project Limits: U.S. 50 to N. of Country Club Drive Realignment

TYPE: 4-LANE (with two-way left turn lane)

Right-of-Way and proposed improvements are approximate only, information shown is for cost estimating purposes only and is not accurate for determining construction limits.

PROJECT LENGTH 1,100

Item Description	Quantity	Units	Unit Cost	Total Cost
Earthwork				
Roadway Excavation	1,927	CY	$60.00	$115,633
Earthwork/Grading Factor			150%	$173,450
Existing Facilities				
Sawcut Existing Asphalt Concrete	2,200	LF	$3.00	$6,600
Removal of Striping	3,300	LF	$1.50	$4,950
Removal of Pavement Markings	45	SF	$3.00	$135
Relocate Existing Fence	2,200	LF	$25.00	$55,000
Structural Section				
Hot Mix Asphalt (Type A)	869	Ton	$130.00	$112,928
Class 2 Aggregate Base	1,312	CY	$80.00	$104,943
AC Overlay	446	Ton	$125.00	$55,688
Drainage & Utilities				
Drainage (15% of Earthwork & Struc Sec total)			15%	$84,396
Relocate Utility Pole	2	EA	$8,500.00	$17,000
Traffic Items				
Striping Imps (4 lanes)	1,100	LF	$7.00	$7,700
Pavement Markings	405	SF	$6.00	$2,430
Signs	6	EA	$350.00	$2,100
Subtotal Roadway Construction Items				**$742,953**
Supplemental Items				
Traffic Management Plan/Traffic Control			4%	$29,718
Construction Contingency			25%	$185,738
Subtotal Supplemental Items				**$215,456**
Construction Subtotal				**$958,410**
Right-of-Way[1]				
Undeveloped	20,000	SF	$12.00	$240,000
Right-of-way Acquisition Support			10%	$24,000
Subtotal R/W Items				**$264,000**
Capital Support				
PR/ED (PD,PE,PM)			10%	$95,841
PS&E (PS)			20%	$191,682
CONSTRUCTION (CM)			15%	$143,761
Subtotal Capital Support Items				**$431,284**
Project Total				**$1,653,694**
Rounded				**$1,654,000**

1. Widening to 4 lanes in addition to Bass Lake improvements being implemented with Country Club Realignment

El Dorado County - 2020 TIF Update

Segment R-13

Prepared By: QUINCY ENGINEERING

PRELIMINARY COST

Headington Road Extension

Project Limits: Missouri Flat Road to El Dorado Road

TYPE: 2 Lane

Right-of-Way and proposed improvements are approximate only, information shown is for cost estimating purposes only and is not accurate for determining construction limits.

Item Description	Quantity	Units	Unit Cost	Total Cost
			PROJECT LENGTH	**3,500**
Earthwork				
Roadway Excavation	14,625	CY	$60.00	$877,528
Earthwork/Grading Factor			150%	$1,316,292
Structural Section				
Hot Mix Asphalt (Type A)	7,605	Ton	$140.00	$1,064,700
Class 2 Aggregate Base	8,788	CY	$80.00	$703,040
Drainage & Utilities				
Drainage (15% of Earthwork & Struc Sec total)			15%	$594,234
Specialty Items				
HMA Dike	650	LF	$15.00	$9,750
HMA Gutter	650	LF	$30.00	$19,500
Driveway	1	EA	$6,000.00	$6,000
Sidewalk Ramp	2	EA	$4,000.00	$8,000
Traffic Items				
Street Lights and Pull Boxes	4	EA	$8,000.00	$32,000
Street Lights Conduit System	400	LF	$30.00	$12,000
Striping Imps (2 lanes)	3,500	LF	$5.00	$17,500
Pavement Markings	360	SF	$6.00	$2,160
Signs	13	EA	$350.00	$4,550
Subtotal Roadway Construction Items				**$4,667,254**
Supplemental Items				
Traffic Management Plan/Traffic Control			4%	$186,690
Construction Contingency			25%	$1,166,814
Subtotal Supplemental Items				**$1,353,504**
Structure Items				
Bridge / CONSPAN	5,600	SF	$350.00	$1,960,000
Subtotal Structure Construction Items				**$1,960,000**
Construction Subtotal				**$7,980,758**
Right-of-Way				
Undeveloped	252,000	SF	$12.00	$3,024,000
Right-of-way Acquisition Support			10%	$302,400
Subtotal R/W Items				**$3,326,400**
Capital Support				
PR/ED (PD,PE,PM)			10%	$798,076
PS&E (PS)			20%	$1,596,152
CONSTRUCTION (CM)			15%	$1,197,114
Subtotal Capital Support Items				**$3,591,341**
Project Total				**$14,898,499**
Rounded				**$14,899,000**

1. Design per plans provided by County on 9/24/20
2. Project does not include signalization of Missouri Flat/Headington, that work is a separate project

El Dorado County

Segment R-6

Prepared By:

PRELIMINARY COST

Saratoga Way

Project Limits: El Dorado Hills Blvd to Wilson Blvd

TYPE: 4-LANE

Right-of-Way and proposed improvements are approximate only, information shown is for cost estimating purposes only and is not accurate for determining construction limits.

			PROJECT LENGTH	3,700
Item Description	**Quantity**	**Units**	**Unit Cost**	**Total Cost**
Earthwork				
Roadway Excavation	9,916	CY	$60.00	$594,931
Earthwork/Grading Factor			90%	$535,438
Existing Facilities				
Sawcut Existing Asphalt Concrete	3,700	LF	$3.00	$11,100
Removal of Striping	14,800	LF	$1.50	$22,200
Removal of Pavement Markings	400	SF	$3.00	$1,200
Removal of Existing Landscaping	8,800	SF	$20.00	$176,000
Remove Existing Curb, Gutter, Sidewalk	880	LF	$100.00	$88,000
Structural Section				
Hot Mix Asphalt (Type A)	4,876	Ton	$130.00	$633,848
Class 2 Aggregate Base	6,614	CY	$80.00	$529,124
AC Overlay	914	Ton	$125.00	$114,244
Drainage & Utilities				
Drainage (15% of Earthwork & Struc Sec total)			15%	$361,138
Specialty Items				
Concrete Sidewalk	25,680	SF	$15.00	$385,200
Curb and Gutter	4,280	LF	$50.00	$214,000
Median Island Curb	7,000	LF	$25.00	$175,000
Median Island Flatwork	10,500	SF	$15.00	$157,500
Driveway	1	EA	$6,000.00	$6,000
Sidewalk Ramp	4	EA	$4,000.00	$16,000
Small Retaining Wall (0 to 5')	300	LF	$250.00	$75,000
Medium Retaining Wall (6 to 10')	880	LF	$450.00	$396,000
Concrete Barrier	700	LF	$500.00	$350,000
Landscaping				
Median Treatment	21,000	SF	$6.00	$126,000
Traffic Items				
Street Lights and Pull Boxes	2	EA	$8,000.00	$16,000
Street Lights Conduit System	100	LF	$30.00	$3,000
Traffic Signal Modification (high)	2	LS	$200,000.00	$400,000
Striping Imps (4 lanes)	3,700	LF	$7.00	$25,900
Pavement Markings	990	SF	$6.00	$5,940
Signs	15	EA	$350.00	$5,180
Subtotal Roadway Construction Items				**$5,423,941**
Supplemental Items				
Traffic Management Plan/Traffic Control			4%	$216,958
Construction Contingency			25%	$1,355,985
Subtotal Supplemental Items				**$1,572,943**
Construction Subtotal				**$6,996,884**
Right-of-Way				
Developed (landscaped)	32,500	SF	$20.00	$650,000
Undeveloped	184,000	SF	$12.00	$2,208,000
Right-of-way Acquisition Support			10%	$285,800
Subtotal R/W Items				**$3,143,800**
Capital Support				
PR/ED (PD,PE,PM)			10%	$699,688
PS&E (PS)			20%	$1,399,377
CONSTRUCTION (CM)			15%	$1,049,533
Subtotal Capital Support Items				**$3,148,598**
Project Total				**$13,289,282**
Rounded				**$13,290,000**

1. Saratoga is widened to 4 lanes west of Wilson to Iron Point
2. Extending concrete barrier south side of Saratoga near finders where alignment is close to US 50 WB On ramp
3. Assuming no landscaping to replace existing between Mammouth and Arrowhead, not enough room
4. Assuming street lighting only at Finders and Arrowhead intersections
5. ROW Acquisition assumed for landscaped areas on west side north and south of Arrowhead
6. Sidewalk is along north/west side for full length, and east side from Arrowhead to commercial driveway

El Dorado County

Segment R-7

Prepared By: QUINCY ENGINEERING

PRELIMINARY COST

Country Club Drive

Project Limits: East of El Dorado Hills Blvd to Silva Valley Pkwy

TYPE: 2-LANE

Right-of-Way and proposed improvements are approximate only, information shown is for cost estimating purposes only and is not accurate for determining construction limits.

PROJECT LENGTH 5,000

Item Description	Quantity	Units	Unit Cost	Total Cost
Earthwork				
Roadway Excavation	17,360	CY	$60.00	$1,041,610
Earthwork/Grading Factor			150%	$1,562,415
Existing Facilities				
Removal of Striping	1,200	LF	$1.50	$1,800
Removal of Pavement Markings	180	SF	$3.00	$540
Structural Section				
Hot Mix Asphalt (Type A)	8,337	Ton	$130.00	$1,083,761
Class 2 Aggregate Base	10,479	CY	$80.00	$838,341
AC Overlay	145	Ton	$125.00	$18,141
Drainage & Utilities				
Drainage (15% of Earthwork & Struc Sec total)			15%	$681,640
Specialty Items				
Concrete Sidewalk	60,000	SF	$15.00	$900,000
Curb and Gutter	10,000	LF	$50.00	$500,000
Driveway	2	EA	$6,000.00	$12,000
Sidewalk Ramp	4	EA	$4,000.00	$16,000
Traffic Items				
Street Lights and Pull Boxes	8	EA	$8,000.00	$64,000
Street Lights Conduit System	400	LF	$30.00	$12,000
Traffic Signal Modification (high)	1	LS	$200,000.00	$200,000
Traffic Signal New (high)	1	LS	$350,000.00	$350,000
Striping Imps (4 lanes)	5,000	LF	$7.00	$35,000
Pavement Markings	540	SF	$6.00	$3,240
Signs	20	EA	$350.00	$7,000
Subtotal Roadway Construction Items				**$7,327,488**
Supplemental Items				
Traffic Management Plan/Traffic Control			4%	$293,100
Construction Contingency			25%	$1,831,872
Subtotal Supplemental Items				**$2,124,971**
Structure Items				
Box Culvert	5,600	SF	$350.00	$1,960,000
Mobilization			10%	$196,000
Time-Related Overhead			10%	$196,000
Subtotal Structure Construction Items				**$2,352,000**
Construction Subtotal				**$11,804,459**
Right-of-Way [1]				
Developed (parking)	13	Stall	$2,800.00	$36,400
Developed (landscaped)	3,400	SF	$19.60	$66,640
Developed (building)	0	SF	$225.00	$0
Undeveloped	300,000	SF	$12.00	$3,600,000
Right-of-way Acquisition Support			10%	$370,304
Subtotal R/W Items				**$4,073,344**
Capital Support				
PR/ED (PD,PE,PM)			10%	$1,180,446
PS&E (PS)			20%	$2,360,892
CONSTRUCTION (CM)			15%	$1,770,669
Subtotal Capital Support Items				**$5,312,007**
Project Total				**$21,189,810**
Rounded				**$21,190,000**

1. Right of way and feasibility need to be researched through Raley's shopping center.
2. Assuming connection to EDH Blvd is via Park Drive
3. Signal mod is for Country Club (Park) / EDH Blvd
4. Box Culvert is for creek crossing just west of intersection with SVP

El Dorado County

Segment R-8

Prepared By: QUINCY ENGINEERING

PRELIMINARY COST

Country Club Drive

Project Limits: Silva Valley Pkwy to Tong Road

TYPE: 2-LANE (with two-way left turn lane)

Right-of-Way and proposed improvements are approximate only, information shown is for cost estimating purposes only and is not accurate for determining construction limits.

PROJECT LENGTH 3,600

Item Description	Quantity	Units	Unit Cost	Total Cost
Earthwork				
Roadway Excavation	11,688	CY	$60.00	$701,282
Earthwork/Grading Factor			90%	$631,154
Structural Section				
Hot Mix Asphalt (Type A)	5,581	Ton	$130.00	$725,546
Class 2 Aggregate Base	7,877	CY	$80.00	$630,151
AC Overlay	304	Ton	$125.00	$37,969
Drainage & Utilities				
Drainage (15% of Earthwork & Struc Sec total)			15%	$408,915
Specialty Items				
Concrete Sidewalk	43,200	SF	$15.00	$648,000
Curb and Gutter	7,200	LF	$50.00	$360,000
Driveway	1	EA	$6,000.00	$6,000
Sidewalk Ramp	6	EA	$4,000.00	$24,000
Traffic Items				
Street Lights and Pull Boxes	2	EA	$8,000.00	$16,000
Street Lights Conduit System	400	LF	$30.00	$12,000
Striping Imps (4 lanes)	300	LF	$7.00	$2,100
Striping Imps (2 lanes)	2,300	LF	$5.00	$11,500
Pavement Markings	450	SF	$6.00	$2,700
Signs	20	EA	$350.00	$7,000
Subtotal Roadway Construction Items				**$4,574,317**
Supplemental Items				
Traffic Management Plan/Traffic Control			4%	$182,973
Construction Contingency			25%	$1,143,579
Subtotal Supplemental Items				**$1,326,552**
Structure Items				
Box Culvert Extensions	320	SF	$350.00	$112,000
Bridge Mobilization			10%	$11,200
Bridge Time-Related Overhead			10%	$11,200
Subtotal Structure Construction Items				**$134,400**
Construction Subtotal				**$6,035,269**
Right-of-Way				
Undeveloped	223,600	SF	$12.00	$2,683,200
Right-of-way Acquisition Support			10%	$268,320
Subtotal R/W Items				**$2,951,520**
Capital Support				
PR/ED (PD,PE,PM)			10%	$603,527
PS&E (PS)			20%	$1,207,054
CONSTRUCTION (CM)			15%	$905,290
Subtotal Capital Support Items				**$2,715,871**
Project Total				**$11,702,660**
Rounded				**$11,703,000**

1. Project limits are same as exhibit for Country Club Drive Extension and El Dorado Hills 52 Development
2. Signal Installation at SVP is included with the Country Club from EDH to SVP estimate

El Dorado County

Segment R-9

Prepared By:

QUINCY ENGINEERING

PRELIMINARY COST

Country Club Drive

Project Limits: Tong Road to Bass Lake Rd

TYPE: 2-LANE

TYPICAL CROSS SECTION

Right-of-Way and proposed improvements are approximate only, information shown is for cost estimating purposes only and is not accurate for determining construction limits.

			PROJECT LENGTH	6,000
Item Description	**Quantity**	**Units**	**Unit Cost**	**Total Cost**
Earthwork				
Roadway Excavation	22,062	CY	$60.00	$1,323,720
Earthwork/Grading Factor			150%	$1,985,580
Structural Section				
Hot Mix Asphalt (Type A)	10,643	Ton	$130.00	$1,383,525
Class 2 Aggregate Base	14,813	CY	$80.00	$1,185,067
Drainage & Utilities				
Drainage (15% of Earthwork & Struc Sec total)			15%	$881,684
Specialty Items				
Driveway	2	EA	$6,000.00	$12,000
Sidewalk Ramp	2	EA	$4,000.00	$8,000
Traffic Items				
Street Lights and Pull Boxes	2	EA	$8,000.00	$16,000
Street Lights Conduit System	200	LF	$30.00	$6,000
Traffic Signal Modification (high)	1	LS	$200,000.00	$200,000
Striping Imps (2 lanes)	6,000	LF	$5.00	$30,000
Pavement Markings	450	SF	$6.00	$2,700
Signs	20	EA	$350.00	$7,000
Subtotal Roadway Construction Items				**$7,041,275**
Supplemental Items				
Traffic Management Plan/Traffic Control			4%	$281,651
Construction Contingency			25%	$1,760,319
Subtotal Supplemental Items				**$2,041,970**
Construction Subtotal				**$9,083,245**
Right-of-Way				
Undeveloped	360,000	SF	$12.00	$4,320,000
Right-of-way Acquisition Support			10%	$432,000
Subtotal R/W Items				**$4,752,000**
Capital Support				
PR/ED (PD,PE,PM)			10%	$908,325
PS&E (PS)			20%	$1,816,649
CONSTRUCTION (CM)			15%	$1,362,487
Subtotal Capital Support Items				**$4,087,460**
Project Total				**$17,922,706**
Rounded				**$17,923,000**

1. Traffic Signal Mod and Street Lighting are assumed to be at the Country Club/Bass Lake intersection.
2. Cross Section is similar to exhibit for SVP to Tong Road segment minues Crub Gutter and Sidewalk.

El Dorado County

Segment R-12

Prepared By:

QUINCY ENGINEERING

PRELIMINARY COST

Latrobe Connector

2-LANE

Right-of-Way and proposed improvements are approximate only, information shown is for cost estimating purposes only and is not accurate for determining construction limits.

			PROJECT LENGTH	**1,000**

Item Description	Quantity	Units	Unit Cost	Total Cost
Earthwork				
Roadway Excavation	3,308	CY	$60.00	$198,493
Earthwork/Grading Factor			90%	$178,644
Structural Section				
Hot Mix Asphalt (Type A)	1,650	Ton	$130.00	$214,500
Class 2 Aggregate Base	2,194	CY	$80.00	$175,496
AC Overlay	0	Ton	$125.00	$0
Drainage & Utilities				
Drainage (15% of Earthwork & Struc Sec total)			15%	$115,070
Specialty Items				
Concrete Sidewalk	6,000	SF	$15.00	$90,000
Curb and Gutter	1,000	LF	$50.00	$50,000
Median Island Curb	2,000	LF	$25.00	$50,000
Driveway	2	EA	$6,000.00	$12,000
Sidewalk Ramp	4	EA	$4,000.00	$16,000
Landscaping				
Landscaping & Irrigation	10,000	SF	$5.00	$50,000
Traffic Items				
Street Lights and Pull Boxes	2	EA	$8,000.00	$16,000
Street Lights Conduit System	200	LF	$30.00	$6,000
Traffic Signal New (high)	1	LS	$350,000.00	$350,000
Striping Imps (2 lanes)	1,000	LF	$5.00	$5,000
Pavement Markings	900	SF	$6.00	$5,400
Signs	10	EA	$350.00	$3,500
Subtotal Roadway Construction Items				**$1,536,104**
Supplemental Items				
Traffic Management Plan/Traffic Control			4%	$61,444
Construction Contingency			25%	$384,026
Subtotal Supplemental Items				**$445,470**
Construction Subtotal				**$1,981,574**
Capital Support				
PR/ED (PD,PE,PM)			10%	$198,157
PS&E (PS)			20%	$396,315
CONSTRUCTION (CM)			15%	$297,236
Subtotal Capital Support Items				**$891,708**
Project Total				**$2,873,282**
Rounded				**$2,874,000**

1. Matching cross section of existing Carson Crossing (2 lanes, SW on one side, landscaped median)
2. Curb and Gutter or open graded ditch assumed to be equivalent cost. Leaving in C&G item.
3. Signal is for intersection of Carson Crossing/Golden Foothill Parkway
4. Assuming no Right of Way acquisition needed (developer dedicated)

El Dorado County - 2020 TIF Update

Prepared By:

QUINCY ENGINEERING

PRELIMINARY COST

El Dorado Hills Blvd/Saratoga Way/Park Drive Intersection Improvements

Project Limits: Intersection Improvements Only

Right-of-Way and proposed improvements are approximate only, information shown is for cost estimating purposes only and is not accurate for determining construction limits.

Item Description	Quantity	Units	Unit Cost	Total Cost
			PROJECT LENGTH	**600**
Earthwork				
Roadway Excavation	861	CY	$60.00	$51,671
Earthwork/Grading Factor			90%	$46,504
Existing Facilities				
Sawcut Existing Asphalt Concrete	520	LF	$3.00	$1,560
Removal of Striping	12,000	LF	$1.50	$18,000
Removal of Pavement Markings	540	SF	$3.00	$1,620
Remove Existing Lighting and Landscaping	1	LS	$50,000.00	$50,000
Structural Section				
Hot Mix Asphalt (Type A)	447	Ton	$130.00	$58,130
Rubberized Hot Mix Asphalt - Open Graded	81	Ton	$150.00	$12,195
Class 2 Aggregate Base	562	CY	$80.00	$44,966
AC Overlay	377	Ton	$125.00	$47,109
Drainage & Utilities				
Drainage (15% of Earthwork & Struc Sec total)			15%	$39,086
Specialty Items				
Concrete Sidewalk	100	SF	$12.00	$1,200
Curb and Gutter	100	LF	$33.00	$3,300
Median Island Curb	120	LF	$15.00	$1,800
Median Island Flatwork	960	SF	$8.00	$7,680
Sidewalk Ramp	2	EA	$4,000.00	$8,000
Small Retaining Wall (0 to 5')	150	LF	$200.00	$30,000
Traffic Items				
Street Lights and Pull Boxes	2	EA	$8,000.00	$16,000
Street Lights Conduit System	400	LF	$30.00	$12,000
Traffic Signal Modification (high) [2]	1	LS	$200,000.00	$200,000
Striping Imps (6 lanes)	450	LF	$7.50	$3,375
Pavement Markings	450	SF	$6.00	$2,700
Signs	8	EA	$350.00	$2,800
Subtotal Roadway Construction Items				**$659,695**
Supplemental Items				
Traffic Management Plan/Traffic Control			4%	$26,388
Construction Contingency			25%	$164,924
Subtotal Supplemental Items				**$191,312**
Construction Subtotal				**$851,007**
Capital Support				
CONSTRUCTION (CM)			15%	$127,651
Subtotal Capital Support Items				**$127,651**
Project Total				**$978,658**
Rounded				**$979,000**

1. Assuming all improvements can fit inside existing County ROW
2. Need ramp and sidewalk work on NW and SW curb returns due to adition of riht turn lane
3. Added overlay to full lenth of improvemetns on El Dorado and 50' up Saratoga and Park
4. Retaining wall will be needed at NW corner of intersection behind curb return

MEMORANDUM

DATE: November 13, 2020

TO: Rafael Martinez, Director of Transportation

FROM: John P. Long, P.E

SUBJECT: TIF Major Update
Technical Memorandum - New Evaluation of Cameron Park Drive/US 50 Interchange

Executive Summary

In 2018, an "Alternative Screening Evaluation" was prepared for the Cameron Park Drive/Highway 50 interchange. The intent of that study was to develop more economically viable alternatives for the interchange that meet LOS and operational requirements at a lower cost and reduced impacts than alternatives that were identified in a 2008 Caltrans Project Study Report (PSR). Four alternatives meeting those goals were developed with input from County and Caltrans staff, plus public involvement.

The on-going update of the County's Traffic Impact Fee (TIF) Program is taking a new look at roadway needs for the County. The TIF Update is based on a 2040 horizon year and a slower development growth rate than the County's prior Fee Program. The 2018 interchange "Alternative Screening Evaluation" was based on 2045 traffic forecasts - beyond the 2040 TIF horizon year - and it used the higher growth rate from the prior Fee Program. The updated TIF traffic operations analysis of Cameron Park interchange resulted in the following conclusions:

- Key intersections at/near the interchange would operation at an acceptable LOS in 2040
- There would be unacceptable levels of traffic queuing on the eastbound off-ramp causing vehicles to back up onto the eastbound US 50 mainline.

The new TIF analysis found that widening of the eastbound off-ramp would solve its queuing issues through 2040. Yet additional improvements will be needed to maintain acceptable LOS beyond the 2040 horizon. The County recognizes that Caltrans projects have a long lead time to be planned, approved and designed and that right of way should be secured to ensure their viability.

Thus, the recommendations for the funding of improvements to the Cameron Park Drive/US 50 interchange in the 2040 TIF Update involve the following:

- Funding the preparation of Preliminary Engineering and Environmental Document that will allow the County and Caltrans to officially select both interim and long-term improvements for the interchange
- Funding right-of-way purchases to preserve the land needed for long-term improvements
- Funding the widening of eastbound off-ramp

These recommendations allow the County to work with Caltrans on logical steps to the ultimate improvement while providing the benefits of a first phase of construction to happen sooner than waiting on funding/implementing the ultimate design. The County has applied this same logic to define 2040 funding levels for the Ponderosa Road/US 50 Interchange.

Background

In 2008, a Project Study Report (PSR) was completed by El Dorado County on the Cameron Park Drive/Highway 50 Interchange following Caltrans guidelines. The preferred alternative from the 2008 PSR was a compact diamond/partial cloverleaf that had a cost of just over $87 million, when adjusted to 2015 dollars.

In 2018, The Long Range Planning Division of the County retained Dokken Engineering to conduct an “Alternative Screening Evaluation.” The intent of this study was to develop, analyze, and present more economically viable alternatives for the interchange that meet LOS and operational requirements at a lower cost and reduced impacts than the alternatives in the 2008 PSR. Four alternatives meeting this goal were developed with input from County and Caltrans staff. The four alternatives are:

- Alternative 1 – Widening: widens Cameron Park Drive from two to three through lanes in each direction; widens all the ramps.
- Alternative 2 – Rodeo Road Off-Ramp: removes eastbound off-ramp and replaces with new eastbound off-ramp connection to Rodeo Road; adds at Cameron Park Drive a southbound to eastbound loop on-ramp.
- Alternative 3 – East Hook Ramps: adds hook ramps from eastbound US 50 to Coach Lane, east of Cameron Park Drive; adds at Cameron Park Drive a southbound to eastbound loop on-ramp.
- Alternative 4 – Diverging Diamond: replaces the current interchange with a Diverging Diamond Interchange (DDI) configuration.

A significant public outreach effort was conducted to get comments on the four alternative interchange designs.

The estimated total cost including the design, environmental review, right of way acquisition and construction for the four alternatives range between $44 million and $69 million (2018 dollars).

Based on the results of the Alternative Screening Evaluation and discussion with the Long Range Planning Division of the County, Alternative 2 was dropped from the viable alternatives. On July 24, 2018, a motion was approved by the Board of Supervisors to carry forward Alternatives 1, 3, and 4 to preliminary design and environmental studies.

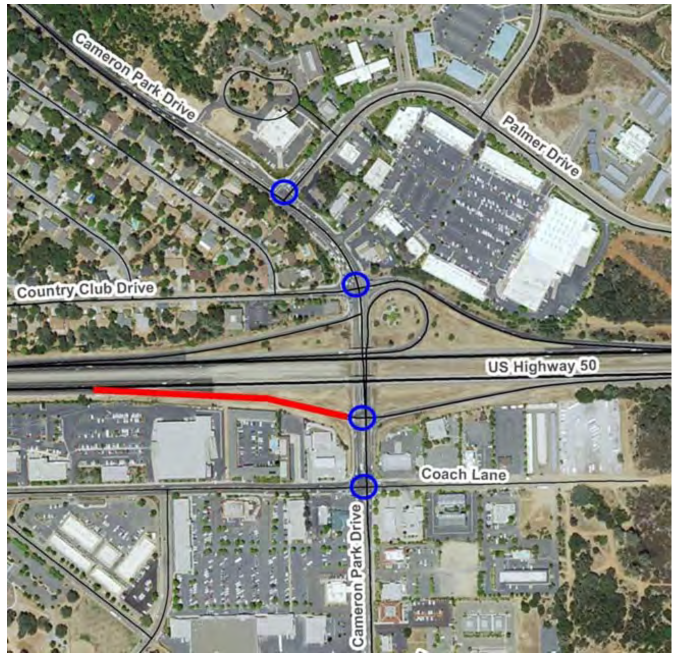
Updated Analysis for the Traffic Impact Fee Program

The on-going update of the County’s CIP and Traffic Impact Fee (TIF) Program is taking a new look at roadway needs for the County. The Update is based on a 2040 horizon year and is using a Board-adopted slower development growth rate than the prior Fee Program.

For the 2018 Alternative Screening Evaluation for the Cameron Park Interchange, it was decided to use 2045 for the traffic forecasts. Not only was the horizon year for Cameron Park Alternative Screening Evaluation beyond the 2040 horizon year that is being used for the on-going update of the TIF Program, the Alternative Screening Evaluation was based on the higher growth rate that was used for the prior Fee Program.

The updated TIF traffic operations analysis of Cameron Park interchange, based on new projected 2040 traffic volumes, resulted in the following conclusions:

- The four key intersections in the interchange area (shown in blue on figure at right) would operation at an acceptable LOS in 2040
- There would be unacceptable levels of traffic queuing on the eastbound off-ramp (shown in red on the figure at right) causing vehicles to back up onto the eastbound US 50 mainline.
- There is an existing sight distance problem on the eastbound off-ramp that prevents vehicles from making right-turns on red.



Cameron Park Interchange Area

Several key factors were defined related to improvements:

- Widening of the Eastbound Off-ramp would solve queuing through 2040
- Additional improvements will be needed to maintain acceptable LOS beyond the 2040 horizon
- Caltrans projects have a long lead time to be planned, approved and designed.
- Right of way should be secured

The widening of the eastbound off-ramp would involve adding a second right-turn lane and a second left-turn lane. However, having two lanes for right-turns almost doubles the number of vehicles that can make right-turns during each green phase and would substantially reduce the delay for right-turn vehicles. The extra left-turn lane does the same thing for left-turning vehicles and together the two new lanes would solve the queuing problem on the EB off-ramp.

This exact ramp widening is an element of the least expensive of the four ultimate interchange alternatives identified in the 2018 Alternative Screening Evaluation. A widening of this off-ramp is also needed for one of the other alternatives. Thus it is a building block for two of the ultimate interchange designs.

The ramp widening does not solve the sight distance issue on the eastbound off-ramp. However, Caltrans' has a planned project involving limited widening under the US 50 bridge. Their project would:

- Solve the sight distance problem, which will allow right-turns on red, thus further reducing delay for right turning vehicles
- Separate bikes and pedestrians along the west side of Cameron Park Drive under the freeway

- Provide a new bike lane along the east side of Cameron Park Drive under the freeway
- Provide a portion of the exact design concept for widening under the bridge envisioned for two of the four ultimate interchange alternatives

No matter what improvements are made to the interchange, Caltrans will require that preliminary engineering and an environmental document be completed. That effort could consider all four of the ultimate alternatives and select both the first improvement phase and the ultimate design. The feasibility of the Rodeo Road Alternative would be discussed further with Caltrans during that effort. This effort will provide the County with an agreement with Caltrans and thus certainty on what it needs to fund and implement. With that agreement, right-of-way could then be preserved for the selected ultimate design.

Thus, the recommendations for the funding of improvements to the Cameron Park Drive/US 50 interchange in the 2040 CIP and TIF involve the following:

- Funding the preparation of Preliminary Engineering and Environmental Document that will allow the County and Caltrans to officially select interim and long-term improvements for the interchange
- Funding right-of-way purchases to preserve the land needed for long-term improvements
- Funding widening of the eastbound off-ramp

The recommendations for TIF funding allow the County to work with Caltrans on logical steps to the ultimate improvement while providing funds for a first phase of construction. That first phase would result in decreases in delays for vehicles using the interchange to happen sooner than waiting for full funding of the ultimate improvement.

Cost Estimate for Recommended Interchange Improvements in the 2020 CIP and TIF

The cost estimate for funding in the TIF Update was based on the following:

- A new cost estimate for widening the eastbound off-ramp for an additional right-turn lane and an additional left-turn lane.
- Averaging the cost estimates of the four ultimate alternatives in the 2018 Alternative Screening Evaluation for the following two elements:
    - The cost of preparing the Preliminary Engineering and Environmental Document (PA&ED) and preparing the final design
    - The cost of right-of-way for the ultimate design

The 2018 cost estimates from the Alternative Screening Evaluation were increased by eight percent to reflect inflation over the last two years.

Application to Other Interchanges

The County has applied the same logic used to define 2040 funding levels for the Cameron Park Drive/US 50 interchange in the TIF Update (i.e. the funding Caltrans required studies, right-of-way preservation and interim improvements) to define the 2040 TIF funding level for the Ponderosa Road/US 50 Interchange.

COUNTY OF EL DORADO
DEPARTMENT OF TRANSPORTATION

INTEROFFICE MEMORANDUM

Date: November 19, 2020

To: File

From: Natalie K. Porter, P.E., T.E.,
Senior Traffic Engineer

Subject: *TIF Major Update*
New Evaluation of Ponderosa Road/U.S. 50 Interchange

Executive Summary

County of El Dorado Department of Transportation (Transportation) staff has been working in conjunction with Caltrans staff on the Ponderosa Road/U.S. Highway 50 Interchange since the mid 2000's. In 2008 Caltrans delegated lead agency status to El Dorado County for purposes of the California Environmental Quality Act (CEQA). Preliminary Engineering studies were conducted by El Dorado County Transportation staff and our consultants. The Draft Project Study Report (PSR) was approved by Caltrans in 2017. The final approval of the document is pending. The Board of Supervisors certified the CEQA document and the National Environmental Policy Act (NEPA) in March 2020. Caltrans has no further comment on the CEQA document with the NEPA approval pending.

The environmental documents analyzed four alternatives. The preferred alternative includes modification of the existing interchange to realign North Shingle Road and Wild Chaparral Drive 400' to the north on Ponderosa Road, realignment of the westbound off-ramp and loom on-ramp to a location opposite Wild Chaparral Drive, cul-de-sac- Wild Chaparral Drive west of Ponderosa Road, and realignment of Durock Road to the south opposite Sunset Lane.

The on-going update of the County's Traffic Impact Fee (TIF) Program is taking a new look at roadway needs for the County. The TIF Update is based on a 2040 horizon year and a slower development growth rate than the County's prior Fee Program. The 2017 CEQA document and Draft PSR/PR was based on traffic forecasts using the higher growth rate from the prior Fee Program. The updated TIF traffic operations analysis of Ponderosa Road interchange resulted in the following conclusions:

- Key intersections at/near the interchange would operation at an acceptable LOS in 2040
- There would be unacceptable levels of traffic queuing on the off-ramps causing vehicles to back up onto the US 50 mainline and local roads.

The new TIF analysis found that implementing the relocation of North Shingle Road, Wild Chaparral Drive and Durock Road would solve queuing issues through 2040 and maintain acceptable LOS through the 2040 horizon. The County recognizes that Caltrans projects have a long lead time to be planned, approved and designed and that right of way should be secured to ensure their viability.

The recommendations for the funding of improvements to the Ponderosa Road/US 50 interchange in the 2040 TIF Update involve the following:

- Funding the completion of the Preliminary Engineering and Environmental Document will allow the County and Caltrans to officially select both interim and long-term improvements for the interchange
- Funding right-of-way purchases to preserve the land needed for long-term improvements
- Funding the first two phases of the interchange

These recommendations allow the County to work with Caltrans on logical steps to the ultimate improvement while providing the benefits of a first phase of construction to happen sooner than waiting on funding/implementing the ultimate design. The County has applied this same logic to define 2040 funding levels for the Cameron Park Drive/U.S. Highway 50 Interchange.

Background

In 2006, El Dorado County Department of Transportation staff began coordinating with Caltrans on an improvement project for the Ponderosa Road/U.S. Highway 50 interchange. The draft Project Study Report (PSR) was completed by El Dorado County on the Ponderosa Road/U.S. Highway 50 Interchange following Caltrans guidelines. Caltrans approved the draft document in 2017, with the final approval pending. The Board of Supervisors adopted the CEQA and the National Environmental Policy Act (NEPA) on March 10, 2020. The Board also approved the Build Alternative 1. Caltrans has reviewed the CEQA document and had no further questions, with the NEPA approval pending.

The environmental document evaluated four alternatives that were being proposed for this project:

- Build Alternative 1 option proposed to widen the existing bridge from three to five lanes. It includes road widening and realignments of North Shingle and Durock Roads. Wild Chaparral Drive remains in the existing condition which allows access to the park and ride lot adjacent to Wild Chaparral Drive and to the businesses and residences using this local road to access Ponderosa Road. Alternative 1 also includes adding turn pockets, providing acceleration/deceleration lanes, HOV bypass lanes and ramp metering, and modifications to loop on- and off-ramps in both east and west directions. Utility relocations will pursue an undergrounding option where feasible. This alternative meets the purpose and need of the project and includes a project design exception approved by Caltrans for additional ingress and egress to the businesses off of Mother Lode Drive in the project area.

- Build Alternative 2 is similar to Build Alternative 1, but it would additionally realign the existing Wild Chaparral Drive connection to the north on Ponderosa Road and would create a new cul-de-sac at the existing connection to Ponderosa Road.

- Build Alternative 3 would widen the existing overpass from 3 to 5 lanes. The U.S 50 ramps and approaches would be widened to the point they conform to the local roads and/or ramp intersections. Local roads would not be widened under this alternative. Build Alternative 3 is characterized as a “minimum impact” build solution because it would require less right-of-way (ROW) impacts compared with Build Alternatives 1 and 2; however, it would only minimally improve the degrading LOS situation in the project area by 2035.

- The fourth alternative was the No-Build Alternative which would maintain the existing facility. The No-Build Alternative does not address the current deficiencies or long-term traffic needs of the U.S. 50 corridor or the Ponderosa Interchange.

A significant public outreach effort was conducted to get comments on the four alternative interchange designs. Transportation staff will proceed with the projects through the NEPA clearance process, final design and construction.

The 2020 Capital Improvement Program identified three separate projects that will implement Build Alternative 1 with updated cost estimates. These are U.S. 50/Ponderosa Road/South Shingle Road Interchange Improvements (#71333/36104010); U.S. 50/Ponderosa Road Interchange – Durock Road Realignment (#71338/36104008); and U.S. 50/Ponderosa Road Interchange – North Shingle Road Realignment (#71339/36104009).

Preferred Build Alternative 1

Updated Analysis for the Traffic Impact Fee Program

The on-going update of the County's CIP and Traffic Impact Fee (TIF) Program is taking a new look at roadway needs for the County. The Update is based on a 2040 horizon year and is using a Board-adopted slower development growth rate than the prior Fee Program.

The Build Alternatives were based on the higher growth rate that was used for the prior Fee Program. It is acknowledged that the traffic studies for the interchange will need to be updated.

The updated TIF traffic operations analysis of the Ponderosa Road interchange, based on new projected 2040 traffic volumes, resulted in the following conclusions:

- The key intersections in the interchange area would operate at an acceptable LOS in 2040
- There would be unacceptable levels of traffic queuing on the local roads and potentially the off-ramps causing vehicles to back up onto the U.S. Highway 50 mainline.

Ponderosa Road Interchange Area

Several key factors were defined related to improvements:

- Implementing the relocation of North Shingle Road and Durock Road as defined in the 2020 CIP would solve queuing through 2040
- Additional improvements may be needed to maintain acceptable LOS beyond the 2040 horizon
- Caltrans projects have a long lead time to be planned, approved and designed.
- Right of way should be secured

No matter what improvements are made to the interchange, Caltrans will require additional preliminary engineering and the NEPA environmental document be completed. This effort will provide the County with an agreement with Caltrans and thus certainty on what it needs to fund and implement. With that agreement, right-of-way could then be preserved for the selected ultimate design.

Thus, the recommendations for the funding of improvements to the Ponderosa Road/U.S. Highway 50 interchange in the 2020 CIP and TIF involve the following:

- Funding the preparation of Preliminary Engineering and Environmental Document that will allow the County and Caltrans to officially select interim and long-term improvements for the interchange
- Funding right-of-way purchases to preserve the land needed for long-term improvements
- Funding the relocation of North Shingle Road and Durock Road projects.

The recommendations for TIF funding allow the County to work with Caltrans on logical steps to the ultimate improvement while providing funds for a first phase of construction. That first phase would result in decreases in delays for vehicles using the interchange to happen sooner than waiting for full funding of the ultimate improvement.

Cost Estimate for Recommended Interchange Improvements in the 2020 CIP and TIF

The cost estimate for funding in the TIF Update was based on the following:

- Incorporating the first two phases of the interchange.

- Incorporating the Preliminary Engineering and Environmental Document costs based on the latest 2020 interchange estimate.

- Incorporating the cost of right-of-way for the ultimate design