

Appendix E

Energy Calculations

Airport Perimeter Dike FEMA and Seismic Improvements: NPORDS Reuse

Construction Fuel Consumption	Gasoline	Diesel
Construction On-Road Vehicles	7,291	31,413
Construction Off-Road Equipment	-	693,903
Total For Construction	7,291	725,316

Airport Perimeter Dike FEMA and Seismic Improvements: NPORDS Reuse

	Phase	Vehicle Type	Construction Phase Days	Trips Per Day	Total Trips	Miles Per Trip	Total Miles	Fuel Type	Gasoline		Diesel	
									Weighted Fuel Economy (miles/gallon)	Fuel Consumption (gallons)	Weighted Fuel Economy (miles/gallon)	Fuel Consumption (gallons)
Construction On-Road Vehicles	General	Worker	477	27.5	13117.5	12.4	162,657	LDA,LDT1, LDT2	26.70118167	6,077.56	34.81870119	10.88
		Vendor	477	0	0	8.4	-	HHDT			6.018149872	-
		Hauling	477	0	0	35	-	HHDT			6.018149872	-
	Temporary Platform	Worker	53	20	1060	12.4	13,144	LDA,LDT1, LDT2	26.70118167	491.12	34.81870119	0.88
		Vendor	53	0	0	8.4	-	HHDT			6.018149872	-
		Hauling	53	30.603773	1622	35	56,770	HHDT			6.018149872	9,433
	Restoration	Worker	50	20	1000	12.4	12,400	LDA,LDT1, LDT2	26.70118167	463.32	34.81870119	0.83
		Vendor	50	0	0	8.4	-	HHDT			6.018149872	-
		Hauling	50	94	4700	4	18,800	HHDT			6.018149872	3,124
	Landfill Grading	Worker	20	28	560	12.4	6,944	LDA,LDT1, LDT2	26.70118167	259.46	34.81870119	0.46
		Vendor	20	0	0	8.4	-	HHDT			6.018149872	-
		Hauling	20	0	0	0	-	HHDT			6.018149872	-
	CDSM	Worker	324	0	0	12.4	-	LDA,LDT1, LDT2	26.70118167	-	34.81870119	-
		Vendor	324	0	0	8.4	-	HHDT			6.018149872	-
		Hauling	324	10	3240	35	113,400	HHDT			6.018149872	18,843
Total Fuel Consumption (Gallons)										7,291.45		31,413.07

Notes:

1. Fuel Consumption is total miles multiplied by the percent gasoline or diesel respectively and then divided by fuel economy. It was assumed all MHDT and HHDT are diesel. LDA, LDT1, and LDT2 were assumed to be a mix of gasoline and diesel as ratioed by their VMT.

	LDA,LDT1,LDT2	MHDT	HHDT
Gasoline %	99.77%	0	0
Diesel %	0.23%	1	1

Airport Perimeter Dike FEMA and Seismic Improvements: NPORDS Reuse

Phase name	Offroad Equipment Type	Amount	Days in Phase	Usage Hours	Horse Power	Load Factor	Fuel Consumption Rate lb/hp-hr	Gasoline Fuel Consumption (gallons)	Diesel Fuel Consumption (gallons)	
General	Forklifts	2	477	10	134	0.2	0.367		13,199	
General	Tractors/Loaders/Backhoes	2	477	11	76	0.37	0.408		16,936	
General	Other Construction Equipmer	6	477	10	400	0.42	0.367		248,223	
General	Off-Highway Trucks	1	477	2	376	0.38	0.367		7,037	
Temp Platform and Di	Excavators	1	53	10	268	0.38	0.367		2,786	
Temp Platform and Di	Forklifts	1	53	10	134	0.2	0.367		733	
Temp Platform and Di	Other Construction Equipmer	1	53	10	100	0.43	0.367		1,177	
Temp Platform and Di	Graders	1	53	10	238	0.41	0.367		2,670	
Temp Platform and Di	Rubber Tired Dozers	1	53	10	130	0.4	0.367		1,423	
Temp Platform and Di	Off-Highway Trucks	3	53	10	376	0.38	0.367		11,728	
Restoration	Excavators	1	50	10	268	0.38	0.367		2,629	
Restoration	Forklifts	1	50	10	134	0.2	0.367		692	
Restoration	Plate Compactors	1	50	10	100	0.43	0.367		1,110	
Restoration	Graders	1	50	10	238	0.41	0.367		2,519	
Restoration	Rubber Tired Dozers	1	50	10	130	0.4	0.367		1,342	
Restoration	Off-Highway Trucks	3	50	10	376	0.38	0.367		11,064	
Landfill Grading	Graders	1	20	5	238	0.41	0.367		504	
Landfill Grading	Tractors/Loaders/Backhoes	1	20	5	200	0.37	0.367		382	
Landfill Grading	Excavators	1	20	5	380	0.38	0.367		745	
Landfill Grading	Off-Highway Trucks	1	20	5	376	0.38	0.367		738	
CDSM	Other General Industrial Equip	2	324	10	165	0.48	0.367		26,495	
CDSM	Other Construction Equipmer	2	324	10	24	0.42	0.408		3,749	
CDSM	Other Construction Equipmer	2	324	10	75	0.42	0.408		11,715	
CDSM	Other General Industrial Equip	2	324	10	50	0.74	0.408		13,761	
CDSM	Bore/Drill Rigs	2	324	10	580	0.5	0.367		97,015	
CDSM	Excavators	2	324	10	268	0.38	0.367		34,069	
CDSM	Pumps	2	324	10	11	0.74	0.408		3,027	
CDSM	Tractors/Loaders/Backhoes	2	324	10	217	0.37	0.367		26,860	
CDSM	Other General Industrial Equip	2	324	10	402	0.74	0.367		99,517	
CDSM	Off-Highway Trucks	2	324	10	376	0.38	0.367		47,798	
CDSM	Dumpers/Tenders	2	324	10	16	0.38	0.408		2,261	
Total Diesel Fuel Use from Construction Off-Road									-	693,903

1. Equipment list is from CalEEMod.
2. Fuel Consumption is 0.408 for less than 100 hp and .367 if greater than or equal to 100 hp based on CARB Off-Road Diesel Engine Emission Factors
3. To convert to gallons the conversion factor of 7.1089 lb/fallon is used
4. Fuel consumption is amount multiplied by usage hours, days in phase, horsepower, loadfactor, and fuel consumption rate divided by conversion factor.
5. For simplification, gasoline powered equipment was assumed to have the same fuel consumption as diesel equipment.

Airport Perimeter Dike FEMA and Seismic Improvements: NPORDS Reuse

		Weighting					Fuel Economy					Weighted Fuel Economy
		LDA	LDT1	LDT2	MHDT	HHDT	LDA	LDT1	LDT2	MHDT	HHDT	Miles per Gallon
Worker	LDA, LDT1,LDT2	0.5	0.25	0.25	0	0	29.33817	24.30993	23.81847			26.70118167
Vendor	HHDT,MHDT	0	0	0	0.5	0.5						0
Gasoline	Hauling	0	0	0	0	1						0
Worker	LDA, LDT1,LDT2	0.5	0.25	0.25	0	0	41.79647	23.7491	31.93276	8.711203	6.01815	34.81870119
Vendor	HHDT,MHDT	0	0	0	0.5	0.5				8.711203	6.01815	7.364676622
Diesel	Hauling	0	0	0	0	1				8.711203	6.01815	6.018149872

Notes:

1. It was assumed all MHDT and HHDT are diesel. LDA, LDT1, and LDT2 were assumed to be a mix of gasoline and diesel as ratioed by their VMT.
2. EMFAC 2014 was used to estimate fuel economy based on VMT and fuel consumption.

Airport Perimeter Dike FEMA and Seismic Improvements: Offsite Disposal

Construction Fuel Consumption	Gasoline	Diesel
Construction On-Road Vehicles	7,032	311,598
Construction Off-Road Equipment	-	691,534
Total For Construction	7,032	1,003,132

Airport Perimeter Dike FEMA and Seismic Improvements: Offsite Disposal

								Gasoline		Diesel		
	Phase	Vehicle Type	Construction Phase Days	Trips Per Day	Total Trips	Miles Per Trip	Total Miles	Fuel Type	Weighted Fuel Economy (miles/gallon)	Fuel Consumption (gallons)	Weighted Fuel Economy (miles/gallon)	Fuel Consumption (gallons)
Construction On-Road Vehicles	General	Worker	477	27.5	13117.5	12.4	162,657	LDA,LDT1, LDT2	26.70118167	6,077.56	34.81870119	10.88
		Vendor	477	0	0	8.4	-	HHDT			6.018149872	-
		Hauling	477	101	48177	35	1,686,195	HHDT			6.018149872	280,185
	Temporary Platform	Worker	53	20	1060	12.4	13,144	LDA,LDT1, LDT2	26.70118167	491.12	34.81870119	0.88
		Vendor	53	0	0	8.4	-	HHDT			6.018149872	-
		Hauling	53	30.603773	1622	35	56,770	HHDT			6.018149872	9,433
	Restoration	Worker	50	20	1000	12.4	12,400	LDA,LDT1, LDT2	26.70118167	463.32	34.81870119	0.83
		Vendor	50	0	0	8.4	-	HHDT			6.018149872	-
		Hauling	50	94	4700	4	18,800	HHDT			6.018149872	3,124
	CDSM	Worker	324	0	0	12.4	-	LDA,LDT1, LDT2	26.70118167	-	34.81870119	-
		Vendor	324	0	0	8.4	-	HHDT			6.018149872	-
		Hauling	324	10	3240	35	113,400	HHDT			6.018149872	18,843
	Total Fuel Consumption (Gallons)										7,031.99	

Notes:

1. Fuel Consumption is total miles multiplied by the percent gasoline or diesel respectively and then divided by fuel economy. It was assumed all MHDT and HHDT are diesel. LDA, LDT1, and LDT2 were assumed to be a mix of gasoline and diesel as ratioed by their VMT.

	LDA,LDT1,LDT2	MHDT	HHDT
Gasoline %	99.77%	0	0
Diesel %	0.23%	1	1

Airport Perimeter Dike FEMA and Seismic Improvements: Offsite Disposal

Phase name	Offroad Equipment Type	Amount	Days in Phase	Usage Hours	Horse Power	Load Factor	Fuel Consumption Rate lb/hp-hr	Gasoline Fuel Consumption (gallons)	Diesel Fuel Consumption (gallons)
General	Forklifts	2	477	10	134	0.2	0.367		13,199
General	Tractors/Loaders/Backhoes	2	477	11	76	0.37	0.408		16,936
General	Other Construction Equipmer	6	477	10	400	0.42	0.367		248,223
General	Off-Highway Trucks	1	477	2	376	0.38	0.367		7,037
Temp Platform and Di	Excavators	1	53	10	268	0.38	0.367		2,786
Temp Platform and Di	Forklifts	1	53	10	134	0.2	0.367		733
Temp Platform and Di	Other Construction Equipmer	1	53	10	100	0.43	0.367		1,177
Temp Platform and Di	Graders	1	53	10	238	0.41	0.367		2,670
Temp Platform and Di	Rubber Tired Dozers	1	53	10	130	0.4	0.367		1,423
Temp Platform and Di	Off-Highway Trucks	3	53	10	376	0.38	0.367		11,728
Restoration	Excavators	1	50	10	268	0.38	0.367		2,629
Restoration	Forklifts	1	50	10	134	0.2	0.367		692
Restoration	Plate Compactors	1	50	10	100	0.43	0.367		1,110
Restoration	Graders	1	50	10	238	0.41	0.367		2,519
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Restoration	Off-Highway Trucks	3	50	10	376	0.38	0.367		11,064
CDSM	Other General Industrial Equip	2	324	10	165	0.48	0.367		26,495
CDSM	Other Construction Equipmer	2	324	10	24	0.42	0.408		3,749
CDSM	Other Construction Equipmer	2	324	10	75	0.42	0.408		11,715
CDSM	Other General Industrial Equip	2	324	10	50	0.74	0.408		13,761
CDSM	Bore/Drill Rigs	2	324	10	580	0.5	0.367		97,015
CDSM	Excavators	2	324	10	268	0.38	0.367		34,069
CDSM	Pumps	2	324	10	11	0.74	0.408		3,027
CDSM	Tractors/Loaders/Backhoes	2	324	10	217	0.37	0.367		26,860
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CDSM	Off-Highway Trucks	2	324	10	376	0.38	0.367		47,798
CDSM	Dumpers/Tenders	2	324	10	16	0.38	0.408		2,261
Total Diesel Fuel Use from Construction Off-Road								-	691,534

1. Equipment list is from CalEEMod.
2. Fuel Consumption is 0.408 for less than 100 hp and .367 if greater than or equal to 100 hp based on CARB Off-Road Diesel Engine Emission Factors
3. To convert to gallons the conversion factor of 7.1089 lb/fallon is used
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Airport Perimeter Dike FEMA and Seismic Improvements: Offsite Disposal

		Weighting					Fuel Economy					Weighted Fuel Economy
		LDA	LDT1	LDT2	MHDT	HHDT	LDA	LDT1	LDT2	MHDT	HHDT	Miles per Gallon
Worker	LDA, LDT1,LDT2	0.5	0.25	0.25	0	0	29.33817	24.30993	23.81847			26.70118167
Vendor	HHDT,MHDT	0	0	0	0.5	0.5						0
Gasoline	Hauling	0	0	0	0	1						0
Worker	LDA, LDT1,LDT2	0.5	0.25	0.25	0	0	41.79647	23.7491	31.93276	8.711203	6.01815	34.81870119
Vendor	HHDT,MHDT	0	0	0	0.5	0.5				8.711203	6.01815	7.364676622
Diesel	Hauling	0	0	0	0	1				8.711203	6.01815	6.018149872

Notes:

1. It was assumed all MHDT and HHDT are diesel. LDA, LDT1, and LDT2 were assumed to be a mix of gasoline and diesel as ratioed by their VMT.
2. EMFAC 2014 was used to estimate fuel economy based on VMT and fuel consumption.

Source: EMFAC2021 (v1.0.2) Emissions Inventory

Region Type: Statewide

Region: California

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, tons/year for Emissions, 1000 gallons/year for Fuel Consumption

Region	Calendar Y	Vehicle Ca	Model Year	Speed	Fuel	Population	VMT	Trips	Fuel Consumption
Statewide	2024	HHDT	Aggregate	Aggregate	Gasoline	150.122193	3070320.371	982191.8593	806.613441
Statewide	2024	HHDT	Aggregate	Aggregate	Diesel	307158.339	13353497405	1558025182	2218870.864
Statewide	2024	LDA	Aggregate	Aggregate	Gasoline	12932359.3	1.76321E+11	20804957958	6009948.623
Statewide	2024	LDA	Aggregate	Aggregate	Diesel	46051.8551	483582134.1	67168218.15	11569.92729
Statewide	2024	LDT1	Aggregate	Aggregate	Gasoline	1316921.63	15544126321	1988755242	639414.6512
Statewide	2024	LDT1	Aggregate	Aggregate	Diesel	676.78567	3333701.663	670156.2553	140.3716937
Statewide	2024	LDT2	Aggregate	Aggregate	Gasoline	6196167.72	85736943844	10043176601	3599599.864
Statewide	2024	LDT2	Aggregate	Aggregate	Diesel	21611.8849	312724422.2	35797556.33	9793.216131
Statewide	2024	MHDT	Aggregate	Aggregate	Gasoline	49136.1987	865662605.1	321479279.9	174320.3431
Statewide	2024	MHDT	Aggregate	Aggregate	Diesel	277729.374	3798992671	1034261638	436104.2337