

Air Quality Emissions Calculations

Vehicle Class	Proposed Action - VMT/yr and Idling Time (hr/yr)	Emissions (tons/year)										
		CO	NOx	SO ₂	PM ₁₀	PM _{2.5}	VOC	CO ₂	CH ₄	N ₂ O	CO ₂ e	MSAT
Passenger Car	1,449,835	2.84	0.09	0.00	0.05	0.01	0.02	386.04	0.01	0.00	386.78	0.00
Passenger Truck	1,449,835	3.25	0.18	0.00	0.06	0.01	0.03	512.84	0.01	0.00	513.92	0.00
Single Unit Truck	15,447,508	90.55	3.09	0.10	1.27	0.31	1.65	15,200.46	0.28	0.07	15,228.84	0.16
Combination Truck	1,490,432	34.30	3.10	0.02	0.39	0.12	0.90	2,733.47	0.15	0.02	2,743.43	0.09
Idling Truck	727,575	32.47	46.98	0.02	0.40	0.37	2.75	5,858.13	0.60	0.00	5,873.16	0.34
Total Emissions		163.41	53.43	0.14	2.17	0.82	5.35	24,690.93	1.05	0.10	24,746.12	0.60

Vehicle Class or Rail	Alternative 1 - VMT/yr and Idling Time (hr/yr)	Emissions (tons/year)										
		CO	NOx	SO ₂	PM ₁₀	PM _{2.5}	VOC	CO ₂	CH ₄	N ₂ O	CO ₂ e	MSAT
Passenger Car	1,449,835	2.84	0.09	0.00	0.05	0.01	0.02	386.04	0.01	0.00	386.78	0.00
Passenger Truck	1,449,835	3.25	0.18	0.00	0.06	0.01	0.03	512.84	0.01	0.00	513.92	0.00
Single Unit Truck	15,447,508	90.55	3.09	0.10	1.27	0.31	1.65	15,200.46	0.28	0.07	15,228.84	0.16
Combination Truck	852,502	19.62	1.77	0.01	0.23	0.07	0.52	1,563.50	0.09	0.01	1,569.19	0.05
Idling Truck	700,172	31.25	45.21	0.02	0.38	0.35	2.64	5,637.49	0.58	0.00	5,651.96	0.33
Rail ⁽¹⁾	5,758 ton-miles/train round trip	0.50	2.20	0.03	0.05	0.05	0.24	102.46	0.01	0.00	103.74	0.00
Total Emissions		148.00	52.53	0.17	2.04	0.80	5.10	23,402.79	0.98	0.09	23,454.43	0.55

⁽¹⁾ Includes rail idling emissions; assumed 30 minutes per train.

Vehicle Class	Alternative 2 - VMT/yr and Idling Time (hr/yr)	Emissions (tons/year)										
		CO	NOx	SO ₂	PM ₁₀	PM _{2.5}	VOC	CO ₂	CH ₄	N ₂ O	CO ₂ e	MSAT
Passenger Car	966,557	1.89	0.06	0.00	0.03	0.01	0.02	257.36	0.01	0.00	257.85	0.00
Passenger Truck	966,557	2.16	0.12	0.00	0.04	0.01	0.02	341.89	0.01	0.00	342.61	0.00
Single Unit Truck	10,349,886	60.67	2.07	0.07	0.85	0.21	1.10	10,184.36	0.19	0.05	10,203.38	0.11
Combination Truck	999,422	23.00	2.08	0.01	0.26	0.08	0.60	1,832.95	0.10	0.01	1,839.63	0.06
Idling Truck	487,513	21.76	31.48	0.01	0.27	0.25	1.84	3,925.25	0.40	0.00	3,935.32	0.23
Total Emissions		109.48	35.80	0.10	1.45	0.55	3.58	16,541.82	0.71	0.06	16,578.80	0.40

Assume 15 minutes idling for all trucks entering the site for proposed action and both alternatives.

Class 1	Motocycles, Car, Van, Pickup
Class 2	Single-Unit Truck
Class 3	Double Unit Truck
Class 4	Triple Unit Truck

Conversion from Daily to Yearly Traffic, based on R112 PTR

Year	2019
Annual Average Daily Traffic	45109
Tue/Wed/Thu Average Daily Traffic	49608
AADT/T-Th Factor	0.91

Site	Description
A	Shaw north of E Pioneer
C	E Pioneer east of 13th St SE
D	E Main Ave north of 5th Ave NE

	Scenario A - Proposal (covenant)	Scenario B (Proposal, with rail)	Scenario D (Mitigated site plan)
Bldg sq ft	2.6m	2.6m	1.7m
Peak hour trips	884	856	579
Heavy Truck	771	441	517
Light Truck	7,991	7,991	5,354
Employee	1500 total (500 each shift)	1500 total (500 each shift)	1000 total (333 each shift)

Vehicle Class	Scenario A		Scenario B		Scenario D	
	Daily	Yearly	Daily	Yearly	Daily	Yearly
Passenger Car	1,500	498,225	1,500	498,225	1,000	332,150
Single-Unit Truck	7,991	2,654,211	7,991	2,654,211	5,354	1,778,331
Double & Triple Unit Truck	771	256,088	441	146,478	517	171,722

Roundtrip Distance from Freeway to Site (miles)

To/From SR 512	3.53
To/From SR 410	2.29
Total	5.82

Average Vehicle Speed from Tube Counts (mph)

Site	EB	WB	NB	SB
A			40.8	35.7
C	36.1	36.6		
D			39.8	39

Average for All

38

Scenario A Total Vehicle Miles Traveled (Yearly) and Average Speed

Vehicle Class	VMT	Avg Speed
Passenger Car, Van, Pickup	2,899,670	38
Single-Unit Truck	15,447,508	
Double & Triple Unit Truck	1,490,432	

MOVES Vehicle Type	VMT	Avg Speed
21	1449835	38
31	1449835	38
52	15447508	38
61	1490432	38

Scenario B Total Vehicle Miles Traveled (Yearly) and Average Speed

Vehicle Class	VMT	Avg Speed
Passenger Car, Van, Pickup	2,899,670	38
Single-Unit Truck	15,447,508	
Double & Triple Unit Truck	852,502	

MOVES Vehicle Type	VMT	Avg Speed
21	1449835	38
31	1449835	38
52	15447508	38
61	852502	38

Scenario D Total Vehicle Miles Traveled (Yearly) and Average Speed

Vehicle Class	VMT	Avg Speed
Passenger Car, Van, Pickup	1,933,113	38
Single-Unit Truck	10,349,886	
Double & Triple Unit Truck	999,422	

MOVES Vehicle Type	VMT	Avg Speed
21	966557	38
31	966557	38
52	10349886	38
61	999422	38

MOVES Speed Bin = 9
37.5 mph <= Speed <42.5 mph

Kuntson Farms EIS - Rail Alternative - Locomotive Throughput Data and Criteria Pollutant and CO₂ Emissions

400 tons-miles/gal diesel (EPA document; Technical Highlights - Emission Factors for Locomotives, EPA-420-F-09-025, April 2009)
15.2 bhp-hr/gal (conversion factor, switching haul, EPA-420-F-09-025)
67 tons/rail car [national avg. (1991-2001) from https://www.bts.gov/archive/publications/transportation_statistics_annual_report/2003/chapter_02/railcar_weights]
1.25 miles for the rail spur
55 rail cars/train
2 trains/day
5,758 tons-miles/train round trip (assumes train weight after unloading for return trip is 25% of full load)
14.4 gal diesel per train round trip
3.94 gal/hour/train of diesel fuel for idling (estimated average locomotive fuel use on idle setting: <https://www.railserveleaf.biz/pdf/rsi-white-paper-fuel-emissions.pdf>)
0.5 hours, Assumed idle time per train (30 minutes)
32.7 gal/day diesel fuel, including for idling
11,936 gal/yr train diesel fuel
15.2 bhp-hr/gal (EPA-420-F-09-025)

Switch Locomotive Average Emission Factors (grams/horsepower-per hour), CH₄ and N₂O Emission Factors (grams/gallon diesel fuel)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O
Locomotive	11.00	1.20	2.50	0.16	0.26	0.25	512.38	0.8	0.26

Notes:
Emission factors are based on the Switch Locomotives - Exhaust Emission Standards (40 CFR 1033.101)
Emission factors are conservatively based on Tier 1 locomotive.
Emission factor for PM2.5 is 97% of PM10
Emission Factors for CH₄ and N₂O from EPA's Emission Factors for Greenhouse Gas Inventories, April 2022.
bhp = brake horsepower
gal = gallons
hr = hour
yr = year

Locomotive Emissions (tons/yr)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O
2.2	0.24	0.5	0.03	0.05	0.05	102.46	0.01	0.003

Idle fuel use (gal/hr) per locomotive type

3
3.1
3.3
3.8
3.8
3.8
3.8
3.5
3.5
4.6
4.6
5.5
5.2
3.5
5
4
2.9
5.5
6
3
3
3.4
3.4
3.4

94.6 Total
3.941667 Average (gal/hr)

Kuntson Farms EIS - Rail Alternative - Locomotive Mobile Source Air Toxics Emissions Estimates

MSAT	Emission Factor ^(a)	Units	Diesel Fuel Use	Units	Diesel Heating Value ^(b)	Units	Emissions	Units
Benzene	7.76E-04	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	6.34E-04	tons/year
Toluene	2.81E-04	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	2.30E-04	tons/year
Xylene	1.93E-04	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	1.58E-04	tons/year
Formaldehyde	7.89E-05	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	6.45E-05	tons/year
Acrolein	7.88E-06	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	6.44E-06	tons/year
Acetaldehyde	2.52E-05	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	2.06E-05	tons/year
Total Polycyclic Aromatic Hydrocarbons	2.12E-04	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	1.73E-04	tons/year
TOTAL							1.29E-03	tons/year

^(a) MSAT emission factors obtained from EPA AP-42 document; large stationary diesel engine emission factors in Tables 3.4-3 and 3.4-4 as surrogates.

^(b) Diesel heating value obtained from AP-42, Appendix A - Miscellaneous Data and Conversion Factors

Summary

Vehicle Class	Proposed Action - VMT/yr and Idling Time (hr/yr)	Emissions (tons/year)										
		CO	NOx	SO ₂	PM ₁₀	PM _{2.5}	VOC	CO ₂	CH ₄	N ₂ O	CO ₂ e	MSAT
Passenger Car	6,999,801	13.70	0.42	0.01	0.25	0.04	0.11	1,863.80	0.04	0.01	1,867.36	0.01
Passenger Truck	6,999,801	15.67	0.85	0.02	0.27	0.05	0.16	2,476.00	0.06	0.01	2,481.19	0.02
Single Unit Truck	2,580,704	15.13	0.52	0.02	0.21	0.05	0.28	2,539.43	0.05	0.01	2,544.17	0.03
Combination Truck	284,167	6.54	0.59	0.00	0.08	0.02	0.17	521.17	0.03	0.00	523.06	0.02
Idling Truck	123,062	5.49	7.95	0.00	0.07	0.06	0.46	990.84	0.10	0.00	993.38	0.06
Total Emissions		56.54	10.33	0.05	0.87	0.23	1.19	8,391.23	0.28	0.04	8,409.17	0.13

Vehicle Class or Rail	Alternative 1 - VMT/yr and Idling Time (hr/yr)	Emissions (tons/year)										
		CO	NOx	SO ₂	PM ₁₀	PM _{2.5}	VOC	CO ₂	CH ₄	N ₂ O	CO ₂ e	MSAT
Passenger Car	6,999,801	13.70	0.42	0.01	0.25	0.04	0.11	1,863.80	0.04	0.01	1,867.36	0.01
Passenger Truck	6,999,801	15.67	0.85	0.02	0.27	0.05	0.16	2,476.00	0.06	0.01	2,481.19	0.02
Single Unit Truck	2,103,226	12.33	0.42	0.01	0.17	0.04	0.22	2,069.59	0.04	0.01	2,073.45	0.02
Combination Truck	230,041	5.29	0.48	0.00	0.06	0.02	0.14	421.90	0.02	0.00	423.44	0.01
Idling Truck	100,226	4.47	6.47	0.00	0.06	0.05	0.38	806.98	0.08	0.00	809.05	0.05
Rail ⁽¹⁾	5,758 ton-miles/train round trip	0.50	2.20	0.03	0.05	0.05	0.24	102.46	0.01	0.00	103.74	0.00
Total Emissions		51.97	10.84	0.08	0.86	0.25	1.26	7,740.72	0.25	0.04	7,758.23	0.11

⁽¹⁾ Includes rail idling emissions; assumed 30 minutes per train.

Vehicle Class	Alternative 2 - VMT/yr and Idling Time (hr/yr)	Emissions (tons/year)										
		CO	NOx	SO ₂	PM ₁₀	PM _{2.5}	VOC	CO ₂	CH ₄	N ₂ O	CO ₂ e	MSAT
Passenger Car	4,666,534	9.14	0.28	0.01	0.17	0.03	0.07	1,242.53	0.03	0.01	1,244.91	0.01
Passenger Truck	4,666,534	10.45	0.57	0.01	0.18	0.03	0.11	1,650.67	0.04	0.01	1,654.13	0.01
Single Unit Truck	1,720,473	10.08	0.34	0.01	0.14	0.03	0.18	1,692.96	0.03	0.01	1,696.12	0.02
Combination Truck	189,447	4.36	0.39	0.00	0.05	0.02	0.11	347.45	0.02	0.00	348.71	0.01
Idling Truck	82,041	3.66	5.30	0.00	0.05	0.04	0.31	660.56	0.07	0.00	662.26	0.04
Total Emissions		37.69	6.88	0.03	0.58	0.15	0.79	5,594.16	0.18	0.02	5,606.12	0.09

Assume 15 minutes idling for all trucks entering the site for proposed action and both alternatives.

Emission Calc

Emission Type	Pollutant	Pollutant ID	January Emission Factor				July Emission Factor				Average Emission Factor (ton/mi)				Scenario A VMT/yr or idle hr				Scenario A Emissions (ton/yr)				Scenario B VMT/yr or idle hr				Scenario B Emissions (ton/yr)				Scenario D VMT/yr or idle hr				Scenario D Emissions (ton/yr)			
			21	31	52	61	21	31	52	61	21	31	52	61	21	31	52	61	21	31	52	61	21	31	52	61	21	31	52	61	21	31	52	61				
MSAT	Benzene	20	7.0E-10	9.8E-10	5.0E-09	2.9E-08	7.4E-10	1.0E-09	5.3E-09	3.1E-08	7.2E-10	1.0E-09	5.1E-09	3.0E-08	6999801.3	6999801.3	2580704.4	284167.32	5.04E-03	7.09E-03	1.33E-02	8.48E-03	6999801.3	6999801.3	2103225.78	230041.32	5.04E-03	7.09E-03	1.08E-02	6.86E-03	4666534.2	4666534.2	1720473.48	189446.82	3.36E-03	4.73E-03	8.85E-03	5.65E-03
MSAT	Formaldehyde	25	2.5E-10	3.5E-10	1.8E-09	1.0E-08	2.6E-10	3.7E-10	1.9E-09	1.1E-08	2.5E-10	3.6E-10	1.8E-09	1.1E-08	6999801.3	6999801.3	2580704.4	284167.32	1.78E-03	2.50E-03	4.72E-03	3.02E-03	6999801.3	6999801.3	2103225.78	230041.32	1.78E-03	2.50E-03	3.85E-03	2.45E-03	4666534.2	4666534.2	1720473.48	189446.82	1.19E-03	1.66E-03	3.15E-03	2.01E-03
MSAT	Butadiene	24	3.3E-11	5.8E-11	6.5E-11	7.4E-11	3.3E-11	5.8E-11	6.4E-11	7.4E-11	3.3E-11	5.8E-11	6.5E-11	7.4E-11	6999801.3	6999801.3	2580704.4	284167.32	2.30E-04	4.08E-04	1.66E-04	2.10E-05	6999801.3	6999801.3	2103225.78	230041.32	2.30E-04	4.08E-04	1.36E-04	1.70E-05	4666534.2	4666534.2	1720473.48	189446.82	1.53E-04	2.72E-04	1.11E-04	1.40E-05
MSAT	Naphthalene Particle	23	7.5E-14	1.1E-13	8.1E-13	4.2E-12	7.5E-14	1.1E-13	8.1E-13	4.3E-12	7.5E-14	1.1E-13	8.1E-13	4.3E-12	6999801.3	6999801.3	2580704.4	284167.32	5.23E-07	7.80E-07	2.08E-06	1.22E-06	6999801.3	6999801.3	2103225.78	230041.32	5.23E-07	7.80E-07	1.70E-06	8.88E-07	4666534.2	4666534.2	1720473.48	189446.82	3.49E-07	5.20E-07	1.39E-06	8.14E-07
MSAT	Naphthalene Gas	185	3.2E-11	4.7E-11	2.1E-10	1.2E-09	3.4E-11	4.9E-11	2.3E-10	1.3E-09	3.3E-11	4.8E-11	2.2E-10	1.3E-09	6999801.3	6999801.3	2580704.4	284167.32	2.32E-04	3.34E-04	5.69E-04	3.55E-04	6999801.3	6999801.3	2103225.78	230041.32	2.32E-04	3.34E-04	4.64E-04	2.88E-04	4666534.2	4666534.2	1720473.48	189446.82	1.55E-04	2.23E-04	3.80E-04	2.37E-04
MSAT	Acrolein	27	1.1E-11	1.6E-11	7.8E-11	4.5E-10	1.2E-11	1.7E-11	8.2E-11	4.8E-10	1.1E-11	1.6E-11	8.0E-11	4.6E-10	6999801.3	6999801.3	2580704.4	284167.32	8.02E-05	1.14E-04	2.07E-04	1.31E-04	6999801.3	6999801.3	2103225.78	230041.32	8.02E-05	1.14E-04	1.68E-04	1.06E-04	4666534.2	4666534.2	1720473.48	189446.82	5.53E-05	1.07E-05	1.38E-04	8.73E-05
MSAT	Acetaldehyde	26	1.5E-10	2.2E-10	8.8E-10	4.8E-09	1.5E-10	2.3E-10	9.0E-10	4.9E-09	1.5E-10	2.3E-10	8.9E-10	4.8E-09	6999801.3	6999801.3	2580704.4	284167.32	1.06E-03	1.58E-03	2.29E-03	1.37E-03	6999801.3	6999801.3	2103225.78	230041.32	1.06E-03	1.58E-03	1.87E-03	1.11E-03	4666534.2	4666534.2	1720473.48	189446.82	7.04E-04	1.05E-03	1.53E-03	9.12E-04
MSAT	Ethylbenzene	41	2.8E-10	4.1E-10	1.8E-09	1.1E-08	2.9E-10	4.2E-10	1.9E-09	1.2E-08	2.8E-10	4.2E-10	1.8E-09	1.1E-08	6999801.3	6999801.3	2580704.4	284167.32	1.98E-03	2.91E-03	4.48E-03	3.25E-03	6999801.3	6999801.3	2103225.78	230041.32	1.98E-03	2.91E-03	3.81E-03	2.63E-03	4666534.2	4666534.2	1720473.48	189446.82	1.32E-03	1.43E-03	1.32E-03	2.17E-03
MSAT	Acenaphthene gas	170	6.3E-13	9.0E-13	4.1E-12	2.3E-11	6.5E-13	9.4E-13	4.4E-12	2.5E-11	6.4E-13	9.2E-13	4.3E-12	2.4E-11	6999801.3	6999801.3	2580704.4	284167.32	4.48E-06	6.45E-06	1.10E-05	6.85E-06	6999801.3	6999801.3	2103225.78	230041.32	4.48E-06	6.45E-06	8.95E-06	5.54E-06	4666534.2	4666534.2	1720473.48	189446.82	2.98E-06	3.90E-06	7.32E-06	4.57E-06
MSAT	Acenaphthene particle	70	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6999801.3	6999801.3	2580704.4	284167.32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6999801.3	6999801.3	2103225.78	230041.32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4666534.2	4666534.2	1720473.48	189446.82	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MSAT	Acenaphthylene gas	71	2.8E-12	4.1E-12	1.9E-11	1.1E-10	3.0E-12	4.3E-12	2.0E-11	1.1E-10	2.9E-12	4.2E-12	1.9E-11	1.1E-10	6999801.3	6999801.3	2580704.4	284167.32	2.03E-05	2.93E-05	4.98E-05	3.11E-05	6999801.3	6999801.3	2103225.78	230041.32	2.03E-05	2.93E-05	4.06E-05	2.52E-05	4666534.2	4666534.2	1720473.48	189446.82	1.35E-05	1.95E-05	3.32E-05	2.07E-05
MSAT	Acenaphthylene particle	72	2.2E-14	3.3E-14	2.4E-13	1.3E-12	2.2E-14	3.3E-14	2.4E-13	1.3E-12	2.2E-14	3.3E-14	2.4E-13	1.3E-12	6999801.3	6999801.3	2580704.4	284167.32	1.56E-07	2.32E-07	6.20E-07	3.63E-07	6999801.3	6999801.3	2103225.78	230041.32	1.56E-07	2.32E-07	5.05E-07	2.94E-07	4666534.2	4666534.2	1720473.48	189446.82	1.04E-07	1.55E-07	4.13E-07	2.42E-07
MSAT	Anthracene gas	172	5.3E-13	7.6E-13	3.5E-12	2.0E-11	5.5E-13	7.9E-13	3.7E-12	2.1E-11	5.4E-13	7.7E-13	3.6E-12	2.0E-11	6999801.3	6999801.3	2580704.4	284167.32	3.75E-06	5.41E-06	9.21E-06	5.75E-06	6999801.3	6999801.3	2103225.78	230041.32	3.75E-06	5.41E-06	7.51E-06	4.65E-06	4666534.2	4666534.2	1720473.48	189446.82	2.50E-06	3.61E-06	6.14E-06	3.88E-06
MSAT	Anthracene particle	72	2.3E-14	3.4E-14	2.5E-13	1.3E-12	2.3E-14	3.4E-14	2.5E-13	1.3E-12	2.3E-14	3.4E-14	2.5E-13	1.3E-12	6999801.3	6999801.3	2580704.4	284167.32	1.61E-07	2.41E-07	6.42E-07	3.77E-07	6999801.3	6999801.3	2103225.78	230041.32	1.61E-07	2.41E-07	5.24E-07	3.05E-07	4666534.2	4666534.2	1720473.48	189446.82	1.08E-07	1.60E-07	2.51E-07	1.51E-07
MSAT	Benz[a]anthracene gas	173	8.5E-14	1.2E-13	5.6E-13	3.2E-12	8.8E-14	1.3E-13	5.9E-13	3.4E-12	8.7E-14	1.2E-13	5.8E-13	3.3E-12	6999801.3	6999801.3	2580704.4	284167.32	6.06E-07	8.74E-07	1.49E-06	9.28E-07	6999801.3	6999801.3	2103225.78	230041.32	6.06E-07	8.74E-07	1.21E-06	7.51E-07	4666534.2	4666534.2	1720473.48	189446.82	0.04E-07	1.82E-07	9.92E-07	6.19E-07
MSAT	Benz[a]anthracene particle	73	2.1E-13	3.2E-13	2.3E-12	1.2E-11	2.1E-13	3.2E-13	2.3E-12	1.2E-11	2.1E-13	3.2E-13	2.3E-12	1.2E-11	6999801.3	6999801.3	2580704.4	284167.32	1.48E-06	2.21E-06	5.90E-06	3.46E-06	6999801.3	6999801.3	2103225.78	230041.32	1.48E-06	2.21E-06	4.81E-06	2.80E-06	4666534.2	4666534.2	1720473.48	189446.82	9.87E-07	1.47E-06	2.93E-06	2.31E-06
MSAT	Benz[b]a]pyrene gas	174	4.6E-15	6.7E-15	3.0E-14	1.7E-13	4.8E-15	6.9E-15	3.2E-14	1.8E-13	4.7E-15	6.8E-15	3.1E-14	1.8E-13	6999801.3	6999801.3	2580704.4	284167.32	3.30E-08	4.75E-08	8.09E-08	5.05E-08	6999801.3	6999801.3	2103225.78	230041.32	3.30E-08	4.75E-08	6.59E-08	4.09E-08	4666534.2	4666534.2	1720473.48	189446.82	2.20E-08	3.19E-08	5.39E-08	3.37E-08
MSAT	Benz[b]a]pyrene particle	74	5.3E-13	7.9E-13	5.7E-12	3.0E-11	5.3E-13	7.9E-13	5.7E-12	3.1E-11	5.3E-13	7.9E-13	5.7E-12	3.0E-11	6999801.3	6999801.3	2580704.4	284167.32	3.71E-06	5.54E-06	1.08E-05	6.86E-06	6999801.3	6999801.3	2103225.78	230041.32	3.71E-06	5.54E-06	1.20E-05	7.01E-06	4666534.2	4666534.2	1720473.48	189446.82	2.45E-06	3.67E-06	8.95E-06	5.78E-06
MSAT	Benz[b]fluoranthene gas	175	6.3E-14	9.1E-14	4.2E-13	2.3E-12	6.6E-14	9.4E-14	4.4E-13	2.5E-12	6.4E-14	9.3E-14	4.3E-13	2.4E-12	6999801.3	6999801.3	2580704.4	284167.32	4.50E-07	6.48E-07	1.10E-06	6.88E-07	6999801.3	6999801.3	2103225.78	230041.32	4.50E-07	6.48E-07	8.99E-07	5.57E-07	4666534.2	4666534.2	1720473.48	189446.82	3.00E-07	4.32E-07	7.35E-07	4.59E-07
MSAT	Benz[b]fluoranthene particle	75	2.6E-13	3.8E-13	2.8E-12	1.5E-11	2.6E-13	3.9E-13	2.8E-12	1.5E-11	2.6E-13	3.9E-13	2.8E-12	1.																								

Emission Calc

idle-MSAT	Benzo[<i>a,h</i>]perylene particle	76	7.0E-13	7.0E-13	123062	8.63E-08	100226	7.03E-08	82041	5.75E-08
idle-MSAT	Benzo[<i>k</i>]fluoranthene gas	177	0.0E+00	0.0E+00	123062	0.00E+00	100226	0.00E+00	82041	0.00E+00
idle-MSAT	Benzo[<i>k</i>]fluoranthene particle	77	7.1E-13	7.1E-13	123062	8.68E-08	100226	7.07E-08	82041	5.78E-08
idle-MSAT	Chrysene gas	178	2.6E-11	2.6E-11	123062	3.18E-06	100226	2.59E-06	82041	2.12E-06
idle-MSAT	Chrysene particle	78	2.6E-11	2.6E-11	123062	3.23E-06	100226	2.63E-06	82041	2.16E-06
idle-MSAT	Dibenzo[<i>a,h</i>]anthracene gas	168	0.0E+00	0.0E+00	123062	0.00E+00	100226	0.00E+00	82041	0.00E+00
idle-MSAT	Dibenzo[<i>a,h</i>]anthracene particle	68	5.6E-13	5.6E-13	123062	6.94E-08	100226	5.65E-08	82041	4.62E-08
idle-MSAT	Fluoranthene gas	169	5.5E-10	5.5E-10	123062	6.77E-05	100226	5.52E-05	82041	4.52E-05
idle-MSAT	Fluoranthene particle	69	8.0E-11	8.0E-11	123062	9.85E-06	100226	8.02E-06	82041	6.56E-06
idle-MSAT	Fluorene gas	181	8.3E-10	8.3E-10	123062	1.02E-04	100226	8.29E-05	82041	6.79E-05
idle-MSAT	Fluorene particle	81	3.6E-11	3.6E-11	123062	4.40E-06	100226	3.58E-06	82041	2.93E-06
idle-MSAT	Indeno[1,2,3- <i>c,d</i>]pyrene gas	182	0.0E+00	0.0E+00	123062	0.00E+00	100226	0.00E+00	82041	0.00E+00
idle-MSAT	Indeno[1,2,3- <i>c,d</i>]pyrene particle	82	1.1E-12	1.1E-12	123062	1.38E-07	100226	1.13E-07	82041	9.21E-08
idle-MSAT	Naphthalene gas	185	1.8E-08	1.8E-08	123062	2.17E-03	100226	1.77E-03	82041	1.43E-03
idle-MSAT	Naphthalene particle	23	5.0E-13	5.0E-13	123062	6.11E-08	100226	4.98E-08	82041	4.08E-08
idle-MSAT	Phenanthrene gas	183	1.4E-09	1.4E-09	123062	1.74E-04	100226	1.41E-04	82041	1.16E-04
idle-MSAT	Phenanthrene particle	83	8.4E-11	8.4E-11	123062	1.04E-05	100226	8.46E-06	82041	6.93E-06
idle-MSAT	Pyrene gas	184	6.5E-10	6.5E-10	123062	8.03E-05	100226	6.54E-05	82041	5.35E-05
idle-MSAT	Pyrene particle	84	1.2E-10	1.2E-10	123062	1.42E-05	100226	1.16E-05	82041	9.47E-06

CO2 equivalent based on global warming potential (GWP) of 1 for CO2, 25 for CH4, and 298 for N2O, per 40 CFR 98.

VMT and Speed

Class 1	Motocycles, Car, Van, Pickup
Class 2	Single-Unit Truck
Class 3	Double Unit Truck
Class 4	Triple Unit Truck

Conversion from Daily to Yearly Traffic, based on R112 PTR

Year	2019
Annual Average Daily Traffic	45109
Tue/Wed/Thu Average Daily Traffic	49608
AADT/T-Th Factor	0.91

Site	Description
A	Shaw north of E Pioneer
C	E Pioneer east of 13th St SE
D	E Main Ave north of 5th Ave NE

Daily and Yearly Traffic from Site

Vehicle Class	Scenario A		Scenario B		Scenario D	
	Daily	Yearly	Daily	Yearly	Daily	Yearly
Passenger Car	7,242	2,405,430	7,242	2,405,430	4,828	1,603,620
Single-Unit Truck	1,335	443,420	1,088	361,379	890	295,614
Double & Triple Unit Truck	147	48,826	119	39,526	98	32,551

Roundtrip Distance from Freeway to Site (miles)

To/From SR 512	3.53
To/From SR 410	2.29
Total	5.82

Average Vehicle Speed from Tube Counts (mph)

Site	EB	WB	NB	SB
A			40.8	35.7
C	36.1	36.6		
D			39.8	39

Average for All 38

Scenario A Total Vehicle Miles Traveled (Yearly) and Average Speed

Vehicle Class	VMt	Avg Speed
Passenger Car, Van, Pickup	13,999,603	38
Single-Unit Truck	2,580,704	
Double & Triple Unit Truck	284,167	

320 4,938.13
1477 4,201.61
1477 462.65
9,602.39

MOVES Vehicle Type	VMt	Avg Speed
21	6999801	38
31	6999801	38
52	2580704	38
61	284167	38

Scenario B Total Vehicle Miles Traveled (Yearly) and Average Speed

Vehicle Class	VMt	Avg Speed
Passenger Car, Van, Pickup	13,999,603	38
Single-Unit Truck	2,103,226	
Double & Triple Unit Truck	230,041	

MOVES Vehicle Type	VMt	Avg Speed
21	6999801	38
31	6999801	38
52	2103226	38
61	230041	38

Scenario D Total Vehicle Miles Traveled (Yearly) and Average Speed

Vehicle Class	VMt	Avg Speed
Passenger Car, Van, Pickup	9,333,068	38
Single-Unit Truck	1,720,473	
Double & Triple Unit Truck	189,447	

MOVES Vehicle Type	VMt	Avg Speed
21	4666534	38
31	4666534	38
52	1720473	38
61	189447	38

MOVES Speed Bin = 9
37.5 mph <= Speed <42.5 mph

MOVES Output

yearID	MonthID	SourceType	PollutantID	avgSpeedBinID	rateperdistance	Lookup Code
2026	1	21	2	9	1.96686E-06	1-21-2
2026	1	21	3	9	6.34829E-08	1-21-3
2026	1	21	5	9	6.10624E-09	1-21-5
2026	1	21	6	9	1.18238E-09	1-21-6
2026	1	21	20	9	6.98018E-10	1-21-20
2026	1	21	23	9	7.45986E-14	1-21-23
2026	1	21	24	9	3.29328E-11	1-21-24
2026	1	21	25	9	2.48231E-10	1-21-25
2026	1	21	26	9	1.50216E-10	1-21-26
2026	1	21	27	9	1.11972E-11	1-21-27
2026	1	21	31	9	1.76881E-09	1-21-31
2026	1	21	41	9	2.77598E-10	1-21-41
2026	1	21	68	9	1.23475E-14	1-21-68
2026	1	21	69	9	8.13868E-14	1-21-69
2026	1	21	70	9	0	1-21-70
2026	1	21	71	9	2.22025E-14	1-21-71
2026	1	21	72	9	2.30141E-14	1-21-72
2026	1	21	73	9	2.11273E-13	1-21-73
2026	1	21	74	9	5.29407E-13	1-21-74
2026	1	21	75	9	2.57913E-13	1-21-75
2026	1	21	76	9	1.4325E-12	1-21-76
2026	1	21	77	9	2.57913E-13	1-21-77
2026	1	21	78	9	1.78579E-13	1-21-78
2026	1	21	81	9	0	1-21-81
2026	1	21	82	9	5.38208E-13	1-21-82
2026	1	21	83	9	8.04344E-14	1-21-83
2026	1	21	84	9	8.80731E-14	1-21-84
2026	1	21	87	9	1.56886E-08	1-21-87
2026	1	21	90	9	0.000266264	1-21-90
2026	1	21	98	9	3.5235E-07	1-21-98
2026	1	21	100	9	1.63127E-09	1-21-100
2026	1	21	106	9	2.354E-08	1-21-106
2026	1	21	107	9	1.04867E-08	1-21-107
2026	1	21	110	9	1.44305E-09	1-21-110
2026	1	21	116	9	2.9425E-09	1-21-116
2026	1	21	117	9	1.573E-09	1-21-117
2026	1	21	168	9	0	1-21-168
2026	1	21	169	9	8.77914E-13	1-21-169
2026	1	21	170	9	6.25817E-13	1-21-170
2026	1	21	171	9	2.84041E-12	1-21-171
2026	1	21	172	9	5.25035E-13	1-21-172
2026	1	21	173	9	8.47815E-14	1-21-173
2026	1	21	174	9	4.61247E-15	1-21-174
2026	1	21	175	9	6.28582E-14	1-21-175
2026	1	21	176	9	0	1-21-176
2026	1	21	177	9	6.28582E-14	1-21-177

MOVES Output

2026	1	21	178	9	9.48489E-14 1-21-178
2026	1	21	181	9	1.26765E-12 1-21-181
2026	1	21	182	9	0 1-21-182
2026	1	21	183	9	3.36376E-12 1-21-183
2026	1	21	184	9	1.00377E-12 1-21-184
2026	1	21	185	9	3.24616E-11 1-21-185
2026	1	31	2	9	2.25111E-06 1-31-2
2026	1	31	3	9	1.27212E-07 1-31-3
2026	1	31	5	9	7.67085E-09 1-31-5
2026	1	31	6	9	1.83029E-09 1-31-6
2026	1	31	20	9	9.8318E-10 1-31-20
2026	1	31	23	9	1.11274E-13 1-31-23
2026	1	31	24	9	5.83639E-11 1-31-24
2026	1	31	25	9	3.48129E-10 1-31-25
2026	1	31	26	9	2.24846E-10 1-31-26
2026	1	31	27	9	1.59028E-11 1-31-27
2026	1	31	31	9	2.34981E-09 1-31-31
2026	1	31	41	9	4.08138E-10 1-31-41
2026	1	31	68	9	1.84181E-14 1-31-68
2026	1	31	69	9	1.214E-13 1-31-69
2026	1	31	70	9	0 1-31-70
2026	1	31	71	9	3.31181E-14 1-31-71
2026	1	31	72	9	3.43286E-14 1-31-72
2026	1	31	73	9	3.15143E-13 1-31-73
2026	1	31	74	9	7.89684E-13 1-31-74
2026	1	31	75	9	3.84713E-13 1-31-75
2026	1	31	76	9	2.13678E-12 1-31-76
2026	1	31	77	9	3.84713E-13 1-31-77
2026	1	31	78	9	2.66376E-13 1-31-78
2026	1	31	81	9	0 1-31-81
2026	1	31	82	9	8.02811E-13 1-31-82
2026	1	31	83	9	1.19979E-13 1-31-83
2026	1	31	84	9	1.31373E-13 1-31-84
2026	1	31	87	9	2.26593E-08 1-31-87
2026	1	31	90	9	0.000353724 1-31-90
2026	1	31	98	9	5.45427E-07 1-31-98
2026	1	31	100	9	2.17565E-09 1-31-100
2026	1	31	106	9	2.54846E-08 1-31-106
2026	1	31	107	9	1.05323E-08 1-31-107
2026	1	31	110	9	1.92462E-09 1-31-110
2026	1	31	116	9	3.18557E-09 1-31-116
2026	1	31	117	9	1.57983E-09 1-31-117
2026	1	31	168	9	0 1-31-168
2026	1	31	169	9	1.26799E-12 1-31-169
2026	1	31	170	9	9.03879E-13 1-31-170
2026	1	31	171	9	4.10246E-12 1-31-171
2026	1	31	172	9	7.58316E-13 1-31-172

MOVES Output

2026	1	31	173	9	1.22451E-13 1-31-173
2026	1	31	174	9	6.66186E-15 1-31-174
2026	1	31	175	9	9.07871E-14 1-31-175
2026	1	31	176	9	0 1-31-176
2026	1	31	177	9	9.07871E-14 1-31-177
2026	1	31	178	9	1.36992E-13 1-31-178
2026	1	31	181	9	1.83089E-12 1-31-181
2026	1	31	182	9	0 1-31-182
2026	1	31	183	9	4.85833E-12 1-31-183
2026	1	31	184	9	1.44977E-12 1-31-184
2026	1	31	185	9	4.68849E-11 1-31-185
2026	1	52	2	9	5.88343E-06 1-52-2
2026	1	52	3	9	2.08858E-07 1-52-3
2026	1	52	5	9	1.75723E-08 1-52-5
2026	1	52	6	9	4.64923E-09 1-52-6
2026	1	52	20	9	4.96331E-09 1-52-20
2026	1	52	23	9	8.05236E-13 1-52-23
2026	1	52	24	9	6.46305E-11 1-52-24
2026	1	52	25	9	1.78646E-09 1-52-25
2026	1	52	26	9	8.80393E-10 1-52-26
2026	1	52	27	9	7.77605E-11 1-52-27
2026	1	52	31	9	6.53682E-09 1-52-31
2026	1	52	41	9	1.76141E-09 1-52-41
2026	1	52	68	9	1.33283E-13 1-52-68
2026	1	52	69	9	8.78511E-13 1-52-69
2026	1	52	70	9	0 1-52-70
2026	1	52	71	9	2.39659E-13 1-52-71
2026	1	52	72	9	2.4842E-13 1-52-72
2026	1	52	73	9	2.28054E-12 1-52-73
2026	1	52	74	9	5.71456E-12 1-52-74
2026	1	52	75	9	2.78399E-12 1-52-75
2026	1	52	76	9	1.54628E-11 1-52-76
2026	1	52	77	9	2.78399E-12 1-52-77
2026	1	52	78	9	1.92763E-12 1-52-78
2026	1	52	81	9	0 1-52-81
2026	1	52	82	9	5.80957E-12 1-52-82
2026	1	52	83	9	8.6823E-13 1-52-83
2026	1	52	84	9	9.50684E-13 1-52-84
2026	1	52	87	9	1.03608E-07 1-52-87
2026	1	52	90	9	0.000984007 1-52-90
2026	1	52	98	9	1.38547E-06 1-52-98
2026	1	52	100	9	1.20924E-08 1-52-100
2026	1	52	106	9	5.37095E-08 1-52-106
2026	1	52	107	9	1.62635E-08 1-52-107
2026	1	52	110	9	1.06971E-08 1-52-110
2026	1	52	116	9	6.71368E-09 1-52-116
2026	1	52	117	9	2.43951E-09 1-52-117

MOVES Output

2026	1	52	168	9	0 1-52-168
2026	1	52	169	9	5.79776E-12 1-52-169
2026	1	52	170	9	4.13292E-12 1-52-170
2026	1	52	171	9	1.87583E-11 1-52-171
2026	1	52	172	9	3.46734E-12 1-52-172
2026	1	52	173	9	5.59899E-13 1-52-173
2026	1	52	174	9	3.04608E-14 1-52-174
2026	1	52	175	9	4.15117E-13 1-52-175
2026	1	52	176	9	0 1-52-176
2026	1	52	177	9	4.15117E-13 1-52-177
2026	1	52	178	9	6.26385E-13 1-52-178
2026	1	52	181	9	8.37161E-12 1-52-181
2026	1	52	182	9	0 1-52-182
2026	1	52	183	9	2.22143E-11 1-52-183
2026	1	52	184	9	6.62894E-12 1-52-184
2026	1	52	185	9	2.14377E-10 1-52-185
2026	1	61	2	9	2.30836E-05 1-61-2
2026	1	61	3	9	2.16822E-06 1-61-3
2026	1	61	5	9	9.93154E-08 1-61-5
2026	1	61	6	9	1.38307E-08 1-61-6
2026	1	61	20	9	2.87255E-08 1-61-20
2026	1	61	23	9	4.28648E-12 1-61-23
2026	1	61	24	9	7.39804E-11 1-61-24
2026	1	61	25	9	1.03772E-08 1-61-25
2026	1	61	26	9	4.76306E-09 1-61-26
2026	1	61	27	9	4.46756E-10 1-61-27
2026	1	61	31	9	1.21835E-08 1-61-31
2026	1	61	41	9	1.10802E-08 1-61-41
2026	1	61	68	9	7.095E-13 1-61-68
2026	1	61	69	9	4.67654E-12 1-61-69
2026	1	61	70	9	0 1-61-70
2026	1	61	71	9	1.27577E-12 1-61-71
2026	1	61	72	9	1.3224E-12 1-61-72
2026	1	61	73	9	1.214E-11 1-61-73
2026	1	61	74	9	3.042E-11 1-61-74
2026	1	61	75	9	1.48199E-11 1-61-75
2026	1	61	76	9	8.23124E-11 1-61-76
2026	1	61	77	9	1.48199E-11 1-61-77
2026	1	61	78	9	1.02613E-11 1-61-78
2026	1	61	81	9	0 1-61-81
2026	1	61	82	9	3.09258E-11 1-61-82
2026	1	61	83	9	4.62181E-12 1-61-83
2026	1	61	84	9	5.06073E-12 1-61-84
2026	1	61	87	9	5.85574E-07 1-61-87
2026	1	61	90	9	0.00183401 1-61-90
2026	1	61	98	9	4.12154E-06 1-61-98
2026	1	61	100	9	6.43859E-08 1-61-100

MOVES Output

2026	1	61	106	9	1.61075E-07 1-61-106
2026	1	61	107	9	3.90367E-08 1-61-107
2026	1	61	110	9	5.6957E-08 1-61-110
2026	1	61	116	9	2.01344E-08 1-61-116
2026	1	61	117	9	5.85548E-09 1-61-117
2026	1	61	168	9	0 1-61-168
2026	1	61	169	9	3.27679E-11 1-61-169
2026	1	61	170	9	2.33584E-11 1-61-170
2026	1	61	171	9	1.06018E-10 1-61-171
2026	1	61	172	9	1.95968E-11 1-61-172
2026	1	61	173	9	3.16445E-12 1-61-173
2026	1	61	174	9	1.72159E-13 1-61-174
2026	1	61	175	9	2.34616E-12 1-61-175
2026	1	61	176	9	0 1-61-176
2026	1	61	177	9	2.34616E-12 1-61-177
2026	1	61	178	9	3.5402E-12 1-61-178
2026	1	61	181	9	4.73147E-11 1-61-181
2026	1	61	182	9	0 1-61-182
2026	1	61	183	9	1.25551E-10 1-61-183
2026	1	61	184	9	3.74655E-11 1-61-184
2026	1	61	185	9	1.21162E-09 1-61-185
2026	7	21	2	9	1.94882E-06 7-21-2
2026	7	21	3	9	5.77367E-08 7-21-3
2026	7	21	5	9	6.44602E-09 7-21-5
2026	7	21	6	9	1.18238E-09 7-21-6
2026	7	21	20	9	7.42781E-10 7-21-20
2026	7	21	23	9	7.4838E-14 7-21-23
2026	7	21	24	9	3.28035E-11 7-21-24
2026	7	21	25	9	2.60416E-10 7-21-25
2026	7	21	26	9	1.51512E-10 7-21-26
2026	7	21	27	9	1.17114E-11 7-21-27
2026	7	21	31	9	1.76881E-09 7-21-31
2026	7	21	41	9	2.89065E-10 7-21-41
2026	7	21	68	9	1.23872E-14 7-21-68
2026	7	21	69	9	8.16481E-14 7-21-69
2026	7	21	70	9	0 7-21-70
2026	7	21	71	9	2.22737E-14 7-21-71
2026	7	21	72	9	2.30879E-14 7-21-72
2026	7	21	73	9	2.11951E-13 7-21-73
2026	7	21	74	9	5.31107E-13 7-21-74
2026	7	21	75	9	2.58741E-13 7-21-75
2026	7	21	76	9	1.43709E-12 7-21-76
2026	7	21	77	9	2.58741E-13 7-21-77
2026	7	21	78	9	1.79152E-13 7-21-78
2026	7	21	81	9	0 7-21-81
2026	7	21	82	9	5.39935E-13 7-21-82
2026	7	21	83	9	8.06926E-14 7-21-83

MOVES Output

2026	7	21	84	9	8.83558E-14 7-21-84
2026	7	21	87	9	1.63681E-08 7-21-87
2026	7	21	90	9	0.000266264 7-21-90
2026	7	21	98	9	3.5235E-07 7-21-98
2026	7	21	100	9	1.63703E-09 7-21-100
2026	7	21	106	9	2.354E-08 7-21-106
2026	7	21	107	9	1.04867E-08 7-21-107
2026	7	21	110	9	1.44815E-09 7-21-110
2026	7	21	116	9	2.9425E-09 7-21-116
2026	7	21	117	9	1.573E-09 7-21-117
2026	7	21	168	9	0 7-21-168
2026	7	21	169	9	9.15938E-13 7-21-169
2026	7	21	170	9	6.52922E-13 7-21-170
2026	7	21	171	9	2.96344E-12 7-21-171
2026	7	21	172	9	5.47775E-13 7-21-172
2026	7	21	173	9	8.84535E-14 7-21-173
2026	7	21	174	9	4.81224E-15 7-21-174
2026	7	21	175	9	6.55807E-14 7-21-175
2026	7	21	176	9	0 7-21-176
2026	7	21	177	9	6.55807E-14 7-21-177
2026	7	21	178	9	9.8957E-14 7-21-178
2026	7	21	181	9	1.32255E-12 7-21-181
2026	7	21	182	9	0 7-21-182
2026	7	21	183	9	3.50945E-12 7-21-183
2026	7	21	184	9	1.04725E-12 7-21-184
2026	7	21	185	9	3.38676E-11 7-21-185
2026	7	31	2	9	2.22686E-06 7-31-2
2026	7	31	3	9	1.15561E-07 7-31-3
2026	7	31	5	9	8.06767E-09 7-31-5
2026	7	31	6	9	1.83029E-09 7-31-6
2026	7	31	20	9	1.04282E-09 7-31-20
2026	7	31	23	9	1.11663E-13 7-31-23
2026	7	31	24	9	5.81347E-11 7-31-24
2026	7	31	25	9	3.65273E-10 7-31-25
2026	7	31	26	9	2.26234E-10 7-31-26
2026	7	31	27	9	1.65572E-11 7-31-27
2026	7	31	31	9	2.34981E-09 7-31-31
2026	7	31	41	9	4.22995E-10 7-31-41
2026	7	31	68	9	1.84826E-14 7-31-68
2026	7	31	69	9	1.21824E-13 7-31-69
2026	7	31	70	9	0 7-31-70
2026	7	31	71	9	3.32339E-14 7-31-71
2026	7	31	72	9	3.44487E-14 7-31-72
2026	7	31	73	9	3.16245E-13 7-31-73
2026	7	31	74	9	7.92446E-13 7-31-74
2026	7	31	75	9	3.86059E-13 7-31-75
2026	7	31	76	9	2.14425E-12 7-31-76

MOVES Output

2026	7	31	77	9	3.86059E-13 7-31-77
2026	7	31	78	9	2.67307E-13 7-31-78
2026	7	31	81	9	0 7-31-81
2026	7	31	82	9	8.0562E-13 7-31-82
2026	7	31	83	9	1.20399E-13 7-31-83
2026	7	31	84	9	1.31833E-13 7-31-84
2026	7	31	87	9	2.35284E-08 7-31-87
2026	7	31	90	9	0.000353724 7-31-90
2026	7	31	98	9	5.45426E-07 7-31-98
2026	7	31	100	9	2.18352E-09 7-31-100
2026	7	31	106	9	2.54846E-08 7-31-106
2026	7	31	107	9	1.05323E-08 7-31-107
2026	7	31	110	9	1.93158E-09 7-31-110
2026	7	31	116	9	3.18557E-09 7-31-116
2026	7	31	117	9	1.57983E-09 7-31-117
2026	7	31	168	9	0 7-31-168
2026	7	31	169	9	1.31661E-12 7-31-169
2026	7	31	170	9	9.38541E-13 7-31-170
2026	7	31	171	9	4.25979E-12 7-31-171
2026	7	31	172	9	7.87397E-13 7-31-172
2026	7	31	173	9	1.27147E-13 7-31-173
2026	7	31	174	9	6.91733E-15 7-31-174
2026	7	31	175	9	9.42687E-14 7-31-175
2026	7	31	176	9	0 7-31-176
2026	7	31	177	9	9.42687E-14 7-31-177
2026	7	31	178	9	1.42246E-13 7-31-178
2026	7	31	181	9	1.9011E-12 7-31-181
2026	7	31	182	9	0 7-31-182
2026	7	31	183	9	5.04464E-12 7-31-183
2026	7	31	184	9	1.50536E-12 7-31-184
2026	7	31	185	9	4.86829E-11 7-31-185
2026	7	52	2	9	5.83978E-06 7-52-2
2026	7	52	3	9	1.9087E-07 7-52-3
2026	7	52	5	9	1.86034E-08 7-52-5
2026	7	52	6	9	4.64923E-09 7-52-6
2026	7	52	20	9	5.32988E-09 7-52-20
2026	7	52	23	9	8.08562E-13 7-52-23
2026	7	52	24	9	6.43771E-11 7-52-24
2026	7	52	25	9	1.87336E-09 7-52-25
2026	7	52	26	9	8.95788E-10 7-52-26
2026	7	52	27	9	8.24049E-11 7-52-27
2026	7	52	31	9	6.53682E-09 7-52-31
2026	7	52	41	9	1.86319E-09 7-52-41
2026	7	52	68	9	1.33834E-13 7-52-68
2026	7	52	69	9	8.82138E-13 7-52-69
2026	7	52	70	9	0 7-52-70
2026	7	52	71	9	2.40649E-13 7-52-71

MOVES Output

2026	7	52	72	9	2.49445E-13 7-52-72
2026	7	52	73	9	2.28996E-12 7-52-73
2026	7	52	74	9	5.73816E-12 7-52-74
2026	7	52	75	9	2.79548E-12 7-52-75
2026	7	52	76	9	1.55266E-11 7-52-76
2026	7	52	77	9	2.79548E-12 7-52-77
2026	7	52	78	9	1.93559E-12 7-52-78
2026	7	52	81	9	0 7-52-81
2026	7	52	82	9	5.83355E-12 7-52-82
2026	7	52	83	9	8.71815E-13 7-52-83
2026	7	52	84	9	9.54609E-13 7-52-84
2026	7	52	87	9	1.09687E-07 7-52-87
2026	7	52	90	9	0.000984007 7-52-90
2026	7	52	98	9	1.38547E-06 7-52-98
2026	7	52	100	9	1.2141E-08 7-52-100
2026	7	52	106	9	5.37095E-08 7-52-106
2026	7	52	107	9	1.62635E-08 7-52-107
2026	7	52	110	9	1.07401E-08 7-52-110
2026	7	52	116	9	6.71368E-09 7-52-116
2026	7	52	117	9	2.43951E-09 7-52-117
2026	7	52	168	9	0 7-52-168
2026	7	52	169	9	6.13793E-12 7-52-169
2026	7	52	170	9	4.3754E-12 7-52-170
2026	7	52	171	9	1.98588E-11 7-52-171
2026	7	52	172	9	3.67078E-12 7-52-172
2026	7	52	173	9	5.9275E-13 7-52-173
2026	7	52	174	9	3.2248E-14 7-52-174
2026	7	52	175	9	4.39473E-13 7-52-175
2026	7	52	176	9	0 7-52-176
2026	7	52	177	9	4.39473E-13 7-52-177
2026	7	52	178	9	6.63136E-13 7-52-178
2026	7	52	181	9	8.86279E-12 7-52-181
2026	7	52	182	9	0 7-52-182
2026	7	52	183	9	2.35177E-11 7-52-183
2026	7	52	184	9	7.01788E-12 7-52-184
2026	7	52	185	9	2.26956E-10 7-52-185
2026	7	61	2	9	2.29495E-05 7-61-2
2026	7	61	3	9	1.98831E-06 7-61-3
2026	7	61	5	9	1.05657E-07 7-61-5
2026	7	61	6	9	1.38307E-08 7-61-6
2026	7	61	20	9	3.09325E-08 7-61-20
2026	7	61	23	9	4.30619E-12 7-61-23
2026	7	61	24	9	7.36901E-11 7-61-24
2026	7	61	25	9	1.08805E-08 7-61-25
2026	7	61	26	9	4.8631E-09 7-61-26
2026	7	61	27	9	4.75385E-10 7-61-27
2026	7	61	31	9	1.21835E-08 7-61-31

MOVES Output

2026	7	61	41	9	1.17875E-08 7-61-41
2026	7	61	68	9	7.12762E-13 7-61-68
2026	7	61	69	9	4.69804E-12 7-61-69
2026	7	61	70	9	0 7-61-70
2026	7	61	71	9	1.28164E-12 7-61-71
2026	7	61	72	9	1.32848E-12 7-61-72
2026	7	61	73	9	1.21958E-11 7-61-73
2026	7	61	74	9	3.05599E-11 7-61-74
2026	7	61	75	9	1.4888E-11 7-61-75
2026	7	61	76	9	8.26909E-11 7-61-76
2026	7	61	77	9	1.4888E-11 7-61-77
2026	7	61	78	9	1.03085E-11 7-61-78
2026	7	61	81	9	0 7-61-81
2026	7	61	82	9	3.1068E-11 7-61-82
2026	7	61	83	9	4.64307E-12 7-61-83
2026	7	61	84	9	5.084E-12 7-61-84
2026	7	61	87	9	6.22963E-07 7-61-87
2026	7	61	90	9	0.00183401 7-61-90
2026	7	61	98	9	4.12154E-06 7-61-98
2026	7	61	100	9	6.46741E-08 7-61-100
2026	7	61	106	9	1.61075E-07 7-61-106
2026	7	61	107	9	3.90367E-08 7-61-107
2026	7	61	110	9	5.72119E-08 7-61-110
2026	7	61	116	9	2.01344E-08 7-61-116
2026	7	61	117	9	5.85548E-09 7-61-117
2026	7	61	168	9	0 7-61-168
2026	7	61	169	9	3.48602E-11 7-61-169
2026	7	61	170	9	2.485E-11 7-61-170
2026	7	61	171	9	1.12787E-10 7-61-171
2026	7	61	172	9	2.0848E-11 7-61-172
2026	7	61	173	9	3.3665E-12 7-61-173
2026	7	61	174	9	1.83151E-13 7-61-174
2026	7	61	175	9	2.49596E-12 7-61-175
2026	7	61	176	9	0 7-61-176
2026	7	61	177	9	2.49596E-12 7-61-177
2026	7	61	178	9	3.76626E-12 7-61-178
2026	7	61	181	9	5.03358E-11 7-61-181
2026	7	61	182	9	0 7-61-182
2026	7	61	183	9	1.33568E-10 7-61-183
2026	7	61	184	9	3.98577E-11 7-61-184
2026	7	61	185	9	1.28899E-09 7-61-185

Rate per Hour

MOVESScenarioID	MOVESRunID	yearID	monthID	dayID	hourID	linkID	pollutantID	processID	sourceTypeID	regClassID	SCC	fuelTypeID	modelYearID	roadTypeID	temperature	relHumidity	ratePerHour
Knutson_2022_run	1	2026	1	5	1	530530100	1	90	62	0		2	0	1	38.1	87.6	4.26545E-06
Knutson_2022_run	1	2026	1	5	1	530530100	2	90	62	0		2	0	1	38.1	87.6	4.46289E-05
Knutson_2022_run	1	2026	1	5	1	530530100	3	90	62	0		2	0	1	38.1	87.6	6.45659E-05
Knutson_2022_run	1	2026	1	5	1	530530100	5	90	62	0		2	0	1	38.1	87.6	8.26258E-07
Knutson_2022_run	1	2026	1	5	1	530530100	20	90	62	0		2	0	1	38.1	87.6	1.39991E-08
Knutson_2022_run	1	2026	1	5	1	530530100	23	90	62	0		2	0	1	38.1	87.6	4.96762E-13
Knutson_2022_run	1	2026	1	5	1	530530100	24	90	62	0		2	0	1	38.1	87.6	4.48502E-09
Knutson_2022_run	1	2026	1	5	1	530530100	25	90	62	0		2	0	1	38.1	87.6	2.11833E-07
Knutson_2022_run	1	2026	1	5	1	530530100	26	90	62	0		2	0	1	38.1	87.6	1.53215E-07
Knutson_2022_run	1	2026	1	5	1	530530100	27	90	62	0		2	0	1	38.1	87.6	1.92402E-08
Knutson_2022_run	1	2026	1	5	1	530530100	31	90	62	0		2	0	1	38.1	87.6	2.69701E-08
Knutson_2022_run	1	2026	1	5	1	530530100	33	90	62	0		2	0	1	38.1	87.6	2.22262E-05
Knutson_2022_run	1	2026	1	5	1	530530100	41	90	62	0		2	0	1	38.1	87.6	2.86563E-08
Knutson_2022_run	1	2026	1	5	1	530530100	68	90	62	0		2	0	1	38.1	87.6	5.63705E-13
Knutson_2022_run	1	2026	1	5	1	530530100	69	90	62	0		2	0	1	38.1	87.6	8.00013E-11
Knutson_2022_run	1	2026	1	5	1	530530100	70	90	62	0		2	0	1	38.1	87.6	0
Knutson_2022_run	1	2026	1	5	1	530530100	71	90	62	0		2	0	1	38.1	87.6	4.74684E-14
Knutson_2022_run	1	2026	1	5	1	530530100	72	90	62	0		2	0	1	38.1	87.6	2.09417E-11
Knutson_2022_run	1	2026	1	5	1	530530100	73	90	62	0		2	0	1	38.1	87.6	4.19205E-11
Knutson_2022_run	1	2026	1	5	1	530530100	74	90	62	0		2	0	1	38.1	87.6	1.54265E-11
Knutson_2022_run	1	2026	1	5	1	530530100	75	90	62	0		2	0	1	38.1	87.6	4.62922E-12
Knutson_2022_run	1	2026	1	5	1	530530100	76	90	62	0		2	0	1	38.1	87.6	7.0136E-13
Knutson_2022_run	1	2026	1	5	1	530530100	77	90	62	0		2	0	1	38.1	87.6	7.05098E-13
Knutson_2022_run	1	2026	1	5	1	530530100	78	90	62	0		2	0	1	38.1	87.6	2.62709E-11
Knutson_2022_run	1	2026	1	5	1	530530100	79	90	62	0		2	0	1	38.1	87.6	3.43919E-06
Knutson_2022_run	1	2026	1	5	1	530530100	81	90	62	0		2	0	1	38.1	87.6	3.57649E-11
Knutson_2022_run	1	2026	1	5	1	530530100	82	90	62	0		2	0	1	38.1	87.6	1.12274E-12
Knutson_2022_run	1	2026	1	5	1	530530100	83	90	62	0		2	0	1	38.1	87.6	8.44212E-11
Knutson_2022_run	1	2026	1	5	1	530530100	84	90	62	0		2	0	1	38.1	87.6	1.15378E-10
Knutson_2022_run	1	2026	1	5	1	530530100	87	90	62	0		2	0	1	38.1	87.6	3.7729E-06
Knutson_2022_run	1	2026	1	5	1	530530100	90	90	62	0		2	0	1	38.1	87.6	0.00805158
Knutson_2022_run	1	2026	1	5	1	530530100	91	90	62	0		2	0	1	38.1	87.6	0.0939859
Knutson_2022_run	1	2026	1	5	1	530530100	98	90	62	0		2	0	1	38.1	87.6	0.00807224
Knutson_2022_run	1	2026	1	5	1	530530100	100	90	62	0		2	0	1	38.1	87.6	5.49193E-07
Knutson_2022_run	1	2026	1	5	1	530530100	110	90	62	0		2	0	1	38.1	87.6	5.05256E-07
Knutson_2022_run	1	2026	1	5	1	530530100	111	90	62	0		2	0	1	38.1	87.6	1.7764E-07
Knutson_2022_run	1	2026	1	5	1	530530100	112	90	62	0		2	0	1	38.1	87.6	1.40649E-07
Knutson_2022_run	1	2026	1	5	1	530530100	115	90	62	0		2	0	1	38.1	87.6	1.19057E-07
Knutson_2022_run	1	2026	1	5	1	530530100	118	90	62	0		2	0	1	38.1	87.6	3.64607E-07
Knutson_2022_run	1	2026	1	5	1	530530100	119	90	62	0		2	0	1	38.1	87.6	0
Knutson_2022_run	1	2026	1	5	1	530530100	168	90	62	0		2	0	1	38.1	87.6	0
Knutson_2022_run	1	2026	1	5	1	530530100	169	90	62	0		2	0	1	38.1	87.6	5.50334E-10
Knutson_2022_run	1	2026	1	5	1	530530100	170	90	62	0		2	0	1	38.1	87.6	4.85305E-10
Knutson_2022_run	1	2026	1	5	1	530530100	171	90	62	0		2	0	1	38.1	87.6	7.91781E-10
Knutson_2022_run	1	2026	1	5	1	530530100	172	90	62	0		2	0	1	38.1	87.6	3.68651E-10
Knutson_2022_run	1	2026	1	5	1	530530100	173	90	62	0		2	0	1	38.1	87.6	6.63084E-11
Knutson_2022_run	1	2026	1	5	1	530530100	174	90	62	0		2	0	1	38.1	87.6	0
Knutson_2022_run	1	2026	1	5	1	530530100	175	90	62	0		2	0	1	38.1	87.6	0
Knutson_2022_run	1	2026	1	5	1	530530100	176	90	62	0		2	0	1	38.1	87.6	1.26932E-12
Knutson_2022_run	1	2026	1	5	1	530530100	177	90	62	0		2	0	1	38.1	87.6	0
Knutson_2022_run	1	2026	1	5	1	530530100	178	90	62	0		2	0	1	38.1	87.6	2.58716E-11
Knutson_2022_run	1	2026	1	5	1	530530100	181	90	62	0		2	0	1	38.1	87.6	8.27355E-10
Knutson_2022_run	1	2026	1	5	1	530530100	182	90	62	0		2	0	1	38.1	87.6	0
Knutson_2022_run	1	2026	1	5	1	530530100	183	90	62	0		2	0	1	38.1	87.6	1.41064E-09
Knutson_2022_run	1	2026	1	5	1	530530100	184	90	62	0		2	0	1	38.1	87.6	6.52329E-08
Knutson_2022_run	1	2026	1	5	1	530530100	185	90	62	0		2	0	1	38.1	87.6	1.76515E-08

Kuntson Farms EIS - Rail Alternative - Locomotive Throughput Data and Criteria Pollutant and CO₂ Emissions

- 400 tons-miles/gal diesel (EPA document; Technical Highlights - Emission Factors for Locomotives, EPA-420-F-09-025, April 2009)
- 15.2 bhp-hr/gal (conversion factor, switching haul, EPA-420-F-09-025)
- 67 tons/rail car [national avg. (1991-2001) from https://www.bts.gov/archive/publications/transportation_statistics_annual_report/2003/chapter_02/railcar_weights]
- 1.25 miles for the rail spur
- 55 rail cars/train
- 2 trains/day
- 5,758 tons-miles/train round trip (assumes train weight after unloading for return trip is 25% of full load)
- 14.4 gal diesel per train round trip
- 3.94 gal/hour/train of diesel fuel for idling (estimated average locomotive fuel use on idle setting: <https://www.railserveleaf.biz/pdf/rsi-white-paper-fuel-emissions.pdf>)
- 0.5 hours, Assumed idle time per train (30 minutes)
- 32.7 gal/day diesel fuel, including for idling
- 11,936 gal/yr train diesel fuel
- 15.2 bhp-hr/gal (EPA-420-F-09-025)

Switch Locomotive Average Emission Factors (grams/horsepower-per hour), CH₄ and N₂O Emission Factors (grams/gallon diesel fuel)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O
Locomotive	11.00	1.20	2.50	0.16	0.26	0.25	512.38	0.8	0.26

Notes:

Emission factors are based on the Switch Locomotives - Exhaust Emission Standards (40 CFR 1033.101)

Emission factors are conservatively based on Tier 1 locomotive.

Emission factor for PM2.5 is 97% of PM10

Emission Factors for CH₄ and N₂O from EPA's Emission Factors for Greenhouse Gas Inventories, April 2022.

bhp = brake horsepower

gal = gallons

hr = hour

yr = year

Locomotive Emissions (tons/yr)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O
2.2	0.24	0.5	0.03	0.05	0.05	102.46	0.01	0.003

Idle fuel use (gal/hr) per locomotive type

- 3
- 3.1
- 3.3
- 3.8
- 3.8
- 3.8
- 3.5
- 3.5
- 4.6
- 4.6
- 5.5
- 5.2
- 3.5
- 5
- 4
- 2.9
- 5.5
- 6
- 3
- 3
- 3.4
- 3.4
- 3.4
- 94.6 Total
- 3.941667 Average (gal/hr)

Kuntson Farms EIS - Rail Alternative - Locomotive Mobile Source Air Toxics Emissions Estimates

MSAT	Emission Factor ^(a)	Units	Diesel Fuel Use	Units	Diesel Heating Value ^(b)	Units	Emissions	Units
Benzene	7.76E-04	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	6.34E-04	tons/year
Toluene	2.81E-04	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	2.30E-04	tons/year
Xylene	1.93E-04	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	1.58E-04	tons/year
Formaldehyde	7.89E-05	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	6.45E-05	tons/year
Acrolein	7.88E-06	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	6.44E-06	tons/year
Acetaldehyde	2.52E-05	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	2.06E-05	tons/year
Total Polycyclic Aromatic Hydrocarbons	2.12E-04	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	1.73E-04	tons/year
TOTAL							1.29E-03	tons/year

^(a) MSAT emission factors obtained from EPA AP-42 document; large stationary diesel engine emission factors in Tables 3.4-3 and 3.4-4 as surrogates.

^(b) Diesel heating value obtained from AP-42, Appendix A - Miscellaneous Data and Conversion Factors