

Appendix H

Regional VMT Assessment



Memorandum

December 12, 2024

Project# 27900

To: Macey Winter, City of San Marcos

Cc: Kayleen Burnett & Sean Anderson, Costco Wholesale

From: Kristine Connolly, Mychal Loomis, PE/TE/PTOE/RSP₁, Andrew McIntyre, & Rebecca Hoffman

Project: San Marcos Costco Business Center - Fuel Facility Addition

Subject: Regional VMT Assessment

Kittelson & Associates, Inc. (Kittelson) has prepared this memorandum to document how the proposed addition of a 36-fueling position Costco Gasoline facility to the existing Costco Business Center site in San Marcos, California (herein referred to as the "Project") is expected to impact regional vehicle miles traveled (VMT). This memorandum presents a quantitative trip generation and VMT analysis in accordance with the City of San Marcos *Transportation Impact Analysis Guidelines* (November 2020).

INTRODUCTION / BACKGROUND

Project Background

The Project is located on site of the existing Costco Business Center at 150 S Bent Avenue in San Marcos. The Project will replace existing parking in the northern portion of the site with a new Costco Gasoline fuel facility with 36 vehicle fueling positions.

Costco Gasoline fuel facilities serve as an ancillary use to the Costco Warehouses and Business Centers. Like other Costco services, fuel can only be purchased by members. Payment can only be made with credit card, and unlike traditional gas/service station operations, there are no other automotive services (such as repairs) or other type of sales (including food or sundries) associated with the Costco Gasoline facility. The *San Marcos Costco Business Center Fuel Facility Addition Local Transportation Analysis Report* prepared by Kittelson & Associates, Inc. and dated October 2024 details the anticipated trip generation of the proposed Costco fuel facility.

VMT Background / Requirements & Impact Threshold

Typically, traffic operations are evaluated based on two key performance measures: level of service (LOS) and queuing. However, with the adoption of SB 743 in California, additional standards for evaluating traffic impacts under the California Environmental Quality Act (CEQA) are required. As of July 1, 2020, lead agencies in California are required to evaluate development projects for Vehicles Miles Traveled (VMT). To fulfill requirements associated with this legislation, the City of San Marcos updated its Traffic Impact Analysis Guidelines¹ ("guidelines") in November 2020 to account for both LOS and VMT assessments. The guidelines

¹ <https://www.san-marcos.net/home/showpublisheddocument/25036/637412185038870000>

include methodologies and criteria to evaluate land use and transportation projects, based in part on *Technical Advisory on Evaluating Transportation Impacts in CEQA* from the California Office of Planning and Research (OPR)².

Vehicle Miles Traveled is one of four significance criteria used to determine whether a project results in a significant impact to the environment under CEQA. VMT estimates are also used to inform the air quality/greenhouse gas analyses required through CEQA. The analysis presented in this memorandum was conducted to comply with requirements outlined in the City's guidelines. Based on these guidelines, and consistent with OPR guidance for retail projects, a significant impact will occur if the Project results in a net increase in existing total citywide VMT.

VMT Analysis Methodology

The City's guidelines recommend that total VMT for retail projects be assessed using the SANDAG travel demand model, calculating total citywide VMT with and without the project. However, since the land use associated with this Project (members-only fuel facility) is not easily represented in the model, an alternative methodology was adopted using Costco-specific transaction data from nearby Costco facilities. The methodology includes the following components that comprise the change in regional VMT attributed to the Project:

- Change in regional VMT associated with existing members shifting their gas trips from other Costco facilities to the new facility.
- Change in regional VMT associated with existing members shifting their gas trips from other non-Costco facilities to the new facility.
- Change in regional VMT associated with Costco members replacing their existing non-Costco gas trips with shared (internal) Business Center/Gas trips.
- Change in regional VMT associated with employees traveling to and from the new facility.

VMT ASSESSMENT

Proprietary Data

The VMT analysis was conducted using proprietary data provided by Costco Wholesale for the following four locations:

- 951 Palomar Airport Road, Carlsbad (Carlsbad)
- 12350 Carmel Mountain Road, San Diego (Carmel Mountain)
- 1755 Hacienda Drive, Vista (Vista)
- 725 Center Drive, San Marcos (San Marcos)

The data includes the following:

- Approximate home locations of Costco members who completed a gas transaction at any of the four existing Costco fuel facilities in the Project area between May 1, 2023 and June 12, 2023, grouped into 1-square-mile zones:

² https://opr.ca.gov/docs/20190122-743_Technical_Advisory.pdf

- Number of visits to the four existing Costco fuel facilities between May 1, 2023 and June 12, 2023 by members in each 1-square-mile zone
- Market areas of the four existing Costco warehouses and fuel facilities (for current markets and for after the new fuel facility opens) and projected market area for the new facility

Daily Trip Generation

Daily trip generation estimates were developed for the Project site as well as the four existing Costco fuel facilities listed above. The trip generation estimates were developed using a database of trip data and travel characteristics for Costco facilities around the United States, Canada, and Mexico. The *San Marcos Costco Business Center Fuel Facility Addition Local Transportation Analysis* prepared by Kittelson & Associates, Inc. and dated May 2024 details the trip generation methodology and analysis.

Table 1 shows the anticipated daily trip generation for the new fuel facility and the four existing facilities in the region.

Table 1. Daily Trip Generation Estimates for Costco Fuel Facilities in the San Diego North County Area

Trip Type	San Marcos BC	Carlsbad	Carmel Mountain	San Marcos	Vista
Unadjusted Costco Fuel Facility Trip Generation	11,825	8,868	9,284	8,970	5,207
Internal Trips (Members; Shared Trips)	2,192	2,460	2,335	2,148	1,121
External Trips	9,633	6,408	6,949	6,822	4,086
<i>Primary Trips</i>	2,409	1,615	1,751	1,719	1,035
Truck Trips	10	10	10	10	10
Employee Trips	8	8	8	8	8
Member Trips (Gas-Only)	2,391	1,597	1,733	1,701	1,017
<i>Diverted Trips (Members; Gas Only)</i>	3,917	2,601	2,821	2,769	1,656
<i>Pass-by Trips (Members; Gas Only)</i>	3,307	2,192	2,377	2,334	1,395

Source: Kittelson & Associates, 2024

Each trip type is described briefly below, including an explanation of how this analysis accounts for VMT associated with each type.

- Costco Member Shared (Internal) Business Center/Gas Trips – A portion of the trips anticipated at the new fuel facility will be shared trips with the Business Center. These trips are assumed to already take place on the network (to the Business Center) and replace additional separate trips that Costco members would have taken to purchase gas elsewhere. For that reason, the change in regional VMT associated with these trips is expected to be less than zero.
- Truck Trips – Based on Section 2.1.3.3 of the City of San Marcos *Transportation Impact Analysis Guidelines* and Section 15064.3 of the CEQA Guidelines, the VMT associated with trucks and the movement of goods is not required to be analyzed and mitigated for the evaluation of transportation impacts. Truck trips are excluded from this analysis.
- Employee Trips – Employee trips are evaluated separately from Costco member trips because average trip lengths for employees may differ from member trips. VMT is calculated by multiplying expected employee trips with an average trip length provided by the San Diego Association of Governments (SANDAG).

- Costco Member Primary Gas-Only Trips – Primary gas-only trips (vehicles traveling to the site for the sole purpose of visiting the fuel facility) are assumed to be trips that already exist on the network today to purchase gas at other existing locations, and will shift their purchases to the new Costco fuel facility from either 1) an existing Costco fuel facility or 2) an existing non-Costco gas station. The difference in VMT associated with shifting these trips to the new facility is calculated based on the anticipated change in trip length.
- Costco Member Diverted Gas-Only Trips – Diverted gas-only trips (vehicles making an existing trip on the roadway that travel out-of-direction to visit the site) are assumed to be existing trips shifted from existing non-Costco gas stations near the Project site. The difference in VMT associated with shifting these trips to the new facility is calculated based on the anticipated change in trip length.
- Costco Member Pass-by Gas-Only Trips – Pass-by trips (vehicles making an existing trip on the adjacent roadway that stop at the site and then continue on their trip) are typically excluded from VMT calculations since pass-by trip lengths are assumed to be zero. Because the Project site is offset from the arterial network, pass-by trip lengths are assumed to be positive and are included in the VMT calculations.

All Costco member Project trips included in this analysis are assumed to be existing trips on the network. Due to the nature of gas purchases, members who would purchase fuel at the new Costco fuel facility are already purchasing gas somewhere today. Therefore, this analysis determines the change in regional VMT by calculating the difference between trip lengths associated with traveling to the new facility versus traveling to an existing facility.

Shifting Regional (Costco) Trips

The addition of a new Costco fuel facility provides another option for existing Costco members and results in lower average trip lengths for some members within the existing market areas. This section presents the change in VMT associated with existing regional Costco trips that are expected to shift to the new Costco fuel facility.

To understand the extent to which primary trip lengths are reduced by Costco members replacing their existing Costco gas trips with visits to the new facility, ArcGIS Online software was used to calculate average trip distances to the four existing Costco facilities and the new facility for two scenarios: without and with the new fuel facility. The software routed member trips from each 1-square-mile zone to the existing Costco facility the member visited, according to the proprietary transaction data from May/June 2023. This analysis was then conducted assuming the presence of the new facility and assuming members would visit the facility with the shortest travel time from their homes. The following provides more details regarding the methodology and assumptions of this analysis:

- The center of each 1-square-mile zone was used for the starting/ending point of member trips.
- The data provided by Costco includes information regarding all gas transactions at the four existing facilities between May 1, 2023 and June 12, 2023 by members who live within the combined market areas of the existing warehouses. The daily gas transactions for each site were used to calculate existing trip lengths.
- Each transaction is assumed to correspond to two one-way trips between the members' homes and the fuel facility (i.e., one roundtrip).
- To calculate the average trip lengths to the four existing Costco fuel facilities, trip distances between each 1-square-mile zone and the four existing facilities were determined using ArcGIS online software.
 - Trips were routed based on minimum travel time on the existing roadway network (as opposed to shortest distance since shorter distances along low-speed streets can result in longer travel times).

- o The corresponding trip distances were then multiplied with the number of transactions made at each fuel facility by members within each 1- square-mile zone and summed to calculate the total one-way distance traveled to each facility.
- o The total one-way distances were then divided by the average daily visits to the facility to provide the average one-way trip length for each facility. Table 2 shows the average existing trip lengths for each facility.
- To calculate the average trip lengths to the five fuel facilities when the new facility opens, origin-destination pairings were updated using the ArcGIS online software.
 - o To determine which existing Costco members would shift their trips from an existing Costco facility to the new one, it was assumed that if the travel time from a 1-square mile zone to the new facility was less than the travel time to any of the existing facilities, all members within that zone would choose to visit the new facility. In other words, all gas-only trips currently made to existing Costco facilities from that zone are assumed to shift to the new facility. For zones that are closer (by travel time) to an existing facility, no shift was made, and trips by members in those zones were assumed to remain at the existing sites. Figure 1 shows the approximate home locations of existing Costco members and identifies the members whose homes are located closer (in travel time) to the new Costco fuel station than any other existing Costco facility (and would therefore shift to the new facility).
- The trips expected to shift from existing Costco facilities to the new facility are *gas-only* trips. This is important to note since shared trips between fuel facilities and Business Centers versus shared trips between fuel facilities and warehouses have different characteristics and rates. In other words, since the new facility is on the site of a Business Center, it will not attract members whose existing Costco gas trip is tied to an existing Costco *warehouse* trip. Those trips are assumed to be driven by the warehouse trip and are not expected to shift.

Table 2. Average Costco Fuel Facility Trip Lengths (Existing and Future)

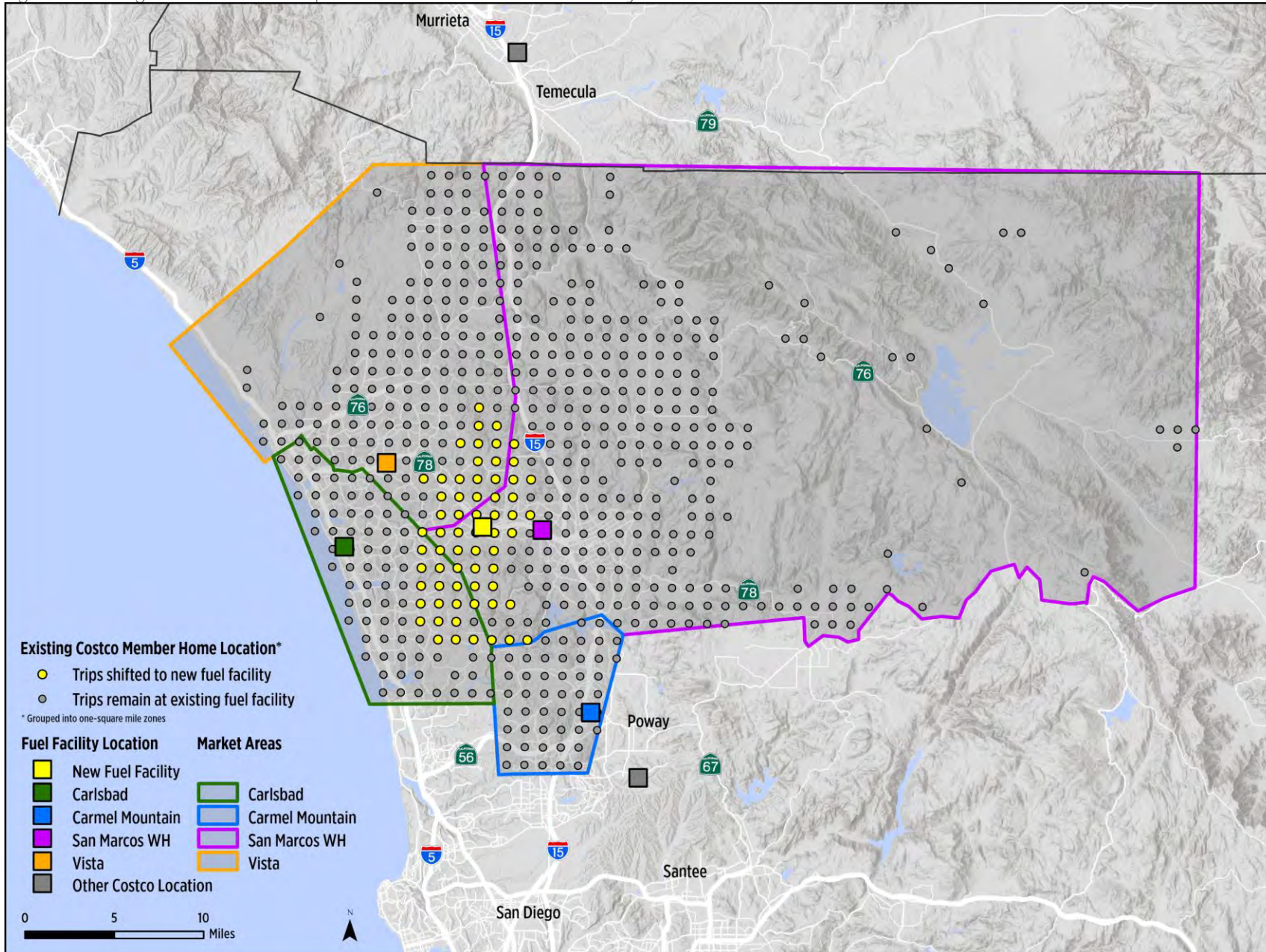
Facility	Existing			After New Facility		
	Daily Transactions (Total)	Total Distance (One Way)	Average Trip Length (One Way)	Daily Transactions (Total)	Total Distance (One Way)	Average Trip Length (One Way)
Carlsbad	864	7,182	8.3	660	5,509	8.3
Carmel Mountain	677	4,982	7.4	654	4,564	7.0
San Marcos	921	7,531	8.2	664	5,960	9.0
Vista	785	5,019	6.4	669	4,079	6.1
San Marcos BC (New Facility)	N/A	N/A	N/A	600	2,248	3.7

Source: Kittelson & Associates, 2024

Note: Daily transaction data were used only to determine changes to average trip lengths, not to estimate the number of trips to fuel facilities. Table 3 provides estimated trip generation for each existing and proposed facility.

As shown in Table 2, average trip lengths for the existing facilities generally decrease with the addition of the new facility. However, the average trip length for San Marcos increases slightly since the approximate home locations of members whose trips are expected to shift to the new facility are also close to the existing San Marcos facility. The trips expected to remain at the existing San Marcos facility are from members who live farther from the site, increasing the average trip distance.

Figure 1. Existing Costco Membership Locations and Member Fuel Facility Shift



To calculate the change in VMT associated with this shift, the percentage of trips for each existing facility that are expected to shift to the new facility is calculated. These rates are applied to the trip generation for each facility, which is then multiplied by the trip length. For example, since 203 of the 864 existing transactions for Carlsbad are expected to shift to the new facility, a rate of 23% is applied to the trip generation for Carlsbad (1,597 estimated daily primary gas-only trips) to determine the actual number of trips expected to shift to the new fuel facility or remain at Carlsbad. These trips are multiplied by the existing and future trip lengths to determine the change in regional VMT. Table 3 below shows the net change in regional VMT associated with shifting primary gas-only trips from existing Costco fuel facility to the new fuel facility.

Table 3. Change in VMT Associated with Shifting Costco Primary Gas-Only Member Trips

Facility	Existing			Percent of Existing Trips Shifting to New Facility	Future (After New Facility)		
	Daily Primary Gas Only Trips	Average Trip Length (One Way)	Daily VMT		Daily Primary Gas Only Trips (Total)	Average Trip Length (One Way)	Daily VMT
Carlsbad	1,597	8.3	13,255	23%	1,230	8.3	10,209
Carmel Mountain	1,733	7.4	12,824	3%	1,681	7.0	11,767
San Marcos	1,701	8.2	13,948	28%	1,225	9.0	11,025
Vista	1,017	6.4	6,509	15%	864	6.1	5,270
San Marcos BC (New Facility)	0	N/A	0	N/A	1,048	3.7	3,878
Total	6,048	7.6	46,536	N/A	6,048	7.0	42,149
Change in Daily VMT							-4,387

Source: Kittelson & Associates, 2024

As shown in Table 3, the addition of the new Costco facility is anticipated to reduce the average trip length for regional Costco gas-only primary trips from 7.6 miles to 7.0 miles, resulting in an overall decrease in VMT associated with shifting Costco primary trips.

Shifting Local (Non-Costco) Trips

Primary Gas-Only Member Trips

Of the 2,391 primary gas-only daily member trips expected to be generated by the new fuel facility, 1,048 trips (or about 44%) are expected to be trips shifted from other Costco facilities to the new facility. The remaining 1,343 trips are assumed to be trips that already exist on the transportation network to other non-Costco gas stations. To determine how regional VMT may change if these trips shifted to the new Costco facility, the GIS exercise described above was repeated to calculate the trip distance between each 1-square-mile zone where members live to the nearest non-Costco gas station. The following provides more detail regarding the methodology and assumptions of this analysis:

- Only members whose closest Costco fuel facility (by travel time) is the proposed facility in San Marcos were considered in this part of the analysis. Members whose home address is closer to an existing Costco facility would be expected to visit that location if they decided to make a transaction at a Costco fuel facility.
- The existing average trip distance was calculated between members' homes and the nearest non-Costco gas station (by travel time). In reality, several factors determine where a person chooses to buy

gas; for simplicity and a conservative approach, this analysis uses shortest travel time from home as the sole determinant.

Based on this exercise, it was determined that the average trip distance from members' homes to the nearest non-Costco gas station is approximately 1.4 miles. As shown in Table 4, applying this trip distance to the remaining 1,343 primary gas-only trips results in an existing VMT estimate of 1,880 miles. If all these trips were shifted to the new Costco facility (average trip length of 3.7 miles), the future VMT would equal about 4,969 miles, which represents an increase in regional VMT of about 3,089 miles.

Table 4. Change in VMT Associated with Shifting Non-Costco Primary Gas-Only Member Trips

	Existing (to nearest non Costco gas stations)	Future (to new Costco facility)	Difference
Number of Trips	1,343	1,343	-
Average Trip Length (miles)	1.4	3.7	2.3
VMT	1,880	4,969	3,089

Source: Kittelson & Associates, 2024

Diverted Gas-Only Member Trips

A portion of Project trips are diverted trips associated with members who are traveling on the surrounding street network for some other primary purpose and stop by the fuel facility during that trip. Diverted trips for the Project are likely to originate from CA-78; for the purpose of this analysis, half of the diverted trips were assumed to be traveling eastbound on CA-78 and half of the trips were assumed to be traveling westbound on CA-78.

To calculate the change in regional VMT associated with diverted gas-only trips, diverted trip distances were first calculated for members diverting from their primary trip to visit existing non-Costco gas stations in the vicinity of the Costco site. Then, diverted trip distances were calculated from the same point of diversion to the San Marcos BC fuel facility. The total number of diverted trips are then multiplied by the distance between non-Costco gas stations and by the distance to the new Costco facility to calculate existing and future VMT for each diversion route.

Table 5 presents the findings of this analysis. As shown in the table, there is a slight difference between the average diverted trip distance for the non-Costco gas station and the new Costco fuel facility, resulting in an increase in daily regional VMT of 196 miles.

Table 5. Change in VMT Associated with Shifting Non-Costco Diverted Gas-Only Member Trips

	Diverted Trip Distance* (mi.)			Number of Daily Diverted Trips	Daily VMT
	CA 78 WB	CA 78 EB	Average		
Non-Costco Gas Stations (Existing)	0.4	0.3	0.35	3,917	1,371
San Marcos BC Fuel Facility (Future)	0.5	0.3	0.4	3,917	1,567
Change in Daily VMT					+196

Source: Kittelson & Associates, 2024

* Calculated as round-trip distance (including diversion point to destination, destination to original roadway, and credit for distance traveled in direction of original trip)

Pass-by Gas-Only Member Trips

Typically, VMT associated with pass-by trips is assumed to be zero, since pass-by trips are existing trips on the network that require no out-of-direction travel. However, since the Project site is located almost 1,000 feet north of San Marcos Boulevard, this analysis includes this minimal out-of-direction travel in the VMT calculations. These new Project pass-by trips are assumed to replace existing pass-by trips at other nearby non-Costco gas stations. The pass-by trip distance associated with the existing non-Costco trips is conservatively assumed to be zero. Table 6 provides the increase in VMT expected due to pass-by trips to the site.

Table 6. Change in VMT Associated with Shifting Non-Costco Pass-by Gas-Only Member Trips

	Existing (to nearest non Costco gas stations)	Future (to new Costco facility)	Difference
Number of Trips	3,307	3,307	-
Average Trip Length (miles)	0.0	0.2	0.2
VMT	0	661	661

Source: Kittelson & Associates, 2024

Shared (Internal) Business Center/Gas Member Trips

A portion of the trips anticipated at the new fuel facility will be shared trips with the Business Center, when members shop at the Business Center and buy gas during a single visit to the Costco site. Although they account for a trip to both the Business Center and the fuel facility, these trips to the site are already on the street network today since members are already making the trip to the Business Center. Further, since the members who are now adding a stop at the fuel facility to their trip to the Business Center would have had to make a separate trip to a different non-Costco gas station off-site, the Project is eliminating these separate trips from the street network and the VMT associated with them.

To calculate the change in VMT associated with this trip type, it was assumed that Costco members making a new internal trip to the fuel facility were previously making the same proportion of trip types as the data show for daily trips (i.e., the same percentage of gas-only diverted, pass-by, and primary trips relative to total gas-only trips). It was also assumed that these members were making these separate gas trips as a matter of convenience, at the non-Costco gas station closest to their homes. Therefore, the average trip lengths calculated to these non-Costco facilities in the previous section (see Table 4) were used here to estimate VMT.

As shown in Table 7, replacing these existing non-Costco gas trips with shared Business Center/Costco Gas trips will reduce regional VMT by approximately 1,124 miles.

Table 7. Change in VMT Associated with Shared Business Center/Fuel Facility Member Trips

Trip Type	Number of Daily Trips	Existing (Separate Gas Trip)		Future (Shared BC/Gas Trip)		Difference
		Average Trip Distance	Daily VMT	Average Trip Distance	Daily VMT	
Total Internal Trips	2,192	-	1,124	0	0	-1,124
Primary Trips	548	1.4	767	0	0	-767
Pass-by Trips	752	0.0	0	0	0	0
Diverted Trips	892	0.4	357	0	0	-357

Source: Kittelson & Associates, 2024

All Shifting Local (non-Costco) Trips

The total change in VMT associated with shifting local (non-Costco) trip is calculated in Table 8.

Table 8. Change in VMT Associated with all Shifting Local (non-Costco) Trips

Member Trip Type	Existing Daily VMT	Future Daily VMT (With Project)	Change in Regional Daily VMT
Shifting Non-Costco Primary Gas-Only	1,880	4,969	+3,089
Shifting Non-Costco Diverted Gas-Only	1,371	1,567	+196
Shifting Non-Costco Pass-by Gas-Only	0	661	+661
Shared Business Center/Fuel Facility	1,124	0	-1,124
Total VMT	4,375	7,197	+2,822

Source: Kittelson & Associates, 2024

Employee Trips

The Project is expected to require two employees on site to operate the facility. With two shifts occurring daily, these 4 employees are expected to make 8 daily trips (to and from the facility). The VMT associated with these 8 trips was estimated to be about 116 miles using an average VMT per employee of 14.5, which represents the expected average VMT per employee within the census tract in 2025, as provided by SANDAG's *San Diego Region SB743 VMT Maps*³.

SUMMARY

Table 9 presents the change in regional daily VMT associated with the opening of the proposed new Costco fuel facility at the existing San Marcos Business Center. The change in total regional daily VMT is calculated by comparing the existing VMT by Costco members in the Project area and VMT by members and employees after the new facility is opened. As presented in the table, the change in total regional daily VMT with the new fuel facility is estimated to be a net decrease of 1,449 miles.

Table 9. Change in Regional VMT

Trip Type	Existing VMT	Future VMT (With Project)	Change in Regional Daily VMT
Shifting Regional Trips (Existing Costco Trips)	46,536	42,149	-4,387
Shifting Local Trips (Existing Non-Costco Trips)	4,375	7,197	+2,822
Employee Trips	0	116	+116
Total VMT	50,911	49,462	-1,449

Source: Kittelson & Associates, 2024

³ <https://www.arcgis.com/apps/webappviewer/index.html?id=bb8f938b625c40cea14c825835519a2b>