# RCTC TRUCK STUDY AND REGIONAL LOGISTICS MITIGATION FEE

Supplemental Technical Memorandum 1: Existing and Future Conditions

Model Validation, Calibration and Forecasts

Prepared for :



Prepared by:

۱۱SD

In partnership with FEHR / PEERS

Revised: March 2018

## Table of Contents

1.	Introduction	. 1
2.	Adjusting the SCAG Model	. 1
3.	Forecasting the Growth in Logistics in Riverside County	. 5
4.	Results of New Model Runs	10
5.	Next Steps	13

## Table of Figures

Exhibit 1: Comparison of Modeled to Actual Truck Percentages on Riverside County Freeways	2
Exhibit 2: Comparison of Modeled to Actual Truck Volumes on Riverside County Freeways	2 3 1
Exhibit 4: AM and PM Peak Hour Comparison of Traffic Counts and SCAG Model Adjusted Volumes	 5
Exhibit 5: Steps Used to Forecast Logistics Growth	6
Exhibit 6: Caltrans Economic Forecast for Riverside and San Bernardino Counties	7
Exhibit 7: Caltrans Economic Forecast Transportation Employment Compared to the SCAG model's Transportation Employment Data for Riverside	8
Exhibit 8: The Proportion of Warehousing to Transportation Employment from the Riverside- San Bernardino-Ontario MSA	8
Exhibit 9: Extrapolated EDD to 2040 using the 2003 to 2016 trend for warehousing and other transportation employment	9
Exhibit 10: TAZs with Largest Warehousing/Logistics Growth	0
Exhibit 11: Existing Freeway Deficiencies in Western Riverside County	1
Exhibit 12: Future Freeway Deficiencies in Western Riverside County	1
Exhibit 13: New Logistics Trucks on Freeways in Western Riverside County	2
Exhibit 14: Examples of Attribution of 2040 Traffic Flow to Differing Sources	4

## 1. INTRODUCTION

This supplemental technical memorandum documents the modeling steps used to prepare the forecasts of freeway impacts arising from new logistics development in Riverside County, and presents the results of the model runs.

The first section of this supplemental technical memorandum describes how the model was reviewed and calibrated to correct the problems reported in the earlier Technical Memorandum 1<sup>1</sup>. The second section describes the methodology used to forecast the growth in logistics in Riverside County. This is followed by a section describing the results of the model runs used to identify the impacts of truck traffic arising from new logistics warehouses. The final section of this memo discusses next steps in the analysis process.

## 2. ADJUSTING THE SCAG MODEL

Best industry practice requires that a regional travel demand model be adjusted and revalidated prior to using it for sub-regional studies:

"Agencies that use MPO models for purposes other than regional planning should ensure that the model provides the appropriate scale and sensitivity for applications at a sub-regional level such as corridor, sub-area, or local planning studies. Below the regional level, model refinements are likely necessary to ensure the model meets the validation targets established in these guidelines and is appropriately sensitive to smaller scale changes associated with sub-regional studies." Source: <u>California Regional Transportation Plan Guidelines</u>, California Transportation Commission, 2010.

Technical Memorandum 1 described a series of diagnostic tests that were performed on the SCAG model to test its validity for use to conduct technical evaluation as part of the RCTC Truck Study and Regional Logistics Mitigation Fee. The tests showed that the model represented truck traffic on Riverside County freeways well. For example, Exhibit 1 compares the percentage of trucks in the traffic on various freeways in the model versus the percentage in the Caltrans performance measurement system (PeMS) data, and Exhibit 2 shows a similar comparison for the truck volumes. The exhibits show a close correlation between the model and actual values, and no systemic tendency towards over- or under-estimating the truck percentage.

<sup>&</sup>lt;sup>1</sup> See the discussion of diagnostic tests of the SCAG model in *Technical Memorandum 1: Existing and Future Conditions*, WSP, October 2017

#### Exhibit 1: Comparison of Modeled to Actual Truck Percentages on Riverside County Freeways



Data sources: SCAG 2016 RTP Travel Demand Model; Caltrans Freeway Performance Monitoring System (PeMS)





Data sources: SCAG 2016 RTP Travel Demand Model; Caltrans Freeway Performance Monitoring System (PeMS)

However, the tests also revealed that there was an issue warranting adjustment. Exhibit 3 shows link flows from a SCAG model run for 2016 compared to PeMS data for the same year. This data was evaluated two ways, namely:

- The shaded area in Exhibit 3 shows the allowable deviation based on Caltrans guidelines. The allowable deviation reflects the fact that the actual traffic volumes on roads fluctuate from day to day, so the "normal" traffic volume that a model should replicate is a range rather than a fixed value. A model is considered generally valid if 75% of the points fall within the allowable deviation. In this case 77% of the sites are within the allowable range in the AM peak hour and 81% in the PM peak hour, so the model passes this test of validity.
- The second test was to see whether there a general tendency for the model to overestimate or under-estimate freeway volumes on freeways in Riverside County. The exhibit shows that the model failed this test demonstrating a tendency to overestimate freeway traffic, as illustrated by the fact the points nearly all fall above the equilibrium line which crosses diagonally through the middle of the exhibits, with an average over-estimation of 26% in the AM peak hour and 20% in the PM peak hour.



#### Exhibit 3: AM and PM Peak Hour Comparison of Traffic Counts and SCAG Model Volumes

Data sources: SCAG 2016 RTP Travel Demand Model; Caltrans Freeway Performance Monitoring System (PeMS)

Both the AM and PM peak hour overestimates can be reduced by factoring down model volumes in a post-model adjustment. Note that only car volumes were factored down, not truck volumes, because Exhibit 2 showed that the truck volumes were not in error.

Exhibit 4 shows the results after applying the factors of 0.74 and 0.80 in the AM peak hour and PM peak hour. The accuracy of the forecasts was much improved by these adjustments, with the R-squared<sup>2</sup> value increasing from 0.15 to 0.79 in the AM peak hour and from 0.53 to 0.84 in the PM peak hour. The factoring down of the model forecasts to correct for the overestimation of car volumes by the model is important in the context of the study to ensure both existing and future deficiencies on the freeway network are not being overstated.

<sup>&</sup>lt;sup>2</sup> R-squared is a measure of how well the forecast accounts for variations in the traffic counts. R-squared values can range from 0.00, indicating no relationship between the model values and the counts, to 1.00, indicating that the model accounts fully for variation in the count data set.

## Exhibit 4: AM and PM Peak Hour Comparison of Traffic Counts and SCAG Model Adjusted Volumes



Data sources: SCAG 2016 RTP Travel Demand Model (adjusted volumes); Caltrans Freeway Performance Monitoring System (PeMS)

### 3. FORECASTING THE GROWTH IN LOGISTICS IN RIVERSIDE COUNTY

The steps used to forecast for the growth in logistics in Riverside County are illustrated in Exhibit 5. The steps in the process are described in the following section. The data sources recommended as the basis to accomplish these steps was previously described in Technical Memorandum 1.

- 1. The starting point for forecasting logistics growth in Riverside County was the adopted SCAG 2016 RTP/SCS. The SCS included a number of employment categories, of which the most relevant for this study is Transportation and Warehousing (corresponding to NAICS code 48-49). Warehousing employment (NAICS subcategory code 493) is included within this broad category, along with such things as air and rail transportation, trucking, transit, pipeline, and postal service jobs. The SCS data was obtained from SCAG in the form of socio-economic data (SED) inputs for the latest SCAG model (v6.3).
- 2. The growth in jobs in the Transportation and Warehousing category was derived as the difference in the employment figures for 2016 and 2040.

#### Exhibit 5: Steps Used to Forecast Logistics Growth



- 3. Caltrans' Transportation Economics Branch provides annual county-level projections of employment by 2-digit NAICS industry categories out to 2050<sup>3</sup>. Their forecast is shown in Exhibit 6. This was compared to the forecast from the adopted SCAG SCS as a reasonableness check. As can be seen in Exhibit 7, the two forecasts are reasonably consistent. The SCS forecast is a little lower in magnitude than the Caltrans' forecast, making it a more conservative basis for a fee program<sup>4</sup>.
- 4. Next, the growth in employment in the warehouse sub-category needed to be separated out from the growth of the broader Transportation and Warehousing category. The best available data for accomplishing this comes from the California Employment Development Department (EDD). EDD collects data on employment by detailed NAICS industries, but only at the Metropolitan Statistical Area (MSA)

<sup>&</sup>lt;sup>3</sup> http://www.dot.ca.gov/hq/tpp/offices/eab/socio\_economic.html

<sup>&</sup>lt;sup>4</sup> The Mitigation Fee Act prohibits agencies from over-charging a fee, but not under-charging (in most cases an agency is not required to charge any fee at all). For fee studies it is important not to *over*-state impacts. This is different from studies done pursuant to CEQA, where it is important not to *under*-state impacts.



geography. Moreover, EDD does not include long-term forecasts. Therefore, the EDD historical data for the Riverside-San Bernardino-Ontario MSA extrapolated into the future based on the continuation of historical trend.

The proportion of Transportation and Warehouse employment that is in the warehousing sub-category was computed (see Exhibit 8) to observe the historical trend. As seen in Exhibit 8, 2003 marks an inflection point where the rate of growth in warehousing increases relative to the growth of transportation employment as a whole. Therefore, the post-2003 trend was used to extrapolate from 2016 to 2040 for both for the warehousing sub-category and the rest of Transportation sub-categories.

Exhibit 6: Caltrans Economic Forecast for Riverside and San Bernardino Counties



**\\S**])





#### Exhibit 8: The Proportion of Warehousing to Transportation Employment from the Riverside-San Bernardino-Ontario MSA





- 5. As a reasonableness check, the growth in warehouse jobs and non-warehouse jobs in the Transportation and Warehouse category were compared to historic trends. As can be seen in
- 6. , the forecasts produced by steps 1 through 4 appear to be reasonable in light of the best available data, and generally reflect a continuation of recent historical trends.

## Exhibit 9: Extrapolated EDD to 2040 using the 2003 to 2016 trend for warehousing and other transportation employment



7. Steps 1 through 5 produced a control total for the growth in warehouse jobs in Riverside County, but contain no information about where in the county the jobs would be located. The best available data for the distribution of growth among the traffic analysis zones (TAZs) comes from a study currently underway by SCAG, some products of which are available for modeling purposes<sup>5</sup>. Exhibit 10 shows the TAZs with the highest warehousing growth in the SCAG model SED. The large majority of growth is associated with the World Logistics Center—this TAZ contains 91% of the growth shown for the county at the time the SED was developed. Another 3% of the projected growth is reflected in a TAZ encompassing the western portion of the March Joint Powers Authority (JPA) March Air Force Base Reuse Plan. Three additional TAZ's each show 1% of the forecast growth in warehousing, while six additional TAZs each show warehousing growth of less than 1%.

The control total from Step 5 was multiplied by the percentage of growth for each TAZ to produce the forecast of the growth in warehouse employment by TAZ.

<sup>&</sup>lt;sup>5</sup> The on-going SCAG study also produced some forecasts of warehouse jobs by TAZ, but the SCAG team stated that these were very preliminary and recommended that they not be used for the current nexus study.





### 4. RESULTS OF NEW MODEL RUNS

Once the model was prepared as described in the previous sections, new model runs were performed to forecast various traffic performance measures including the volume-to-capacity V/C ratio for each portion of the freeway network in Riverside County. The V/C ratio was computed using the passenger car equivalent (PCE) factors<sup>6</sup> embedded in the model. The Riverside County Congestion Management Plan (CMP) sets a target LOS of "E" (V/C ratio no greater than 0.99) for freeways, so any segment with a V/C ratio equal to or greater than 1.00 is considered deficient as defined by the CMP.

Exhibit 11 plots the existing freeway V/C ratios geographically. There are three current deficiencies as illustrated: I-15 in the Jurupa Valley, I-215 between downtown Riverside and Moreno Valley, and SR-91 through Corona. It should be noted that in many cases the extents of congestion drivers experience is exacerbated by queuing from downstream segments where deficiencies are observed (i.e. the bottlenecks identified by the model).

Exhibit 12 illustrates the impact of 2040 travel demands on the existing freeway network with no additional capacity improvements. The deficiencies shown in Exhibit 11 worsen and an additional three deficiencies are identified. Both plots only show Western Riverside County because no deficiencies were observed on freeways elsewhere in Riverside.

<sup>&</sup>lt;sup>6</sup> PCE factors are used to account for the difference in size, speed, and maneuverability between different classes of vehicles, including the effect of slopes on the operating characteristics of trucks.



#### Exhibit 11: Existing Freeway Deficiencies in Western Riverside County

Exhibit 12: Future Freeway Deficiencies in Western Riverside County





Exhibit 13 shows the relative growth in truck traffic due to new logistics, with the bandwidth being proportional to the increased volume. The largest flows of trucks are forecast to come from truck traffic to and from the proposed World Logistics Center. The largest increases in truck flows would occur on SR-60 and I-215 west of the World Logistics Center. However, truck traffic from new warehouses would contribute to worsening traffic conditions at all of the deficient freeway sections previously identified in Exhibit 11 and Exhibit 12, and as indicated by the black ellipses in Exhibit 13.



#### Exhibit 13: New Logistics Trucks on Freeways in Western Riverside County

## 5. NEXT STEPS

Once the existing and future deficiencies were identified and the truck traffic arising from new logistics warehouses was forecast, the next step in the study process will be to determine how much of each future deficiency can be attributed to new truck trips from warehouses. Exhibit 14 shows that there are three possible situations in terms of the determining the relative share of future forecast traffic growth hat may be attributable to growth in warehousing in Riverside County:

- Some freeway segments have an existing deficiency that will be worsened with the addition of traffic from new growth. SR-91 between Riverside and Corona and SR-60 in western Moreno Valley appear to fall into this category. In these cases, the percent of the deficiency attributable to new growth is the portion of the excess traffic (excess being the traffic above the capacity of the road) that arises from new growth rather from existing traffic.
- The second case occurs when the existing traffic volumes are below the capacity of the freeway, but the addition of traffic from new growth creates a deficiency where none previously existed. I-15 north of Corona and SR-60 in eastern Moreno Valley are two examples of this. In such cases 100% of the deficiency can be attributed to new development.
- In the final situation, freeway volumes are below the capacity of the freeway, even when the traffic from new development is added in. In such cases there is no deficiency. No fee can be collected because no improvement is needed to mitigate the impacts of new growth.

It should be noted that in all three examples, the proportion of traffic impacts associated with new warehousing development in Riverside County (illustrated in orange in the exhibit) is relatively small compared to the traffic impacts associated with all other growth (illustrated in blue in the exhibit). As such, the share of the cost of mitigation attributable to growth in warehousing in Riverside County must be commensurate with the relative share of the impact resulting from these uses. Determination of mitigation needs, costs and the relative share attributable to new warehousing in Riverside County will be the subject of the next technical memorandum.



#### Exhibit 14: Examples of Attribution of 2040 Traffic Flow to Differing Sources