

# Appendix H

## **Energy Consumption Worksheets**





**Complete Streets Improvements  
Construction Energy Analysis**

**Construction Fuel Summary**

164,567 gallons of diesel fuel for heavy-duty construction equipment  
11,050 gallons of diesel fuel for haul trucks  
6,887 gallons of diesel fuel for vendor trucks  
11,385 gallons of fuel (primarily gasoline) for workers

182,504 Total Gallons Diesel  
11,385 Total Gallons Gasoline

	State Fuel Consumption (2014, gallons)	Percent of Annual Project Compared to State
Diesel	3,400,000,000	0.0054%
Gasoline	14,400,000,000	0.0001%

**Estimated Fuel Savings from Project Regulatory Compliance and Mitigation Measures**

Estimated Diesel Fuel Savings from Anti-Idling Regulation:  
8,298 gallons diesel fuel savings (total)

State fuel consumption data:

United States Energy Information Administration (USEIA), "Table F3: Motor Gasoline Consumption, Price, and Expenditure Estimates, 2015," [http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep\\_fuel/html/fuel\\_mg.html&sid=CA](http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_fuel/html/fuel_mg.html&sid=CA), accessed December 2016;  
"Table F7: Distillate Fuel Oil Consumption Estimates, 2015,"  
[http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep\\_fuel/html/fuel\\_use\\_df.html&sid=CA](http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_fuel/html/fuel_use_df.html&sid=CA), accessed December 2016.

**Complete Streets Improvements**

**Construction Energy Analysis**

**Off-Road Equipment**

**Equipment ≤ 50 hp**

pounds fuel/hp-hr (OFFROAD2011 model, ≤ 50 hp): 0.408 lb/hp-hr  
 diesel pounds/gallon (CARB density assumption): 7.07 lb/gal  
 diesel gallons/hp-hr: 0.0577 gal/hp-hr  
 Total hp-hr for equipment ≤ 50 hp: 21,850 hp-hr  
 Total diesel gallons: 1,261 gal

**Equipment > 50 hp**

pounds fuel/hp-hr (OFFROAD2011 model, > 50 hp): 0.367 lb/hp-hr  
 diesel pounds/gallon (CARB density assumption): 7.07 lb/gal  
 diesel gallons/hp-hr: 0.0519 gal/hp-hr  
 Total hp-hr for equipment > 50 hp: 504,088 hp-hr  
 Total diesel gallons: 26,167 gal

**Total diesel gallons (off-road equipment):** 27,428 gal (1/6th of project)  
 164,567 gal (full project)

Phase	Equipment	Number	Hours/Day	HP	Load	Days	Total hp-hr
<b>Proposed Project</b>							
1 Demolition	Concrete/Industrial Saws	2	10	81	0.73	13	15,374
1 Demolition	Crushing/Proc. Equipment	2	10	85	0.78	13	17,238
1 Demolition	Excavators	2	10	162	0.38	13	16,006
1 Demolition	Rubber Tired Loaders	2	10	199	0.36	13	18,626
1 Demolition	Signal Boards	4	10	6	0.82	13	2,558
1 Demolition	Tractors/Loaders/Backhoes	2	10	97	0.37	13	9,331
2 Site Preparation	Excavators	2	10	162	0.38	13	16,006
2 Site Preparation	Rubber Tired Loaders	2	10	199	0.36	13	18,626
2 Site Preparation	Signal Boards	4	10	6	0.82	13	2,558
2 Site Preparation	Tractors/Loaders/Backhoes	2	10	97	0.37	13	9,331
3 Grading	Excavators	2	10	162	0.38	13	16,006
3 Grading	Plate Compactors	2	10	8	0.43	13	894
3 Grading	Rubber Tired Loaders	2	10	199	0.36	13	18,626
3 Grading	Signal Boards	4	10	6	0.82	13	2,558
3 Grading	Tractors/Loaders/Backhoes	2	10	97	0.37	13	9,331
4 Utility Trenching	Tractors/Loaders/Backhoes	2	10	97	0.37	13	9,331
4 Utility Trenching	Trenchers	2	10	80	0.5	13	10,400
5 Building Construction	Excavators	2	10	162	0.38	25	30,780
5 Building Construction	Plate Compactors	2	10	8	0.43	25	1,720
5 Building Construction	Rubber Tired Loaders	2	10	199	0.36	25	35,820
5 Building Construction	Signal Boards	4	10	6	0.82	25	4,920
5 Building Construction	Tractors/Loaders/Backhoes	4	10	97	0.37	25	35,890
6 Paving	Excavators	2	10	162	0.38	25	30,780
6 Paving	Forklifts	2	10	89	0.2	25	8,900
6 Paving	Graders	2	10	174	0.41	25	35,670
6 Paving	Pavers	2	10	125	0.42	25	26,250
6 Paving	Paving Equipment	4	10	130	0.36	25	46,800
6 Paving	Plate Compactors	2	10	8	0.43	25	1,720
6 Paving	Rollers	2	10	80	0.38	25	15,200
6 Paving	Rubber Tired Loaders	2	10	199	0.36	25	35,820
6 Paving	Signal Boards	4	10	6	0.82	25	4,920
6 Paving	Tractors/Loaders/Backhoes	2	10	97	0.37	25	17,945
		(1/6th of project)		Total hp-hr for equipment ≤ 50 hp:			21,850
		(1/6th of project)		Total hp-hr for equipment > 50 hp:			504,088

**Complete Streets Improvements  
Construction Energy Analysis**

**On-Road Haul Trucks**

EMFAC2014 Diesel Fuel Consumption Factor: <sup>1</sup>	0.1715 gallons/mile		
Total Haul Truck VMT:	9,580 miles		
<b>Total VMT diesel gallons (on-road haul trucks):</b>	<b>1,643</b>		
<i>Estimated Fuel Savings from</i>			
<i>Anti-Idling Regulation (64 percent based on</i>			
<i>estimated CARB emissions reductions):<sup>3</sup></i>			
EMFAC2014 Diesel Fuel Consumption Factor: <sup>2</sup>	1.6569 gallons/hour		
Total Haul Truck Idle-Hours per Year:	120 hours		
<b>Total Idling diesel gallons (on-road haul trucks):</b>	<b>198</b>		
			<i>(1/6th of project) 551</i>
			<i>(full project) 3,307</i>
<b>Total diesel gallons (on-road haul trucks):</b>	<b>1,842 gal</b>	<b>(1/6th of project)</b>	
	<b>11,050 gal</b>	<b>(full project)</b>	

1. California Air Resources Board, EMFAC2014 (San Diego Air Basin; T7 Single Construction; Annual; CY 2017; Aggregate MY; Aggregate Speed)
2. California Air Resources Board, EMFAC2014 (San Diego Air Basin; T7 Single Construction; Annual; CY 2017; Aggregate MY; 5 miles per hour converted to hourly rate)
3. Source: California Air Resources Board (CARB), 2004. Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling, Appendix F, July 2004, <https://www.arb.ca.gov/regact/idling/idling.htm>, accessed November 2016.

Phase	Days	Total One-Way		VMT	Idle Hours
		Trips	Miles/Trip		
<b>Proposed Project</b>					
1 Demolition	13	-	-	-	-
2 Site Preparation	13	375	20	7,500	94
3 Grading	13	104	20	2,080	26
4 Utility Trenching	13	-	-	-	-
5 Building Construction	25	-	-	-	-
6 Paving	25	-	-	-	-
	(1/6th of project)		Total Haul Truck VMT:	9,580	
	(1/6th of project)		Total Idle-Hours:		120

**Complete Streets Improvements  
Construction Energy Analysis**

**On-Road Vendor Trucks**

EMFAC2014 Diesel Fuel Consumption Factor:<sup>1</sup> 0.1541 gallons/mile  
 Total Vendor Truck VMT: 5,504 miles  
**Total VMT diesel gallons (on-road vendor trucks): 848**

EMFAC2014 Diesel Fuel Consumption Factor:<sup>2</sup> 1.5889 gallons/hour  
 Total Vendor Truck Idle-Hours per Year: 189 hours  
**Total Idling diesel gallons (on-road vendor trucks): 299**

**Total diesel gallons (on-road vendor trucks): 1,148 gal (1/6th of project)**  
**6,887 gal (full project)**

*Estimated Fuel Savings from  
 Anti-Idling Regulation (64 percent based on  
 estimated CARB emissions reductions):<sup>3</sup>*  
*(1/6th of project) 832*  
*(full project) 4,992*

1. California Air Resources Board, EMFAC2014 (San Diego Air Basin; HHDT and MHDT; Annual; CY 2017; Aggregate MY; Aggregate Speed)
2. California Air Resources Board, EMFAC2014 (San Diego Air Basin; HHDT and MHDT; Annual; CY 2017; Aggregate MY; 5 miles per hour converted to hourly rate)
3. Source: California Air Resources Board (CARB), 2004. Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling, Appendix F, July 2004, <https://www.arb.ca.gov/regact/idling/idling.htm>, accessed November 2016.

Phase	Days	One-Way Trips/Day	Miles/Trip	VMT	Idle Hours
<b>Proposed Project</b>					
1 Demolition	13	2	7.3	190	7
2 Site Preparation	13	2	7.3	190	7
3 Grading	13	2	7.3	190	7
4 Utility Trenching	13	2	7.3	190	7
5 Building Construction	25	24	7.3	4,380	150
6 Paving	25	2	7.3	365	13
	(1/6th of project)	Total Vendor Truck VMT:		5,504	
	(1/6th of project)	Total Idle-Hours:			189

**Complete Streets Improvements  
Construction Energy Analysis**

**On-Road Workers (LDA, LDT1, LDT2)**

EMFAC2014 Gasoline Fuel Consumption Factor: <sup>1</sup>	0.0418	gallons/mile	
Total Worker VMT:	45,360	miles	
<b>Total gasoline gallons (workers):</b>	<b>1,898</b>		
<b>Total gasoline gallons with Savings (workers):</b>	<b>1,898</b>	gal	<b>(1/6th of project)</b>
	<b>11,385</b>	gal	<b>(full project)</b>

1. California Air Resources Board, EMFAC2014 (San Diego Air Basin; LDA, LDT1, LDT2; CY 2017; Aggregate MY; Aggregate Speed)

Phase	Days	One-Way Trips/Day	Miles/Trip	VMT
<b>Proposed Project</b>				
1 Demolition	13	35	10.8	4,914
2 Site Preparation	13	25	10.8	3,510
3 Grading	13	30	10.8	4,212
4 Utility Trenching	13	10	10.8	1,404
5 Building Construction	25	56	10.8	15,120
6 Paving	25	60	10.8	16,200
		(1/6th of project)	Total Worker VMT:	45,360