California Senate Bill 743 Implementation Assistance Project:
Case Studies on Using Vehicle Miles Traveled to Evaluate Transportation Impacts in CEQA

Irwindale Regional Shopping Center

Case Study

January 2020

The SB 743 Implementation Assistance Project was coordinated by the
Urban Sustainability Accelerator, a joint program of the
Toulan School of Urban Studies and Planning and the
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Participating Agencies

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We make special mention here of some of the most active participants: **Mike McKeever** (who initiated the project), former CEO of the Sacramento Area Council of Governments (SACOG); **Chris Ganson** (a leading participant in every phase), with the California Governor's Office of Planning and Research; **Jeannie Lee** (who led the Legal Advisory Committee), also with the California Governor's Office of Planning and Research; **Kate White** with the California State Transportation Agency; **Bruce Griesenbeck** with the Sacramento Area Council of Governments; **Ping Chang** with the Southern California Association of Governments; **Ron Milam** at Fehr & Peers Transportation Consultants; and **Jamey Volker** at Volker Law Offices, and PhD candidate in Transportation Technology and Policy at UC Davis.

Many thanks also to the project team: **Robert Liberty**, Project Manager and **Judy Walton**, Project Coordinator, both with the Urban Sustainability Accelerator at Portland State University; **Lynn Peterson** former Secretary of Transportation for Washington State (now President of the Metro Council of metropolitan Portland, Oregon); and finally the late **Sam Seskin**, nationally recognized transportation consultant.

Fregonese Associates assisted with preparation of communication materials and three case studies.

The analysis for this particular case study on the Irwindale regional shopping center development was carried out by **Alex Steinberger** at Fregonese Associates, with technical support from **Ron Milam** and **Jinghua Xu** at Fehr & Peers and **Gordon Garry**, transportation consultant (formerly with SACOG). Special thanks to technical advisors **Chris Ganson** and **Jamey Volker** (see above) for their detailed reviews.

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Case Study: Irwindale Regional Shopping Center

1. About the SB 743 Implementation Assistance Project

This case study is one of five undertaken as part of the SB 743 Implementation Assistance Project: From Driving More to Driving Less, a collaboration among California state agencies and metropolitan planning organizations, consulting professionals and project staff (see Appendix A). The project was managed by the Urban Sustainability Accelerator at Portland State University.

The purpose of the project was to assist with the development and implementation of new Guidelines governing transportation impact analysis under CEQA (California Environmental Quality Act). These were being drafted to carry out the groundbreaking provisions of California Senate Bill 743, which fundamentally changed transportation impact analysis as part of CEQA compliance. The updated CEQA Guidelines were adopted in December 2018 during the course of this project.

The nationally important feature of SB 743 (passed in 2013) was the elimination of auto delay, level of service (LOS), and similar measures of traffic congestion or vehicular capacity as a basis for determining the significant transportation impacts of new projects. Charged with selecting a replacement metric and developing associated guidance, the Governor's Office of Planning and Research (OPR) selected Vehicle Miles Traveled (VMT) – i.e., the amount and distance of automobile travel attributable to a project – as the preferred CEQA transportation metric going forward.

That shift necessitated corresponding changes in how transportation impacts are to be mitigated – from such methods as widening roads or adding turn lanes to improve LOS standards, to measures such as increasing transit service or instituting parking fees to reduce project-generated VMT.

The five case studies that form the core of this project represent a sample of previously approved land use and transportation projects, selected by the project's leadership to highlight different topics in implementing OPR's updated guidelines and technical guidance being drafted at the time. Each case study draws on a project's environmental impact report (EIR) and related documents prepared under the former LOS maintenance standard as a basis for illustrating what a new, VMT-based transportation impact analysis would look like, pursuant to the updated CEQA statute, guidelines, and technical advisory.

You can find more details about the project on the website at https://www.sb743.org. This includes the other case studies, related workshops, and a resource library.

Disclaimer: The approach and technical methods used here are illustrations of how the new CEQA analysis can be approached; they are not endorsements of that approach by any of the participating governments or technical experts. Reasonable minds can and do differ regarding how to implement the CEQA guidelines. That was true even among the distinguished experts who contributed to these case studies. CEQA gives lead agencies significant discretion in how they undertake their CEQA responsibilities and these case studies illustrate ways in which that discretion can be exercised.

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2. Irwindale Regional Shopping Center Project Description

(a) Project Overview

The proposed Irwindale Regional Shopping Center project consists of an approximately 700,000 square-foot outlet mall and associated parking to be built on a 63.5-acre site in the City of Irwindale in Los Angeles County. According to the project's Draft Environmental Impact Report[1] (hereafter "DEIR"), the project site is currently occupied by the Irwindale Speedway, a raceway, and is bordered primarily by heavy industrial uses with residential neighborhoods nearby. In addition to retail space, the project will include a range of amenities such as a central plaza and an outdoor performance area. The shopping center is expected to employ approximately 5,000 people (DEIR, p. 3-12).

The Irwindale Regional Shopping Center will serve an area and population far in excess of the 1,500 people living in Irwindale. It is intended to draw travelers from outside the city's jurisdiction (competing with other regional centers in the Los Angeles Basin), provide jobs to people within Irwindale and surrounding areas, and provide a revenue source for the city. The site is easily accessed by residents in the San Gabriel Valley.[2]

A VMT analysis for the Irwindale project would need to determine the change in overall VMT resulting from the project. This case study tests a screening approach that assesses home-based shopping trips to the project and compares them to home-based shopping trips in absence of the project. Increases in VMT from those trips could point to increases in overall VMT, which would indicate a significant environmental impact, indicating that a more comprehensive analysis of VMT is appropriate.

VMT for home-based shopping trips was determined using SCAG's (Southern California Association of Regional Governments) regional travel model.

The case study also examines a few of the several possible mitigation strategies that could be available to projects of this type.

Reasons for selection as a case study

This project was selected for a case study because it is a regional-serving retail development. Whereas adding local-serving retail tends to reduce VMT by improving proximity to shopping, adding regional-serving retail can increase VMT compared to existing shopping travel patterns.

Regional malls the size of the Irwindale Regional Shopping Center have market areas with populations of several hundreds of thousands of people, with travel distances for customers of 15 to 30 minutes. The project Draft EIR alludes to this broad market area in its "Project Objectives" (p. 3-25).[3]

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[1] *Draft Environmental Impact Report: Irwindale Regional Shopping Center*, SCH No. 2014071042, City of Irwindale, Los Angeles County, Calif., Dec. 20, 2014. [DEIR] See: https://www.irwindaleca.gov/DocumentCenter/View/1207.

[2] See Table 5.C: "Project's Consistency with Regional Plans" in the project DEIR, specifically data for RTP/SCS G2 and RTP/SCS G5 (DEIR, p. 5-5).

[3] Specifically these two objectives: "To provide a… shopping experience for outlet-focused customers looking for bargains within *and outside* the region," and "To increase tourism and bolster the image of Irwindale as a *regional hub*" (emphasis added).

(b) Project Details

Location and existing conditions

The project area is west of Interstate 605, south of Interstate 210, and north of Interstate 10 in the northwestern portion of the City of Irwindale. Specifically, the site is located at the southwest corner of the I-605/Live Oak Avenue interchange, approximately 750 feet east of Arrow Highway, at 500 Speedway Drive (see Figure 1).

Figure 1: Location of Irwindale Regional Shopping Center. (Source: Project DEIR)

The project site consists of three parcels of land,[4] totaling approximately 63.5 acres. The Irwindale Event Center (formerly the Irwindale Speedway) currently occupying the site includes seating for 6,000 spectators and parking for over 3,000 automobiles. Prior to the speedway the project site was used as an outdoor swap meet for several years, and prior to the swap meet it was a landfill operated by Los Angeles County.

The City's General Plan designates the entire project site as Commercial/Recreation. It is zoned M-2 Heavy Manufacturing, and is bordered by an active quarry to the south, a trucking and distribution center to the west, a landfill and Live Oak Avenue to the north, and the I-605 freeway to the east (DEIR, p. 2-23).

[4] Identified as Assessor's Parcel Numbers (APN) 8532-004-022, 8532-004-025, and 8532-004-026.

Project phases

The project is proposed in two phases (see Figure 2). Phase 1 is slated to include demolition of the speedway and associated buildings, all site preparation and grading, and development of approximately 455,000 square feet, or 65 percent of the total project building space.

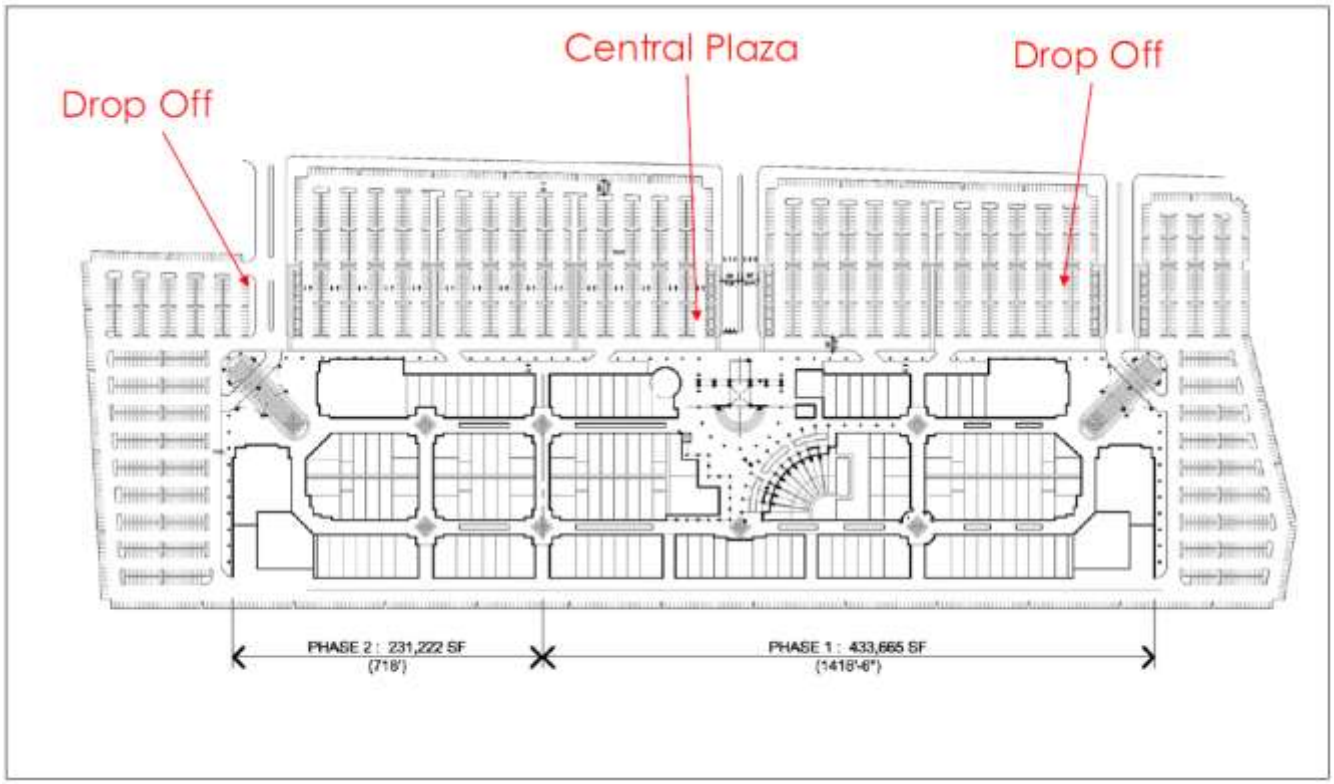

Figure 2: Conceptual site plan for the Irwindale Regional Shopping Center. (Source: Project DEIR)

Phase 2 will include development of approximately 245,000 square feet, or the remaining 35 percent of the total project space. In addition to the primary function of the shopping center (to provide commercial space for shopping opportunities) the project includes ancillary amenities such as a central plaza for public gatherings, entryway features, an outdoor entertainment/performance area, and a food court.

The Draft EIR for the Irwindale Regional Shopping Center examines the impacts of the proposed project, including demolition of the Irwindale Speedway. Section 4.7, "Transportation and Traffic," analyzes the potential impacts of the project on the surrounding transportation system.

3. CEQA Analysis

This section compares approaches to a CEQA transportation impact analysis before and after SB 743's implementation. We examine the following four topics of relevance to the Irwindale project case study:

(a) New CEQA exemption provided by SB 743
(b) Thresholds of significance (for transportation impacts)
(c) Transportation impact analysis

(d) Mitigation measures

(a) New CEQA Exemption Provided by SB 743

SB 743 created a new statutory exemption from CEQA review for certain types of land use projects (see Pub. Resources Code § 21155.4). Specifically, it exempts residential, employment centers,[5] or mixed-use developments (including a subdivision or zoning change) that are:

(1) Proposed within a transit priority area, as defined in Public Resources Code section 21099(a)(7).
(2) Undertaken to implement and are consistent with a specific plan for which an EIR has been certified.
(3) Consistent with the relevant Sustainable Communities Strategy or alternative planning strategy approved by[6] the California Air Resources Board.

The Irwindale Regional Shopping Center project, however, does not qualify for this exemption since it is not a residential, employment center, or mixed-use development (including a subdivision or zoning change).

(b) Thresholds of Significance

Screening thresholds for transportation impacts

Many agencies use "screening thresholds" to quickly identify when a project should be expected to cause a less-than-significant impact without conducting a detailed study.

Screening thresholds for LOS analysis (pre-SB 743)

In its Initial Study[7] the City of Irwindale used criteria from CEQA Guidelines Appendix G to determine whether Transportation and Traffic (among other environmental topics) warranted further environmental review in an EIR. The two criteria and findings relevant to this case study are:

Criterion 1: Would the project "[c]onflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways, and freeways, pedestrian and bicycle paths, and mass transit?"

> *Finding*: The IS determined that the project's potential to have an adverse impact on roadway segments and intersections (including the adjacent freeway) was a potentially significant impact. It recommended that a Traffic Impact Analysis be prepared and that discussion of the topic be included in an EIR.

Criterion 2: Would the project "[c]onflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other

[5] As defined in Public Resources Code section 21099(1)(b).

[6] "Approved by" means that CARB, pursuant to Section 65080(H)(2)(b) of the Government Code, has accepted an MPO's determination that the SCS or alternative planning strategy would, if implemented, achieve the GHG emissions reduction targets.

[7] *Initial Study: Irwindale Regional Shopping Center*, City of Irwindale, Los Angeles County, CA. July 10, 2014. https://www2.irwindaleca.gov/WebLink/PDF/pkifobfnzn0pcangmdfvtme1/2/Irwindale%20Shopping%20Center%20Initial%20Study%207-10-14.pdf

standards established by the county congestion management agency for designated roads or highways?"

> *Finding*: The IS determined that the project's potential to increase the volume of traffic on local roadways was a potentially significant impact. It suggested that project trip generation estimates and traffic impacts be evaluated in a Traffic Impact Analysis and in the project EIR.

Screening thresholds for VMT analysis (post-SB 743)

OPR's *Technical Advisory for Evaluating Transportation Impacts in CEQA* (hereafter "Technical Advisory"), which was prepared to help lead agencies and practitioners implement SB 743, suggests that lead agencies may consider screening out a land use project from VMT impact analysis using any of these criteria (p. 13):

(a) Small project size
(b) Location in low-VMT areas (residential and office projects)[8]
(c) Location near transit (residential, retail, office, and mixed-use projects)
(d) Provision of affordable housing (residential projects)

Of these criteria, only "c" is relevant for a regional-serving retail project such as Irwindale. Here are the details of screening criterion "c":

Projects near transit: land use projects proposed within ½ mile of an existing major transit stop or an existing stop along a high-quality transit corridor may generally be presumed to have a less than significant impact on VMT. This presumption would not apply, however, if project-specific or location-specific information indicates that the project will still generate significant levels of VMT. See Public Resources Code section 15064, (3)(b)(1) and Technical Advisory, pp. 13-14.

The Irwindale Regional Shopping Center project does not meet this screening threshold. As the map in Figure 3 below shows, the project is not located within an identified Transit Priority Area (TPA), meaning it is not "within ½ mile of an existing major transit stop or an existing stop along a high-quality transit corridor" (see Glossary in Appendix B for definitions of "major transit stop," "high quality transit corridor," and "transit priority area" or "TPA").[9] Thus the Irwindale Regional Shopping Center project can be considered to have a potentially significant transportation impact (meaning it may increase net total VMT) and would require a detailed VMT analysis under SB 743.

[8] The "location in low-VMT area" screening does not apply to retail projects, where any net increase in VMT is considered significant.

[9] Note: A TPA may include major transit stops that are existing *or planned* (within the planning horizon included in a Transportation Improvement Program) (Pub. Resources Code § 21099 (a) (7)); but since the project is not located within a TPA anyway, there is no need to examine the TPA further to determine which stops are "existing."

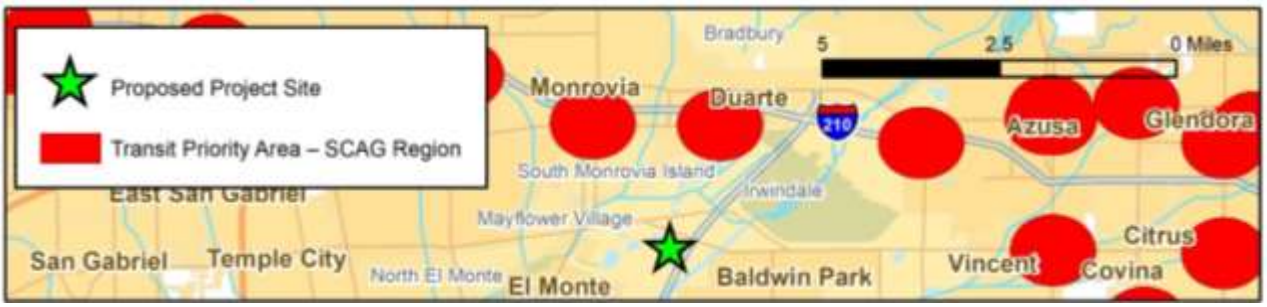

Figure 3: SCAG's 2016 Transit Priority Areas in the vicinity of the project site. (Source: Southern California Association of Governments [SCAG])

In the absence of qualification for screening the lead agency may reasonably conclude the project may increase net total VMT, and would thus need a detailed VMT analysis under SB 743.

Numeric thresholds of significance for transportation impacts

Numeric thresholds of significance for LOS analysis

Under CEQA lead agencies have discretion in setting thresholds for the significance of environmental impacts.[10] The lead agency for this project, the City of Irwindale, used the following two thresholds of significance to evaluate the different traffic scenarios in its transportation/traffic impact analysis:

Threshold 1: Would the project "[c]ause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system?" (For specific LOS thresholds of significance for Irwindale, Baldwin Park, and Caltrans see the Draft Environmental Impact Report, pages 4.7-24 to 4.7-25.)

Threshold 2: Would the project "[e]xceed, either individually or cumulatively, the City's LOS D criteria at all study area intersections."

Both thresholds were based on the Appendix G checklist in the CEQA Guidelines.[11] For the results of the analysis, see section below titled "LOS-based impact analysis (CEQA pre-SB 743)."

Numeric thresholds of significance for VMT analysis

OPR's *Technical Advisory on Evaluating Transportation Impacts in CEQA* (2018) provides guidance to lead agencies on setting VMT significance thresholds. For retail projects, it advises that "estimating the total change in VMT (i.e., the difference in total VMT in the area affected with and without the project) is the best way to analyze a retail project's transportation impacts" (p. 16). This is because retail development tends to redistribute shopping trips rather than create new ones, so total VMT in the area affected could either increase or decrease depending on previously existing retail travel patterns.

[10] The Guidelines caution, however, that "[c]ompliance with the threshold does not relieve a lead agency of the obligation to consider substantial evidence indicating that the project's environmental effects may still be significant," and that "the lead agency should briefly explain how compliance with the threshold means that the project's impacts are less than significant" (CEQA Guidelines, §15064(b)(2).

[11] See Appendix G in *Guidelines for Implementation of the California Environmental Quality Act*, Chapter 3 in Division 6 (Resources Agency) under Title 14 (Natural Resources) of the California Code of Regulations. Hereafter "CEQA Guidelines" or "Guidelines."

Whereas "local-serving" retail tends to reduce VMT (and may therefore in general be screened out from VMT analysis), regional-serving retail development, such as Irwindale, often leads to substitution of longer trips for shorter ones, replacing for example trips to locally-serving retail and more proximate regional-serving retail with longer trips. This would increase VMT (Technical Advisory, p.16). OPR thus recommends the threshold of significance for retail projects be "any net increase in total VMT" in the area affected (p.16). Such an increase may indicate a significant transportation impact caused by the project.[12]

The Irwindale Regional Shopping Center project, with over 700,000 proposed square feet of retail and intended to draw travelers from outside the city, will be regional-serving and potentially increase total VMT. The lead agency should conduct a VMT analysis to determine whether its transportation impact is indeed significant (i.e., whether it causes a net increase in total VMT, the threshold of significance).

Method for determining the VMT threshold of significance

The VMT assessment undertaken for this case study employed a different approach than the one recommended in OPR's Technical Advisory, due to limited resources. This simplified approach is perhaps best considered as a potential screening analysis that could help indicate whether a full analysis might be necessary, and possibly save time.

In order to simplify the modeling effort, the approach we undertook examined only VMT from home-based shopping (HBSH) trips rather than examining all vehicle travel. HBSH trips were used as a proxy for retail VMT; however, compliance with CEQA Guidelines would require inclusion of other retail-related travel behavior, such as employee commute trips.

After determining an "impact area" (see below) we quantified VMT from HBSH trips within the area. According to SCAG's model, existing shopping patterns within the defined impact area include 2,029,339 average daily VMT from HBSH trips. This existing baseline amount was thus established as the numeric threshold for the project. If the project were to cause a net increase in HBSH VMT in excess of this threshold, it would likely indicate a significant transportation impact. In that case, a full analysis would be needed to quantify the total net VMT added by the project, and the corresponding amount of VMT mitigation.

See the next section for the results of the transportation impact analysis (both LOS-based and VMT impacts) using the identified thresholds above.

(c) Transportation Impact Analysis

LOS-based impact analysis (CEQA pre-SB 743)

Section 4.7 of the Draft EIR analyzes the potential traffic and circulation impacts of the proposed project based on an independent Traffic Impact Analysis (TIA). The analysis focuses on traffic congestion at key intersections as well as freeway segments and ramp junctions. The impact area was defined as intersections where the project would add 50 or more trips during the a.m., p.m., or Saturday peak hours. The study area included 21 intersections on both local (City of Baldwin Park and City of Irwindale) and state (Caltrans) rights of way (DEIR, p. 4.7-1). See Figure 4.

[12] In cases where such development decreases VMT, lead agencies may consider the impact to be less-than-significant.

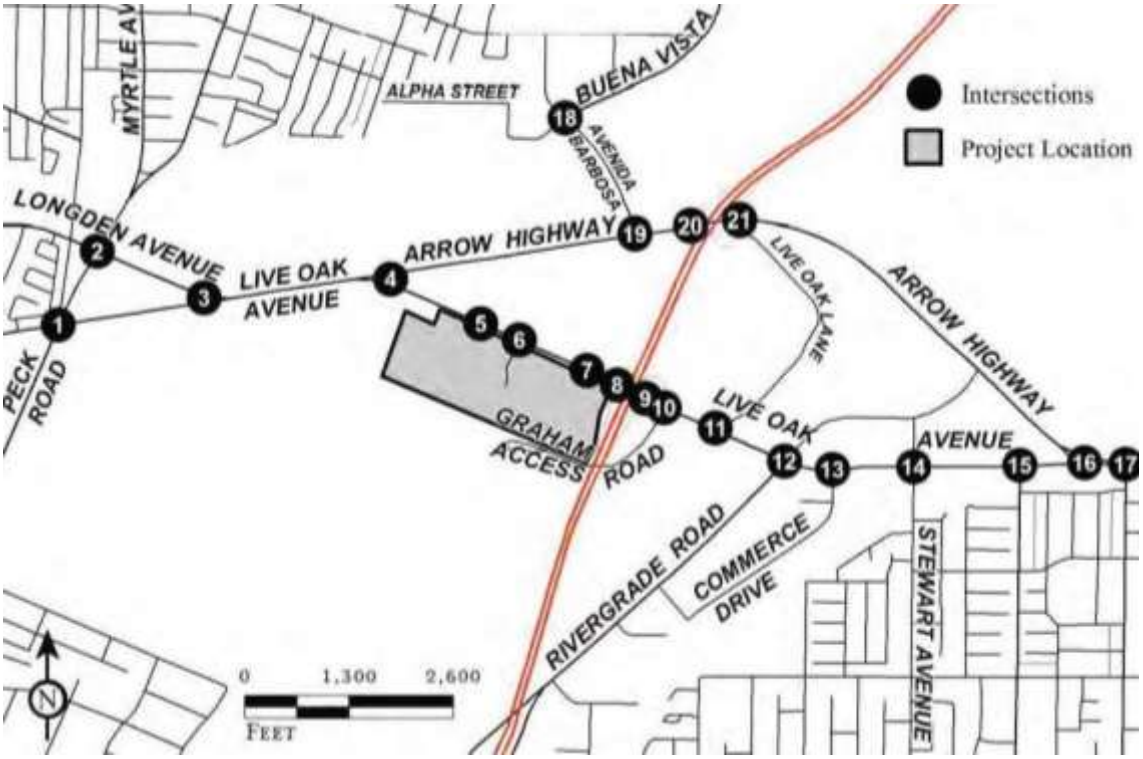

Figure 4: Study area intersections for Irwindale Regional Shopping Center EIR (Source: DEIR, p. 4.7- 3)

The TIA examined baseline LOS and with-project traffic conditions for various scenarios including existing conditions (2014), future baseline (2018), and future baseline with cumulative projects.[13] It analyzed weekday and weekend peak traffic on freeways and local intersections.

Table 1 shows the determination of significance for each of the two CEQA impact criteria described in the numeric thresholds section above. A more detailed discussion follows.

Table 1: Determination of Significance for Traffic Impacts on LOS

Impact Criteria	Potentially Significant?	Explanation
Cause an increase in traffic	Yes	See discussion below this table.
Exceed county CMP's LOS standard	No	The LOS standards adopted by the City and Caltrans are more stringent than the CMP standard; therefore the analysis according to the City and Caltrans standards would satisfy CMP standards as well.

[13] The TIA evaluated the shopping center in one phase, since the length of time between construction of Phase I and Phase II would not be significant.

In the analysis, the second threshold was modified to show that the more stringent local standards (City and Caltrans) were applied instead of the CMP standard. The two thresholds read as follows:

- Threshold 1: "Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system?"
- Threshold 2: "Exceed, either individually or cumulatively, the City's LOS D criteria at all study area intersections."

Using these two thresholds, the analysis found no significant impact under three scenarios (DEIR, p. 1-35):

- Existing Conditions (2014) With Project Freeway LOS Impacts
- Future Baseline Plus Cumulative Project With Project Freeway LOS Impacts
- Cumulative Impacts

However, it found potentially significant impacts under the following two scenarios (DEIR, p. 1-35 to 1-37):

- Existing Conditions (2014) With Project Intersection LOS Impacts – "The project contributes to the less than standard LOS at one intersection and two driveways, resulting in a significant impact." (Impact 4.7.6.1)
- Future Baseline Plus Cumulative Projects With Project Intersection LOS - "The project contributes to the less than standard LOS at intersections…with Project a.m. and p.m. peak hour LOS analysis, resulting in a significant impact requiring mitigation. In addition, the project contributes to the less than standard LOS at three intersections in the Future Baseline Plus Cumulative Projects with Project Saturday peak hour LOS analysis, resulting in a significant impact requiring mitigation." (Impact 4.7.6.2)

Mitigation measures for these significant impacts are discussed below in the Mitigation section.

VMT impact analysis (CEQA post-SB 743)

As discussed above, the Irwindale Regional Shopping Center project would need to show no net increase in total VMT over existing conditions in the area affected to demonstrate a less- than-significant VMT impact. To conduct this analysis it was necessary to first determine the "area affected," or impact area. Similar to the LOS analysis, the VMT impact analysis requires examining the full area over which travel patterns for all retail-related trips would be changed by the project.

Determining the impact area

The impact area was determined by first modeling travel behavior for the SCAG region, both with and without the project.[14] It is important to point out that the method we used to determine the impact area was selected in part due to limited resources available. It examines only certain trip types, whereas OPR's Technical Advisory recommends analyzing *all* trip types and looking at the change in overall VMT

[14] Note: LOS analysis requires the same travel demand model be run at the start, but LOS analysis then needs microsimulation to assess volumes at particular intersections, which requires assessment of trip distribution and trip routing.

around the project (not using a proxy or examining only a certain trip type). While this approach is not as robust, it could likely be useful for screening purposes.

The approach we selected, described in the section above on determining the VMT threshold of significance, uses a proxy for retail-related trips. The best proxy in SCAG's regional travel model is home-based shopping (HBSH) trips. Admittedly, this can introduce some bias into impact area and VMT estimates because it does not examine other types of trip-making related to retail besides HBSH, such as employee travel. It is important to remember that a full VMT study (like a full LOS study), as recommended in the Technical Advisory, would require running an appropriate travel model that would include other retail-related travel behavior besides HBSH trips.

We chose to determine the impact area by isolating retail-related trips using an activity-based or four-step travel demand model. Since the use of a single trip purpose may create issues if using a TAZ-to-TAZ dataset, the model was run using larger Combined Statistical Areas (CSAs). An impact area was then selected by identifying CSAs showing changes of greater than 1,000 average daily home-based shopping VMT between the no-build and build alternatives, as shown in the map in Figure 5.

Again, our approach to defining a suitable impact area for this retail analysis is not one recommended by OPR's Technical Advisory but is a reflection of limited resources; and we thought it might be considered useful for preliminary screening purposes. If other retail-related travel behavior were included, this preliminary impact area might need to be redefined or expanded.

VMT analysis (avoiding data truncation at boundaries)

OPR's Technical Advisory states that "VMT estimation should not be truncated at a modeling or jurisdictional boundary for convenience of analysis when travel behavior is substantially affected beyond that boundary" (p. 23). For retail projects, as mentioned above, lead agencies need to assess the change in total VMT across the entire area affected since such projects typically re-route travel from other

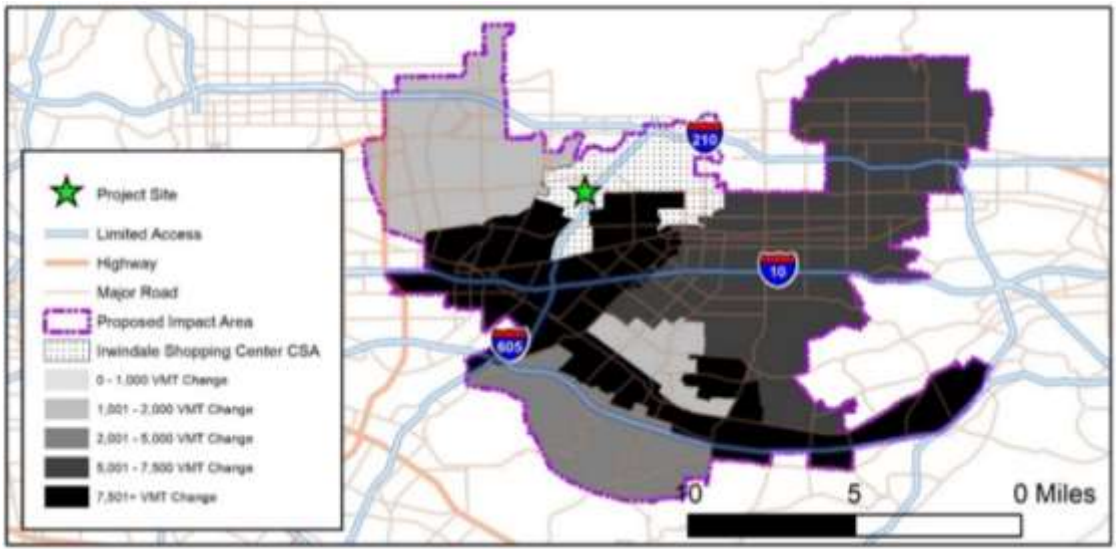

Figure 5: Net VMT change in proposed impact area.[15] (Source: SCAG.)

retail destinations. (While this applies to all retail, the Technical Advisory recommends that local-serving retail can be presumed to reduce VMT and therefore register a less-than-significant impact) (p. 16).

Given the above, with a regional-serving retail project there is a need to understand retail trip flows across a region. This often necessitates the use of a four-step or activity-based model that assigns trips across geographies such as traffic analysis zones (TAZs).

In this case study, to test our potential screening methodology described previously, VMT for home-based shopping (HBSH) trips with and without the project was determined using SCAG's regional travel model. HBSH trips were used as a proxy for all retail-related trips and for project-generated VMT in order to illustrate this potential screening methodology, but, as stated earlier, compliance with CEQA post-SB 743 would likely require inclusion of other retail-related travel behavior, such as employee commutes and shopping trips other than home-based.

As shown in Table 2, the build alternative represents an increase in VMT from HBSH trips of 86,977 over existing conditions. Based just on this screening method, the results show the project would cause a net increase in VMT within the area affected, which would be a potentially significant impact requiring mitigation, and would therefore require a full analysis.

Table 2: VMT Estimates for Home-Based Shopping Trips, With and Without Project[1]

	Without Project (Existing Conditions)	With Project (Current Year + Project)	Net Change
Average Daily HBSH VMT	2,029,339	2,116,316	+86,977

[1]See notes earlier in this case study about this methodology.

[15] Some CSAs not included in the impact area did exhibit a VMT change above the 1,000 average daily VMT zonal threshold chosen for this analysis; however, these were screened out due to their distance from the project site. As happens in large-scale regional travel models, "noise" may occur in zones some distance from a project. Lead agencies should use professional judgment and additional analysis to determine if the findings regarding outlying zones should be included.

VMT impacts for the shopping center project were modeled in two other sections of the EIR: Air Quality, and Greenhouse Gas Emissions and Climate Change. For the Irwindale Regional Shopping Center, as in most land use development projects, VMT is the most direct indicator of total GHG emissions, as vehicle exhaust would comprise approximately 80 percent of the project's total CO2 emissions (DEIR Appendix B, p. 48). The Air Quality and Greenhouse Gas Emissions study used CalEEMod (California Emissions Estimator Model) to forecast the project's VMT impacts from mobile source emitters (automobiles). The results are presented in Figure 6 below

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Other Non-Asphalt Surfaces	0.00	0.00	0.00		
Parking Lot	0.00	0.00	0.00		
Regional Shopping Center	17,787.00	27,405.00	27405.00	44,414,001	44,414,001
Total	17,787.00	27,405.00	27,405.00	44,414,001	44,414,001

Figure 6: CalEEMod VMT trip summary. (Source: Project DEIR, Appendix B, p. 91.)

The difference in estimates of average additional VMT per day – 121,682 from the DEIR [44,414,001 annual VMT divided by 365 days per year] from the DEIR versus 86,977 from this case study – could be explained by:

- The limitation of this case study to home based trips.
- Differences between the SCAG travel model used in this case study and the CalEEMod estimator used in the DEIR (in the Air Quality and Greenhouse Gas Emissions study).
- The difference between air quality analyses, which estimate VMT for all trips within a defined study area regardless of where those trips start or end, and transportation impact analyses, which estimate VMT for all trips attributable to the project, over whatever area those trips originate and end.

More generally the different purposes for VMT estimates – air quality, greenhouse gas emissions, transportation – means different methods may be used in creating VMT estimates, and the results may not be directly comparable. (See "Technical Insights for Lead Agency Staff" at the end of this case study for additional comment on this subject.)

(d) Mitigation Measures

LOS mitigation (CEQA pre-SB 743)

As discussed above, a traffic impact analysis identified potentially significant environmental impacts of the project with respect to traffic and circulation. Significant impacts were identified based on increases in traffic that were substantial in relation to the existing traffic load and capacity of the street system.

The analysis identified five intersections that would need mitigation due to increased traffic. It proposed mitigation measures for two of the five intersections sufficient to fully mitigate their impact. However, for the other three, it found that impacts would be "significant and unavoidable even with mitigation." Table 3 summarizes the mitigation measures and resulting performance improvements associated with each of the five intersections.

Table 3: Traffic Mitigation Measures for Irwindale Regional Shopping Center in EIR			
	Performance w/out Mitigation	**Performance w/Mitigation**	**Mitigation Measure**
Driveway 1/Live Oak Avenue	LOS F	LOS D	The project applicant shall install a traffic signal at the Driveway 1/Live Oak Avenue intersection.
Driveway 3/Live Oak Avenue	LOS F	LOS D	The project applicant shall install a traffic signal at the Driveway 3/Live Oak Avenue intersection.
I-605 Northbound Off-Ramps/Live Oak Avenue	LOS F	Significant and unavoidable even with mitigation	The project applicant shall make a fair-share contribution to install a traffic signal and add a second northbound right-turn lane.
Avenida Barbosa/Arrow Highway	LOS F	Significant and unavoidable even with mitigation	The project applicant shall make a fair-share contribution to add a second eastbound left-turn lane.
Arrow Highway/Live Oak Avenue	LOS F	Significant and unavoidable even with mitigation	The project applicant shall make a fair-share contribution to add an eastbound through lane.

Source: Irwindale Regional Shopping Center Draft EIR.

VMT mitigation (CEQA post-SB 743)

For retail project VMT, the Technical Advisory (pp. 5, 16, 30 and Appendix I) recommends assessing the change in total VMT with and without the project to assess the amount to be mitigated. A full analysis of the total change in VMT would inform project proponents of the magnitude of mitigation needed to bring the project to a less than significant impact. That analysis was not undertaken for this case study due to lack of resources, but selected mitigation measures were assessed for their effectiveness on the project.

Given the net increase in VMT shown in the analysis above (using HBSH trips as a proxy for all retail-related trips) the Irwindale Regional Shopping Center project might be deemed to have a significant impact without mitigation; although again one would need to first consider the effects of other retail-related trip types, particularly shopping trips that are not home-based.

The assessment method used to determine VMT reduction due to mitigation measures should be comparable to the method used to assess the change in VMT resulting from the project. Thus in proposing VMT mitigation for a project, the lead agency must select strategies that, among other criteria, a) are capable of being modeled by a VMT estimation model that can produce results comparable to the pre-mitigation analysis (apples-to-apples); and b) can show "substantial evidence" for the resulting reductions in travel demand, such as being documented in credible research (ultimately it may depend on what a judge views as "substantial evidence" supporting the agency's conclusions on how much a given measure would mitigate the impact).

We selected three potential mitigation measures for analysis:

- *Add frequent bus service at the site* – currently, the closest transit stop is ¾ mile away.
- *Implement a $3/day parking charge* – for all on-street spaces in commercial areas throughout the impact area.
- *Increase the land use mix by 10%* – by adding a residential component to the project and its vicinity, and by implementing zoning regulations that encourage mixed use throughout the impact area.

For the purposes of this case study, impacts were estimated "off-model" using generalized research results supplied by the California Air Resources Board (CARB) and the California Air Pollution Control Officer's Association (CAPCOA). See results in Table 4.

This assessment is not comparable to the assessment of the actual project, but was undertaken as a demonstration. Lead agencies may refer to *CEQA Guidelines* section 15126.4 on mitigation procedures, and should ensure reasonableness of elasticities being used. For example, in a retail project with fairly frequent transit nearby, the responsiveness of travelers to transit may be overstated.

Table 4: Impact of Three Selected Mitigation Strategies for Retail VMT

Strategy	Source	Percent Reduction	VMT Mitigated in Irwindale case
Distance to Transit	Bailey, Mokhtarian, and Little (2008)[1]	2.0% for every 1/4 mile decrease in distance to transit	126,979 (by decreasing distance to transit by ¾ mile)
Parking Pricing	Dueker et al., 1998[2]	1.9% for $3/day charge	40,210 (by implementing $3/day parking charge in-street in commercial areas)
Land Use Mix	Kockelman, 1997[3]	0.1% for every 1% change in land use mix	21,163 (by increasing land use mix by 10%)

1. https://arb.ca.gov/cc/sb375/policies/transitaccess/transit_access_brief120313.pdf
2. https://arb.ca.gov/cc/sb375/policies/pricing/parking_pricing_brief.pdf
3. https://arb.ca.gov/cc/sb375/policies/mix/lu-mix_brief.pdf

While we examined three measures here, note that EIRs frequently include an array of mitigation measures. Resources such as CAPCOA or CARB may be consulted for more information and ideas for other measures. Note also that while the three example mitigation strategies were tested independently in this case study, they should also be tested as a package whenever possible to measure the potential for synergy between strategies.

Once again, we emphasize that the VMT figures used in Table 4 above, and shown in Table 2 as well, consist solely of home-based shopping (HBSH) trips. While such trips account for perhaps the largest proportion of VMT for projects like the Irwindale shopping center, a more accurate estimate of VMT should include work trips by employees as well as other trip types related to the facility's operations. Lead agencies should review the options for making this more thorough estimate. At a minimum, they should be sure the trips counted in assessing project VMT, ascertaining threshold VMT, and assessing

VMT reduction due to mitigation measures all focus on the same trip types, as recommended in OPR's Technical Advisory. This may be achieved using an appropriately locally calibrated and validated travel demand model.

At a minimum, any methodology should maintain comparability across analyses, to ensure that assessments of project VMT, threshold VMT, and VMT reduction due to mitigation measures all focus on the same trip types for an apples-to-apples comparison.

Other mitigation approaches not discussed in this case study are in lieu fees (for which there are many precedents) and a VMT offset "exchange," a concept developed during the project.

5. Insights and Policy Implications

(a) Implications for Policy Makers

Regional mitigation strategies

For some regional-serving retail projects, it may not be possible to mitigate increases in VMT at the project level. In those cases, other strategies, including regional strategies, are likely to be most effective at mitigating VMT.

Workshops and papers generated by this project describe the legal and administrative precedents for regional approaches that may be preferable to project level or local VMT mitigation strategies. Regional approaches include tiering (an established practice in CEQA), regional planning, and creating a regional mitigation bank. In lieu fees have also "been found to be valid mitigation where there is both a commitment to pay fees and evidence that mitigation will actually occur" (Technical Advisory, p. 27).

Another approach, developed in the course of this case study, is the concept of VMT mitigation offset exchanges, a form of market approach with parallels to both carbon trading and the transfer of development rights. Video and slide presentations on this concept are available on the project website at www.SB743.org.[16]

(b) Technical Insights for Lead Agency Staff

Applicability of case study methods for SB 743 compliance

The VMT analysis and impact area determination methods demonstrated in this case study relied on trip lengths derived from home-based shopping (HBSH) trips. While HBSH trips are a major source of retail VMT, they are not the only source, and all trips generated by the facility must be analyzed. The abbreviated approach used here might be useful as a preliminary screening step to help determine whether additional VMT estimation is necessary; although in most cases further work would be needed to generate the required total VMT estimate and to verify an appropriate impact area.

Threshold and project VMT estimation methods

Different methodologies consider the VMT impacts of a project differently. This case study assessment considered just one trip type – Home-Based Shopping (HBSH) trips – of those associated with the

[16] See also Elkind, Lamm and Prather, "An Analysis of Vehicle Miles Traveled Banking and Exchange Frameworks," published by the Center for Law, Energy and the Environment and the Institute for Transportation Studies at UC Berkeley (October 2018).

project. Lead agencies have discretion as to which VMT estimation method is used as long as the method's validity is supported by "substantial evidence" and is consistent with the method that is used to set the significance threshold. A range of VMT estimation methods are evaluated in scholarly research, which may provide requisite substantial evidence in support of a lead agency's choice of calculation. Regardless of what method is chosen by lead agencies, comparable methods should be used to obtain threshold VMT, estimate project VMT, and assess VMT reduction from mitigation measures.

Combined vs isolated mitigation impacts

The three VMT mitigation measures tested and discussed in this case study are far from exhaustive – there are many others that could have been applied. In addition, it is possible that some mitigation measures may produce greater reductions when applied as a package, rather than in isolation. Further testing using peer-reviewed research, a VMT sketch tool, or a travel demand model may be warranted to fully understand the combined impact of mitigation measures.

Selecting a VMT estimation method

The choice of method for assessing VMT mitigation measures should be driven by the nature of the mitigation strategy, its area of impact, and how well it can be measured by a given VMT estimation tool. If the method differs from that used to estimate threshold VMT, ensure that peer reviewed research and consistent trip length assumptions are used, to ensure apples-to-apples comparisons.

Integrated VMT impact and impact area analysis

Although the impact area was presented here ahead of the transportation impact analysis, these two steps are integrated. Modeling must first be done at the regional level to identify the impact area, but that modeling also shows net change in VMT, which is the quantification of the transportation impact.

Impact threshold and model noise

The "VMT change" threshold used here to identify the impact area was +/- 1,000 average daily VMT. The lead agency should set this threshold based on professional judgment about how to screen out any "noise" in the regional travel model. Improvements in travel demand modeling techniques of this type for assessing VMT will also be useful for CEQA analyses of greenhouse gas impacts, energy impacts, etc.

Consistency and integration of VMT estimates for different purposes in EIR

Consistency of VMT calculations in an EIR is certainly preferable in terms of efficiency, but the widely different requirements of different sections of an EIR make this difficult. The model or tools required would have to meet multiple sections' requirements. For this reason the 'second best' solution has become the norm: analyze each section with the best available model or tool. That said, an effort could be made to make the more simplified tools such as CalEEMod use as many of the parameters and assumptions from the more complicated tools, such as a regional travel model. It would require modifications of the simple tools to be flexible (i.e., replace internal assumptions with variables that the analyst can substitute for the default data values).

Appendix A:
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Appendix B:
Glossary of Terms and Acronyms Used in the Case Studies

CalEEMod – California Emissions Estimator Model.

Caltrans – California Department of Transportation.

CAPCOA – California Air Pollution Control Officers Association.

CARB – California Air Resources Board.

CEQA – California Environmental Quality Act.

CMP – Congestion Management Program. The California state CMP requires urbanized counties to prepare their own CMPs in order to receive their share of gas tax revenue.

CRC – California Code of Regulations, which contains the CEQA Guidelines.

CSTDM – California Statewide Travel Demand Model.

DEIR – Draft Environmental Impact Report.

EIR – Environmental Impact Report.

HOV – High Occupancy Vehicle.

HQTA – High-Quality Transit Area. While not defined in statute, the term is used by some MPOs for mapping purposes, and is generally based on definitions of "major transit stop" and "high quality transit corridor" in the State Public Resources Code (specifically the section implementing SB 375, the Sustainable Communities Strategy). SCAG, for example, defines an HQTA for mapping purposes as "the area within one-half mile from major transit stops and high quality transit corridors."

HQTC– High Quality Transit Corridor, defined in CEQA as a corridor with fixed route bus service with service intervals of 15 minutes or less during peak commute hours.

Infill Site – defined in CEQA as a lot located within an urban area that has been previously developed, or on a vacant site where at least 75% of the perimeter of the site adjoins, or is separated only by an improved public right-of-way from parcels that are developed with qualified urban uses.

LOS – Level of Service, a standard for measuring vehicle delay, initially designed as a performance standard for highways. It is sometimes described as a ratio between the volume of vehicles and the capacity of a roadway. LOS standards in the Highway Capacity Manual (HCM) and AASHTO Geometric Design of Highways and Streets ("Green Book") use letters A through F, with A being the best and F the worst. LOS "A" describes free flow and "F" describes stop-and-go movement and gridlock.

Low-VMT Area – an area that exhibits VMT below the designated numeric threshold. For residential projects, this includes areas such as transportation analysis zones, or TAZs, that exhibit average VMT per capita less than or equal to 85% of existing city or regional household VMT per capita (Technical Advisory, p. 12).

Major Transit Stop – a site containing an existing rail station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service intervals of 15 minutes or less during the morning and afternoon peak commute periods (Pub. Resources Code § 21064.3). Major transit stops may be included in a regional transportation plan.

MPO – Metropolitan Planning Organization. Federal law requires that any urbanized area with a population of at least 50,000 be guided and maintained by a regional entity known as a metropolitan

planning organization. SB 375 details specific roles for California MPOs, expanding their role in regional planning. Eighteen MPOs are designated in California, accounting for approximately 98% of the state's population.

OPR – California Governor's Office of Planning and Research.

PRC – Public Resources Code for the state of California, which contains the CEQA statutes.

RTP – Regional Transportation Plan. A long-term blueprint of a region's transportation system, which identifies and analyzes transportation needs of the metropolitan region and creates a framework for project priorities. Usually RTPs are conducted every five years and plan for thirty years into the future. They are normally the product of recommendations put forth and studies carried out by an MPO, with the participation of dozens of transportation and infrastructure specialists.

SACOG – Sacramento Area Council of Governments, one of the largest MPOs in California.

SACSIM – Sacramento Activity-Based Travel Simulation model, used for regional travel forecasting.

SANBAG – San Bernardino Associated Governments. SANBAG (or "SanBAG") was the regional transportation planning agency and MPO for San Bernardino County, and the funding agency for the county's transit systems. In January 2017, SANBAG split into the San Bernardino County Transportation Authority (SBCTA) and the San Bernardino Council of Governments (SBCOG).

SB 375 – California Senate Bill 375, the "Sustainable Communities and Climate Protection Act of 2008," which is an effort to reduce greenhouse gases by requiring each MPO to develop a "Sustainable Communities Strategy" that integrates transportation, land-use and housing policies to plan for achievement of the greenhouse gas emissions target for their region.

SB 743 – California Senate Bill 743, passed in 2013 – the subject of these case studies.

SCAG – Southern California Association of Governments, the MPO for six of the ten counties in Southern California (Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura). It is the largest MPO in the country, representing over 18.5 million people in an area covering over 38,000 square miles.

SCS – Sustainable Communities Strategy, required by SB 375.

TA – Technical Advisory. OPR publishes a series of these advisories on CEQA-related aspects.

TAZ – Traffic Analysis Zone (or "Transportation Analysis Zone"), the unit of geography most commonly used in transportation planning models. The population of a zone varies, but a zone of under 3,000 people is common for a typical metropolitan planning software. The spatial extent also varies, ranging from very large areas in an exurb to a few city blocks or buildings in a central business district.

TIP – Transportation Improvement Program.

TPA – Transit Priority Area. An area within one-half mile of a major transit stop that is existing or planned, if the planned stop is scheduled to be completed within the planning horizon included in a Transportation Improvement Program adopted pursuant to sections 450.216 and 450.322 of Title 23 of the Code of Federal Regulations (Pub. Resources Code § 21099(a)(7)).

TPP – Transit Priority Project. A TPP meets these specifications: (1) contains at least 50 percent residential use, based on total building square footage and, if the project contains between 26% and 50% nonresidential uses, a floor area ratio of not less than 0.75; (2) provides a minimum net density of at least 20 dwelling units per acres; and (3) is within one-half mile of a major transit stop or high-quality transit corridor included in a regional transportation plan (Pub. Resources Code § 21155(b)).

URBEMIS – URBan EMISsions model, used for quantifying emissions from land use projects.

VMT – Vehicle Miles Traveled, which as a result of SB 743 replaces LOS as the metric for measuring transportation impact under CEQA.

Appendix C: Method to Estimate Travel Effects of a Project that Adds Retail Jobs to an Area

Gordon Garry, Transportation Consultant
March 18, 2018

The traditional approach to estimating the travel effects of a proposed project is to do a "with and without" pair of travel model runs, compare the differences, then mitigate the impacts if significant.

The main problem with using a regional travel model in this comparison is that a) there is very little difference between the two datasets, and b) travel models have, to a greater or lesser degree, "noise" that results in some random, unexpected and largely unexplainable results. These two factors makes this approach problematic at best.

This case study was selected to evaluate the transportation impacts of a major new retail development. The main question to be asked is whether the project changes retail travel behavior of residents in the study area, not just travel directly related to the project site itself. This type of travel impact is unusual for such a study, which normally focuses on impacts related to the proposed project only. It also makes the travel "noise" problem even more of a complication.

The process proposed here is designed to examine the travel model data that is most central to the issue of redistribution of retail travel by the study area residents. The idea is to take travel most related to retail – both the vehicle trips and the miles traveled – aggregate them to subareas, calculate the average miles per trip, and compare the two scenarios.

The choices in implementing this process include selecting one or more trip purposes and deciding whether to analyze them separately or in combination.

The advantage of this approach is that the analysis focuses on the travel most related to the policy question, so the analysis should provide the clearest description of the travel effects.

The disadvantages are that the analysis is different from what is the norm in traffic impact analyses; it does not include all travel and full system impacts. The analysis only provides indicators, not full system statistics. Using indicators could leave open the possibility of different conclusions by analysts and the general public.

This tradeoff between focus vs. comprehensive is deliberate and intentional. The travel model noise problem, especially in a retail project analysis, presents such a large obstacle to good analysis that an alternative is necessary. The approach presented here is an attempt to find such an alternative.

The information in this proposal is mostly taken from *SCAG Regional Travel Demand Model and 2012 Model Validation,*[17] (hereafter abbreviated "SCAG RTDM"). The two scenarios analyzed here are referred

[17] http://www.scag.ca.gov/Documents/SCAG_RTDM_2012ModelValidation.pdf

to as the base scenario, which is the no-build alternative and the build scenario, which is the base-plus-project alternative.

Step 1: Choose trip purpose(s)

As mentioned above, this approach can be implemented with one or more trip purposes (individually or grouped). The trip purposes from the SCAG model are listed below in Table 3-9 (SCAG RTDM, p. 3-12). Home-based shop (HBSH) trips are calculated using retail employment as described in the text box below labeled "Trip Attractions Model." Other trip purposes that use retail employment for generating trips are shown in Table 3-21 from the SCAG model (SCAG RTDM, p. 3-22).

The cleanest approach to estimating the effect of retail employment is to use the Home Based Shop (HBSH) trip purpose because only Retail employment is used. Again, if the analysis choice is centered on the issue of finding a clear indicator of travel effects then only Home Based Shop trips would be analyzed.

Other trip purposes also use Retail employment, as seen in Table 3-21 (SCAG RTDM, p. 3-22). These purposes include Home Based Other (HBO), Other Based Other (OBO), and Work Based Other (WBO). These trip purposes use other employment types as well, which makes the analysis more difficult because the effects of all the employment types will be seen as grouped.

The six Home Based Work (HBW) models will also include Retail employment, but only when grouped with other employment types, plus we don't know the distribution of any employment types across the three income classes. And lastly the commuting impacts due to Retail employment is not relevant to the shopping trip making impacts of study area residents.

Table 3-9: Trip Purposes

Purpose	Description
HBWD	Home Based Work - Direct
HBWS	Home Based Work - Strategic
HBCU	Home Based College and University
HBSC	Home Based School
HBSH	Home Based Shop
HBSR	Home Based Social and Recreation
HBSP	Home Based Serve Passenger
HBO	Home Based Other
WBO	Non Home Based Work
OBO	Non Home Based Other

Trip Attractions Model

The trip attraction models for all non-HBW purposes are linear regression models that estimate attractions for each trip purpose, and then allocate total attractions to car ownership/income markets in proportion to the share of productions by household income in each car ownership market. The models are applied in two steps. First, total attractions for each purpose are calculated using the attraction equations shown in Table 3-20. For HBSH trips, attractions are estimated by applying a trip rate R to the zonal retail employment. The steps for calculating R are as follows:

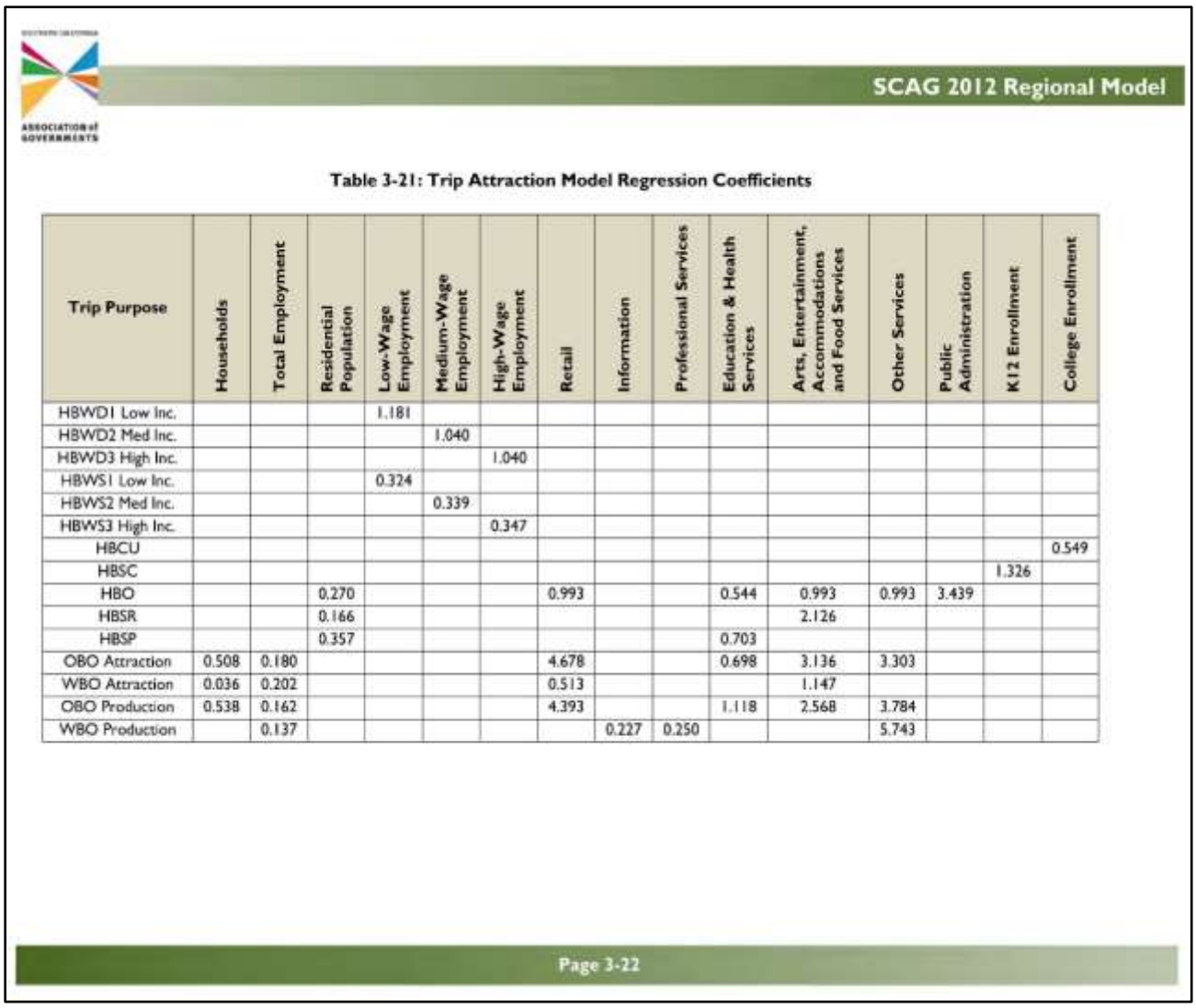
Step 1: Calculate regionwide resident population to retail employment ratio, R1.
Step 2: Calculate the same ratio for each RSA, R2.
Step 3: Calculate for each RSA the relative retail service index RSI = R2/R1.
Step 4: Range bracket RSI to 0.5 – 1.5.
Step 5: Assign this RSI to each TAZ of that RSA
Step 6: Apply the equation R = 2.105 + 4.108*RSI to estimate the attraction rate

Task: Only the HBSH trip purpose data will be analyzed.

The regional retail employment in the region in 2012 was 783,237. The shopping center project is assumed to have 5,000 jobs, which will increase the regional retail employment by 0.6%. Lead agency staff would need to decide if this amount of increase is large enough to go through a process of modifying the trip generation results from the scenario model run. Staff should review the HBSH attractions model described in the box above. The resident population in 2012 was 18,001,553, which makes the ratio of population to retail employment (R1) increase from 0.04351 in the base scenario to 0.04379 in the build scenario.[18]

The Regional Statistical Area (RSA) that Irwindale is located in will increase its R2 value substantially in the build scenario, while R2 for all other RSAs will decrease slightly.

[18] Ed. explanation of the calculations: 783,237/18,001,553 = 0.04351 versus the build scenario 788,237/18,001,553 = 0.04379



Trip Purpose	Households	Total Employment	Residential Population	Low-Wage Employment	Medium-Wage Employment	High-Wage Employment	Retail	Information	Professional Services	Education & Health Services	Arts, Entertainment, Accommodations and Food Services	Other Services	Public Administration	K12 Enrollment	College Enrollment
HBWD1 Low Inc.				1.181											
HBWD2 Med Inc.					1.040										
HBWD3 High Inc.						1.040									
HBWS1 Low Inc.				0.324											
HBWS2 Med Inc.					0.339										
HBWS3 High Inc.						0.347									
HBCU															0.549
HBSC														1.326	
HBO			0.270				0.993			0.544	0.993	0.993	3.439		
HBSR			0.166								2.126				
HBSP			0.357							0.703					
OBO Attraction	0.508	0.180					4.678			0.698	3.136	3.303			
WBO Attraction	0.036	0.202					0.513				1.147				
OBO Production	0.538	0.162					4.393			1.118	2.568	3.784			
WBO Production		0.137						0.227	0.250			5.743			

Step 2: Choose the appropriate trip table for the trip purpose

Each trip purpose is applied separately through the first three major steps of the travel model: Trip Generation, Trip Distribution, and Mode Choice. Then trip purposes are combined for Travel Assignment. The analysis, focused on miles traveled, should use the vehicle trip table for the selected trip purpose. In this case the HBShop vehicle table should be used, which will be produced at the end of the Mode Choice step.

Task: Save the HBSH daily vehicle trip table as a separate file from both scenarios.

Step 3: Combine vehicle trip table with the appropriate travel distance table

A trip table includes the number of trips between each TAZ-TAZ pair. To get vehicle miles traveled, the number of vehicle trips must be multiplied by the appropriate distance for each TAZ-TAZ pair. This involves choosing the most appropriate time period. Since shopping trips are most often made during off-peak periods, the midday travel conditions are most appropriate.

The travel distance is calculated by taking the final traffic assignment network results and skimming that table to get the congested travel distance for each TAZ-TAZ pair.

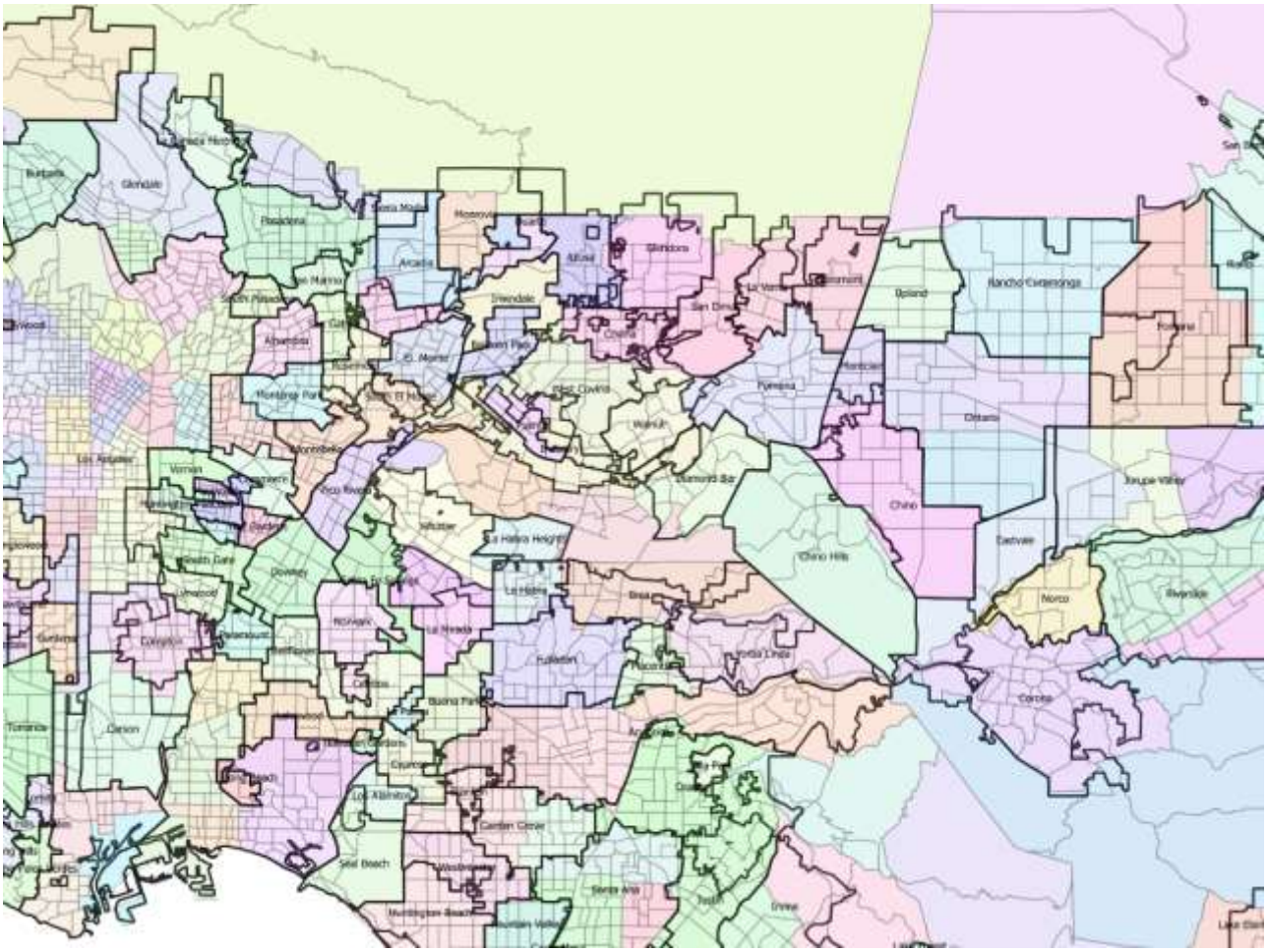
The skim table multiplied by the vehicle trip table will produce the VMT table.

Task: Use the mid-day traffic assignment network to produce a skim table of congested travel distance for both scenarios. Multiply the skim table by the HBSH vehicle trip table to get the VMT table for each scenario.

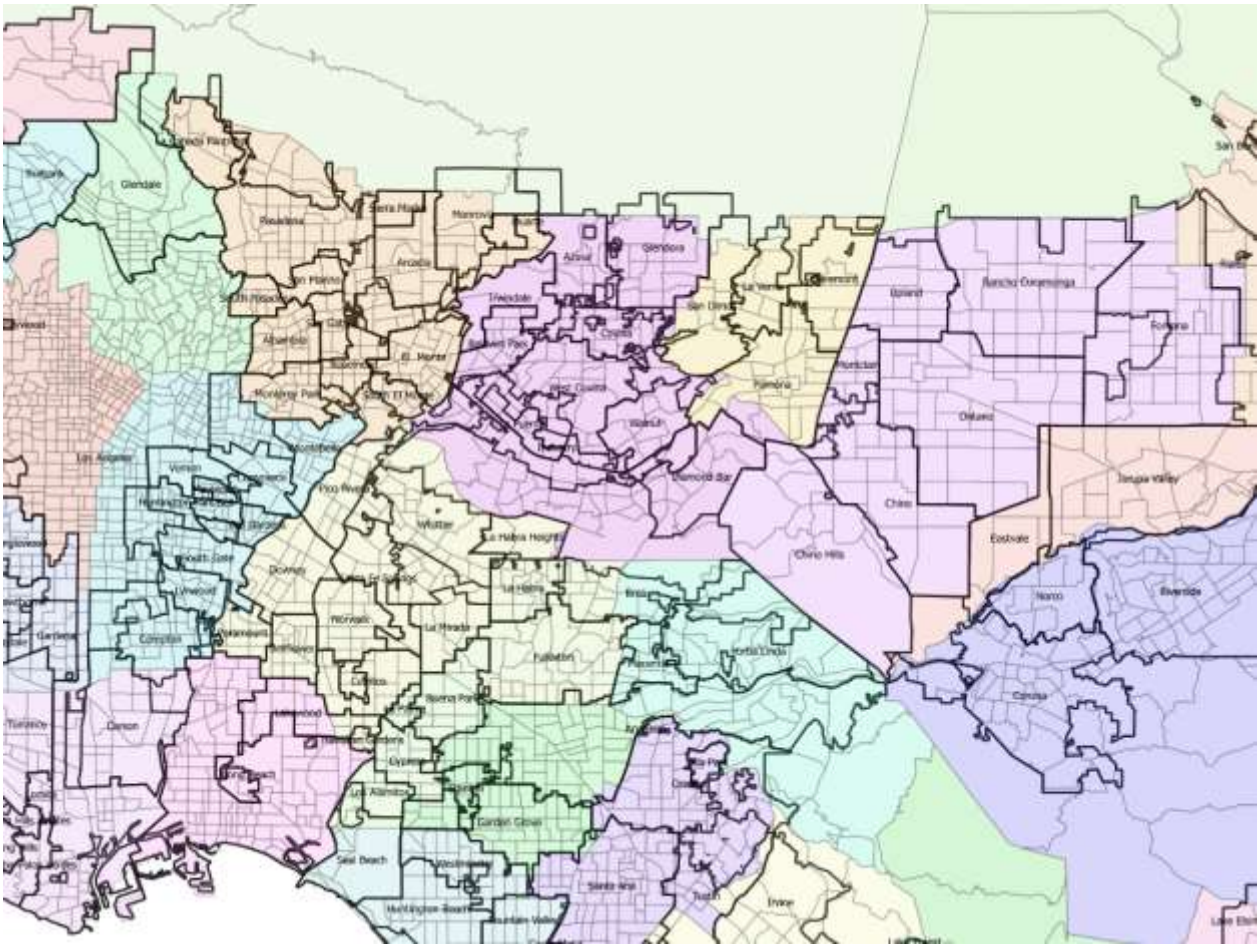
Step 4: Aggregate VMT table for summary and analysis

Any region is generally too large to analyze a TAZ-based table. The SCAG region is one of the largest in the country, making the problem all the more impossible. A grouping of TAZs is needed that can be small enough for analysis (by table or by map) yet large enough to capture meaningful trends. The SCAG region has two such sub-area geographies for this type of analysis: the Regional Statistical Area (RSA) and the Community Statistical Area (CSA). See the two figures below (Irwindale is in the upper middle part of each map).

CSA Example



RSA Example



For the Irwindale case study, using the CSA as the grouping of VMT data is recommended. The process is to sum TAZs to CSAs to produce a VMT table. Then sum all the VMT that either begins or ends at each CSA, being careful not to double count the within-CSA travel.

The comparison of the two scenarios (base scenario and build scenario) would then be done. It is expected that the CSAs nearest to Irwindale will show the largest differences.

Task: Aggregate the VMT from TAZs to CSAs for each scenario. Summarize the CSA VMT table by adding the row-total VMT with the column-total VMT and subtract the intra-CSA VMT for each scenario.

Export the CSA data to a database file. Append a copy of the database file to a CSA shape file for mapping analysis. (Both scenarios should be appended to the same shape file.) Add both database files into a spreadsheet for tabular analysis.

Analysis notes

A note on this method of calculating VMT: there is no empirical data to compare to the sum of VMT in this method. The sum of the whole model area VMT is actually twice the Home Based VMT because VMT is summed according to the area that one end of the trip is associated with. With two trip ends per trip we get twice the VMT.

The VMT data is only useful for comparing the two scenarios – base scenario (no-build alternative) and build scenario (base-plus-project alternative) – to show changes that can be associated with the shopping center project. This "comparison only" characteristic of the VMT data can make it difficult to determine level of significance and effectiveness of mitigation measures.

The difficulty in determining level of significance is largely due to the fact that this metric has not been used before. If the policy imperative is that any increase in VMT is significant , [Ed. note: which it is with retail] then this measure could more easily be used, given one caveat: a rule must be put in place to determine where the remaining "noise" is in this analysis so it can be filtered out. Staff may need to see the initial data before they can make any headway on this issue.

Mitigation measures are problematic because only the VMT associated with the Home Based Shop trip purpose is calculated. All other trip purposes have been ignored. One could conduct the same set of calculations for all other trip purposes to estimate the CSA sub-area and entire model area VMT, but the model noise problem would likely arise again.