

# Appendix C

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Energy Calculations

# 21-11061 280-330 Skyway Drive IS-MND

Last Updated: 6/17/21

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

HP: 0 to 100	0.0588	HP: Greater than 100	0.0529
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*Values above are expressed in gallons per horsepower-hour/BSFC.*

CONSTRUCTION EQUIPMENT						
Construction Equipment	#	Hours per Day	Horsepower	Load Factor	Construction Phase	Fuel Used (gallons)
Dumpers/Tenders	1	8	16	0.38	Demolition Phase	120.05
Rough Terrain Forklifts	1	8	100	0.4	Demolition Phase	789.79
Rubber Tired Dozers	1	8	247	0.4	Demolition Phase	1,754.75
Tractors/Loaders/Backhoes	1	8	97	0.37	Demolition Phase	708.64
Graders	1	8	187	0.41	Site Preparation Phase	1,069.91
Dumpers/Tenders	1	8	16	0.38	Site Preparation Phase	120.05
Rough Terrain Forklifts	1	8	100	0.4	Site Preparation Phase	620.55
Rubber Tired Dozers	3	8	247	0.4	Site Preparation Phase	4,136.20
Tractors/Loaders/Backhoes	1	8	97	0.37	Site Preparation Phase	556.79
Bore/Drill Rigs	1	8	221	0.5	Grading Phase	934.55
Cranes	1	8	231	0.29	Grading Phase	566.56
Pumps	1	8	84	0.74	Grading Phase	584.45
Rubber Tired Dozers	1	8	247	0.4	Grading Phase	835.59
Tractors/Loaders/Backhoes	2	8	97	0.37	Grading Phase	674.90
Air Compressors	1	8	78	0.48	Building Construction Phase	4,593.88
Cement and Mortar Mixers	1	8	9	0.56	Building Construction Phase	618.41
Concrete/Industrial Saws	1	8	81	0.73	Building Construction Phase	7,255.23
Pavers	1	8	130	0.42	Building Construction Phase	6,026.18
Plate Compactors	1	8	8	0.43	Building Construction Phase	422.09
Rubber Tired Dozers	1	8	247	0.4	Building Construction Phase	10,904.51
Tractors/Loaders/Backhoes	1	8	97	0.37	Building Construction Phase	4,403.69
Paving Equipment	1	8	132	0.36	Building Construction Phase	5,244.76
Welders	1	8	46	0.45	Building Construction Phase	2,539.88
Air Compressors	1	8	78	0.48	Architectural Coating Phase	316.82
Cranes	1	8	231	0.29	Paving Phase	509.91
Pressure Washers	1	8	13	0.3	Paving Phase	33.00
Tractors/Loaders/Backhoes	1	8	97	0.37	Paving Phase	303.70
<b>Total Fuel Used</b>						<b>56,524.79</b>
						<b>(Gallons)</b>

Construction Phase	Days of Operation
Demolition Phase	42
Site Preparation Phase	33
Grading Phase	20
Building Construction Phase	261
Paving Phase	18
Architectural Coating Phase	18
<b>Total Days</b>	<b>392</b>

WORKER TRIPS				
Constuction Phase	MPG [2]	Trips	Trip Length (miles)	Fuel Used (gallons)
Demolition Phase	24.4	10	10.8	185.90

Site Preparation Phase	24.4	18	10.8	262.92
Grading Phase	24.4	15	10.8	132.79
Building Construction Phase	24.4	32	10.8	3696.79
Paving Phase	24.4	88	10.8	701.11
Architectural Coating Phase	24.4	6	10.8	47.80
<b>Total</b>				<b>5,027.31</b>

**HAULING AND VENDOR TRIPS**

Trip Class	MPG [2]	Trips	Trip Length (miles)	Fuel Used (gallons)
<b>HAULING TRIPS</b>				
Demolition Phase	7.5	171	20.0	456.00
Site Preparation Phase	7.5	0	20.0	0.00
Grading Phase	7.5	0	20.0	0.00
Building Construction Phase	7.5	0	20.0	0.00
Paving Phase	7.5	0	20.0	0.00
Architectural Coating Phase	7.5	0	20.0	0.00
<b>Total</b>				<b>456.00</b>
<b>VENDOR TRIPS</b>				
Demolition Phase	7.5	0	7.3	0.00
Site Preparation Phase	7.5	0	7.3	0.00
Grading Phase	7.5	0	7.3	0.00
Building Construction Phase	7.5	13	7.3	3302.52
Paving Phase	7.5	0	7.3	0.00
Architectural Coating Phase	7.5	0	7.3	0.00
<b>Total</b>				<b>3,302.52</b>

<b>Total Gasoline Consumption (gallons)</b>	<b>5,027.31</b>
<b>Total Diesel Consumption (gallons)</b>	<b>60,283.31</b>

**Sources:**

[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. 2019. *National Transportation Statistics 2019*. Available at: <https://www.bts.gov/topics/national-transportation-statistics>.

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Populate one of the following tables (Leave the other blank):

<b>Annual VMT</b>	<b>OR</b>	<b>Daily Vehicle Trips</b>
Annual VMT: 2,060,103		Daily Vehicle Trips: Average Trip Distance:

Fleet Class	Fleet Mix	Fuel Economy (MPG) [1]	
Light Duty Auto (LDA)	0.543528	Passenger Vehicles	24.4
Light Duty Truck 1 (LDT1)	0.058189	Light-Med Duty Trucks	17.9
Light Duty Truck 2 (LDT2)	0.173108	Heavy Trucks/Other	7.5
Medium Duty Vehicle (MDV)	0.133952	Motorcycles	44
Light Heavy Duty 1 (LHD1)	0.027894		
Light Heavy Duty 2 (LHD2)	0.007577		
Medium Heavy Duty (MHD)	0.011427		
Heavy Heavy Duty (HHD)	0.006062		
Other Bus (OBUS)	0.000688		
Urban Bus (UBUS)	0.000393		
Motorcycle (MCY)	0.029232		
School Bus (SBUS)	0.000646		
Motorhome (MH)	0.007304		

Fleet Mix					
Vehicle Type	Percent	Fuel Type	Annual VMT: VMT	Vehicle Trips: VMT	Fuel Consumption (Gallons)
Passenger Vehicles	54.35%	Gasoline	1119724	0.00	45890.31
Light-Medium Duty Trucks	36.52%	Gasoline	752451	0.00	42036.34
Heavy Trucks/Other	6.20%	Diesel	127708	0.00	17027.71
Motorcycle	2.92%	Gasoline	60221	0.00	1368.66

<b>Total Gasoline Consumption (gallons)</b>	<b>89295.32</b>
<b>Total Diesel Consumption (gallons)</b>	<b>17027.71</b>

Sources:

[1] United States Department of Transportation, Bureau of Transportation Statistics. 2019. National Transportation Statistics 2019. Available at: <https://www.bts.gov/topics/national-transportation-statistics>.