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MEMORANDUM

DATE: April 25, 2023

TO: Kristine Simmons, Construction Administration

FROM: Ron Brugger, Senior Air Quality Specialist

SUBJECT: Energy Analysis Memorandum for the Proposed Palmdale Road Retail Development in Victorville, California (LSA Project No. RDE2202)

INTRODUCTION

This energy analysis for the proposed Palmdale Road Retail Development in Victorville, San Bernardino County, California (project) has been prepared using methods and assumptions recommended in the Mojave Desert Air Quality Management District's (MDAQMD) *California Environmental Quality Act (CEQA) Air Quality Handbook* (MDAQMD 2020).

PROJECT LOCATION

The 2.2-acre project site is located on the northeast corner of the intersection of Palmdale Road and Cantina Street in Victorville. The project's land use is designated as Commercial. The project site comprises two parcels (Assessor's Parcel Numbers 3103-561-11 and 3103-561-12). Figure 1 shows the project location (all figures are in Attachment A).

PROJECT DESCRIPTION

The proposed project would construct a 3,600-square-foot (sf) car wash and a 1,000 sf coffee shop with associated parking. One parking space would be a Level 3 charging station, and another three spaces would be prepared for future EV chargers. The coffee shop would have two lanes for drive-thru service. Figure 2 shows the site plan.

METHODOLOGY

The operations of the proposed project would consume energy from vehicle fuel and electricity. The project would not include natural gas. Electricity consumption has been estimated using the California Emissions Estimator Model (CalEEMod) (CAPCOA n.d.), equipment specifications, and project plans. Vehicle fuel usage has been estimated using the CalEEMod vehicle information for vehicle miles traveled (VMT) combined with fleet mix and fuel efficiency data from the CARB EMFAC2021 model (CARB n.d.). To be conservative and allow for a variation of the coffee shop plan, it was analyzed as a

3,000 sf building rather than the planned 1,000 sf building. To show a worst-case analysis, as the proposed project is a retail project, it was assumed that the project would operate 365 days per year.

Operational Energy Demand

Energy consumption in support of or related to project operations would include transportation energy demands and facilities energy demands (energy consumed by building operations and site maintenance activities).

Transportation Energy Demand

The largest source of operational energy use would be vehicle operation of patron, employee, and delivery/service personnel. Based on the *Final Focused Traffic Impact Analysis Report* (David Evans and Associates, Inc. 2023) and information from the car wash developer, the coffee shop would generate 1,271 total daily trips and the car wash would generate 350 daily trips. CalEEMod was used to characterize these project-related trips. CalEEMod divides total nonresidential trips across the following three trip purpose types:

- "Home-Work" represents trips traveling in either direction between home and work locations.
- "Work-Other" represents trips made by an employee traveling in either direction between a work location and all other locations that are not home.
- "Other-Other" represents trips made by a person traveling in either direction between land uses that do not involve home or work locations.

CalEEMod assumed that for the Victorville region, the home-work trips would average 18.5 miles, work-other trips would average 10.0 miles, and other-other trips would average 4.5 miles. The CalEEMod output is included in Attachment B. The three primary fuels used for vehicles are gasoline, diesel, and electricity. The EMFAC2021 model was used to generate vehicle fleet mix and fuel efficiency rates applicable to the Victorville region. The EMFAC2021 output data are included in Attachment C. Table A lists data from EMFAC2021, showing this data for vehicles in each category.

Table A: Vehicle Data for the Project Region

Category	Gasoline	Diesel	Electric
Percentage of Automobiles by Fuel	94.0%	0.3%	5.7%
Percentage of Trucks by Fuel	87.0%	11.8%	1.2%
Average Automobile MPG	28.8	41.1	--
Average Truck MPG	20.2	7.3	--
Average Automobile kWh/mile	--	--	3.4
Average Truck kWh/mile	--	--	3.2
Percentage of Project Vehicles That Are Automobiles			55.9%
Percentage of Project Vehicles That Are Trucks			44.1%

Source: EMFAC2021 for San Bernardino County (Mojave Desert portion), 2024 operating year.
kWh/mile = kilowatt-hours per mile
MPG = miles per gallon

Table B shows the estimated annual fuel consumption for gasoline- and diesel-powered vehicles and electricity use for electric-powered vehicles. Table B shows that an estimated 222,171 gallons of gasoline fuel would be consumed per year, an estimated 42,741 gallons of diesel fuel would be consumed per year, and an estimated 66,554 kilowatt-hours (kWh) of electricity would be consumed per year by vehicles during operation of the proposed project.

Table B: Estimated Vehicle Operations Fuel Consumption

Land Use	Annual VMT from CalEEMod modeling	Annual VMT for Gasoline-Powered Vehicles	Annual VMT for Diesel-Powered Vehicles	Annual VMT for Electric-Powered Vehicles	Gasoline Consumption (gal/yr)	Diesel Consumption (gal/yr)	Electricity Consumption (kWh/yr)
Car Wash	1,288,488	1,171,233	69,109	47,869	47,967	9,228	14,369
Coffee Shop	4,679,421	4,253,585	250,984	173,846	174,204	33,513	52,185
Total	**5,967,909**	**5,424,818**	**320,093**	**221,715**	**222,171**	**42,741**	**66,554**

Source: CalEEMod modeling and EMFAC2021.

[1] The trip generation assessment, the project is to generate 1,621 total net new trips. Default CalEEMod vehicle fleet mix utilized. Based on the size of the site and relative location, trips were assumed to be local rather than regional.

[2] The average automobile gasoline fuel economy is 22.9 mpg and average truck diesel fuel economy is 8.0 mpg.

CalEEMod = California Emission Estimator Model
gal/yr = gallons per year
kWh/yr = kilowatt-hours per year
VMT = vehicle miles traveled.

Trip generation by the proposed project would be consistent with other similar retail uses of similar scale and configuration as reflected in the CalEEMod output (Attachment B). That is, the proposed project does not propose uses or operations that would inherently result in excessive and wasteful vehicle trips or in associated excessive and wasteful vehicle energy consumption. Therefore, project transportation energy consumption would not be considered inefficient, wasteful, or otherwise unnecessary.

Facility Energy Demand

The annual electricity demands for facility operations were provided per the CalEEMod output and are shown in Table C. The project would be designed to not use any natural gas.

Table C: Project Annual Operational Energy Demand Summary

Electricity Demand for Facility Operations	kWh/yr
Coffee Shop	35,067
Car Wash	45,000
Parking Lot Lights	59,146
Total	**139,212**

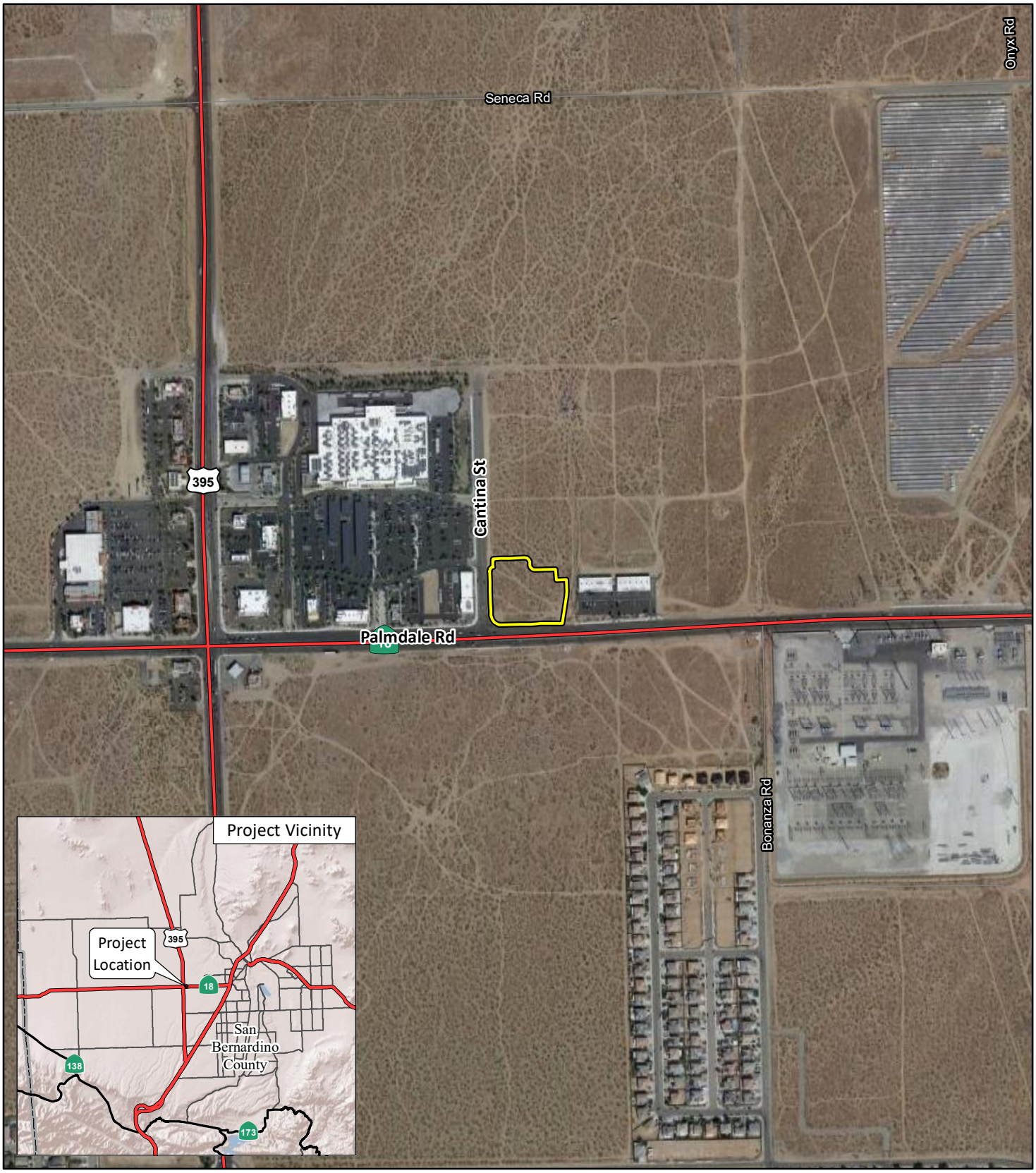
Source: Project Design and CalEEMod Modeling Output.
kWh/yr = kilowatt-hours per year

As shown in Table C, the estimated electricity demand for facility operations would be approximately 139,212 kWh per year. Adding in the electricity demand from vehicles, the total project-related electricity demand would be approximately 205,766 kWh per year. In 2021, the nonresidential sector of San Bernardino County consumed approximately 10,381 million kWh of electricity (CEC n.d.). Therefore, the increase in electricity demand from the proposed project is insignificant compared to the County's 2021 demand.

Attachment A: Figures
B: CalEEMod Output
C: EMFAC2021 Output
D: References

ATTACHMENT A

FIGURES



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LEGEND

Project Location

FIGURE 1

N

0 340 680

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SOURCE: Google Maps (2021)

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Palmdale Road Retail Development

Regional Project Location

LSA

FIGURE 2

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0 30 60

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SOURCE: ArchSource Design

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Palmdale Road Retail Development

Site Plan

ATTACHMENT B

CALEEMOD OUTPUT

1. Basic Project Information

1.1 Basic Project Information

Data Field	Value
Project Name	Palmdale Road Retail Development (RDE2202)
Operational Year	2024
Lead Agency	
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	2.8
Precipitation (days)	1.4
Location	34.50731566658318, -117.3943073714567
County	San Bernardino-Mojave Desert
City	Victorville
Air District	Mojave Desert AQMD
Air Basin	Mojave Desert
TAZ	5102
EDFZ	10
Electric Utility	Southern California Edison
Gas Utility	Southwest Gas Corp.
App Version	2022.1.1.10

1. Basic Project Information

1.2 Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description
User Defined Retail	4	User Defined Unit	0.45	3,600	5,000	0		Car Wash
Fast Food Restaurant with Drive Thru	3	1000sqft	0.2	3,000	5,000	0		Dutch Bros Coffee Shop
Parking Lot	2	Acre	1.55	2	13,470	0		Parking Area

5.9. Operational Mobile Sources

5.9.1 Unmitigated

Land Use Type	Trips/Weekday	Trips/Saturday	Trips/Sunday	Trips/Year	VMT/Weekday	VMT/Saturday	VMT/Sunday	VMT/Year
User Defined Retail	350	350	350	127,750	3,530	3,530	3,530	1,288,488
Fast Food Restaurant with Drive Thru	1,271	1,271	1,271	463,951	12,820	12,820	12,820	4,679,421
Parking Lot	0	0	0	0	0	0	0	0
Total	1,621	1,621	1,621	591,701	16,350	16,350	16,350	5,967,910

5.11. Operational Energy Consumption

5.11.1 Unmitigated

Land Use	Electricity (kWh/yr)	Natural Gas (kBTU/yr)
User Defined Retail	45,000	0
Fast Food Restaurant with Drive Thru	35,067	0
Parking Lot	59,146	0
Total	139,212	

5.12. Operational Water and Wastewater Consumption

5.12.1 Unmitigated

Land Use	Indoor Water (gal/year)	Outdoor Water (gal/year)
User Defined Retail	2,482,000	110,693
Fast Food Restaurant with Drive Thru	910,601	110,693
Parking Lot	0	298,206
Total	3,392,601	519,592

5.13. Operational Waste Generation

5.13.1 Unmitigated

Land Use	Waste (ton/year)	Cogeneration (kWh/year)
User Defined Retail	8	0
Fast Food Restaurant with Drive Thru	35	0
Parking Lot	0	0
Total	43	

8 User Changes to Default Data

Screen	Justification
Land Use	Site = 2.2 acres, landscape area = 23,470sf, paving area = 1.55ac.
Construction: Construction Phases	Site is vacant and undeveloped.
Operations: Vehicle Data	FF Restaurant rate from project traffic study, pass-by already included. Car wash rate from car wash developer.
Operations: Energy Use	Estimated car wash electricity use based on project information. Neither the FF Restaurant nor the Car Wash will use natural gas.
Operations: Water and Waste Water	Car wash water use based on 19.43 gallons/car = 6,800 gallons/day = 2,482,000 gallons/year (365 days/year).
Operations: Solid Waste	Estimated solid waste generation based on project info.

ATTACHMENT C

EMFAC2021 OUTPUT

Source: EMFAC2021 (v1.0.2) Emissions Inventory
Region Type: Sub-Area
Region: San Bernardino (MD)
Calendar Year: 2024
Season: Annual
Vehicle Classification: EMFAC2007 Categories
Units: miles/year for CVMT and EVMT, trips/year for Trips, kWh/year for Energy Consumption, 1000 gallons/year for Fuel Consumption

Region	Calenda	Vehicle Category	Model Year	Speed	Fuel	Population	Total VMT	CVMT	EVMT	Trips	Energy Consumption	Fuel Consumption	Average MPG	Average kWh/mile
Automobiles														
San Bernardino (MD)	2024	LDA	Aggregate	Aggregate	Gasoline	309,549	4,461,397,591	4,461,397,591	0	497,117,403	0	152,748		
San Bernardino (MD)	2024	LDT1	Aggregate	Aggregate	Gasoline	31,234	363,700,501	363,700,501	0	46,401,838	0	15,078	28.8	
San Bernardino (MD)	2024	MCY	Aggregate	Aggregate	Gasoline	18,162	36,380,276	36,380,276	0	12,604,340	0	890		
San Bernardino (MD)	2024	LDA	Aggregate	Aggregate	Diesel	1,035	11,815,946	11,815,946	0	1,522,448	0	286	41.1	
San Bernardino (MD)	2024	LDT1	Aggregate	Aggregate	Diesel	16	74,689	74,689	0	15,768	0	3		
San Bernardino (MD)	2024	LDA	Aggregate	Aggregate	Electricity	13,624	231,985,358	0	231,985,358	23,686,622	89,565,495	0		
San Bernardino (MD)	2024	LDA	Aggregate	Aggregate	Plug-in Hybrid	8,183	140,804,818	69,698,340	71,106,478	11,741,580	21,476,276	2,190		3.4
San Bernardino (MD)	2024	LDT1	Aggregate	Aggregate	Electricity	49	765,847	0	765,847	82,076	295,680	0		
San Bernardino (MD)	2024	LDT1	Aggregate	Aggregate	Plug-in Hybrid	34	638,220	285,191	353,030	49,373	106,626	9		
Trucks														
San Bernardino (MD)	2024	LDT2	Aggregate	Aggregate	Gasoline	137,726	1,958,194,467	1,958,194,467	0	222,450,178	0	82,256		
San Bernardino (MD)	2024	LHDT1	Aggregate	Aggregate	Gasoline	13,065	157,138,101	157,138,101	0	63,650,841	0	12,040		
San Bernardino (MD)	2024	LHDT2	Aggregate	Aggregate	Gasoline	1,727	20,574,066	20,574,066	0	8,414,207	0	1,760		
San Bernardino (MD)	2024	MDV	Aggregate	Aggregate	Gasoline	104,993	1,423,808,468	1,423,808,468	0	165,539,931	0	74,484		
San Bernardino (MD)	2024	MH	Aggregate	Aggregate	Gasoline	3,091	8,738,835	8,738,835	0	101,128	0	1,833		
San Bernardino (MD)	2024	MHDT	Aggregate	Aggregate	Gasoline	899	20,892,259	20,892,259	0	5,879,627	0	4,070	20.2	
San Bernardino (MD)	2024	HHDT	Aggregate	Aggregate	Gasoline	3	58,555	58,555	0	17,493	0	15		
San Bernardino (MD)	2024	OBUS	Aggregate	Aggregate	Gasoline	272	5,355,261	5,355,261	0	1,778,168	0	1,064		
San Bernardino (MD)	2024	SBUS	Aggregate	Aggregate	Gasoline	96	1,990,477	1,990,477	0	125,848	0	216		
San Bernardino (MD)	2024	UBUS	Aggregate	Aggregate	Gasoline	55	1,721,652	1,721,652	0	72,167	0	455		
San Bernardino (MD)	2024	LDT2	Aggregate	Aggregate	Diesel	435	6,645,964	6,645,964	0	724,111	0	208		
San Bernardino (MD)	2024	LHDT1	Aggregate	Aggregate	Diesel	11,068	133,847,672	133,847,672	0	45,525,026	0	6,559		
San Bernardino (MD)	2024	LHDT2	Aggregate	Aggregate	Diesel	4,732	59,152,060	59,152,060	0	19,463,051	0	3,485		
San Bernardino (MD)	2024	MDV	Aggregate	Aggregate	Diesel	1,715	24,029,199	24,029,199	0	2,750,569	0	1,038		
San Bernardino (MD)	2024	MH	Aggregate	Aggregate	Diesel	1,277	3,600,959	3,600,959	0	41,755	0	344	7.3	
San Bernardino (MD)	2024	MHDT	Aggregate	Aggregate	Diesel	2,714	49,741,789	49,741,789	0	11,262,870	0	5,473		
San Bernardino (MD)	2024	HHDT	Aggregate	Aggregate	Diesel	12,942	831,355,969	831,355,969	0	84,663,710	0	134,492		
San Bernardino (MD)	2024	OBUS	Aggregate	Aggregate	Diesel	72	1,458,109	1,458,109	0	250,554	0	199		
San Bernardino (MD)	2024	SBUS	Aggregate	Aggregate	Diesel	626	4,792,215	4,792,215	0	2,962,151	0	632		
San Bernardino (MD)	2024	UBUS	Aggregate	Aggregate	Diesel	3	81,859	81,859	0	3,311	0	10		
San Bernardino (MD)	2024	LDT2	Aggregate	Aggregate	Electricity	786	10,203,117	0	10,203,117	1,395,387	3,939,245	0		
San Bernardino (MD)	2024	LDT2	Aggregate	Aggregate	Plug-in Hybrid	1,052	18,765,435	8,757,204	10,008,230	1,509,727	3,022,784	278		
San Bernardino (MD)	2024	LHDT1	Aggregate	Aggregate	Electricity	36	897,027	0	897,027	162,497	510,989	0		
San Bernardino (MD)	2024	LHDT2	Aggregate	Aggregate	Electricity	9	219,983	0	219,983	39,854	125,332	0		
San Bernardino (MD)	2024	MDV	Aggregate	Aggregate	Electricity	867	11,240,680	0	11,240,680	1,537,992	4,339,830	0		
San Bernardino (MD)	2024	MDV	Aggregate	Aggregate	Plug-in Hybrid	687	11,507,479	5,547,688	5,959,791	986,413	1,800,035	178		3.2
San Bernardino (MD)	2024	MHDT	Aggregate	Aggregate	Electricity	10	265,722	0	265,722	49,727	283,716	0		
San Bernardino (MD)	2024	HHDT	Aggregate	Aggregate	Electricity	35	1,790,040	0	1,790,040	231,625	3,223,430	0		
San Bernardino (MD)	2024	OBUS	Aggregate	Aggregate	Electricity	1	22,711	0	22,711	3,573	24,574	0		
San Bernardino (MD)	2024	SBUS	Aggregate	Aggregate	Electricity	1	16,130	0	16,130	5,911	18,651	0		
San Bernardino (MD)	2024	UBUS	Aggregate	Aggregate	Electricity	0	6,782	0	6,782	257	14,379	0		

Source: EMFAC2021 (v1.0.2) Emissions Inventory
Region Type: Sub-Area
Region: San Bernardino (MD)
Calendar Year: 2024
Season: Annual
Vehicle Classification: EMFAC2007 Categories

Region	Calenda	Vehicle Category	Model Year	Speed	Fuel	Population	Fuel Percentage	Auto/Truck Percentage
Automobiles								
San Bernardino (MD)	2024	LDA	Aggregate	Aggregate	Gasoline	309,549		
San Bernardino (MD)	2024	LDT1	Aggregate	Aggregate	Gasoline	31,234	94.0%	
San Bernardino (MD)	2024	MCY	Aggregate	Aggregate	Gasoline	18,162		
San Bernardino (MD)	2024	LDA	Aggregate	Aggregate	Diesel	1,035	0.3%	
San Bernardino (MD)	2024	LDT1	Aggregate	Aggregate	Diesel	16		55.9%
San Bernardino (MD)	2024	LDA	Aggregate	Aggregate	Electricity	13,624		
San Bernardino (MD)	2024	LDA	Aggregate	Aggregate	Plug-in Hybrid	8,183	5.7%	
San Bernardino (MD)	2024	LDT1	Aggregate	Aggregate	Electricity	49		
San Bernardino (MD)	2024	LDT1	Aggregate	Aggregate	Plug-in Hybrid	34		
Trucks								
San Bernardino (MD)	2024	LDT2	Aggregate	Aggregate	Gasoline	137,726		
San Bernardino (MD)	2024	LHDT1	Aggregate	Aggregate	Gasoline	13,065		
San Bernardino (MD)	2024	LHDT2	Aggregate	Aggregate	Gasoline	1,727		
San Bernardino (MD)	2024	MDV	Aggregate	Aggregate	Gasoline	104,993		
San Bernardino (MD)	2024	MH	Aggregate	Aggregate	Gasoline	3,091	87.0%	
San Bernardino (MD)	2024	MHDT	Aggregate	Aggregate	Gasoline	899		
San Bernardino (MD)	2024	HHDT	Aggregate	Aggregate	Gasoline	3		
San Bernardino (MD)	2024	OBUS	Aggregate	Aggregate	Gasoline	272		
San Bernardino (MD)	2024	SBUS	Aggregate	Aggregate	Gasoline	96		
San Bernardino (MD)	2024	UBUS	Aggregate	Aggregate	Gasoline	55		
San Bernardino (MD)	2024	LDT2	Aggregate	Aggregate	Diesel	435		
San Bernardino (MD)	2024	LHDT1	Aggregate	Aggregate	Diesel	11,068		
San Bernardino (MD)	2024	LHDT2	Aggregate	Aggregate	Diesel	4,732		
San Bernardino (MD)	2024	MDV	Aggregate	Aggregate	Diesel	1,715		
San Bernardino (MD)	2024	MH	Aggregate	Aggregate	Diesel	1,277	11.8%	
San Bernardino (MD)	2024	MHDT	Aggregate	Aggregate	Diesel	2,714		
San Bernardino (MD)	2024	HHDT	Aggregate	Aggregate	Diesel	12,942		
San Bernardino (MD)	2024	OBUS	Aggregate	Aggregate	Diesel	72		44.1%
San Bernardino (MD)	2024	SBUS	Aggregate	Aggregate	Diesel	626		
San Bernardino (MD)	2024	UBUS	Aggregate	Aggregate	Diesel	3		
San Bernardino (MD)	2024	LDT2	Aggregate	Aggregate	Electricity	786		
San Bernardino (MD)	2024	LDT2	Aggregate	Aggregate	Plug-in Hybrid	1,052		
San Bernardino (MD)	2024	LHDT1	Aggregate	Aggregate	Electricity	36		
San Bernardino (MD)	2024	LHDT2	Aggregate	Aggregate	Electricity	9		
San Bernardino (MD)	2024	MDV	Aggregate	Aggregate	Electricity	867		
San Bernardino (MD)	2024	MDV	Aggregate	Aggregate	Plug-in Hybrid	687	1.2%	
San Bernardino (MD)	2024	MHDT	Aggregate	Aggregate	Electricity	10		
San Bernardino (MD)	2024	HHDT	Aggregate	Aggregate	Electricity	35		
San Bernardino (MD)	2024	OBUS	Aggregate	Aggregate	Electricity	1		
San Bernardino (MD)	2024	SBUS	Aggregate	Aggregate	Electricity	1		
San Bernardino (MD)	2024	UBUS	Aggregate	Aggregate	Electricity	0		
San Bernardino (MD)	2024	MHDT	Aggregate	Aggregate	Natural Gas	8		
San Bernardino (MD)	2024	HHDT	Aggregate	Aggregate	Natural Gas	34	0.05%	
San Bernardino (MD)	2024	UBUS	Aggregate	Aggregate	Natural Gas	104		

ATTACHMENT D

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