

Appendix E

Energy Calculations

21-10972 SLO Water Ordinance

Fuel Energy Quantification

Last Updated: 1/12/2022

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		Load		Construction Phase	Fuel Used (gallons)
		Day	Horsepower	Factor			
Crawler Tractors	2	8	212	0.43		Const - Site Preparation	1,541.96
Excavators	2	8	158	0.38		Const - Site Preparation	1,015.57
Tractors/Loaders/Backhoes	2	8	97	0.37		Const - Site Preparation	674.90
Bore/Drill Rigs	1	20	221	0.5		Const - Well Development	1,168.18
Tractors/Loaders/Backhoes	1	12	95	0.37		Op - Site Prep - Discing	49.57
Tractors/Loaders/Backhoes	1	12	95	0.37		Op - Site Prep - Mowing	24.79
Tractors/Loaders/Backhoes	1	12	95	0.37		Op - Maint - Fung. Herb.	223.08
Tractors/Loaders/Backhoes	2	12	95	0.37		Op - Harvesting - Equip	148.72
Other Construction Equipment	1	12	140	0.38		Op - Harvesting - Equip	101.24
Pumps	1	4	7	0.74		Op - Well Operations	444.42
Pumps	1	4	7	0.74		Op - Well Operations	444.42
Total Fuel Used							5,836.85 (Gallons)

Notes:

1. The Main Well Pump and the Booster Pumps are split into separate rows for ease of modeling as only 80 new wells are constructed but it is assumed that 253 new booster pumps would be added.

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Construction Phase	Days of Operation
Const - Site Preparation	20
Const - Well Development	10
Op - Site Prep - Discing	2
Op - Site Prep - Mowing	1
Op - Planting - Worker	8
Op - Planting - Foreman	17
Op - Maint - General - Worker	17
Op - Maint - General - Foreman	29
Op - Maint - Fung. Herb.	9
Op - Harvesting - Equip	3
Op - Harvesting - Worker Only	8
Op - Harvesting - Foreman Only	26
Op - Well Operations	365

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WORKER TRIPS

Constuction Phase	MPG [2]	Trips	Trip Length (miles)	Fuel Used (gallons)
Const - Site Preparation	24.4	4	32.0	104.92
Const - Well Development	24.4	4	54.0	88.52
Op - Site Prep - Discing	24.4	4	32.0	10.49
Op - Site Prep - Mowing	24.4	4	32.0	5.25
Op - Planting - Worker	24.4	2	54.0	35.41
Op - Planting - Foreman	24.4	2	10.0	13.93
Op - Maint - General - Worker	24.4	2	54.0	75.25
Op - Maint - General - Foreman	24.4	2	10.0	23.77
Op - Maint - Fung. Herb.	24.4	4	43.3	63.81
Op - Harvesting - Equip	24.4	4	32.0	15.74
Op - Harvesting - Worker Only	24.4	2	54.0	35.41
Op - Harvesting - Foreman Only	24.4	2	10.0	21.31
Op - Well Operations	24.4	0	0.0	0.00
Total				493.81

HAULING AND VENDOR TRIPS

Trip Class	MPG [2]	Trips	Trip Length (miles)	Fuel Used (gallons)
HAULING TRIPS				
Op - Harvesting - Equip	7.5	26	108.0	374.40
Total				374.40

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Energy Consumption Totals

1 - site	Total Gasoline Consumption (gallons) - Construction	193.44
	Total Diesel Consumption (gallons) - Construction	4,400.61
12- Sites	Total Gasoline Consumption (gallons) - Construction	2,321.31
	Total Diesel Consumption (gallons) - Construction	43,461.83
1 - site	Total Gasoline Consumption (gallons) - Operations	300.37
	Total Diesel Consumption (gallons) - Operations	1,810.64
264- Sites	Total Gasoline Consumption (gallons) - Operations	79,297.38
	Total Diesel Consumption (gallons) - Operations	399,790.98
252 Op Sites & 12 Construction	Total Gasoline Consumption (gallons) - Construction + Ops	78,014.26
	Total Diesel Consumption (gallons) - Construction + Ops	499,743.41

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>.

21-10972 SLO Water Ordinance Pump Electricity Consumption

New Well Pump

7 hp
 746 watts per hp¹
 5,222 watts per pump
 4 hours of operation
 20,888 Watt-hrs per pump
 21 KWh per pump per day
 7,624 Annual KWh per pump
 1 pumps per well
 7,624 Annual KWh per well
 0.00762 Annual GWhs per well
 88 New wells
 670,923 Annual KWh per program
 671 Annual MWhs
 0.67092256 Annual GWhs.

Booster Well Pump

7 hp
 746 watts per hp¹
 5,222 watts per pump
 4 hours of operation
 20,888 Watt-hrs per pump
 21 KWh per pump per day
 7,624 Annual KWh per pump
 1 pumps per site
 7,624 Annual KWh per site
 0.00762 Annual GWhs per well
 264 New sites
 2,012,768 Annual KWh per program
 2,013 Annual MWhs
 2.01276768 Annual GWhs.

Total Program Electrical Usage from Pumps

2,683,690 Annual KWh per program
 2,684 Annual MWhs
 2.7 Annual GWhs.

272576 GWhs' In California
 78501.888 GWhs' PG&E
 0.003% % PG&E
 0.001% % State

7,236 GWh growth in California between 2020 and 2030
 0.00037088 % State Growth

Source:

Water Pump Power Consumption Calculator | 0.2 hp to 20 hp Calculation (letsavelectricity.com)