

Appendix E

-nergy Calculations

Construction Fuel Consumption Calculations

San Antonio Road

Compression-Ignition Engine Brake-Specific Fuel Consumption (BSFC) Factors [1]:

HP: 0 to 100	0.0588	HP: >100	0.0529
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Equipment Fuel Consumption

PhaseName	OffRoadEquipmentType	Amount	Hours	HorsePower	LoadFactor	Fuel (gallons)
Demolition	Rubber Tired Dozers	1	1	247	0.4	208.9
Demolition	Tractors/Loaders/Backhoes	2	6	97	0.73	1997.3
Demolition	Concrete/Industrial Saws	1	8	81	0.73	1111.9
Site Preparation	Graders	1	8	187	0.41	194.5
Site Preparation	Tractors/Loaders/Backhoes	1	8	97	0.37	101.2
Grading	Concrete/Industrial Saws	1	8	81	0.73	1250.9
Grading	Tractors/Loaders/Backhoes	2	6	97	0.37	1138.9
Grading	Rubber Tired Dozers	1	1	247	0.4	235.0
Building Construction	Forklifts	2	6	89	0.2	4757.2
Building Construction	Tractors/Loaders/Backhoes	2	8	97	0.37	12789.3
Building Construction	Cranes	1	4	231	0.29	5368.2
Paving	Cement and Mortar Mixers	4	6	9	0.56	177.7
Paving	Pavers	1	7	130	0.42	505.1
Paving	Rollers	1	7	80	0.38	312.6
Paving	Tractors/Loaders/Backhoes	1	7	97	0.37	369.1
Paving	Pavers	0	8	130	0.42	0.0
Paving	Paving Equipment	0	8	132	0.36	0.0
Paving	Rollers	0	8	80	0.38	0.0
Architectural Coating	Air Compressors	1	6	78	0.48	409.2

Total Equipment Fuel Consumption	30927.1 gallons
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tblOffRoadEquipment

Equipment Fuel Consumption Notes:

- Fuel demand rate for construction equipment is derived from: total hours of operation; equipment horsepower, equipment load factor, and equipment fuel usage per hour of operation, as provided from the CalEEMod outputs (Appendix C) and from compression-ignition engine brake-specific fuel consumptions factors for engines (U.S. EPA 2018). Fuel consumed for construction equipment is assumed to be diesel.
- Fuel demand rate for hauling and vendor trips (cut material imports) is derived from hauling and vendor trip number, hauling and vendor trip length, and hauling and vendor vehicle class from “Trips and VMT” Table contained in Section 3.0, Construction Detail, of the CalEEMod results (Appendix C). The fuel economy for hauling and vendor trip vehicles is derived from the United States Department of Transportation (U.S. DOT 2018). Fuel consumed for hauling trucks is assumed to be diesel.

Trip Fuel Consumption

PhaseName	Trip Type	Working Days	Trips/day	Trip Length (mi)	MPG[2]	Fuel (gal)
Site Preparation	WorkerTripNumber	20	5	10.8	24	45.0
Site Preparation	VendorTripNumber	6	0	7.3	7.4	0.0
Site Preparation	HaulingTripNumber	6	0	20	7.4	0.0
Grading	WorkerTripNumber	45	10	10.8	24	202.5
Grading	VendorTripNumber	45	0	7.3	7.4	0.0
Grading	HaulingTripNumber	45	56.022	20	7.4	6813.5
Building Construction	WorkerTripNumber	379	99	10.8	24	16884.5
Building Construction	VendorTripNumber	379	21	7.3	7.4	7851.4
Building Construction	HaulingTripNumber	379	0	20	7.4	0.0
Architectural Coating	WorkerTripNumber	31	18	10.8	24	251.1
Architectural Coating	VendorTripNumber	31	0	7.3	7.4	0.0
Architectural Coating	HaulingTripNumber	31	0	20	7.4	0.0
Total Worker Trip Fuel Consumption (gallons)					17383.1	
Total Vendor/Haul Trip Fuel Consumption (gallons)					14665.0	

Notes: Fuel consumed for worker trips is assumed to be gasoline.

Sources:

tblOffRoadEquipment

[1] United States Environmental Protection Agency. 2018. *Exhaust and Crankcase Emission Factors for Nonroad Compression-Ignition Engines in MOVES2014b*. July 2018. Available at: <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100UXEN.pdf>.

[2] United States Department of Transportation, Bureau of Transportation Statistics. 2018. *National Transportation Statistics 2018*. Available at: <https://www.bts.gov/sites/bts.dot.gov/files/docs/browse-statistical-products-and-data/national-transportation-statistics/223001/ntsntire2018q4.pdf>. Table 4-13: Single-Unit 2-Axle 6-Tire or More Truck Fuel Consumption and Travel; Table 4-23: Average Fuel Efficiency of U.S. Light Duty Vehicles. Light duty vehicles include short wheel base includes passenger cars, light trucks, vans and sport utility vehicles with a wheelbase (WB) equal to or less than 121 inches.

tblOffRoadEquipment

PhaseName	Days
Demolition	40
Site Preparation	6
Grading	45
Building Construction	379
Architectural Coating	31
Paving	25

PhaseName	WorkerTripH	VendorTri	HaulingTriç	WorkerTripLe	VendorTripl	HaulingTripLength
Demolition	10	0	85	10.8	7.3	20
Site Preparation	5	0	0	10.8	7.3	20
Grading	10	0	2521	10.8	7.3	20
Building Construction	99	21	0	10.8	7.3	20
Architectural Coating	18	0	0	10.8	7.3	20
Paving	20	0	0	10.8	7.3	20