



Memorandum

To: Jerry Barton, EDCTC; Bryan Gant, Wood Rodgers

From: Cissy Kulakowski, Benjamin Reibach, Justin Winn

Date: November 17, 2022

Subject: US 50 Pricing Alternatives Sketch-Level Traffic and Revenue Study, FINAL

In order to address long term problems associated with limited data availability and a need for a comprehensive investment strategy for the US 50 Corridor, El Dorado County Transportation Commission (EDCTC), in partnership with local and regional partners and Caltrans District 3, engaged Wood Rodgers and CDM Smith to conduct a system user analysis, identify, and assess pricing and investment strategies for the US 50 Corridor. Innovative pricing and investment strategies will include tolling, pricing, and others to advance the efforts of Caltrans' US 50 Managed Lanes Feasibility Study.

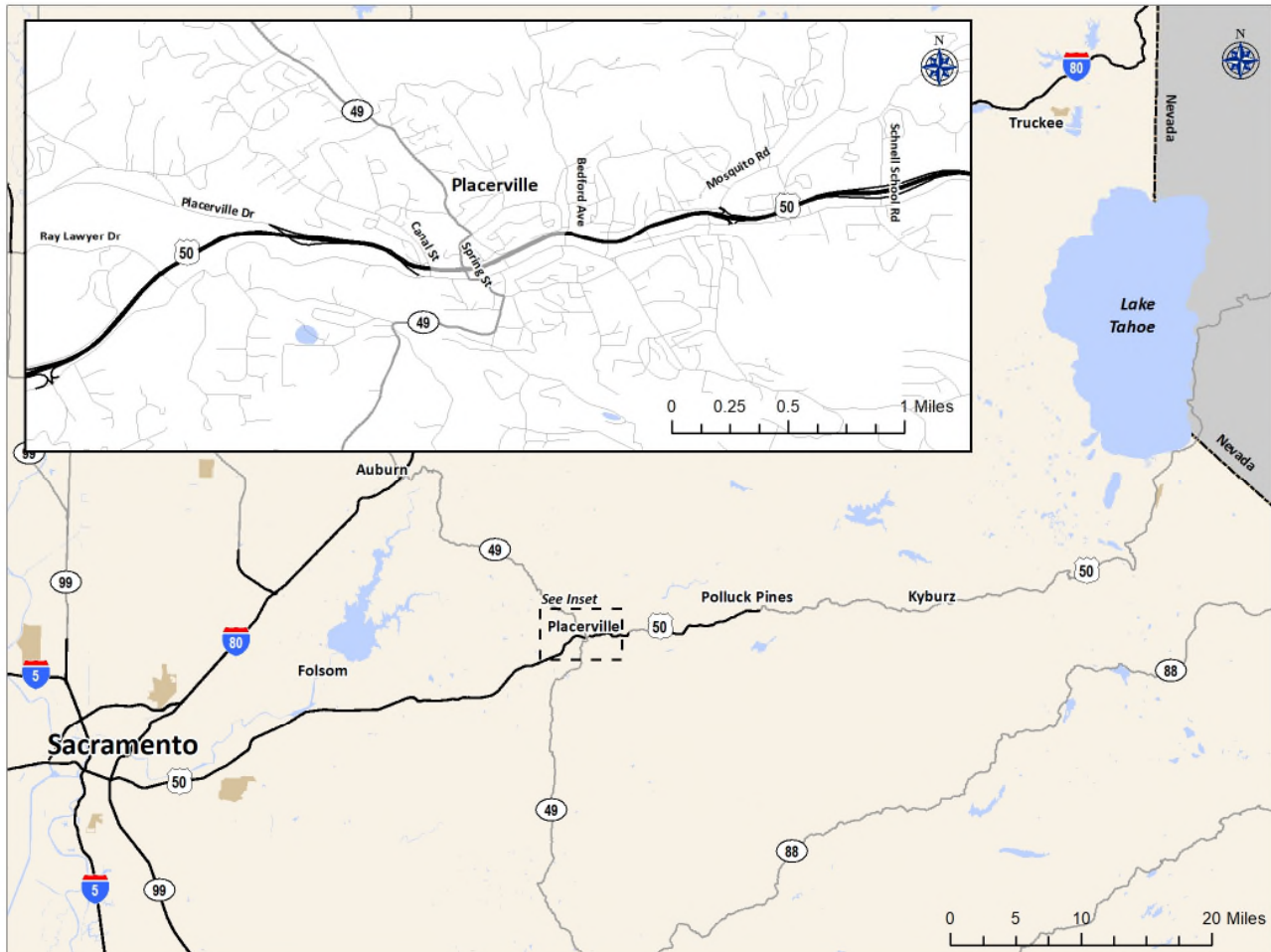
Project Description

CDM Smith performed a sketch-level traffic and revenue study (T&R Study) of potential toll revenue from two pricing alternatives along the US 50 Corridor through Placerville in El Dorado County. The City of Placerville is a city of 11,000 residents¹ located approximately 40 miles northeast of Sacramento, California (see **Figure 1**). The detailed study area for this analysis generally extends one mile east and west from Placerville city limits along US 50, a total distance of approximately 6 miles. US 50 within this area is generally two lanes in each direction with a speed limit of 40 miles per hour. US 50 is access-controlled with grade separations and interchanges between Sacramento and Placerville. Within Placerville, US 50 has three traffic signals, located at Canal Street, Spring Street (SR 49), and Bedford Avenue. There is a third auxiliary lane in the eastbound direction that begins just west of Canal Street and extends through the three stoplights to the east side of Bedford Avenue.

US 50 serves as the primary connection between the Sacramento region and recreational areas to the east, including Lake Tahoe, which is approximately 85 miles east of Sacramento. Fall weekends are considered a peak season in this corridor, with recreational traffic traveling along US 50 to access orchards and vineyards in the Apple Hill region of Camino, just east of Placerville. Winter travel is primarily oriented to Lake Tahoe for skiing and summer recreation is common for destinations in the Sierra Nevada mountains. Holiday weekends increase recreational traffic and result in extreme congestion at the three stoplights in the City of Placerville.

¹ Estimated 2020 population from <https://data.census.gov/cedsci/table?q=population%20of%20placerville,%20ca&g=1600000US0657540>

Figure 1: Study Area



The T&R Study's purpose was to provide an initial analysis of the likely revenue for two scenarios (Ultimate Elevated Express Lanes and Interim Trip to Green Pricing) to assist EDCTC in assessing the viability of the potential option to construct bypass express lanes through Placerville, which was one recommendation from the US 50 Recreational Travel Hot Spots study.

The T&R Study consisted of the following tasks:

- Assemble and Summarize Data
- Estimate Traffic and Revenue

This memorandum documents these efforts, performed largely in March-May 2022.

Data Assembly and Collection

The collection of data for this study included existing traffic counts, travel times, and travel patterns. Due to the planning-level nature and short-term timeframe of the study, using data that was readily available

and didn't require large scale collection efforts was required. Data was obtained from many different sources which are detailed below.

Traffic Count Profile

The two primary sources of data for traffic counts on the study corridor were:

- Previously collected intersection turning counts within Placerville
- Caltrans' Performance Measurement System (PeMS) (<https://pems.dot.ca.gov/>)

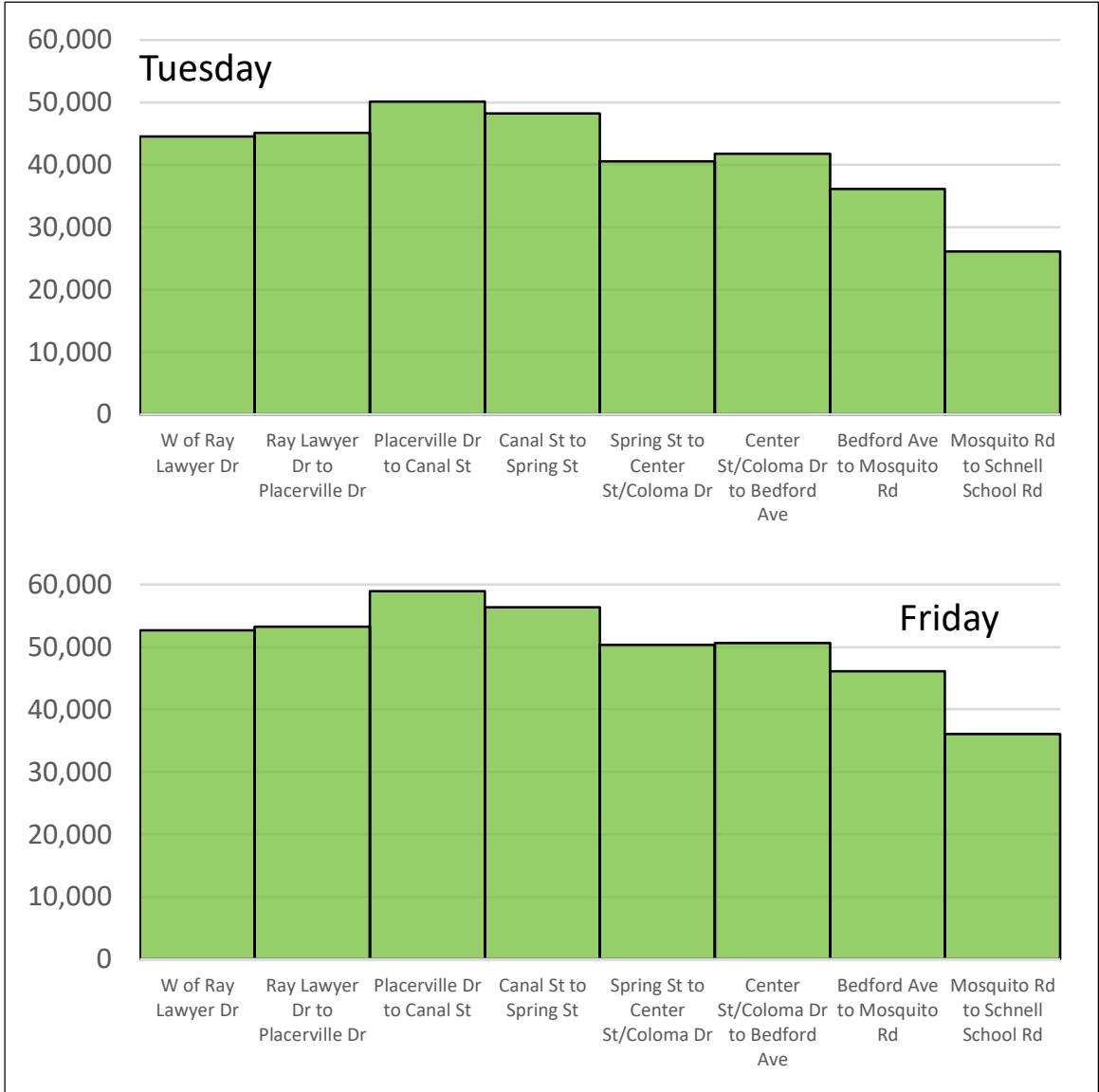
In addition to these main sources of count data, the daily traffic volumes from the Caltrans Census Program were used to scale hourly traffic volumes at different points on US 50 within the study area.

Turning movement counts conducted in 2012 and 2015 at the three signalized intersections on US 50 were used to estimate an hourly traffic profile for each segment of US 50 within the study area. These covered the intersections of US 50 and Canal Street, Spring Street, and Bedford Avenue.

Hourly data from PeMS was downloaded for multiple different locations within the corridor; the PeMS station between Placerville Drive and Ray Lawyer Drive was used to estimate adjustment factors to grow the turning movement counts to 2019 levels.

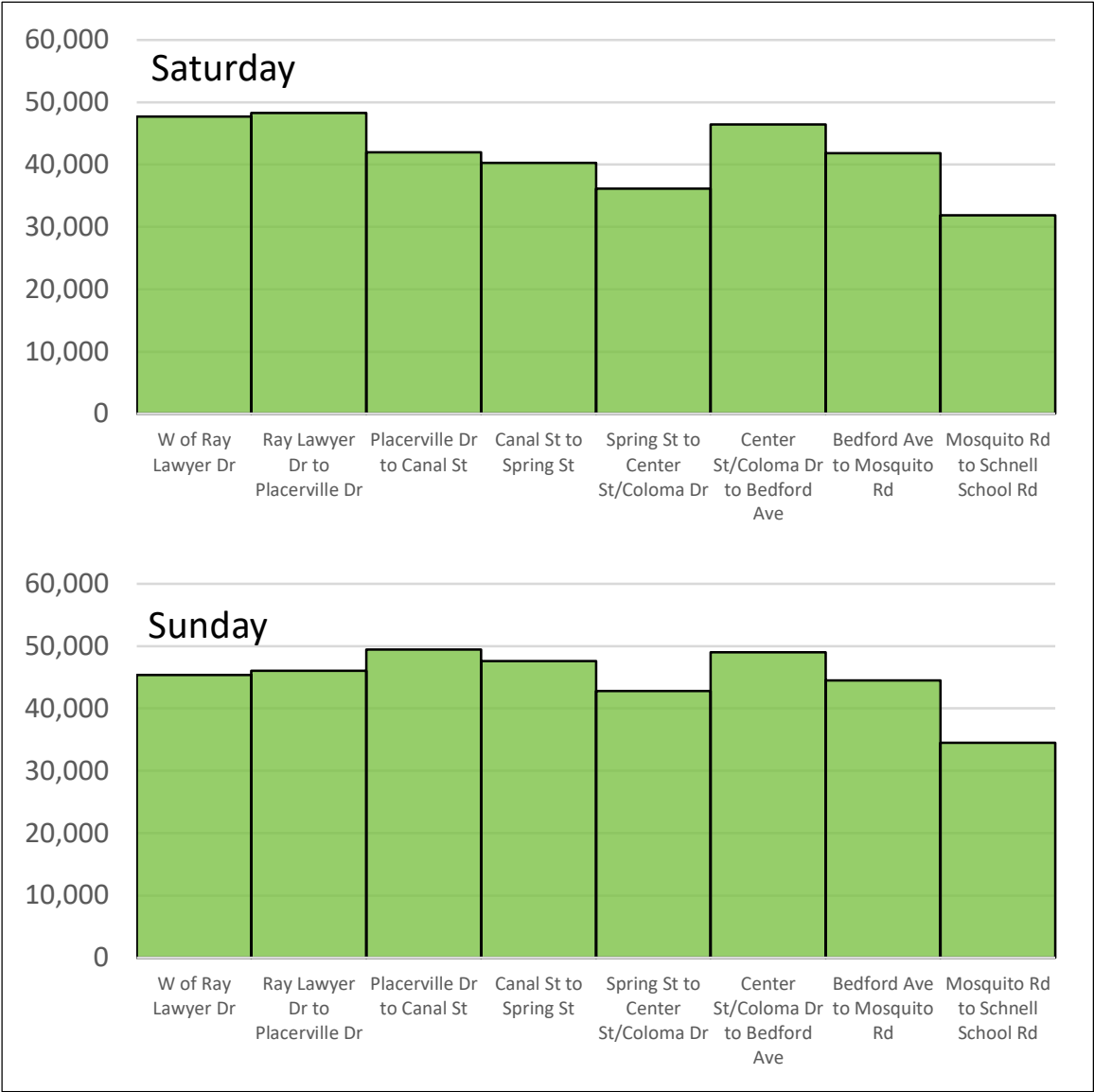
Using the turning movement count data and the mainline data from PeMS, a 2019 hourly traffic profile by location was created for four different days of the week: Tuesday, Friday, Saturday, and Sunday. The daily total of traffic by location for each day is shown below in **Figure 2**. On a daily basis, volumes within the study area are typically highest on Friday and lowest on Tuesday.

Figure 2: Daily Traffic Volumes by Day of Week and Location, Fall 2019



Source: CDM Smith using data from Caltrans PeMS

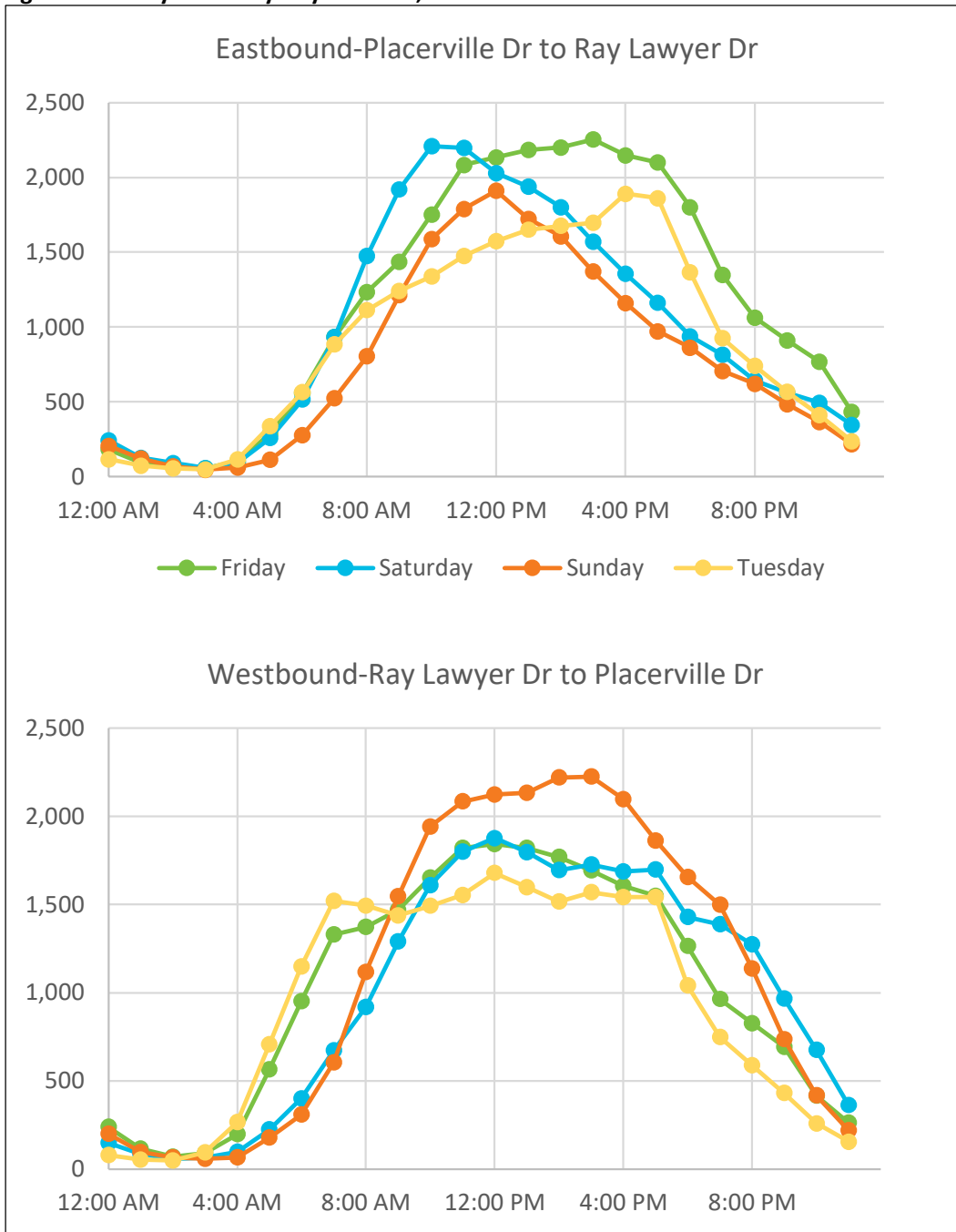
Figure 2 (continued): Daily Traffic Volumes by Day of Week and Location, Fall 2019



Source: CDM Smith using data from Caltrans PeMS

Hourly traffic variation patterns using data from the PeMS station between Placerville Drive and Ray Lawyer Drive are shown in **Figure 3** for days during Fall 2019. In the eastbound direction, traffic is highest either on Friday afternoon or Saturday morning. In the westbound direction traffic is highest on Sundays.

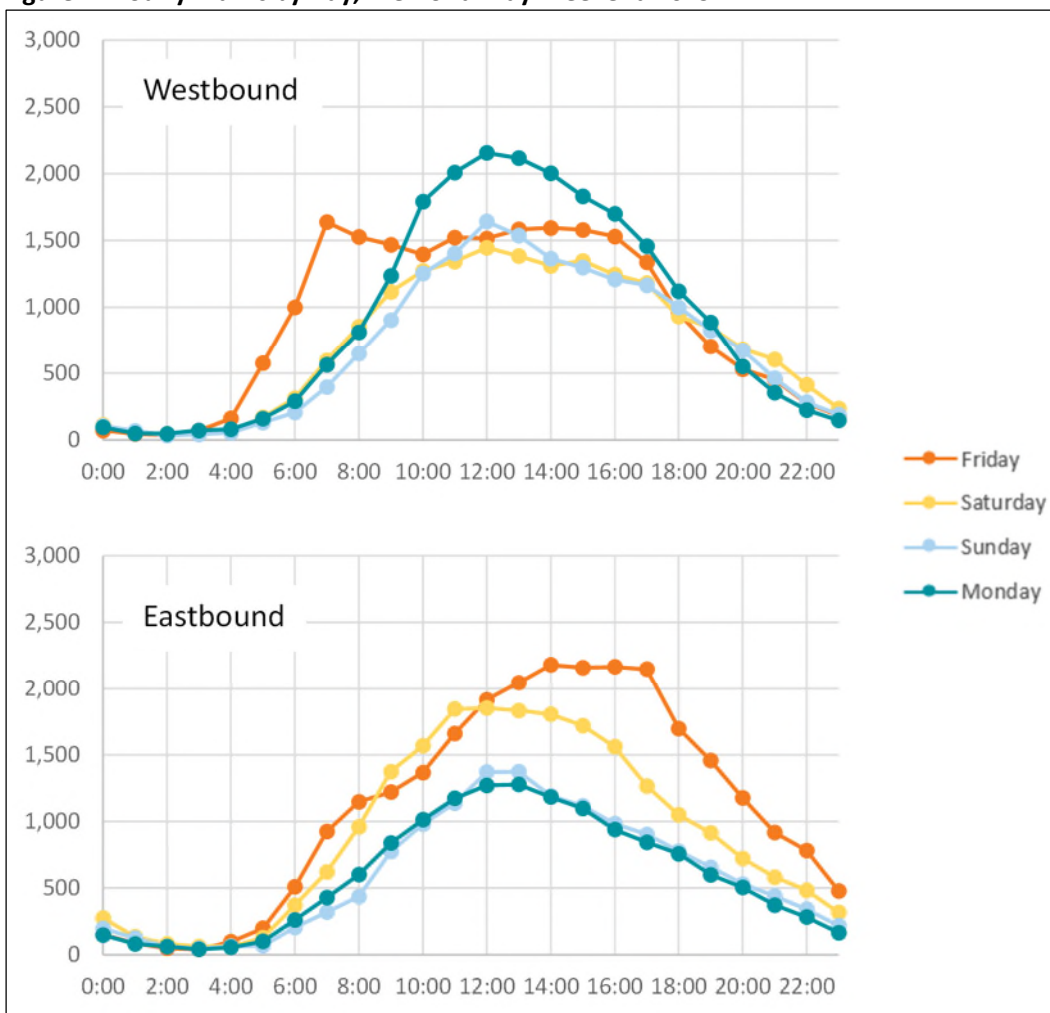
Figure 3: Hourly Traffic by Day of Week, Fall 2019



Source: Caltrans PeMS

A second set of traffic counts were extracted from PeMS to identify hourly variation patterns for various holiday days and weekends. There were two different types of holidays that were reviewed; fixed day holidays and moving day holidays. Examples of fixed day holidays are Memorial Day and Labor Day which always fall on a Monday. Examples of moving day holidays are Independence Day and Christmas, where the day of the week changes from year to year. Traffic patterns for fixed day holidays follow the same pattern from year to year while the moving day holidays depend on which day of the week the holiday falls. **Figure 4** shows the 2019 volumes for the PeMS station at Placerville Drive to Ray Lawyer Drive over Memorial Day weekend. In the eastbound direction volumes are highest on Friday as people leave for the weekend while in the westbound direction volumes are highest on Monday as people returned from the long weekend. Hourly volumes on Friday and Monday are at or exceed 2,000 vehicles per hour for 4 to 6 hours during the middle of the day on these days. This pattern holds true for Labor Day as well.

Figure 4: Hourly Traffic by Day, Memorial Day Weekend 2019



Source: Caltrans PeMS

Travel Speeds and Travel Times

INRIX data was provided By Wood Rodgers for the corridor being analyzed. Data was downloaded from October 1, 2019 through November 24, 2019 by day of the week, representing average non-holiday days in the Fall. **Figure 5** shows speed “heatmaps” for travel in the eastbound direction while **Figure 6** shows speeds in the westbound direction by hour and road segment. In Figures 5 and 6, segments highlighted in shades of green are generally operating at 45 mph or better while cells in shades of yellow are operating in the range of 35 to 45 mph; orange shaded cells are generally 30 mph or slower. Dark orange cells are operating at 15 mph or slower. Travel through the section of US 50 between Spring Street and Mosquito Road are influenced by the three traffic signals, with average speeds in the range of 30 to 45 mph.

In general, the severity of the speed degradation through Placerville is mostly correlated with the traffic demand. On days with higher traffic, the speeds are lower through Placerville. Outside of Placerville, both to the east and west, speeds only experience minor differences throughout the day. In the eastbound direction, speeds are lowest on Saturday, especially near Spring Street, where average speeds fall to below 25 miles per hour from 10 AM to 2 PM. In the westbound direction, speeds are lowest on Saturday, but the total backup is longer on Sunday, stretching as far back as Schnell School Road from 11 AM until 6 PM. Westbound travel speeds drop to below 10 miles per hour through Placerville, improving only after the Spring Street intersection.

Eastbound travel speeds tend to be faster than westbound speeds for several reasons: (1) travel tends to be metered by any upstream congestion that may exist on the roads exiting Sacramento; and (2) within Placerville, a third auxiliary travel lane exists to relieve friction from turning vehicles and provide additional capacity for the eastbound travel toward Lake Tahoe.

Westbound travel speeds are slower than eastbound speeds through Placerville due to queuing that extends back from the traffic signal at Spring Street as far as Schnell School Road. A westbound elevated express lane could provide relief for traffic that is not turning onto local streets in Placerville.

The INRIX travel time/speed data was used to calculate travel time estimates through a 1.7-mile stretch from Placerville Drive to Mosquito Road by hour, day of the week, and direction (see **Table 1**). In the eastbound direction, total travel time between Placerville Drive and Mosquito Road is estimated to be 2 to 3 minutes, regardless of day and time. In the westbound direction, travel along the same route can be as high as 5 minutes on average on a weekday or Friday, 8 minutes on average on Saturday, and 6 minutes on average on Sunday. The severity of the speed degradation is the worst on Saturday, but the overall duration of congestion is worse on Sundays, with slow speeds from 9 AM to 9 PM. With an average off-peak travel time of about 2.2 minutes through this section of US 50, maximum delay in the westbound direction range from about 2.2 minutes on Tuesdays to 5.3 minutes on Saturdays.

Table 1: Average Travel Time from Placerville Drive to Mosquito Road (1.7 miles)

Hour Beginning	Westbound Travel Time				Eastbound Travel Time			
	Tuesday	Friday	Saturday	Sunday	Tuesday	Friday	Saturday	Sunday
12:00 AM	2.2	2.2	2.3	2.2	2.1	2.2	2.1	2.2
1:00 AM	2.2	2.2	2.2	2.3	2.1	2.2	2.2	2.2
2:00 AM	2.2	2.2	2.3	2.3	2.2	2.2	2.2	2.2
3:00 AM	2.1	2.0	2.2	2.1	2.3	2.3	2.3	2.1
4:00 AM	1.9	2.1	2.1	2.2	2.2	2.2	2.1	2.1
5:00 AM	2.0	2.1	2.0	2.0	2.2	2.2	2.0	2.1
6:00 AM	2.3	2.2	2.1	2.2	2.2	2.2	2.2	2.1
7:00 AM	2.9	2.7	2.3	2.1	2.3	2.3	2.3	2.1
8:00 AM	3.5	3.1	2.5	2.2	2.5	2.4	2.3	2.3
9:00 AM	3.0	2.9	2.6	2.4	2.5	2.6	2.7	2.5
10:00 AM	2.7	2.5	2.5	2.4	2.7	2.6	3.1	2.4
11:00 AM	2.6	2.5	2.5	3.0	2.4	2.5	3.1	2.5
12:00 PM	2.6	2.7	2.9	4.6	2.3	2.5	2.9	2.5
1:00 PM	2.8	3.5	3.4	5.8	2.4	2.6	2.9	2.4
2:00 PM	3.7	3.8	3.7	4.7	2.7	2.5	2.6	2.3
3:00 PM	4.4	4.9	5.7	4.5	2.7	2.7	2.4	2.2
4:00 PM	4.3	4.1	7.5	4.5	2.8	2.6	2.3	2.2
5:00 PM	3.6	3.2	7.2	4.1	2.7	2.5	2.3	2.2
6:00 PM	2.5	2.6	4.0	2.8	2.4	2.7	2.7	2.2
7:00 PM	2.3	2.3	2.6	2.3	2.3	2.6	2.7	2.3
8:00 PM	2.2	2.3	2.3	2.2	2.3	2.4	2.4	2.2
9:00 PM	2.3	2.3	2.3	2.2	2.2	2.2	2.3	2.2
10:00 PM	2.3	2.3	2.3	2.1	2.1	2.2	2.3	2.2
11:00 PM	2.2	2.4	2.3	2.2	2.2	2.2	2.2	2.1

Source: INRIX, from October to November 2019, excluding Thanksgiving.

Estimate Traffic and Revenue

The previously described data was used to analyze traffic and revenue potential for two pricing scenarios.

- Scenario 1 – Add one elevated express lane per direction from Placerville Drive to Mosquito Road
- Scenario 2 – Implement pricing during an interim “Trip to Green” operations plan, whereby US 50 traffic is tolled during time periods when the signals are held in a solid green phase and vehicular access across US 50 is limited to emergency vehicles only.

Scenario 1 – Elevated Express Lanes

Elevated express lanes have been identified in the US 50 Recreational Travel Hot Spot study as a potential long-term solution for recurring corridor congestion due to high levels of recreation and tourism travel through the area on weekends. Scenario 1 involved estimating the revenue potential for elevated express/bypass lanes that would allow through traffic to travel through Placerville unimpeded while keeping the existing roadway open for local travel.

Analysis Approach

The following steps were used to evaluate Scenario 1:

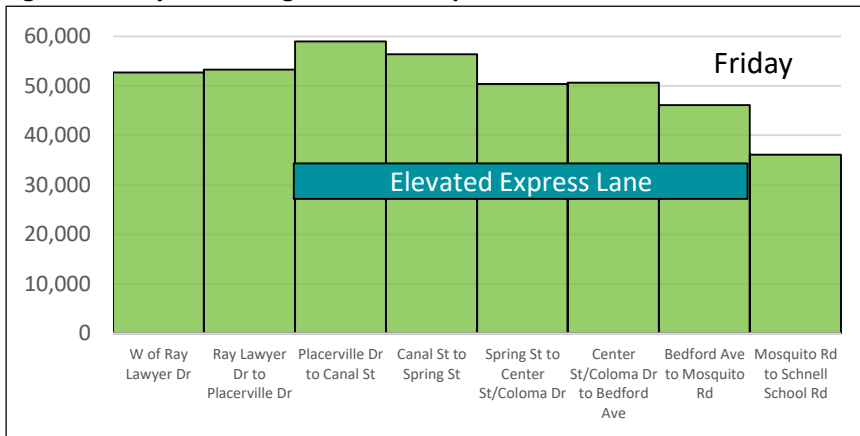
1. Identify traffic eligible to use the lanes (through traffic)
2. Use observed data to estimate potential travel time savings
3. Estimate sketch-level traffic and toll revenue

Identify Eligible Traffic

As noted earlier, hourly traffic profiles representing a typical weekday, Friday, Saturday, Sunday, and holiday were developed for each segment of the US 50 Corridor within the study area. The analysis focused on the hourly traffic on the segments at the express lanes termini, which were the segments from Mosquito Road to Schnell School Road and from Ray Lawyer Drive to Placerville Drive.

As illustrated in **Figure 7**, traffic that would be able to use the express lanes must be traveling from west of Ray Lawyer Drive to east of Mosquito Road. Since the elevated express lanes would serve through traffic only, the maximum demand for the express lane would be limited to the roadway segment with the lowest traffic volume. Although traffic volumes are higher closer to the center of Placerville, the additional traffic represent local trips that either begin or end in Placerville.

Figure 7: Daily Traffic Eligible to Use Express Lanes



For the purposes of this T&R Study, current hourly demand was increased to 2025 levels assuming growth of 1 percent per year from 2019 to 2025 and 0.5 percent per year from 2025 to 2045, using information from the El Dorado County travel demand model.

To estimate potential demand for the express lanes, the total traffic at Mosquito Road was further reduced by the following factors:

- 70 percent of trips at Mosquito Road travel through Placerville to a point west of Ray Lawyer Drive
- 10 percent of through trips may make a stop in Placerville and would use the local lanes (90 percent could use the express lanes)
- Total eligible demand is 63 percent ($0.70 \times (1-0.10)=0.63$)

That is, the maximum amount of traffic that could use the elevated express lanes even under toll-free conditions is estimated to be 63 percent of the traffic at Mosquito Road. This factor was applied to estimate the hourly traffic volumes for a typical Fall weekday, Friday, Saturday, and Sunday that is the start point of the traffic and, toll rate, and revenue analysis.

Estimate Potential Travel Time Savings

Estimated time savings for those choosing to use the express lanes were derived from the observed travel times for each of the days of the week. Since much of the existing delay on US 50 is due to traffic signals, which would remain in place, it was assumed that drivers' *perceived* delay using the existing lanes would match existing levels.

Estimate Sketch-level Traffic and Toll Revenue

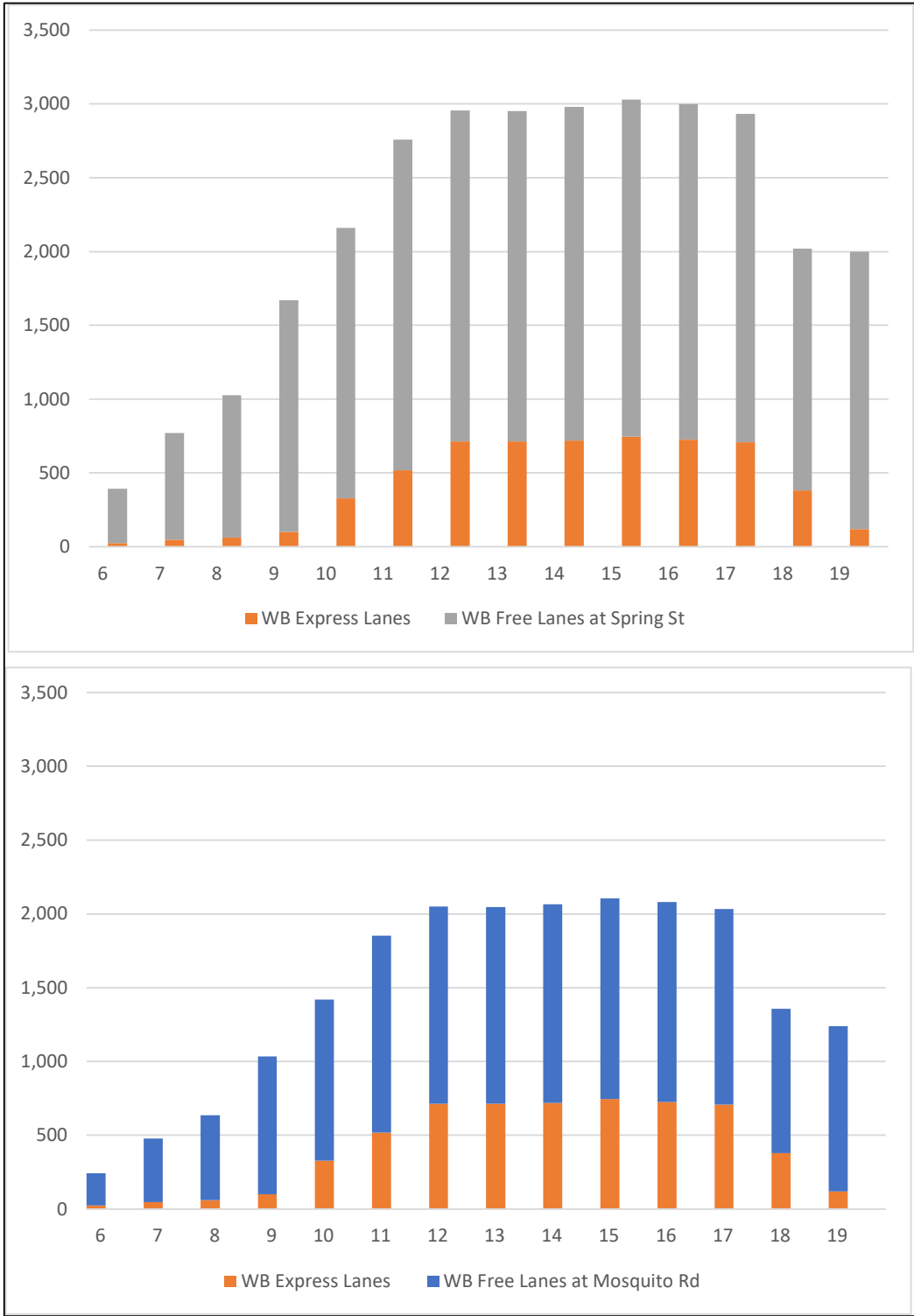
Traffic demand for the express lanes was determined by the maximum eligible demand, the estimated travel time savings during different hours of the day, and drivers' willingness to pay a toll to save time. Because the existing lanes on US 50 would remain available for toll-free use, and are easily accessed by all traffic, the express lanes would attract more traffic during peak traffic periods, when higher delays are expected, and less at night, when little or no delay is expected.

Drivers' willingness to pay is dependent on their value of time. For this sketch-level analysis, recognizing variations in income levels in the region, it was assumed that values of time for out-of-town trips are \$0.295 per minute (or \$17.70 per hour) and values of time for local residents are \$0.266 per minute (or \$16.00 per hour).

Hourly toll schedules were developed for each day of week by direction assuming that tolls would be set low enough to encourage use of the express lanes but high enough to maintain freeflow speeds. Tolls assumed to range from \$0.50 to \$1.75 (in 2021\$) depending on congestion levels in each hour/direction, and the value of time by user group was used to estimate the share of total traffic that would be willing to pay the toll.

Figure 8 illustrates the estimated share of express lanes traffic vs. total westbound traffic demand for a typical holiday in 2025. As shown, the share of demand in the express lanes at Mosquito Road is forecasted to be approximately 700 vehicles per hour out of the total traffic estimated at 2,100 vehicles per hour, or 33 percent. The same traffic, when compared to the higher traffic volumes (3,000 vehicles per hour) at the west end of the corridor, represent approximately 23 percent of total demand.

Figure 8: Estimated Westbound Hourly Express Lane Usage as Share of Total Traffic at Two Locations, 2025 Holiday



Assuming operation 24 hours per day, 365 days per year, the daily traffic and revenue for the express lanes were factored to annual levels. Annual transactions and gross toll revenues are presented in **Table 2** for 2025 through 2045. As shown, gross toll revenues are estimated to be approximately \$1.4 million (in 2021\$) in 2025, increasing to approximately \$1.8 million (in 2021\$) by 2045, driven primarily by traffic growth rates. It is noted that these gross toll revenues do not account for revenue leakage (uncollectible tolls) that may occur due to invalid Fastrak accounts, unreadable camera images, invalid DMV lookups/addresses, non-response to violations notices, etc.

Table 2: Annual Transactions and Toll Revenue, Elevated Express Lanes Through Placerville

Year	Annual Transactions	Annual Gross Toll Revenue (2021\$)
2025	2,004,000	\$1,369,000
2026	2,013,000	1,392,000
2027	2,022,000	1,414,000
2028	2,031,000	1,436,000
2029	2,040,000	1,458,000
2030	2,049,000	1,480,000
2031	2,058,000	1,503,000
2032	2,067,000	1,525,000
2033	2,076,000	1,547,000
2034	2,085,000	1,569,000
2035	2,094,000	1,591,000
2036	2,103,000	1,613,000
2037	2,112,000	1,636,000
2038	2,121,000	1,658,000
2039	2,130,000	1,680,000
2040	2,139,000	1,702,000
2041	2,148,000	1,724,000
2042	2,157,000	1,747,000
2043	2,167,000	1,769,000
2044	2,176,000	1,791,000
2045	2,185,000	1,813,000
Total	43,977,000	\$33,417,000
Notes: Toll revenue numbers do not include deductions for leakage.		

Scenario 2 – Tolling During Trip to Green

In Fall of 2022, the City of Placerville, Caltrans and EDCTC implemented a pilot project called “Trip to Green”, whereby the traffic signals on US 50 in Placerville were held in a solid green phase for through traffic on US 50 and cross-street traffic was rerouted to local streets. The program was tested during the first weekend of August, September (including Labor Day Monday) and October during 2022. As a potential measure to fund the Trip to Green program, and accumulate funding for the longer-term express lanes improvement, CDM Smith was requested to study the revenue potential for a pricing application during Trip to Green weekends assuming this program becomes a short- to medium-term solution for weekend, holiday and recreation and tourism congestion.

The assumptions for Scenario 2 for this sketch-level analysis include the following:

- Pricing applied during 12 weekends, consisting of 5 holiday weekends and 7 “typical” Fall weekends
- Tolls will be charged to all traffic passing through a zone or gantry, although residents of the immediate area will be exempt
- All tolls would be collected via electronic or video methods (non-stop collection)

Analysis Approach

The following steps were used to evaluate Scenario 2:

1. Identify program parameters
2. Estimate sketch-level traffic and toll revenue

Identify Program Parameters

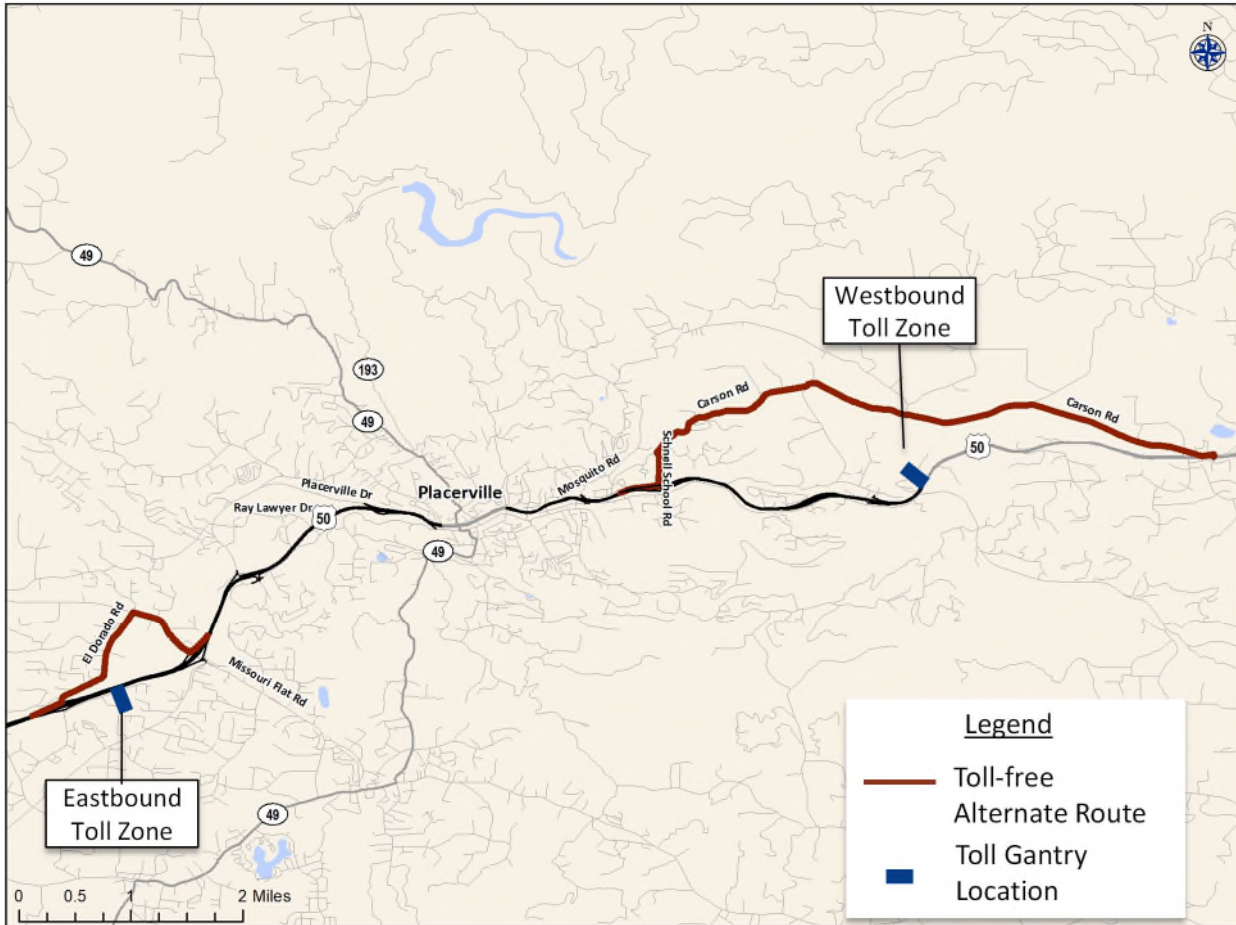
Key elements to assessing the traffic and revenue for Scenario 2 include: identifying the days/weekends that warrant a pricing program of this type; identifying the hourly traffic demand and appropriate hours for pricing; and identifying preferred locations for toll gantries to minimize diversion to local streets. While the Trip to Green program may be in effect for the entire weekend, it was assumed that pricing would only occur during 8 to 10 daytime hours, since there is no congestion during nighttime hours even on peak season weekends.

For Scenario 2 – Trip to Green, Traffic data from PeMS stations were used to create hourly traffic profiles representing for five holiday periods (Memorial Day, Independence Day, Labor Day, Thanksgiving, and Christmas/New Year’s) and a typical Fall weekend.

Next, potential gantry locations were reviewed to identify locations that would be most difficult to bypass and cause the lowest amount of diversion to local streets. The preferred locations were identified to be between El Dorado Road and Missouri Flat Road for eastbound travel and east of Point View Drive for westbound travel (see **Figure 9**). While these are outside of the intersections subject to the Trip to Green, through trips could easily be captured at these locations. As shown in Figure 9, the possible diversion

routes around these toll points are much longer and on lower capacity roadways, which would discourage drivers from leaving US 50.

Figure 9: Potential Tolling Points and Potential Toll-free Diversion Route



Since all traffic would be subject to tolling, local residents would be exempt from pricing since they have few options and are likely to make multiple trips through the priced area. Based on information from the Replica database collected as part of this study, the share of local trips that would be exempt from tolling is estimated to be 10 percent for the purposes of this scenario.

Estimate Sketch-level Traffic and Toll Revenue

For Scenario 2 – Trip to Green, potential tolled transactions were estimated by summing the hourly traffic volumes for three days in each weekend over the priced period and reducing this total by the amount of exempt trips. At a toll of \$1.00, it is assumed that up to 5 percent of traffic would either divert to a toll-free alternate route or consolidate trips to reduce the number of trips across the toll zones over the weekend. Since through trips are not likely to divert around the toll zone given the long-distance nature of their travel, traffic was considered to be relatively insensitive to higher tolls within a reasonable toll

range. Therefore, at tolls of \$1 to \$3 per direction, Scenario 2 is estimated to generate annual gross revenue of approximately \$620,000 to \$1.8 million (2021\$) at current traffic levels with tolling applied to 12 weekends per year. Revenue growth would be proportional to traffic growth for the corridor, ranging between 0.5 to 1.0 percent per year, or about 12 percent through 2035, in the absence of future toll increases, for a range of \$695,000 to \$2.0 million (2021\$).

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We trust these results are suited to your needs. Please let us know if additional information would be useful in your planning for these corridor improvements.

Disclaimer

CDM Smith used currently-accepted professional practices and procedures in the development of the sketch-level traffic and revenue estimates in this report. However, as with any forecast, it should be understood that differences between forecasted and actual results may occur, as caused by events and circumstances beyond the control of the forecasters. In formulating the estimates, CDM Smith reasonably relied upon the accuracy and completeness of information provided (both written and oral) by the El Dorado County Transportation Commission (EDCTC), the California Department of Transportation, and data collected by Wood Rodgers. CDM Smith also relied upon the reasonable assurances of independent parties and is not aware of any material facts that would make such information misleading.

CDM Smith made qualitative judgments related to several key variables in the development and analysis of the traffic and revenue estimates that must be considered as a whole; therefore, selecting portions of any individual result without consideration of the intent of the whole may create a misleading or incomplete view of the results and the underlying methodologies used to obtain the results. CDM Smith gives no opinion as to the value or merit of partial information extracted from this report.

All estimates and projections reported herein are based on CDM Smith's experience and judgment and on a review of information obtained from the multiple agencies listed above. These estimates and projections may not be indicative of actual or future values, and are therefore subject to substantial uncertainty. Certain variables such as future developments, economic cycles, pandemics, government actions, climate change related events, or impacts related to advances in automotive technology etc. cannot be predicted with certainty and may affect the estimates or projections expressed in this report, such that CDM Smith does not specifically guarantee or warrant any estimate or projection contained within this report.

While CDM Smith believes that the projections and other forward-looking statements contained within the report are based on reasonable assumptions as of the date of the report, such forward-looking statements involve risks and uncertainties that may cause actual results to differ materially from the results predicted. Therefore, following the date of this report, CDM Smith will take no responsibility or assume any obligation to advise of changes that may affect its assumptions contained within the report, as they pertain to socioeconomic and demographic forecasts, proposed residential or commercial land use development projects and/or potential improvements to the regional transportation network.

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