

Construction Energy Use

Off-Road Construction Equipment Energy Use												
Phase	Equipment	Fuel	HP	Load Factor	Equipment Count	Hours/Day	Work Days	Gallons /HP-Hr	Gallons /Hour	Gallons /Day	Total Gallons	Total kBtu
Site Preparation	Rubber Tired Dozers	Diesel	247	0.4	3	8.0	22	0.0205133	2.02671	48.641	1,070.1	148,744
	Tractors/Loaders/Backhoes	Diesel	97	0.37	4	8.0	22	0.0191274	0.68648	21.967	483.3	67,176
Grading	Excavators	Diesel	158	0.38	1	8.0	43	0.0197573	1.18623	9.490	408.1	56,721
	Graders	Diesel	187	0.41	1	8.0	43	0.0211437	1.62109	12.969	557.7	77,514
	Rubber Tired Dozers	Diesel	247	0.4	1	8.0	43	0.0205133	2.02671	16.214	697.2	96,909
	Tractors/Loaders/Backhoes	Diesel	97	0.37	3	8.0	43	0.0191274	0.68648	16.476	708.4	98,475
Building Construction	Cranes	Diesel	231	0.29	1	7.0	174	0.0148849	0.99714	6.980	1,214.5	168,817
	Forklifts	Diesel	89	0.2	3	8.0	174	0.0103806	0.18478	4.435	771.6	107,255
	Generator Sets	Diesel	84	0.74	1	8.0	174	0.0154785	0.96214	7.697	1,339.3	186,163
	Tractors/Loaders/Backhoes	Diesel	97	0.37	3	7.0	174	0.0191274	0.68648	14.416	2,508.4	348,668
	Welders	Diesel	46	0.45	1	8.0	174	0.0258535	0.53517	4.281	745.0	103,548
Project Construction Off-Road Total											10,503.5	1,459,992

On-Road Construction Energy Use												
Phase	Trip Type (Fleet Mix)	Trips	Distance (miles)		Work Days	Total VMT	gallons diesel/VMT		Total diesel gallons	gallons gas/VMT	Total gasoline gallons	Total kBtu
Site Preparation	Worker (LDA, LDT1, LDT2)	18	10.8		22	4276.8	0.000224116		0.96	0.034108294	145.87	18,222
Grading	Worker (LDA, LDT1, LDT2)	15	10.8		43	6966.0	0.000224116		1.56	0.034108294	237.60	29,679
	Hauling (HHDT)	125	20		-	2500.0	0.154145714		385.36	0.000267758	0.67	53,649
Building Construction	Worker (LDA, LDT1, LDT2)	118	10.8		174	221745.6	0.000224116		49.70	0.034108294	7,563.36	944,765
	Vendor (HHDT, MHDT)	18	7.3		174	22863.6	0.126423505		2890.50	0.013051900	298.41	438,782
Project Construction On-Road Total						258352.0			3328.1		8245.9	1485096.8

Construction Energy Summary			
Source	Gallons Diesel	Gallons Gas	kBtu
Off-Road Construction Equipment	10,504	-	1,459,992
On-Road Construction Traffic	3,328	8,246	1,485,097
Project Construction Total	13,832	8,246	2,945,089

- Notes:
- 1. Off-road equipment types and horsepower from CalEEMod defaults.
 - 2. Off-road equipment count and hours from CalEEMod for the AQ/GHG modeling.
 - 3. Off-road fuel consumption factors from CARB OFFROAD2017- ORION Web Database, for San Diego County, aggregate model years. <https://www.arb.ca.gov/orion/>
 - 4. On-road fleet mix and trip distances from CalEEMod for the AQ/GHG modeling.
 - 5. On-road fuel consumption factors weighted average for fleet mix from CARB EMFAC2107, for San Diego County, aggregate model years, aggregate speeds. <https://www.arb.ca.gov/emfac/2017/>.
 - 6. 1 Gallon of diesel = 139 kBtu; 1 gallon of gasoline = 124 kBtu.

Annual Operational Energy Use

VMT
430,808

On-Road Operational Energy Use						
Category	Mix	Diesel		Gasoline		kBtu
		Gallons/V MT	Gallons	Gallons/VMT	Gallons	
LDA	55.7888%	0.000243	58.4	0.0298325	7,170.0	897,202
LDT1	6.2607%	0.000013	0.3	0.0298325	804.6	99,821
LDT2	17.8921%	0.000220	17.0	0.0379636	2,926.3	365,213
MDV	11.9061%	0.001045	53.6	0.0449839	2,307.3	293,563
LHDT1	2.4112%	0.026526	275.5	0.0576826	599.2	112,600
LHDT2	0.6269%	0.041309	111.6	0.0401842	108.5	28,965
MHDT	0.8734%	0.084057	316.3	0.0293673	110.5	57,665
HHDT	0.6266%	0.144513	390.1	0.0002511	0.7	54,309
OBUS	0.1929%	0.060935	50.6	0.1066034	88.6	18,024
UBUS	0.0708%	0.000000	0.0	0.1721387	52.5	6,511
MCY	2.8949%	-	0.0	1.0479377	13,069.3	1,620,595
SBUS	0.0971%	0.101327	42.4	0.0182740	7.6	6,840
MH	0.4949%	0.028575	60.9	0.1467278	312.8	47,260
Annual Total			1,376.8		27,558.0	3,608,566

Electricity and Natural Gas			
Type	Source	kWhr	kBtu
Natural Gas	Hot Water, Heating	-	1,786,670
Electricity	Buildings, Lighting	662,344	2,260,012
Total		662,344	4,046,682

Water and Wastewater Energy Use							
Water Use (Mgal)		Electricity Intensity Factors (kWhr/Mgal)				kWhr	kBtu
Indoor	Outdoor	Supply	Treat Water	Distribute	Treat Wastewater		
10.6853	6.73636	2,117	111	1,272	1,911	73,849	251,983

Operation Total		
Energy Type	Quantity	kBtu
Gasoline (Gallons)	27,558	3,417,193
Diesel (Gallons)	1,377	191,373
Natural Gas (kBtu)	1,786,670	1,786,670
Electricity (kWhr)	736,193	4,298,665
Total		9,693,901

Notes:

1. VMT, electricity, natural gas, and water use from project CalEEMod annual output. VMT calculated in CalEEMod annual output using 150 ADT from LLG's Trip Generation Calculations for the project.
2. Fleet mix from CalEEMod default for San Diego County.
3. Fuel consumption factors weighted average for fleet mix from CARB EMFAC2107, for San Diego, aggregate model years for 2024, aggregate speeds. <https://www.arb.ca.gov/emfac/2017/>.
4. Water electricity intensity factors from CalEEMod default for San Diego County.
5. 1 Gallon of diesel = 139 kBtu; 1 gallon of gasoline = 124 kBtu; 1 kWhr = 3.412142 kBtu.

Model Output: OFFROAD2017 (v1.0.1) Emissions Inventory

Region Type: County

Region: San Diego

Calendar Year: 2022

Scenario: All Adopted Rules - Exhaust

Vehicle Classification: OFFROAD2017 Equipment Types

Units: tons/day for Emissions, gallons/year for Fuel, hours/year for Activity, Horsepower-hours/year for Horsepower-hours

Region	CalYr	VehClass	MdlYr	HP_Bin	Fuel	Fuel_gpy	Total_Activity_hpy	Total_Population	Horsepower_Hours_hhpy	Gallons/hp-hour
San Diego	2022	ConstMin - Cranes	Aggregate	300	Diesel	131378.96	40011.23	84.88	8826350.23	0.01488486
San Diego	2022	ConstMin - Excavators	Aggregate	175	Diesel	390620.20	135389.45	228.89	19770957.54	0.01975727
San Diego	2022	ConstMin - Graders	Aggregate	300	Diesel	503156.02	109922.67	144.76	23796957.47	0.02114371
San Diego	2022	ConstMin - Rubber Tired Dozers	Aggregate	300	Diesel	17301.60	3812.48	5.43	843434.30	0.02051328
San Diego	2022	ConstMin - Tractors/Loaders/Backhoes	Aggregate	100	Diesel	1914739.32	1203674.54	1922.37	100104539.93	0.01912740
San Diego	2022	Industrial - Forklifts	Aggregate	100	Diesel	544150.42	635834.72	834.15	52419731.09	0.01038064
San Diego	2022	OFF - Light Commercial - Welders	Aggregate	50	Diesel	341994.05	287568.9	447.76	13228169.4	0.02585347
San Diego	2022	Portable Equipment - Non-Rental Generator	Aggregate	100	Diesel	101387.403	67002.09366	49.91236381	6550211.837	0.01547849

Source: EMFAC2017 (v1.0.3) Emissions Inventory
Region Type: County
Region: San Diego
Calendar Year: 2022
Season: Annual
Vehicle Classification: EMFAC2007 Categories
Units: miles/day for VMT, trips/day for Trips, tons/day for Emissions, 1000 gallons/day for Fuel Consumption

2022 Construction Fleet Fuel Consumption								
Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	VMT	Fuel Consumption (1000 Gal.)	Gallons/VMT
Worker (LDA, LDT1, LDT2)								
San Diego	2022	LDA	Aggregated	Aggregated	DSL	652152.32	13.98689813	
San Diego	2022	LDT1	Aggregated	Aggregated	DSL	2054.346	0.09031383	
San Diego	2022	LDT2	Aggregated	Aggregated	DSL	128253.98	3.722637831	
					Diesel Total	782460.65	17.7998498	0.000224116
San Diego	2022	LDA	Aggregated	Aggregated	GAS	55007781	1756.768474	
San Diego	2022	LDT1	Aggregated	Aggregated	GAS	5914590.8	225.5647168	
San Diego	2022	LDT2	Aggregated	Aggregated	GAS	17717581	726.6298291	
					Gas Total	78639952	2708.96302	0.034108294
					Total VMT	79422413		
Vendor (HHDT, MHDT)								
San Diego	2022	HHDT	Aggregated	Aggregated	DSL	1903709.6	293.7690323	
San Diego	2022	MHDT	Aggregated	Aggregated	DSL	1194911.6	124.4046627	
					Diesel total	3098621.2	418.1736951	0.126423505
San Diego	2022	HHDT	Aggregated	Aggregated	GAS	2078.2646	0.510290016	
San Diego	2022	MHDT	Aggregated	Aggregated	GAS	207021.61	42.66175414	
					Gas Total	209099.88	43.17204416	0.0130519
					Total VMT	3307721.1		
Hauling (HHDT)								
San Diego	2022	HHDT	Aggregated	Aggregated	DSL	1903709.6	293.7690323	0.154145714
San Diego	2022	HHDT	Aggregated	Aggregated	GAS	2078.2646	0.510290016	0.000267758
					Total VMT	1905787.9		

EMFAC2017 (v1.0.2) Emissions Inventory
Region Type: County
Region: San Diego
Calendar Year: 2024
Season: Annual
Vehicle Classification: EMFAC2007 Categories
Units: miles/day for VMT, trips/day for Trips, tons/day for Emissions, 1000 gallons/day for Fuel Consumption. Note 'day' in the unit is operation day.

2024 Operational Fleet Fuel Consumption								
Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	VMT	Fuel Consumption (1000 Gal.)	Gallons/VMT
LDA								
SAN DIEGO	2024	LDA	Aggregated	Aggregated	GAS	56261566	1698.699709	0.029832453
SAN DIEGO	2024	LDA	Aggregated	Aggregated	DSL	679769	13.84063887	0.000243068
					Total VMT	56941335		
LDT1								
SAN DIEGO	2024	LDT1	Aggregated	Aggregated	GAS	5946393.2	215.5186457	0.036232999
SAN DIEGO	2024	LDT1	Aggregated	Aggregated	DSL	1738.3735	0.074416324	0.000012511
					Total VMT	5948131.6		
LDT2								
SAN DIEGO	2024	LDT2	Aggregated	Aggregated	GAS	17427995	666.9735591	0.037963589
SAN DIEGO	2024	LDT2	Aggregated	Aggregated	DSL	140774.84	3.864918477	0.000219988
					Total VMT	17568770		
MDV								
SAN DIEGO	2024	MDV	Aggregated	Aggregated	GAS	11271527	522.198155	0.044983916
SAN DIEGO	2024	MDV	Aggregated	Aggregated	DSL	337025.28	12.13645534	0.001045475
					Total VMT	11608553		
LHDT1								
SAN DIEGO	2024	LHDT1	Aggregated	Aggregated	GAS	1225429.8	141.4935185	0.057682631
SAN DIEGO	2024	LHDT1	Aggregated	Aggregated	DSL	1227536	65.0681503	0.026526318
					Total VMT	2452965.8		
LHDT2								
SAN DIEGO	2024	LHDT2	Aggregated	Aggregated	GAS	196903.05	26.01216243	0.040184201
SAN DIEGO	2024	LHDT2	Aggregated	Aggregated	DSL	450420.07	26.74045115	0.041309279
					Total VMT	647323.11		
MHDT								
SAN DIEGO	2024	MHDT	Aggregated	Aggregated	GAS	218405.97	43.5150898	0.029367277
SAN DIEGO	2024	MHDT	Aggregated	Aggregated	DSL	1263348.4	124.5520637	0.084057162
					Total VMT	1481754.3		
HHDT								
SAN DIEGO	2024	HHDT	Aggregated	Aggregated	GAS	2126.1259	0.496339656	0.000251135
SAN DIEGO	2024	HHDT	Aggregated	Aggregated	DSL	1974261.1	285.6145571	0.144513462
					Total VMT	1976387.2		
OBUS								
SAN DIEGO	2024	OBUS	Aggregated	Aggregated	GAS	61109.536	12.47761195	0.10660341
SAN DIEGO	2024	OBUS	Aggregated	Aggregated	DSL	55937.489	7.132302222	0.060935357
					Total VMT	117047.02		
UBUS								
SAN DIEGO	2024	UBUS	Aggregated	Aggregated	GAS	44934.808	7.735020888	0.172138731
SAN DIEGO	2024	UBUS	Aggregated	Aggregated	DSL	0	0	0
					Total VMT	44934.808		
MCY								
SAN DIEGO	2024	MCY	Aggregated	Aggregated	GAS	625860.67	17.18055872	1.047937677
SBUS								
SAN DIEGO	2024	SBUS	Aggregated	Aggregated	GAS	16394.638	1.659807647	0.018274037
SAN DIEGO	2024	SBUS	Aggregated	Aggregated	DSL	74434.098	9.203447996	0.101327492
					Total VMT	90828.736		
MH								
SAN DIEGO	2024	MH	Aggregated	Aggregated	GAS	85692.576	17.56052126	0.14672783
SAN DIEGO	2024	MH	Aggregated	Aggregated	DSL	33988.34	3.419919056	0.028575308
					Total VMT	119680.92		