Appendix N-2

Transportation Demand Management
Vehicle Miles Traveled Reductions for
The Paradise Valley Development Project
Fehr & Peers, November 1, 2017

APPENDIX N

FEHR PEERS

TECHNICAL MEMORANDUM

Date: November 1, 2017

To: Frans Bigelow, Glorious Land Company

From: Jason D. Pack, P.E.
Paul Herrmann, P.E.

Subject: Transportation Demand Management Vehicle Miles Traveled Reductions for The Paradise Valley Development Project

Executive Summary

Fehr & Peers assisted the Glorious Land Company in quantifying vehicle miles of travel (VMT) for the Paradise Valley Development project in Riverside County, California to evaluate the Paradise Valley project for consistency with Senate Bill 743 (SB 743) requirements. Analysis was conducted for consideration by the County consistent with Technical Guidance documents prepared by the State Office of Planning and Research (OPR) related to VMT, including OPR's Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA dated January 20, 2016 (the "OPR Guidance").

VMT per service population (the sum of resident population and employees) is a metric that can be measured and compared to other jurisdictions in the County. In this analysis, VMT per day per service population is utilized. The RIVTAM (Riverside Traffic Analysis Model) regional travel demand forecasting model was combined with the transportation demand management (TDM) measures to estimate the project level VMT. The following TDM strategies were assumed and reductions to daily VMT were applied:

- Transit Accessibility
- Below Market Rate Housing
- Pedestrian Network
- Traffic Calming
- Neighborhood Electric Vehicle (NEV) Network
- Carshare Program

- Commute Trip Reduction Program including Carpooling, Ride-Matching Assistance, Preferential Carpool Parking, Flexible Work Schedule, Half Time Transportation Coordinator, Vanpool Assistance, Bicycle End-Trip Facilities
- Alternative Work Schedules and Telecommute Program
- Employer-Sponsored Vanpool/Shuttle
- Ride Share Program
- School Pool Program

After the appropriate TDM reductions were applied to the project level VMT, the resulting project VMT per service population is 22.68, which is 19.2% below the Unincorporated County VMT per service population and 15.1% below Riverside County (includes Unincorporated and Incorporated Riverside County) VMT per service population. Based on our analysis, the Paradise Valley project would result in lower vehicle miles traveled in the project area compared to the existing regional average and therefore would be considered to have a less than significant transportation impact, as contemplated in draft State CEQA Guidelines section 15064.3 as currently proposed in the OPR Guidance.

Introduction

At the request of the project applicant, due to the unique features of The Paradise Valley Development project (Project), Fehr & Peers has completed efforts to assist in quantifying vehicle miles of travel (VMT) for the Project. Our work to quantify VMT and VMT reductions for the Project included use of the RIVTAM (Riverside Traffic Analysis Model) regional travel demand forecasting model; review of the proposed specific plan, climate action plan (CAP), and economic study prepared for the Project; and review of the traffic study completed for the Project. Additionally, we have identified appropriate transportation demand management (TDM) strategies for the Project and quantification of VMT reductions associated with those TDM strategies.

This memorandum documents our VMT estimates and reductions for the Project and our conclusions regarding the Project's effect on VMT in the Project area in comparison to the existing regional average, as outlined in the OPR Guidance.

The remainder of this memorandum is divided into three sections. First, we provide context regarding the current status of SB 743. Next, we report our VMT estimates based on the RIVTAM

model and the information provided by the project applicant. Then, we identify the TDM measures that are proposed for the Project and potential VMT reductions associated with those measures. Lastly, we evaluate the project based on the criteria outlined in draft State CEQA Guidelines section 15064.3 as currently proposed in the OPR Guidance.

SB 743 – General CEQA Reform & VMT

Senate Bill 743 (SB743) was approved in 2013 and will change the way transportation impacts will be determined according to the California Environmental Quality Act (CEQA). The bill required OPR to modify the State CEQA Guidelines to identify a more appropriate metric for determining transportation impacts in transit priority areas. The bill goes on to direct OPR to consider applying this metric statewide (everywhere, not just within the transit priority areas), which OPR has completed and has drafted a second set of guidelines to address. The draft guidelines state that a project would cause a significant environmental impact in the event the project causes "substantial additional vehicle miles traveled (per capita, per service population, or other appropriate efficiency measure)." Although lead agencies have the ability to adopt their own significance criteria for identifying impacts under this new metric (with substantial evidence to support their criteria), OPR has provided the OPR Guidance to "map out" potential criteria that could be applied by local agencies. The criteria, as currently written, is outlined below:

- For residential projects, the project impact would be less-than-significant if the resulting project VMT ratio is 15% below both existing regional and city VMT ratio.
- For office projects, the project impact would be less-than-significant if the resulting project VMT ratio is 15% below existing regional VMT ratio.
- For retail projects, the project impact is considered less-than-significant if the project consists of or includes local-serving retail uses. However, retail uses that increase VMT compared to existing shopping patterns may be considered significant, such as large shopping centers with intended regional draw.

While these are not the final guidelines, they are the only guidelines available to compare the Project VMT against. Final guidelines are anticipated by the end of 2017 or early 2018. At this time, the County of Riverside has not adopted any thresholds of significance for assessing project VMT.

The current guidance only focuses on residential and office projects, while the Project is a mixed-use specific plan. Please note, that in our opinion, it is more accurate and defensible to analyze VMT

for a mixed-use project by combining VMT for all land uses, rather than attempting to separate VMT by land use and extracting VMT by land use category for a regional area. This is particularly relevant where retail associated with a proposed development would be local-serving, such as the proposed Project, versus regional-serving[1]. In order to meet the criteria for a less-than-significant physical environmental impact under CEQA as outlined in the OPR Guidance, the Project has been designed to provide a total VMT per service population of at least 15% below the regional average. This encapsulates the OPR's suggested criteria for both residential and office developments, as well as providing local-serving retail opportunities focused on the future Project residents.

Please note that the existing baseline VMT at the Project site is zero since there is no existing development. The Project will increase VMT in the area, but will do so at a lower rate than the surrounding, existing communities per the goals of SB743.

Initial VMT Estimates

Fehr & Peers utilized the calibrated RIVTAM travel demand forecasting model [as modified by LSA Associates (LSA) in conjunction with Linscott, Law & Greenspan's (LLG) effort on the Traffic Impact Study for the Paradise Valley Project (Traffic Study)] to estimate VMT for the Project and surrounding communities. LSA's modifications to RIVTAM included new roadways and traffic analysis zones (TAZs) to represent the Project site. The basic project socioeconomic data (SED) Fehr & Peers used in the assessment is presented in Table 1. Our study included a review of the *Analysis of Onsite Employment Potentials Paradise Valley Specific Plan*, by The Natelson Dale Group, Inc., 2016 and the *Paradise Valley Specific Plan Climate Action Plan,* by LSA, 2016. These SED estimates were incorporated into RIVTAM for use in this VMT assessment.

TABLE 1
SOCIOECONOMIC DATA

Population[1]	Households[1]	Students[2]	Employment[2]	Service Population
25,212	8,490	4,968	4,712	29,924

Sources:
1. *Paradise Valley Specific Plan Climate Action Plan,* LSA, 2016
2. *Analysis of Onsite Employment Potentials Paradise Valley Specific Plan*, The Natelson Dale Group, Inc., 2016

[1] As stated in the Population and Housing Section of the EIR, the supportable amounts of retail and services space will provide for the day-to-day shopping needs of project residents, thereby minimizing outbound traffic for locally-oriented services and amenities.

As noted above, service population is the sum of the population and employment totals for a designated area. Given the mixed use nature of the project, service population was determined to be the best measure of socioeconomic data for comparison to regional jurisdictions.

VMT represents the total number of trips multiplied by trip length. The ITE methodology employed in the traffic study estimates trip ends but does not estimate trip lengths. Therefore, the RIVTAM model was utilized to estimate average trip lengths. The RIVTAM forecasting model is considered the most accurate tool available and has been utilized in other County projects as a way to estimate trip length information in previously undeveloped areas of Riverside County. Travel demand models are the most appropriate tools to estimate VMT because models are able to incorporate the full accounting methodology; which accounts for all trip purposes and the full trip length for each trip purpose (in the RIVTAM case, it tracks trips throughout the entire SCAG region). The RIVTAM model reflects land use characteristics (such as land use type, average trip length by trip purpose, socio-economic and vehicle ownership parameters, and the location of land use) and provides the best tool for estimating how far trips travel to match up with their destinations because it accounts for numerous variables that affect trip making behavior. Additionally, the calibrated RIVTAM travel demand model provides the ability to accurately reflect how the Project interacts with other land uses in Riverside County and the greater SCAG region and can "track" the trips to their ultimate destinations to estimate VMT.

However, RIVTAM estimates trip generation using different methods than what was assumed in the Traffic Study, which used the Institute of Transportation Engineers' (ITE) *Trip Generation Manual*, 2012. LLG then used the internalization results and trip distribution from the RIVTAM model runs to manually assign the ITE trips for purposes of the traffic study. This is considered a standard and conservative approach in regards to the traffic study since the ITE rates result in higher trip generation than what RIVTAM estimates. For this VMT assessment, VMT / average trip length adjustments were made to the model outputs in order for the VMT estimates to be consistent with the traffic study (e.g. trip generation is factored up to be consistent with the traffic study). A trip generation comparison between the model run and the traffic study estimates is presented in Table 2.

TABLE 2
TRIP GENERATION COMPARISON

Trip Generation Source	Total Daily Trips
Traffic Study (ITE)	79,733
RIVTAM Run	63,592

The Project site was designed to provide a mix of uses that support internalization of trips. The trip assignment from LSA's model runs resulted in a 64% internal capture[2]. This internal capture rate is supported by the economic assessment conducted by The Natelson Dale Group, Inc., which estimates that residents of the Project will be roughly one-third permanent residents, one-third vacation home owners and one-third retirees. Given the expected socioeconomic characteristics of the proposed residents, we would expect that the majority of trip purposes could be satisfied on-site. The economic assessment by The Natelson Dale Group, Inc. also identified a mix of commercial, office and light industrial use that could support the proposed population of the Project.

This 64% internal capture was applied to the ITE generated trips that resulted in the 28,542 external trips assigned to the study area in the traffic study. Since the RIVTAM model was used to calculate average trip lengths for all internal and external Project trips, the total number of daily trips (internal and external) was applied to the average trip length to estimate VMT. The RIVTAM model skim matrices, which are model output matrices containing origin and destination pairs and trip distance information, were used to derive average trip lengths. These were utilized in the assessment in addition to peak, off-peak and truck trip tables to estimate the raw model VMT. The raw model VMT was then conservatively adjusted up to match the Traffic Study trip generation estimates. This step provides a conservative approach and consistency with the traffic study and utilizes the best VMT estimation provided by the traffic model. The VMT estimate is provided in Table 3.

TABLE 3
PARADISE VALLEY WEEKDAY VMT

Raw Model VMT	Final Adjusted VMT	VMT per Service Population[1]	Average Trip Length (miles)
601,477	754,139	25.2	11.3

Notes:
1. Service population is the sum of population and employment on site.

Skim matrices also track travel time, distance, costs, or a combination thereof for each origin-

[2] LSA's model runs resulted in 36% of trips generated by the Project site originated or terminated off-site, indicating an internal capture of 64% of the trip ends on-site. Fehr & Peers ran the same model with employment and student enrollment, according to the projections in *Analysis Of Onsite Employment Potentials Paradise Valley Specific Plan, Riverside County, California, The Natelson Group, Inc, 2016*. Fehr & Peers' model runs resulted in a 67% trip end internal capture. As a conservative approach, the trip generation estimates developed in the traffic study, which assumed the 64% internal capture, were applied to the average trip lengths derived from RIVTAM to estimate VMT.

destination zone pair between each TAZ in the model. Fehr & Peers utilized the RIVTAM travel demand skim matrix information to identify VMT for nearby cities, Riverside County (total and just the unincorporated area) and subareas within the region. The resulting VMT estimates are provided in Table 4.

TABLE 4
PARADISE VALLEY VMT

Region	VMT	Service Population	VMT per Service Population[1]	Average Trip Length (miles)
Paradise Valley (adjusted)	754,139	29,924	25.20	11.3
Counties, Planning Areas and Unincorporated County				
Riverside County	134,732,680	5,042,990	26.72	9.5
Unincorporated Riverside County	44,747,654	1,593,607	28.08	11.8
Cities				
Cathedral City	2,345,137	104,373	22.47	6.9
Coachella	2,019,141	105,844	19.08	8.3
Desert Hot Springs	1,708,743	63,437	26.94	11.4
Indian Wells	343,910	10,318	33.33	8.5
Indio	2,774,122	138,835	19.98	6.8
La Quinta	2,500,186	94,712	26.40	8.8
Palm Desert	3,404,283	128,013	26.59	7.4
Palm Springs	4,063,843	141,786	28.66	8.2
Rancho Mirage	1,530,667	55,189	27.74	7.8

Notes:
1. Service population for counties, unincorporated counties and cities was estimated from RIVTAM 2035 SED.

Transportation Demand Management Measures

In addition to the built environment variables that are reflected in the Project VMT described above, the Project includes design features, commonly referred to as Transportation Demand Management (TDM) measures, which have the potential to further reduce VMT beyond the pre-mitigation totals identified above. Some of the TDM measures included are part of the Project design and are considered Project Design Features intended to reduce VMT. Other TDM measures, including Commute Trip Reductions, are part of the Project's CAP and will be adopted as mitigation measures and/or conditions of approval to assist in reducing VMT.

Fehr & Peers worked with the California Air Pollution Control Officers Association (CAPCOA) to develop the transportation section of the 2010 report titled, *Quantifying Greenhouse Gas Mitigation Measures*. This report routinely is relied upon in the CEQA context as an authoritative source of methodologies for quantifying the environmental benefits of mitigation measures, such as the Project's TDM measures. The CAPCOA research and the methodologies were developed by

conducting a comprehensive literature review of studies documenting the effects of TDM strategies on reducing VMT.

Fehr & Peers developed and utilized the CAPCOA *Best Management Practices* document to quantify the effect TDM measures will have on VMT that will be implemented as Project Design Features and/or mitigation measures. These TDM measures and their respective VMT reductions are described in detail below. Note, however, that the CAPCOA document and methodology identifies a maximum VMT reduction associated with TDM measures based on the development type and whether there is a proposed neighborhood electric vehicle (NEV) program. Additionally, although the information presented below provides a guideline for maximum VMT reductions associated with each TDM measure, the effectiveness of the "package" of TDM measures is dependent on the totality of the TDM measures (e.g. bicycle parking is most effective when combined with bicycle infrastructure, which encourages bicycle use, and parking fees, which discourages car use).

As such, Fehr & Peers utilized the CAPCOA approach[3] to estimate VMT reductions associated with the proposed TDM measures that will be implemented as Project Design Features and/or mitigation measures. This approach "corrects" the initial TDM reduction potential to accurately reflect the "package" of total improvements specific to the Project, to ensure that the estimated reductions attributed to TDM measures do not over-estimate the VMT reductions. For example, many of the commute trip reduction (CTR) strategies target the same potential participants in different ways and limits the total reduction potential. This effect is referred to as multiplicative dampening; the effectiveness of additional policies in the same category is diminished when combined with the other strategies. There is also a global cap on VMT reductions that is based on the project's environment and land use context.

The resulting tool that Fehr & Peers developed to facilitate the CAPCOA methodology is known as TDM+. TDM+ is a Microsoft Excel based model that was calibrated and validated to nine existing sites (consisting of urban, urban center, compact infill, suburban center and suburban locations) in California that implemented TDM programs. Fehr & Peers compared these sites' driveway counts (each with a suite of TDM programs) to ITE rates to develop the caps on TDM package VMT reduction potential. This is regarded as a conservative approach in order to not overestimate the reduction potential of the combinations of strategies. The TDM+ Validation and Recalibration

[3] The CAPCOA approach is outlined in Chapter 6: Understanding and Using the Fact Sheets in the *Quantifying Greenhouse Gas Mitigation Measures, CAPCOA, 2010.*

Process memorandum is included for reference as Appendix A. More information on TDM+ can be found at http://www.fehrandpeers.com/project/tdm/.

TDM VMT Reductions

TDM strategies have been used for over 30 years to reduce single occupant vehicle trips. The TDM measures would work to reduce the Project's impacts on the surrounding roadway network through land use and design strategies that would create an environment that promotes alternative mode choice and reduce out-going single occupant vehicle trips. The CAPCOA document identifies the following five sub-categories of VMT reduction strategies associated with the research: Land Use/Location, Neighborhood/Site Enhancements, Parking Policy/Pricing, Transit System Improvements, and Commute Trip Reduction Programs. To determine the amount of VMT reduction that would be attributable to the Project's TDM measures, each TDM strategy was compared to CAPCOA standards. The TDM measures that are contemplated as part of the Project, within each sub-category, are further described below.

Land Use/Location Characteristics

The following land use design characteristics promote reductions in VMT. The Project Design Features used to determine the VMT reductions are noted for each land use characteristic.

- Transit Accessibility – This TDM measure consists of six transit stops that are proposed at the activity cores on-site. This strategy assumes that each residence and employment locations are within a half mile radius of a transit stop.
- Below Market Rate Housing – This TDM measure consists of 5% of housing units that are deed-restricted below market rate housing.

The land use characteristic of Diversity (representing potential internalization associated with diverse land uses), was not applied because the travel demand forecasting model already takes these factors into account and it would effectively be "double counting" of reductions.

Neighborhood / Site Enhancement

The TDM measures described below include amenities that enhance the neighborhoods and promote non-automotive travel. To calculate the VMT reductions using the CAPCOA research, the TDM+ tool requires input assumptions on the usage of the TDM measures throughout the Project.

The input assumptions for each of the neighborhood amenities are described following each TDM measure. As noted following each TDM measure, only a portion of the Project was assumed to utilize the neighborhood amenities provided as a conservative approach in order to not overestimate the VMT reduction.

- Pedestrian Network – The Project proposes an extensive pedestrian network of landscaped sidewalks, neighborhood trails, perimeter trails and provides connections to existing public trails as a TDM measure. This strategy assumes pedestrian facilities and connectivity will be provided on site but does not assume it would connect to other sites.
- Traffic Calming – This TDM measure designs all Project roads and intersections with traffic calming measures and treatments that limit vehicle speeds, and promote walkability and bikeability.
- Neighborhood Electric Vehicle (NEV) Network – The Project proposes an extensive NEV network with NEV facilities on every road throughout the site as a TDM measure. This strategy assumes that one in four households on site will own an NEV.
- Carshare Program – This TDM measure is a low range (suburban) application and assumes one shared vehicle per 2,000 population.

Commute Trip Reduction

The TDM measures described below assist in reducing the home-based-work trip from the Project. Most of these TDM measures are employer-based and are effective for on-site employers. To calculate the VMT reductions using the CAPCOA research, the TDM+ tool requires input assumptions on the employer-based usage of the TDM measures throughout the Project. As noted following each TDM measure, only a portion of the employers were assumed to utilize the commute trip reduction strategies as a conservative approach in order to not overestimate the VMT reduction.

- Commute Trip Reduction Program including Carpooling, Ride-Matching Assistance, Preferential Carpool Parking, Flexible Work Schedule, Half Time Transportation Coordinator, Vanpool Assistance, Bicycle End-Of-Trip Facilities – The Project's specific plan will adopt a voluntary trip reduction program for new commercial and industrial development that promotes commuter choices, employer transportation management, guaranteed ride home programs, and commuter assistance and outreach-type programs intended to reduce commuter vehicle miles traveled.

- Alternative Work Schedules and Telecommute Program – This trip reduction measure accounts for 10% of employee participation on average 1.5 days per week of telecommuting.
- Employer-Sponsored Vanpool/Shuttle Implemented as part of the Site Shuttle System – This TDM measure accounts for preferential vanpool and shuttle parking within the specific plan. The reduction associated assumes low degree of implementation, small employer size and 100% of employees eligible.
- Ride Share Program - The Project will promote ride-sharing programs through a multi-faceted approach such as:
    - Designating a certain percentage of parking spaces for ride sharing vehicles;
    - Designating adequate passenger loading and unloading and waiting areas for ride-sharing vehicles; and
    - Providing a website or message board for coordinating rides.
- School Pool Program– This TDM measure will create a ridesharing program for school children. School pool programs match parents to transport students to schools on site. This TDM measure assumes the lower degree of implementation that 15% of families would participate.

The TDM+ tool was used to incorporate TDM measures that are included as Project Design Features and/or mitigation measures and identified VMT reductions based on the CAPCOA methodology. The TDM+ tool generates outputs, which are potential reductions to total VMT that could be applied based on incorporation of TDM measures into a project. Each TDM measure has an individual maximum potential reduction associated with it, According to the CAPCOA methodology, when combined together as a suite of strategies, the maximum potential is reduced given the overlapping strategy target audiences and relative effectiveness considering the environment and land use mix.

The resulting global maximum VMT reduction after consideration of the overlapping strategies, which is applied to the VMT estimates for GHG assessment, is 10.0% for the proposed Project. The commute trip reduction programs and neighborhood/site enhancement measures have the largest effect on the Project's VMT reduction.

The final estimated VMT associated with the proposed Project, after accounting for the built-environment variables (through the travel demand model assessment) and the TDM reductions (through the CAPCOA method), is presented in Table 5 below.

TABLE 5 PARADISE VALLEY TOTAL VMT SUMMARY AFTER TDM (TRAFFIC ANALYSIS)	
Proposed Project Total	754,139
CAPCOA TDM Reduction (10.0%)	-75,414
Project Final VMT	***678,725***
Service Population	29,924
Project Final VMT per Service Population	***22.68***
Source: Fehr & Peers, 2016.	

As noted above, the total Project weekday VMT is estimated to be 678,725 with a VMT per service population estimate of 22.68.

Conclusion

As shown in Table 5, after TDM reductions were applied, the resulting Project VMT per service population is estimated to be 22.68. As shown in Table 6 below, the Unincorporated Riverside County VMT per service population is estimated to be 28.08. As such, the Project generates VMT per service population that is approximately 19.2% below the Unincorporated County VMT per service population. In addition, the Project is also 15.1% below the total Riverside County (Includes Unincorporated and Incorporated Riverside County) VMT per service population of 26.72. Based on these estimates, the Project would result in lower vehicle miles traveled in the Project area compared to the existing regional average. Therefore, the Project would meet the criteria for less than significance as outlined in draft State CEQA Guidelines section 15064.3 as currently proposed in the OPR Guidance.

TABLE 6 PARADISE VALLEY IMPACT ASSESSMENT SUMMARY		
Region	**Daily VMT per Service Population**	**Project VMT per Service Population Percentage of Regional Comparison**
Paradise Valley Project	22.68	-
Unincorporated Riverside County	28.08	80.8%
Riverside County	26.72	84.9%
Source: Fehr & Peers, 2016.		

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Attachments:

Appendix A – TDM+ Validation and Recalibration Process Memorandum

FEHR & PEERS
TRANSPORTATION CONSULTANTS

MEMORANDUM

Date: November 18, 2010

To: David Vintze and Ian Peterson, BAAQMD

From: Meghan Mitman and Tien-Tien Chan, Fehr & Peers

Subject: ***BAAQMD TDM Tool – Validation and Recalibration Process***

SF10-0501

This memorandum documents the validation and recalibration steps that Fehr & Peers used to enhance the BAAQMD TDM Tool created from the literature review and trip reduction protocols outlined in the recent CAPCOA report, *Quantifying Greenhouse Gas Mitigation Measures*.

Validation Process

The validation process includes selecting Bay Area projects that have documented vehicle miles traveled (VMT) or trip reduction data as well as information about TDM strategies in place with the project, testing the project using the TDM tool, and comparing the VMT reduction results predicted by the TDM tool to the documented data. This process will show how well the tool performs in predicting VMT reduction when compared to documented count or survey data for each site.

The first step in the validation process was to find existing projects that (1) already had in place a variety of measures listed in CAPCOA's report, (2) are located in the San Francisco Bay Area, and (3) have documented VMT reduction, vehicle trip reduction, or mode share shift data. In selecting the validation sites, Fehr & Peers collaborated with BAAQMD to find a good mix of projects that represented different types of settings (urban vs. suburban), varying locations relative to transit, and different uses (residential vs. commercial). **Table 1** shows the categories and final projects selected for validation. Though some categories could not be filled in, due to the lack of available or accessible data, nine candidates were selected.

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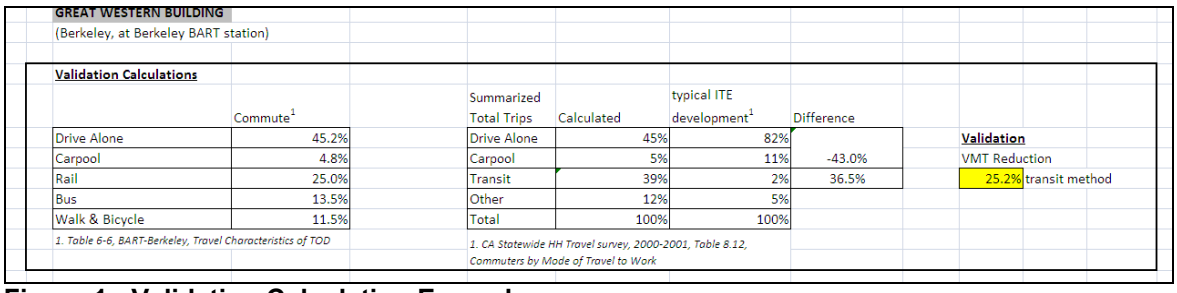
TABLE 1 – VALIDATION SITES

Location	Near Heavy Rail	Away from Heavy Rail
Urban		
Infill	1. Great Western Building – Berkeley (office)	6. Alta Bates Summit Campus – Oakland (medical)
Suburban Center	2. Hacienda Business Park – Pleasanton (office) 3. Alameda County[1] BART TOD (residential) 4. Pleasant Hill BART TOD (residential)	7. Lawrence Berkeley National Laboratory – Berkeley (research park)
Suburban	5. Caltrain TOD (residential)	8. Moraga (mixed-use) 9. Genentech Campus – South San Francisco (office park)

1. Projects located in Hayward, Fremont, and Union City.

Fehr & Peers, 2010.

The next step in the validation process was to review each validation site's report. If the report did not document VMT reduction, calculations steps were used to convert from the reported metrics to percent reduction in VMT. **Figure 1** below provides an example screenshot of the calculation step for the Great Western Building site. The report provided mode share information only and this information was subsequently converted into an estimated VMT reduction. The first step for conversion was to compare reported mode share to a baseline mode share of a typical ITE development. The difference in mode share is calculated for transit trips. For Great Western, transit mode share increases by 36.5%. A last step is taken to incorporate a conservative estimate that new transit trips likely have shorter than average trips lengths, adjusting the final estimated VMT reduction to 25.2%.



GREAT WESTERN BUILDING
(Berkeley, at Berkeley BART station)

Validation Calculations

	Commute[1]
Drive Alone	45.2%
Carpool	4.8%
Rail	25.0%
Bus	13.5%
Walk & Bicycle	11.5%

1. Table 6-6, BART-Berkeley, Travel Characteristics of TOD

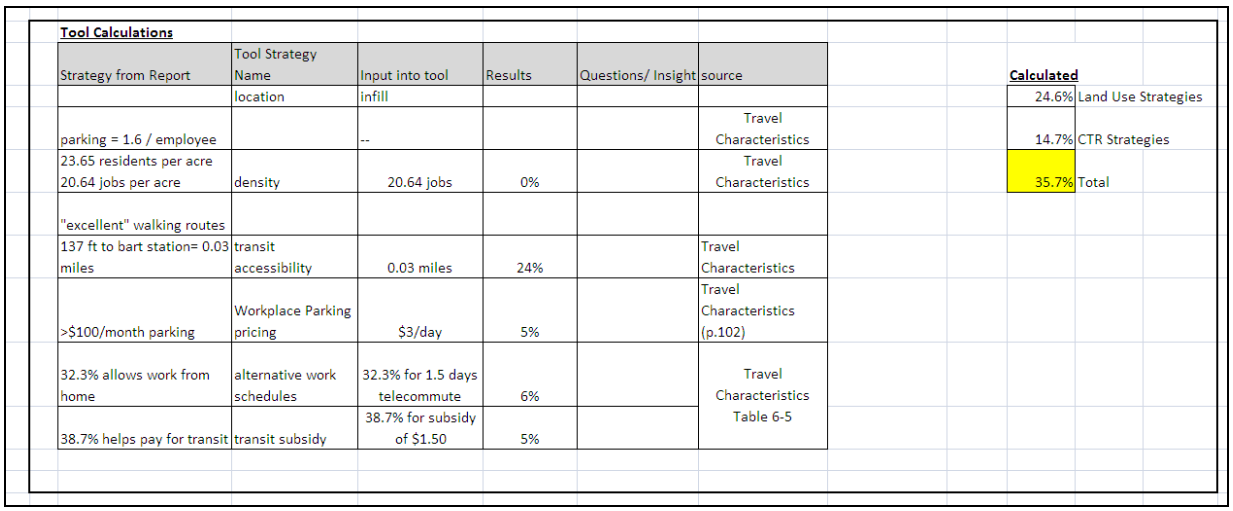
Summarized Total Trips	Calculated	typical ITE development[1]	Difference
Drive Alone	45%	82%	
Carpool	5%	11%	-43.0%
Transit	39%	2%	36.5%
Other	12%	5%	
Total	100%	100%	

1. CA Statewide HH Travel survey, 2000-2001, Table 8.12, Commuters by Mode of Travel to Work

Validation
VMT Reduction
25.2% transit method

Figure 1 - Validation Calculation Example

The next step was to create a list of strategies, as documented in each report, which were in place for the project site. This information was then input into the BAAQMD TDM tool and an estimated VMT reduction was the output. **Figure 2** below provides an example screenshot of the strategies that were tested with the TDM tool and the resulting calculations.



Tool Calculations

Strategy from Report	Tool Strategy Name	Input into tool	Results	Questions/ Insight	source
	location	infill			
parking = 1.6 / employee		--			Travel Characteristics
23.65 residents per acre 20.64 jobs per acre	density	20.64 jobs	0%		Travel Characteristics
"excellent" walking routes					
137 ft to bart station= 0.03 miles	transit accessibility	0.03 miles	24%		Travel Characteristics
>$100/month parking	Workplace Parking pricing	$3/day	5%		Travel Characteristics (p.102)
32.3% allows work from home	alternative work schedules	32.3% for 1.5 days telecommute	6%		Travel Characteristics Table 6-5
38.7% helps pay for transit	transit subsidy	38.7% for subsidy of $1.50	5%		

Calculated

24.6%	Land Use Strategies
14.7%	CTR Strategies
35.7%	Total

Figure 2 - Tool Calculation Example

These steps were repeated for each of the nine validation sites. **Table 2** below summarizes the results of the validation process.

TABLE 2 – VALIDATION SITES COMPARISON

Validation Site	Location	Description	Report Result	Tool Result	Delta
Alameda County BART TOD	Suburban Center	residential - density, trans access, parking limits	14.7%	12.5%	**2.2%**
Alta Bates	Compact Infill	medical - trans access, shuttle, parking pricing, transit sub, ctr marketing	6.0%	23.8%	**-17.8%**
Caltrain TOD	Suburban	residential - density, diversity, trans access, parking limits	5.8%	8.3%	**-2.5%**
Genentech	Suburban	office - transit access, shuttle, transit sub	11.2%	15.0%	**-3.8%**
Great Western	Compact Infill	office - density, transit access, transit subsidy, altern work	25.2%	35.7%	**-10.5%**
Hacienda Business Park	Suburban Center	office - CTR program voluntary, transit sub, alt work	8.3%	14.3%	**-6.1%**
Lawrence Berkeley National Laboratory	Suburban Center	research - trans access, destination access, shuttle, alt work, transit sub, rideshare	17.3%	18.5%	**-1.2%**
Moraga	Suburban	design, trans access, diversity	12.1%	5.0%	**7.1%**
Pleasant Hill BART TOD	Suburban Center	residential - trans access, density, parking limits	16.8%	12.5%	**4.3%**

Fehr & Peers, 2010.

The shadings in the table indicate where there are larger differences between the validation site report result and the result from the TDM tool. These results reflect a careful consideration of all inputs in the tool. The tool is particularly sensitive to the location context of the project site (urban, suburban center, etc.), as trip reduction caps are tied to location. See **Table 2** above for location selections for each validation site. The location definitions in the following section were closely followed to categorize the locations of the nine validation sites. A similar careful analysis of location definition will be required with future use of the tool.

Location Definitions from CAPCOA Report

Urban: A project located within the central city and may be characterized by multi-family housing, located near office and retail. Downtown Oakland and the Nob Hill neighborhood in San Francisco are examples of the typical urban area represented in this category.

Compact Infill: A project located on an existing site within the central city or inner-ring suburb with high-frequency transit service. Examples may be community redevelopment areas, reusing abandoned sites, intensification of land use at established transit stations, or converting underutilized or older industrial buildings. Albany and the Fairfax area of Los Angeles are examples of typical compact infill area as used here.

Suburban Center: A project typically involving a cluster of multi-use development within dispersed, low-density, automobile dependent land use patterns (a suburb). The center may be an historic downtown of a smaller community that has become surrounded by its region's suburban growth pattern in the latter half of the 20th Century. The suburban center serves the population of the suburb with office, retail and housing which is denser than the surrounding suburb.

Suburban: A project characterized by dispersed, low-density, single-use, automobile dependent land use patterns, usually outside of the central city (a suburb). Suburbs typically have the following characteristics:

- Location relative to the regional core: these locations are typically 20 miles or more from a regional CBD
- Ratio or relationship between jobs and housing: jobs poor
- Density character
    - typical building heights in stories: one to two stories
    - typical street pattern: curvilinear (cul-de-sac based)
    - typical setbacks: parking is generally placed between the street and office or retail buildings; large-lot residential is common
    - parking supply: ample, largely surface lot-based
    - parking prices: none
- Transit availability: limited bus service, with peak headways 30 minutes or more

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Recalibration Process

The intent of the recalibration process was to enhance the TDM tool based on the validation results. This process focused on further analyzing the validation results which showed the largest discrepancies. Several questions were posed as part of the recalibration brainstorming to determine *why* there were large discrepancies in certain cases and *what* can be done to refine the TDM tool:

1. Were there any common patterns with the large discrepancy sites? Similar strategies, similar characteristics?

2. Did certain strategies stand out in reporting potentially too high or too low of results?

3. Were there any strategies that posed a high risk of double counting?

4. Were there any unique characteristics of the validation sites which may explain the discrepancies?

5. To what extent were the trip reduction caps "driving" the tool results?

The initial results of the validation process showed that the TDM tool was working fairly well. Five out of the nine projects reported deltas of < 5%. Four projects reported deltas > 5%, of which only two projects had deltas > 10%. The projects that over reported the VMT reduction (greater than 5%) were all office sites. These office sites all had transit accessibility reduction credits combined with some commute trip reduction (CTR) credits. The consistent over-estimation suggests double counting may be occurring.

Enhanced Rules Testing

Based on the validation results, Fehr & Peers tested four strategies to reduce the potential for double counting transit accessibility and CTR reduction credits.

Iteration #1

The first iteration added the following rule:

- Transit Accessibility strategy would only be applied to projects <= ½ mile from transit

This rule was applied because of observations that transit accessibility was consistently reporting high results and projects farther than ½ mile from transit had TDM tool results higher than report results. For example, Alta Bates and Hacienda Business Park are both > ½ mile from transit and both had overestimated TDM tool results. **Table 3** shows the results of this additional rule, with improved deltas for both Alta Bates and Hacienda Business Park. This resulted in three projects with deltas > 5%, of which two were > 10%.

Iteration #2

The second iteration tested the following rule:

- No restriction on Transit Accessibility

- For projects greater than ½ mile from transit: If transit accessibility is applied, no CTR strategies can be applied

This rule was applied to test if the over reporting may have come from the CTR strategies, versus the transit accessibility strategy. This was a good rule to test as office sites were the most common to over report. It is also fairly likely based on the literature that there may be some double-counting occurring at office sites where transit accessibility and CTR strategies are applied. **Table 3** shows the results of this additional rule, with an improved delta for Alta Bates but increased deltas for Genentech and Lawrence Berkeley Labs. This resulted in four projects with deltas > 5%, of which one was > 10%.

Iteration #3

The third iteration tested the following rule:

- If transit accessibility and CTR strategies are both applicable, apply only the one that provides higher effectiveness

This rule was applied as a slight variation from iterations #1 and #2. It is likely that the double-counting of transit accessibility and CTR strategies would apply to projects < ½ mile from transit as well. **Table 3** shows the results of this additional rule, with improved deltas for Alta Bates, Great Western, and Hacienda Business Park, but increased delta for Lawrence Berkeley. This resulted in three projects with deltas > 5%, of which one was > 10%.

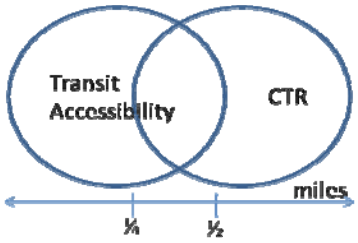
Iteration #4

The fourth iteration tested the following rule:

- For projects <= ¼ mile from transit: apply transit accessibility strategy but do not apply CTR strategies (this assumes the primary VMT reduction for office sites within a 5 minute walk of transit is their transit proximity)

- For projects > ¼ mile and <= ½ mile from transit: apply both transit accessibility and CTR strategies (this assumes that both transit proximity and CTR play a role when the office site is within a 5 to 10 minute walk to transit)

- For projects > ½ mile from transit: do not apply transit accessibility strategy but do apply CTR strategies (this assumes that for office sites more than a 10 minute walk from transit, the primary VMT reduction benefit comes from CTR)



This rule provides an integration of the previous iterations. Projects closest to transit reasonably have a higher risk of double counting with CTR strategies based on the transit

accessibility literature (where all trip reduction credit was attributed to transit proximity). Being less than ¼ mile from transit is probably the greatest motivation to use transit, whereas any additional CTR strategies would likely not provide much incremental benefit. On the other hand, with projects > ½ mile from transit, proximity alone likely will not motivate significant transit use. CTR strategies in these cases will likely have a much larger impact in increasing alternative means of commuting. **Table 3** shows the results of this additional rule, with improved deltas for Alta Bates, Great Western, and Hacienda Business Park, and no increased delta for any other projects. This resulted in two projects with deltas > 5%, of which one was > 10%.

Enhanced Rules Results

Table 3 below provides a summary of the recalibration results for all four iterations. Compared to the original results, iteration #4 provides the lowest deltas across all projects. The two projects that still have deltas > 5% are Alta Bates and Moraga. These project sites may be considered outliers/ unique situations. They also illustrate potential limitations of the tool. Although Alta Bates Medical Campus is relatively close to BART (0.7 miles from MacArthur BART), the transit accessibility strategy may still be overstated. The walking environment and perceived personal safety is low compared to other projects with similar distances to transit. This large delta for Alta Bates may be due to the unique walking environment of this project. For Moraga, this project is actually the entire city of Moraga. The large delta may be due to the fact that the TDM tool (and the CAPCOA report) was created on a project level, rather than a city level.

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TABLE 3 – RECALIBRATION RESULTS

Site	Report Result	Original Tool		Iteration #1		Iteration #2		Iteration #3		Iteration #4	
		Tool Result	Delta	Tool Result	Delta	Tool Result	Delta	Tool Result	Delta	Tool Result	Delta
Alameda County BART TOD	14.7%	12.5%	2.2%	12.5%	2.2%	12.5%	2.2%	12.5%	2.2%	12.5%	2.2%
Alta Bates	6.0%	23.8%	-17.8%	17.6%	-11.6%	7.5%	-1.5%	17.6%	-11.6%	17.6%	-11.6%
Caltrain TOD	5.8%	8.3%	-2.5%	8.3%	-2.5%	8.3%	-2.5%	8.3%	-2.5%	8.3%	-2.5%
Genentech	11.2%	15.0%	-3.8%	15.0%	-3.8%	3.5%	7.6%	15.0%	-3.8%	15%	-3.8%
Great Western	25.2%	35.7%	-10.5%	35.7%	-10.5%	35.7%	-10.5%	24.6%	0.6%	24.6%	0.6%
Hacienda Business Park	8.3%	14.3%	-6.1%	9.2%	-0.9%	5.7%	2.6%	9.2%	-0.9%	9.2%	-0.9%
LBNL	17.3%	18.5%	-1.2%	18.5%	-1.2%	10.0%	7.3%	10.0%	7.3%	18.5%	-1.2%
Moraga	12.1%	5.0%	7.1%	5.0%	7.1%	5.0%	7.1%	5.0%	7.1%	5%	7.1%
Pleasant Hill BART TOD	16.8%	12.5%	4.3%	12.5%	4.3%	12.5%	4.3%	12.5%	4.3%	12.5%	4.3%

Fehr & Peers, 2010.