

Appendix E
General Conformity Analysis Calculations

Table L2-1

Updated Septemebr 2016

PennEast Pipeline Company, LLC

Construction Emissions

All Emissions are in Units of Tons per Construction Period

Project Total Emissions	NO_x	CO	VOC	PM₁₀	PM_{2.5}	SO₂	CO₂e	HAPs
Pipeline Diesel Non-Road Equipment Totals	94.9	24.9	9.8	6.2	6.0	0.27	29,874	0.71
Diesel and Gas On-Road	5.0	22.8	2.53	0.29	0.17	0.03	1,690	0.18
Pipeline Construction Activity Fugitive Dust				1,842	275			
Pipeline Roadway Fugitive Dust				132.39	21			
Pipeline Construction Sub-Total	100	48	12	1,981	302	0.30	31,563	0.88
Compressor Station Diesel Non-Road Equip.	5.5	2.7	0.6	0.4	0.4	0.0	1602.0	0.0
Compressor Station Diesel and Gas On-Road	0.3	1.9	0.20	0.02	0.01	0.00	111	0.01
Compressor Station Construction Fugitive Dust				23	3			
Compressor Station Roadway Fugitive Dust				5.7	0.6			
Comp. Station Construction Sub-Total	5.8	5	1	29	4	0.02	1,712	0.05
Project Total Construction Emissions	106	52	13	2,010	307	0.32	33,276	0.93

General Conformity Threshold								
• <i>Moderate ozone nonattainment (NO_x/VOC)</i>	100	N/A	50	N/A	100	100	N/A	N/A
• <i>PM_{2.5} Maintenance Area (NO_x, VOC, PM_{2.5}, SO₂)</i>								

Project Total Emission Breakdown

Diesel Non-Road Equipment	NO_x	CO	VOC	PM₁₀	PM_{2.5}	SO₂	CO₂e	HAPs
Pipeline Construction - Spread 1	22.2	8.9	2.3	1.4	1.4	0.06	6975.5	0.17
Pipeline Construction - Spread 2	24.6	5.3	2.5	1.6	1.6	0.07	7743.7	0.18
Pipeline Construction - Spread 3	24.2	5.3	2.5	1.6	1.5	0.07	7602.4	0.18
Pipeline Construction - Spread 4	24.0	5.3	2.5	1.6	1.5	0.07	7552.0	0.18
Pipeline Construction Sub-Total	94.9	24.9	9.8	6.2	6.0	0.27	29873.6	0.71
Compressor Station Construction Equip.	5.5	2.7	0.6	0.4	0.4	0.01	1602.0	0.04
PennEast Project Total Non-Road Equip.	100.3	27.6	10.4	6.7	6.5	0.29	31475.6	0.75

Roadway Travel Particulate Matter

Pipeline Construction				PM₁₀	PM_{2.5}			
Combined Pickup Trucks and Vans - Spread 1				26.2	3.9			
Float, Lowboy, Tractor Trucks Spread 1				2.9	0.6			
Bus - Spread 1				1.8	0.3			
Combined Pickup Trucks and Vans - Spread 2				29.1	4.3			
Float, Lowboy, Tractor Trucks Spread 2				2.9	0.6			
Bus - Spread 2				2.0	0.4			
Combined Pickup Trucks and Vans - Spread 3				28.6	4.3			
Float, Lowboy, Tractor Trucks Spread 3				2.9	0.6			
Bus - Spread 3				2.0	0.4			
Combined Pickup Trucks and Vans - Spread 4				28.8	4.3			
Float, Lowboy, Tractor Trucks Spread 4				3.1	0.6			
Bus - Spread 4				2.0	0.4			
Total Pipeline Construction				132	21			
Compressor Station construction:								
Gas Pickup Trucks - Supervisors/Inspectors				3.2	0.4			
Gas Pickup Trucks - Operators				1.9	0.2			
Diesel 1-Ton Trucks with Tools				0.5	0.1			
Total Compressor Station				5.7	0.63			
Total Project Roadway Travel PM				138	21			

Table L2-1 page 2

132.39

Total Project construction Emissions by Spread

Project Elements	NO _x	CO	VOC	PM ₁₀	PM _{2.5}	SO ₂	CO _{2e}	HAPs
Spread 1								
Diesel Non-Road Equipment	22.2	8.9	2.3	1.4	1.4	0.1	6,975	0.2
Diesel and Gas On-Road	1.19	5.3	0.59	0.07	0.04	0.01	400	0.041
Roadway Travel Particulate Matter				31.0	4.9			
Total construction Emissions Spread 1	23.3	14.2	2.9	32.5	6.3	0.1	7,375	0.21
County Breakdown:								
Luzerne County	23.3	14.2	2.9	32.5	6.3	0.1	7,375	0.21
Spread 2								
Diesel Non-Road Equipment	24.6	5.3	2.5	1.6	1.6	0.1	7,744	0.2
Diesel and Gas On-Road	1.27	5.9	0.65	0.074	0.042	0.0067	431	0.045
Roadway Travel Particulate Matter				34.0	5.3			
Total construction Emissions Spread 2	25.9	11.2	3.2	35.7	6.9	0.1	8,175	0.23
County Breakdown:								
Luzerne	4.0	1.7	0.5	5.6	1.1	0.0	1,273	0.04
Carbon	18.6	8.1	2.3	25.6	5.0	0.1	5,872	0.16
Northampton	3.3	1.4	0.4	4.5	0.9	0.0	1,029	0.03
Spread 3								
Diesel Non-Road Equipment	24.2	5.3	2.5	1.6	1.5	0.1	7,602	0.2
Diesel and Gas On-Road	1.26	5.8	0.64	0.07	0.04	0.0066	426	0.044
Roadway Travel Particulate Matter				33.5	5.2			
Total construction Emissions Spread 3	25.4	11.1	3.1	35.2	6.8	0.1	8,028	0.22
County Breakdown:								
Carbon	4.0	1.8	0.5	6	1.1	0.0	1,279	0.04
Northampton	18.7	8.2	2.3	26	5.0	0.1	5,908	0.17
Bucks	1.4	0.6	0.2	2	0.4	0.0	444	0.01
Hunterdon	1.8	0.8	0.2	3	0.5	0.0	582	0.02
Spread 4								
Diesel Non-Road Equipment	24.0	5.3	2.5	1.6	1.5	0.1	7,552	0.2
Diesel and Gas On-Road	1.28	5.85	0.65	0.07	0.04	0.01	433	0.045
Roadway Travel Particulate Matter				34	5.3			
Total construction Emissions Spread 4	25.2	11.2	3.1	36	6.9	0.1	7,985	0.2
County Breakdown:								
Hunterdon	19.24	8.50	2.38	27	5.24	0.06	6,085	0.17
Mercer	6.85	3.03	0.85	10	1.87	0.02	2,166	0.06
Total construction Emissions by County								
Luzerne Equipment Combustion and Roadway PM	27.4	16.0	3.4	38	7	0.08	8,649	0.24
Luzerne Construction Activity PM				307	46			
Luzerne County Emission Totals	27.4	16.0	3.4	345	53.4	0.1	8,649	0.24
Carbon Equipment Combustion and Roadway PM	28.4	14.4	3.4	32	6	0.08	8,753	0.24
Carbon Construction Activity PM				452	68			
Carbon County Emission Totals	28.4	14.4	3.4	483	74.2	0.1	8,753	0.24
Northampton Equipment Combustion and Roadway PM	22.0	9.6	2.7	30	6	0.07	6,937	0.19
Northampton Construction Activity PM				512	77			
Northampton County Emission Totals	22.0	9.6	2.7	543	82.8	0.1	6,937	0.19
Bucks Equipment Combustion and Roadway PM	1.4	0.6	0.2	2	0	0.00	444	0.01
Bucks Construction Activity PM				33	4			
Bucks County Emission Totals	1.4	0.6	0.2	35	4.3	0.0	444	0.01
Hunterdon Equipment Combustion and Roadway PM	21.1	9.3	2.6	30	6	0.1	6,667	0.19
Hunterdon Construction Activity PM				403	60			
Hunterdon County Emission Totals	21.1	9.3	2.6	432	66.1	0.1	6,667	0.19
Mercer Equipment Combustion and Roadway PM	6.8	3.03	0.85	10	2	0.02	2,166	0.06
Mercer Construction Activity PM				158	24			
Mercer County Emission Totals	6.8	3.0	0.8	168	25.6	0.0	2,166	0.06

Table L2-2.1

PennEast Pipeline Company, LLC
Construction Emissions - Off-road Engines - Pipeline Spread 1

Criteria Emissions

Description	Equipment category based on NONROAD classification	SCC ¹	Fuel Type	Equip-ment HP	Number of Equipment	Total Days	Total Weeks	Total Months	Total Working Days	Hours per Day	Total Working hrs	BSFC ² lb/hp-hr	Load Factor ²	EFss (g/hp-hr) ²						N ₂ O EF ⁵ g/MMBtu
														HC	CO	PM	NOx	SO ₂ ³	CO ₂ ⁴	
Chipper	Crushing/Proc. Equipment	2270002054	Diesel	440	2	112	16	10	96	6	1,152	0.367	0.43	0.19	0.79	0.12	3.00	0.005	530.4	0.6
Air Compressors	Light Comm. Air Comp.	2270006015	Diesel	50	4	112	16	10	96	6	2,304	0.408	0.43	0.21	0.91	0.15	3.85	0.005	589.7	0.6
Pumps	Light Commercial Pumps	2270006010	Diesel	40	6	112	16	10	96	6	3,456	0.408	0.43	0.35	1.47	0.28	4.38	0.005	589.3	0.6
Welding Rigs	Light Commercial Welders	2270006025	Diesel	35	38	112	16	10	96	6	21,888	0.481	0.21	0.95	4.09	0.65	4.92	0.006	692.9	0.6
Hydro Mulcher/Seeder	Light Commercial Pumps	2270006010	Diesel	80	2	112	16	10	96	6	1,152	0.408	0.43	0.48	2.36	0.43	4.25	0.005	588.8	0.6
Trucks: Dump, Water, Fuel, Rigs	Off-Highway Trucks	2270002051	Diesel	400	13	112	16	10	96	6	7,488	0.371	0.59	0.14	0.50	0.08	1.33	0.005	536.4	0.6
BH/LDR, Forklift, Bush Hog	Rubber Tire Dozers	2270002063	Diesel	68	4	112	16	10	96	6	2,304	0.412	0.59	0.23	2.07	0.22	3.44	0.005	595.4	0.6
Hydro Ax, Skid Truck	Rubber Tire Dozers	2270002063	Diesel	100	3	112	16	10	96	6	1,728	0.412	0.59	0.23	2.29	0.29	2.44	0.005	595.4	0.6
Auger, Rockpiker, Loader	Rubber Tire Dozers	2270002063	Diesel	180	3	112	16	10	96	6	1,728	0.371	0.59	0.18	0.63	0.12	1.86	0.005	536.3	0.6
Grader	Rubber Tire Dozers	2270002063	Diesel	240	2	112	16	10	96	6	1,152	0.371	0.59	0.18	0.63	0.12	1.86	0.005	536.3	0.6
Skidder, Trencher, Boring	Tracked excavator	2270002036	Diesel	150	5	112	16	10	96	6	2,880	0.371	0.59	0.16	0.65	0.15	1.49	0.005	536.3	0.6
Rock Drill	Tracked excavator	2270002036	Diesel	175	6	112	16	10	96	6	3,456	0.371	0.59	0.16	0.65	0.15	1.49	0.005	536.3	0.6
583 Sideboom, Pipe Benders	Tracked excavator	2270002036	Diesel	235	17	112	16	10	96	6	9,792	0.371	0.59	0.15	0.44	0.08	1.34	0.005	536.3	0.6
D7 Tack Rig	Tracked excavator	2270002036	Diesel	240	1	112	16	10	96	6	576	0.371	0.59	0.15	0.44	0.08	1.34	0.005	536.3	0.6
DB Dozers (Winch, Ripper)	Tracked excavator	2270002036	Diesel	300	22	112	16	10	96	6	12,672	0.371	0.59	0.15	0.44	0.08	1.34	0.005	536.3	0.6
345 Backhoe/Hammer	Tracked excavator	2270002036	Diesel	345	18	112	16	10	96	6	10,368	0.371	0.59	0.15	0.77	0.12	1.90	0.005	536.3	0.6
Vac Lift/Sideboom 594	Tracked excavator	2270002036	Diesel	385	4	112	16	10	96	6	2,304	0.371	0.59	0.15	0.77	0.12	1.90	0.005	536.3	0.6
Padder, Trencher, Backhoes	Tracked excavator	2270002036	Diesel	400	14	112	16	10	96	6	8,064	0.371	0.59	0.15	0.77	0.12	1.90	0.005	536.3	0.6
TOTAL (Tons)																				

NOTES:

Note 1: SCC code based on Appendix A of "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", July 2010, EPA-420-R-10-016.

Note 2: Brake-specific fuel consumption, zero hour steady state emission factor (EFss; g/hp-hr), and load factor are from MOVES2104. Year 2016 is used as the base year for EFs.

Note 3: SO₂ Emissions are calculated using Equation 7 from "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling-Compression-Ignition", July 2010, EPA-420-R-10-018.

$$SO_2 = (BSFC * 453.6 * (1 - soxcnv) - HC_{adj} EF) * 0.01 * soxdsi * 2$$

The correction factor is made to account for fuel sulfur variations; inputs specific to this calculation are noted below

0.02247 soxcnv (fraction of fuel sulfur converted to direct PM) for Base, T0, T1, T2, T3, T3B, T4A, T4B

0.30 soxcnv (fraction of fuel sulfur converted to direct PM) for Base, T4 and T4N

0.0015 soxdsi (weight percent of sulfur in diesel fuel as required per 40 CFR 80.510 for non-road diesel)

0.33 soxbas (default certification fuel sulfur weight percent, 0.33 is default)

Note 4: CO₂ Emissions are calculated using Equation 6 from "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling-Compression-Ignition", July 2010, EPA-420-R-10-018.

$$CO_2 = (BSFC * 453.6 - HC_{adj} EF) * 0.87 * 44/12$$

Table L2-2.1

PennEast Pipeline Company, LLC
Construction Emissions - Off-road Engines - Pipeline Spread 1

Criteria Emissions

Description	VOC ⁶ tons	CO ⁷ tons	PM ⁷ /PM ₁₀ ⁸ tons	PM _{2.5} ⁸ tons	SO ₂ ⁷ tons	NOx ⁷ tons	CO ₂ ⁷ tons	CH ₄ ⁹ tons	N ₂ O ¹⁰ tons	GHG ¹¹ tons of CO ₂ e
Chipper	0.05	0.19	0.03	0.03	0.00	0.72	127.44	0.001	0.002	128.17
Air Compressors	0.01	0.05	0.01	0.01	0.00	0.21	32.20	0.000	0.001	32.39
Pumps	0.02	0.10	0.02	0.02	0.00	0.29	38.61	0.000	0.001	38.84
Welding Rigs	0.18	0.72	0.11	0.11	0.00	0.87	122.89	0.003	0.005	124.37
Hydro Mulcher/Seeder	0.02	0.10	0.02	0.02	0.00	0.19	25.72	0.000	0.000	25.87
Trucks: Dump, Water, Fuel, Rigs	0.30	0.97	0.15	0.15	0.01	2.59	1044.81	0.004	0.014	1049.21
BH/LDR, Forklift, Bush Hog	0.02	0.21	0.02	0.02	0.00	0.35	60.67	0.000	0.001	60.93
Hydro Ax, Skid Truck	0.03	0.26	0.03	0.03	0.00	0.27	66.91	0.000	0.001	67.20
Auger, Rockpiker, Loader	0.04	0.13	0.02	0.02	0.00	0.38	108.48	0.001	0.001	108.94
Grader	0.03	0.11	0.02	0.02	0.00	0.33	96.43	0.001	0.001	96.83
Skidder, Trencher, Boring	0.05	0.18	0.04	0.04	0.00	0.42	150.68	0.001	0.002	151.31
Rock Drill	0.07	0.26	0.06	0.06	0.00	0.59	210.95	0.001	0.003	211.84
583 Sideboom, Pipe Benders	0.24	0.65	0.12	0.11	0.01	2.01	802.65	0.004	0.011	806.04
D7 Tack Rig	0.01	0.04	0.01	0.01	0.00	0.12	48.22	0.000	0.001	48.42
DB Dozers (Winch, Ripper)	0.40	1.08	0.20	0.19	0.01	3.32	1326.03	0.006	0.018	1331.62
345 Backhoe/Hammer	0.38	1.79	0.27	0.26	0.01	4.42	1247.67	0.006	0.017	1252.93
Vac Lift/Sideboom 594	0.09	0.44	0.07	0.07	0.00	1.10	309.41	0.001	0.004	310.71
Padder, Trencher, Backhoes	0.34	1.62	0.24	0.24	0.01	3.98	1125.11	0.005	0.015	1129.86
	2.29	8.90	1.45	1.40	0.06	22.15	6944.86	0.03	0.10	6975.49

NOTES:

Note 5: Emission factor for N2O from 40 CFR 98 Subpart C.

Note 6: Annual VOC Emissions are calculated using the following calculation $(1.053 * \text{HC emission factor (g/hp-hr)} * \text{horsepower} * \text{hours operated} * \text{load factor}) / (2000 \text{ lb/ton} * 453.6 \text{ g/lb})$
1.053 is the ratio of VOC to THC from "Conversion Factors for Hydrocarbon Emission Components", July 2010, EPA-420-R-10-015.

Note 7: Annual CO, PM, SO₂, and NOx Emissions are calculated using the following calculation $(\text{Adj. emission factor (g/hp-hr)} * \text{horsepower} * \text{hours operated} * \text{load factor}) / (2000 \text{ lb/ton} * 453.6 \text{ g/lb})$

Note 8: For diesel engines all PM is considered to be PM₁₀, PM_{2.5} is 97% of PM/PM₁₀.

Note 9: Annual CH₄ emissions are calculated using the following calculation $(\text{Adj. HC emission factor (g/hp-hr)} * (1-0.984) * \text{horsepower} * \text{hours operated} * \text{load factor}) / (2000 \text{ lb/ton} * 453.6 \text{ g/lb})$

This equation is derived in part from subtracting methane from THC to calculate NMHC. $\text{THC} - \text{CH}_4 = \text{NMHC}$; $\text{THC} - \text{NMHC} = \text{CH}_4$; $\text{THC} - (0.984 * \text{THC}) = \text{CH}_4$; $\text{THC} * (1-0.984) = \text{CH}_4$

0.984 is the ratio of MNHC to THC from "Conversion Factors for Hydrocarbon Emission Components", July 2010, EPA-420-R-10-015.

Note 10: Emissions estimate for N2O is based on a diesel higher heating value of 138,000 Btu/gallon and a density 7.05 lb/gallon

Note 11: Greenhouse gasses (GHG) are converted to carbon dioxide equivalents (CO2) using 40 CFR 98 Subpart A global warming potentials as follows:

CO2	1
CH4	25
N2O	298

Table L2-2.2

PennEast Pipeline Company, LLC
Construction Emissions - Off-road Engines - Pipeline Spread 2

Criteria Emissions

Description	Equipment category based on NONROAD classification	SCC ¹	Fuel Type	Equip-ment HP	Number of Equipment	Criteria Emissions					Total Working Days	Hours per Day	Total Working hrs	BSFC ² lb/hp-hr	Load Factor ²	EFss (g/hp-hr) ²						N ₂ O EF ⁵ g/MMBtu
						Total Days	Total Weeks	Total Months	HC	CO						PM	NOx	SO ₂ ³	CO ₂ ⁴			
Chipper	Crushing/Proc. Equipment	2270002054	Diesel	440	2	112	16	10	96	6	1,152	0.367	0.43	0.19	0.79	0.12	3.00	0.005	530.4	0.6		
Air Compressors	Light Comm. Air Comp.	2270006015	Diesel	50	4	112	16	10	96	6	2,304	0.408	0.43	0.21	0.91	0.15	3.85	0.005	589.7	0.6		
Pumps	Light Commercial Pumps	2270006010	Diesel	40	6	112	16	10	96	6	3,456	0.408	0.43	0.35	1.47	0.28	4.38	0.005	589.3	0.6		
Welding Rigs	Light Commercial Welders	2270006025	Diesel	35	40	112	16	10	96	6	23,040	0.481	0.21	0.95	4.09	0.65	4.92	0.006	692.9	0.6		
Hydro Mulcher/Seeder	Light Commercial Pumps	2270006010	Diesel	80	2	112	16	10	96	6	1,152	0.408	0.43	0.48	2.36	0.43	4.25	0.005	588.8	0.6		
Trucks: Dump, Water, Fuel, Rigs	Off-Highway Trucks	2270002051	Diesel	400	13	112	16	10	96	6	7,488	0.371	0.59	0.14	0.50	0.08	1.33	0.005	536.4	0.6		
BH/LDR, Forklift, Bush Hog	Rubber Tire Dozers	2270002063	Diesel	68	4	112	16	10	96	6	2,304	0.412	0.59	0.23	2.07	0.22	3.44	0.005	595.4	0.6		
Hydro Ax, Skid Truck	Rubber Tire Dozers	2270002063	Diesel	100	3	112	16	10	96	6	1,728	0.412	0.59	0.23	2.29	0.29	2.44	0.005	595.4	0.6		
Auger, Rockpiker, Loader	Rubber Tire Dozers	2270002063	Diesel	180	3	112	16	10	96	6	1,728	0.371	0.59	0.18	0.63	0.12	1.86	0.005	536.3	0.6		
Grader	Rubber Tire Dozers	2270002063	Diesel	240	2	112	16	10	96	6	1,152	0.371	0.59	0.18	0.63	0.12	1.86	0.005	536.3	0.6		
Skidder, Trencher, Boring	Tracked excavator	2270002036	Diesel	150	5	112	16	10	96	6	2,880	0.371	0.59	0.16	0.65	0.15	1.49	0.005	536.3	0.6		
Rock Drill	Tracked excavator	2270002036	Diesel	175	8	112	16	10	96	6	4,608	0.371	0.59	0.16	0.65	0.15	1.49	0.005	536.3	0.6		
583 Sideboom, Pipe Benders	Tracked excavator	2270002036	Diesel	235	18	112	16	10	96	6	10,368	0.371	0.59	0.15	0.44	0.08	1.34	0.005	536.3	0.6		
D7 Tack Rig	Tracked excavator	2270002036	Diesel	240	1	112	16	10	96	6	576	0.371	0.59	0.15	0.44	0.08	1.34	0.005	536.3	0.6		
DB Dozers (Winch, Ripper)	Tracked excavator	2270002036	Diesel	300	25	112	16	10	96	6	14,400	0.371	0.59	0.15	0.44	0.08	1.34	0.005	536.3	0.6		
345 Backhoe/Hammer	Tracked excavator	2270002036	Diesel	345	20	112	16	10	96	6	11,520	0.371	0.59	0.15	0.77	0.12	1.90	0.005	536.3	0.6		
Vac Lift/Sideboom 594	Tracked excavator	2270002036	Diesel	385	4	112	16	10	96	6	2,304	0.371	0.59	0.15	0.77	0.12	1.90	0.005	536.3	0.6		
Padder, Trencher, Backhoes	Tracked excavator	2270002036	Diesel	400	18	112	16	10	96	6	10,368	0.371	0.59	0.15	0.77	0.12	1.90	0.005	536.3	0.6		
TOTAL (Tons)																						

NOTES:

- Note 1: SCC code based on Appendix A of "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", July 2010, EPA-420-R-10-016.
- Note 2: Brake-specific fuel consumption, zero hour steady state emission factor (EFss; g/hp-hr), and load factor are from MOVES2104 . Year 2016 is used as the base year for EFs.
- Note 3: SO₂ Emissions are calculated using Equation 7 from "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling-Compression-Ignition", July 2010, EPA-420-R-10-018.
 $SO_2 = (BSFC * 453.6 * (1 - soxcnrv) - HC_{adj\ EF}) * 0.01 * soxdsi * 2$
 The correction factor is made to account for fuel sulfur variations; inputs specific to this calculation are noted below
 0.02247 soxcnrv (fraction of fuel sulfur converted to direct PM) for Base, T0, T1, T2, T3, T3B, T4A, T4B
 0.30 soxcnrv (fraction of fuel sulfur converted to direct PM) for Base, T4 and T4N
 0.0015 soxdsi (weight percent of sulfur in diesel fuel as required per 40 CFR 80.510 for non-road diesel)
 0.33 soxbas (default certification fuel sulfur weight percent, 0.33 is default)
- Note 4: CO₂ Emissions are calculated using Equation 6 from "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling-Compression-Ignition", July 2010, EPA-420-R-10-018.
 $CO_2 = (BSFC * 453.6 - HC_{adj\ EF}) * 0.87 * 44/12$

Table L2-2.2

PennEast Pipeline Company, LLC
Construction Emissions - Off-road Engines - Pipeline Spread 2

Criteria Emissions

Description	VOC ⁶ tons	CO ⁷ tons	PM ⁷ / ₈ / PM ₁₀ ⁸ tons	PM _{2.5} ⁸ tons	SO ₂ ⁷ tons	NOx ⁷ tons	CO ₂ ⁷ tons	CH ₄ ⁹ tons	N ₂ O ¹⁰ tons	GHG ¹¹ tons of CO ₂ e
Chipper	0.05	0.09	0.03	0.03	0.00	0.72	127.44	0.001	0.002	128.17
Air Compressors	0.01	0.02	0.01	0.01	0.00	0.21	32.20	0.000	0.001	32.39
Pumps	0.02	0.03	0.02	0.02	0.00	0.29	38.61	0.000	0.001	38.84
Welding Rigs	0.19	0.09	0.12	0.12	0.00	0.92	129.35	0.003	0.005	130.92
Hydro Mulcher/Seeder	0.02	0.02	0.02	0.02	0.00	0.19	25.72	0.000	0.000	25.87
Trucks: Dump, Water, Fuel, Rigs	0.30	0.72	0.15	0.15	0.01	2.59	1044.81	0.004	0.014	1049.21
BH/LDR, Forklift, Bush Hog	0.02	0.04	0.02	0.02	0.00	0.35	60.67	0.000	0.001	60.93
Hydro Ax, Skid Truck	0.03	0.05	0.03	0.03	0.00	0.27	66.91	0.000	0.001	67.20
Auger, Rockpiker, Loader	0.04	0.08	0.02	0.02	0.00	0.38	108.48	0.001	0.001	108.94
Grader	0.03	0.07	0.02	0.02	0.00	0.33	96.43	0.001	0.001	96.83
Skidder, Trencher, Boring	0.05	0.10	0.04	0.04	0.00	0.42	150.68	0.001	0.002	151.31
Rock Drill	0.09	0.19	0.08	0.08	0.00	0.78	281.26	0.001	0.004	282.45
583 Sideboom, Pipe Benders	0.26	0.59	0.13	0.12	0.01	2.13	849.87	0.004	0.012	853.45
D7 Tack Rig	0.01	0.03	0.01	0.01	0.00	0.12	48.22	0.000	0.001	48.42
DB Dozers (Winch, Ripper)	0.46	1.04	0.22	0.22	0.01	3.77	1506.85	0.007	0.021	1513.21
345 Backhoe/Hammer	0.42	0.96	0.30	0.29	0.01	4.91	1386.30	0.006	0.019	1392.15
Vac Lift/Sideboom 594	0.09	0.21	0.07	0.07	0.00	1.10	309.41	0.001	0.004	310.71
Padder, Trencher, Backhoes	0.44	1.00	0.31	0.31	0.01	5.12	1446.57	0.007	0.020	1452.67
	2.53	5.33	1.61	1.56	0.07	24.60	7709.77	0.04	0.11	7743.67

NOTES:

Note 5: Emission factor for N2O from 40 CFR 98 Subpart C.

Note 6: Annual VOC Emissions are calculated using the following calculation (1.053 * HC emission factor (g/hp-hr) * horsepower * hours operated * load factor) / (2000 lb/ton * 453.6 g/lb)
1.053 is the ratio of VOC to THC from "Conversion Factors for Hydrocarbon Emission Components", July 2010, EPA-420-R-10-015.

Note 7: Annual CO, PM, SO₂, and NOx Emissions are calculated using the following calculation (Adj. emission factor (g/hp-hr) * horsepower * hours operated * load factor) / (2000 lb/ton * 453.6 g/lb)

Note 8: For diesel engines all PM is considered to be PM₁₀, PM_{2.5} is 97% of PM/PM₁₀.

Note 9: Annual CH₄ emissions are calculated using the following calculation (Adj. HC emission factor (g/hp-hr) * (1-0.984) * horsepower * hours operated * load factor) / (2000 lb/ton * 453.6 g/lb)

This equation is derived in part from subtracting methane from THC to calculate NMHC. THC - CH₄ = NMHC; THC - NMHC = CH₄; THC - (0.984 * THC) = CH₄; THC * (1-0.984) = CH₄

0.984 is the ratio of MNHC to THC from "Conversion Factors for Hydrocarbon Emission Components", July 2010, EPA-420-R-10-015.

Note 10: Emissions estimate for N2O is based on a diesel higher heating value of 138,000 Btu/gallon and a density of 7.05 lb/gallon

Note 11: Greenhouse gasses (GHG) are converted to carbon dioxide equivalents (CO₂) using 40 CFR 98 Subpart A global warming potentials as follows:

CO ₂	1
CH ₄	25
N ₂ O	298

Table L2-2.3

PennEast Pipeline Company, LLC
Construction Emissions - Off-road Engines - Pipeline Spread 3

Criteria Emissions

Description	Equipment category based on NONROAD classification	SCC ¹	Fuel Type	Equip-ment HP	Number of Equipment	Total Days	Total Weeks	Total Months	Total Working Days	Hours per Day	Total Working hrs	BSFC ² lb/hp-hr	Load Factor ²	EFss (g/hp-hr) ²					
														HC	CO	PM	NOx	SO ₂ ³	CO ₂ ⁴
Chipper	Crushing/Proc. Equipment	2270002054	Diesel	440	2	112	16	10	96	6	1,152	0.367	0.43	0.19	0.79	0.12	3.00	0.005	530.4
Air Compressors	Light Comm. Air Comp.	2270006015	Diesel	50	4	112	16	10	96	6	2,304	0.408	0.43	0.21	0.91	0.15	3.85	0.005	589.7
Pumps	Light Commercial Pumps	2270006010	Diesel	40	6	112	16	10	96	6	3,456	0.408	0.43	0.35	1.47	0.28	4.38	0.005	589.3
Welding Rigs	Light Commercial Welders	2270006025	Diesel	35	40	112	16	10	96	6	23,040	0.481	0.21	0.95	4.09	0.65	4.92	0.006	692.9
Hydro Mulcher/Seeder	Light Commercial Pumps	2270006010	Diesel	80	2	112	16	10	96	6	1,152	0.408	0.43	0.48	2.36	0.43	4.25	0.005	588.8
Trucks: Dump, Water, Fuel, Rigs	Off-Highway Trucks	2270002051	Diesel	400	13	112	16	10	96	6	7,488	0.371	0.59	0.14	0.50	0.08	1.33	0.005	536.4
BH/LDR, Forklift, Bush Hog	Rubber Tire Dozers	2270002063	Diesel	68	4	112	16	10	96	6	2,304	0.412	0.59	0.23	2.07	0.22	3.44	0.005	595.4
Hydro Ax, Skid Truck	Rubber Tire Dozers	2270002063	Diesel	100	3	112	16	10	96	6	1,728	0.412	0.59	0.23	2.29	0.29	2.44	0.005	595.4
Auger, Rockpiker, Loader	Rubber Tire Dozers	2270002063	Diesel	180	3	112	16	10	96	6	1,728	0.371	0.59	0.18	0.63	0.12	1.86	0.005	536.3
Grader	Rubber Tire Dozers	2270002063	Diesel	240	2	112	16	10	96	6	1,152	0.371	0.59	0.18	0.63	0.12	1.86	0.005	536.3
Skidder, Trencher, Boring	Tracked excavator	2270002036	Diesel	150	5	112	16	10	96	6	2,880	0.371	0.59	0.16	0.65	0.15	1.49	0.005	536.3
Rock Drill	Tracked excavator	2270002036	Diesel	175	8	112	16	10	96	6	4,608	0.371	0.59	0.16	0.65	0.15	1.49	0.005	536.3
583 Sideboom, Pipe Benders	Tracked excavator	2270002036	Diesel	235	18	112	16	10	96	6	10,368	0.371	0.59	0.15	0.44	0.08	1.34	0.005	536.3
D7 Tack Rig	Tracked excavator	2270002036	Diesel	240	1	112	16	10	96	6	576	0.371	0.59	0.15	0.44	0.08	1.34	0.005	536.3
DB Dozers (Winch, Ripper)	Tracked excavator	2270002036	Diesel	300	24	112	16	10	96	6	13,824	0.371	0.59	0.15	0.44	0.08	1.34	0.005	536.3
345 Backhoe/Hammer	Tracked excavator	2270002036	Diesel	345	20	112	16	10	96	6	11,520	0.371	0.59	0.15	0.77	0.12	1.90	0.005	536.3
Vac Lift/Sideboom 594	Tracked excavator	2270002036	Diesel	385	4	112	16	10	96	6	2,304	0.371	0.59	0.15	0.77	0.12	1.90	0.005	536.3
Padder, Trencher, Backhoes	Tracked excavator	2270002036	Diesel	400	17	112	16	10	96	6	9,792	0.371	0.59	0.15	0.77	0.12	1.90	0.005	536.3
TOTAL (Tons)																			

NOTES:

Note 1: SCC code based on Appendix A of "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", July 2010, EPA-420-R-10-016.

Note 2: Brake-specific fuel consumption, zero hour steady state emission factor (EFss; g/hp-hr), and load factor are from MOVES2104 . Year 2016 is used as the base year for EFs.

Note 3: SO₂ Emissions are calculated using Equation 7 from "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling-Compression-Ignition", July 2010, EPA-420-R-10-018.

$$SO_2 = (BSFC * 453.6 * (1 - soxcnv) - HC_{adj} EF) * 0.01 * soxdsl * 2$$

The correction factor is made to account for fuel sulfur variations; inputs specific to this calculation are noted below

0.02247 soxcnv (fraction of fuel sulfur converted to direct PM) for Base, T0, T1, T2, T3, T3B, T4A, T4B

0.30 soxcnv (fraction of fuel sulfur converted to direct PM) for Base, T4 and T4N

0.0015 soxdsl (weight percent of sulfur in diesel fuel as required per 40 CFR 80.510 for non-road diesel)

0.33 soxbas (default certification fuel sulfur weight percent, 0.33 is default)

Note 4: CO₂ Emissions are calculated using Equation 6 from "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling-Compression-Ignition", July 2010, EPA-420-R-10-018.

$$CO_2 = (BSFC * 453.6 - HC_{adj} EF) * 0.87 * 44/12$$

Table L2-2.3

PennEast Pipeline Company, LLC
Construction Emissions - Off-road Engines - Pipeline Spread 3

Criteria Emissions

Description	N ₂ O EF ⁵ g/MMBtu	VOC ⁶ tons	CO ⁷ tons	PM ⁷ /PM ₁₀ ⁸ tons	PM _{2.5} ⁸ tons	SO ₂ ⁷ tons	NOx ⁷ tons	CO ₂ ⁷ tons	CH ₄ ⁹ tons	N ₂ O ¹⁰ tons	GHG ¹¹ tons of CO ₂ e
Chipper	0.6	0.05	0.19	0.03	0.03	0.00	0.72	127.44	0.001	0.002	128.17
Air Compressors	0.6	0.01	0.02	0.01	0.01	0.00	0.21	32.20	0.000	0.001	32.39
Pumps	0.6	0.02	0.03	0.02	0.02	0.00	0.29	38.61	0.000	0.001	38.84
Welding Rigs	0.6	0.19	0.09	0.12	0.12	0.00	0.92	129.35	0.003	0.005	130.92
Hydro Mulcher/Seeder	0.6	0.02	0.02	0.02	0.02	0.00	0.19	25.72	0.000	0.000	25.87
Trucks: Dump, Water, Fuel, Rigs	0.6	0.30	0.72	0.15	0.15	0.01	2.59	1044.81	0.004	0.014	1049.21
BH/LDR, Forklift, Bush Hog	0.6	0.02	0.04	0.02	0.02	0.00	0.35	60.67	0.000	0.001	60.93
Hydro Ax, Skid Truck	0.6	0.03	0.05	0.03	0.03	0.00	0.27	66.91	0.000	0.001	67.20
Auger, Rockpiker, Loader	0.6	0.04	0.08	0.02	0.02	0.00	0.38	108.48	0.001	0.001	108.94
Grader	0.6	0.03	0.07	0.02	0.02	0.00	0.33	96.43	0.001	0.001	96.83
Skidder, Trencher, Boring	0.6	0.05	0.10	0.04	0.04	0.00	0.42	150.68	0.001	0.002	151.31
Rock Drill	0.6	0.09	0.19	0.08	0.08	0.00	0.78	281.26	0.001	0.004	282.45
583 Sideboom, Pipe Benders	0.6	0.26	0.59	0.13	0.12	0.01	2.13	849.87	0.004	0.012	853.45
D7 Tack Rig	0.6	0.01	0.03	0.01	0.01	0.00	0.12	48.22	0.000	0.001	48.42
DB Dozers (Winch, Ripper)	0.6	0.44	1.00	0.21	0.21	0.01	3.62	1446.58	0.007	0.020	1452.68
345 Backhoe/Hammer	0.6	0.42	0.96	0.30	0.29	0.01	4.91	1386.30	0.006	0.019	1392.15
Vac Lift/Sideboom 594	0.6	0.09	0.21	0.07	0.07	0.00	1.10	309.41	0.001	0.004	310.71
Padder, Trencher, Backhoes	0.6	0.42	0.95	0.30	0.29	0.01	4.84	1366.21	0.006	0.019	1371.97
		2.49	5.34	1.58	1.53	0.07	24.16	7569.13	0.04	0.11	7602.44

NOTES:

Note 5: Emission factor for N₂O from 40 CFR 98 Subpart C.

Note 6: Annual VOC Emissions are calculated using the following calculation (1.053 * HC emission factor (g/hp-hr) * horsepower * hours operated * load factor) / (2000 lb/ton * 453.6 g/lb)
1.053 is the ratio of VOC to THC from "Conversion Factors for Hydrocarbon Emission Components", July 2010, EPA-420-R-10-015.

Note 7: Annual CO, PM, SO₂, and NOx Emissions are calculated using the following calculation (Adj. emission factor (g/hp-hr) * horsepower * hours operated * load factor) / (2000 lb/ton * 453.6 g/lb)

Note 8: For diesel engines all PM is considered to be PM₁₀, PM_{2.5} is 97% of PM/PM₁₀.

Note 9: Annual CH₄ emissions are calculated using the following calculation (Adj. HC emission factor (g/hp-hr) * (1-0.984) * horsepower * hours operated * load factor) / (2000 lb/ton * 453.6 g/lb)
This equation is derived in part from subtracting methane from THC to calculate NMHC. THC - CH₄ = NMHC; THC - NMHC = CH₄; THC - (0.984 * THC) = CH₄; THC * (1-0.984) = CH₄
0.984 is the ratio of MNHC to THC from "Conversion Factors for Hydrocarbon Emission Components", July 2010, EPA-420-R-10-015.

Note 10: Emissions estimate for N₂O is based on a diesel higher heating value of 138,000 Btu/gallon and a density of 7.05 lb/gallon

Note 11: Greenhouse gasses (GHG) are converted to carbon dioxide equivalents (CO₂) using 40 CFR 98 Subpart A global warming potentials as follows:

CO ₂	1
CH ₄	25
N ₂ O	298

Table L2-4

PennEast Pipeline Company, LLC
 Construction Emissions - Off-road Engines - Kidder Compressor Station Criteria Emissions

Description	Equipment category based on NONROAD classification	SCC ¹	Fuel Type	Equip-ment HP	Number of Equipment	Total Days	Total Weeks	Total Months	Total Working Days	Hours per Day	Total	BSFC ² lb/hp-hr	Load Factor ²	EFss (g/hp-hr) ²					N ₂ O EF ⁵ g/MMBtu	
											Working hrs			HC	CO	PM	NOx	SO ₂ ³		CO ₂ ⁴
Welding Rigs	Light Commercial Welders	2270006025	Diesel	35	9	154	22	5	132	10	11,880	0.481	0.21	0.951	4.086	0.645	4.916	0.006	692.9	0.6
8,000 Lb All-Terrain Fork Truck	Rubber Tire Dozers	2270002063	Diesel	100	1	245	35	8	210	3	630	0.412	0.59	0.230	2.291	0.295	2.436	0.005	595.4	0.6
D-7 LGP Caterpillar or Equivalent	Tracked Excavator	2270002036	Diesel	240	2	245	35	8	210	10	4,200	0.371	0.59	0.177	0.630	0.122	1.861	0.005	536.3	0.6
325 Caterpillar or Equivalent	Tracked Excavator	2270002036	Diesel	180	2	154	22	5	132	10	2,640	0.371	0.59	0.164	0.650	0.154	1.492	0.005	536.3	0.6
330 Caterpillar with Vacuworks & Shoes	Tracked Excavator	2270002036	Diesel	270	3	154	22	5	132	10	3,960	0.371	0.59	0.154	0.435	0.079	1.342	0.005	536.3	0.6
Cat Rubber Tire Backhoe	Rubber Tire Dozers	2270006005	Diesel	100	3	245	35	8	210	10	6,300	0.412	0.43	0.230	2.291	0.295	2.436	0.005	595.4	0.6
583 Caterpillar Pipelayer	Tracked Excavator	2270002036	Diesel	347	1	154	22	5	132	10	1,320	0.371	0.59	0.155	0.770	0.117	1.899	0.005	536.3	0.6
594 Caterpillar Pipelayer	Tracked excavator	2270002036	Diesel	385	1	154	22	5	132	10	1,320	0.371	0.59	0.155	0.770	0.117	1.899	0.005	536.3	0.6
300 Ton Hydraulic Crane	Tracked excavator	2270002036	Diesel	296	1	14	2	0.5	12	10	120	0.371	0.59	0.154	0.435	0.079	1.342	0.005	536.3	0.6
60 Ton Mantis	Tracked excavator	2270002036	Diesel	240	1	91	13	3	78	10	780	0.371	0.59	0.154	0.435	0.079	1.342	0.005	536.3	0.6
Power Generator	Light Comm. Gen. Sets	2270006005	Diesel	35	1	245	35	8	210	10	2,100	0.408	0.43	0.280	1.530	0.340	4.730	0.005	589.5	0.6
TOTAL (Tons)																				

AECOM assumed engines tiers for construction based on start date and length of time from effective dates of engine tiers

NOTES:

Note 1: SCC code based on Appendix A of "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", July 2010, EPA-420-R-10-016.

Note 2: Brake-specific fuel consumption, zero hour steady state emission factor (EFss; g/hp-hr), and load factor are from MOVES2104. Year 2016 is used as the base year for EFs.

Note 3: SO₂ Emissions are calculated using Equation 7 from "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling-Compression-Ignition", July 2010, EPA-420-R-10-018.

$$SO_2 = (BSFC * 453.6 * (1 - soxcnv) - HC_{adj} EF) * 0.01 * soxdsl * 2$$

The correction factor is made to account for fuel sulfur variations; inputs specific to this calculation are noted below

0.02247 soxcnv (fraction of fuel sulfur converted to direct PM) for Base, T0, T1, T2, T3, T3B, T4A, T4B

0.30 soxcnv (fraction of fuel sulfur converted to direct PM) for Base, T4 and T4N

0.0015 soxdsl (weight percent of sulfur in diesel fuel as required per 40 CFR 80.510 for non-road diesel)

0.33 soxbas (default certification fuel sulfur weight percent, 0.33 is default)

Note 4: CO₂ Emissions are calculated using Equation 6 from "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling-Compression-Ignition", July 2010, EPA-420-R-10-018.

$$CO_2 = (BSFC * 453.6 - HC_{adj} EF) * 0.87 * 44/12$$

Table L2-4

**PennEast Pipeline Company, LLC
Construction Emissions - Off-road Engines - Kidder Compressor Station**

Criteria Emissions

Description	VOC ⁶ tons	CO ⁷ tons	PM ⁷ /PM ₁₀ ⁸ tons	PM _{2.5} ⁸ tons	SO ₂ ⁷ tons	NOx ⁷ tons	CO ₂ ⁷ tons	CH ₄ ⁹ tons	N ₂ O ¹⁰ tons	GHG ¹¹ tons of CO ₂ e
Welding Rigs	0.10	0.39	0.06	0.06	0.0006	0.47	66.70	0.001	0.003	67.51
8,000 Lb All-Terrain Fork Truck	0.01	0.09	0.01	0.01	0.0002	0.10	24.40	0.000	0.000	24.50
D-7 LGP Caterpillar or Equivalent	0.12	0.41	0.08	0.08	0.0032	1.22	351.55	0.002	0.005	353.04
325 Caterpillar or Equivalent	0.05	0.20	0.05	0.05	0.0015	0.46	165.74	0.001	0.002	166.44
330 Caterpillar with Vacuworks & Shoes	0.11	0.30	0.05	0.05	0.0034	0.93	372.95	0.002	0.005	374.52
Cat Rubber Tire Backhoe	0.07	0.68	0.09	0.09	0.0016	0.73	177.80	0.001	0.003	178.83
583 Caterpillar Pipelayer	0.05	0.23	0.03	0.03	0.0015	0.57	159.77	0.001	0.002	160.44
594 Caterpillar Pipelayer	0.05	0.25	0.04	0.04	0.0016	0.63	177.26	0.001	0.002	178.01
300 Ton Hydraulic Crane	0.00	0.01	0.00	0.00	0.0001	0.03	12.39	0.000	0.000	12.44
60 Ton Mantis	0.02	0.05	0.01	0.01	0.0006	0.16	65.30	0.000	0.001	65.57
Power Generator	0.01	0.05	0.01	0.01	0.0002	0.16	20.54	0.000	0.000	20.66
	0.60	2.69	0.44	0.43	0.01	5.47	1594.39	0.009	0.025	1601.96

NOTES:

Note 5: Emission factor for N2O from 40 CFR 98 Subpart C.

Note 6: Annual VOC Emissions are calculated using the following calculation (1.053 * HC emission factor (g/hp-hr) * horsepower * hours operated * load factor) / (2000 lb/ton * 453.6 g/lb)
1.053 is the ratio of VOC to THC from "Conversion Factors for Hydrocarbon Emission Components", July 2010, EPA-420-R-10-015.

Note 7: Annual CO, PM, SO₂, and NOx Emissions are calculated using the following calculation (Adj. emission factor (g/hp-hr) * horsepower * hours operated * load factor) / (2000 lb/ton * 453.6 g/lb)

Note 8: For diesel engines all PM is considered to be PM₁₀, PM_{2.5} is 97% of PM/PM₁₀.

Note 9: Annual CH₄ emissions are calculated using the following calculation (Adj. HC emission factor (g/hp-hr) * (1-0.984) * horsepower * hours operated * load factor) / (2000 lb/ton * 453.6 g/lb)

This equation is derived in part from subtracting methane from THC to calculate NMHC. THC - CH₄ = NMHC; THC - NMHC = CH₄; THC - (0.984 * THC) = CH₄; THC * (1-0.984) = CH₄
0.984 is the ratio of MNHC to THC from "Conversion Factors for Hydrocarbon Emission Components", July 2010, EPA-420-R-10-015.

Note 10: Emissions estimate for N2O is based on a diesel higher heating value of 138,000 Btu/gallon and a density of 7.05 lb/gallon

Note 11: Greenhouse gasses (GHG) are converted to carbon dioxide equivalents (CO₂) using 40 CFR 98 Subpart A global warming potentials as follows:

CO ₂	1
CH ₄	25
N ₂ O	298

Table L2-3.1

PennEast Pipeline Company, LLC
Construction Emissions - Off-road Engines - Pipeline Spread 1 HAPS Emissions Estimates

Description	Equipment category based on NONROAD classification	SCC ¹	Fuel Type	Equipment HP	Number of Equipment	Total Days	Total Weeks	Total Months	Total Working Days	Hours per Day	Total Working hrs	BSFC ²	Load
												lb/hp-hr	Factor ²
Chipper	Crushing/Proc. Equipment	2270002054	Diesel	440	2	112	16	10	96	6	1,152	0.367	0.43
Air Compressors	Light Comm. Air Comp.	2270006015	Diesel	50	4	112	16	10	96	6	2,304	0.408	0.43
Pumps	Light Commercial Pumps	2270006010	Diesel	40	6	112	16	10	96	6	3,456	0.408	0.43
Welding Rigs	Light Commercial Welders	2270006025	Diesel	35	38	112	16	10	96	6	21,888	0.481	0.21
Hydro Mulcher/Seeder	Light Commercial Pumps	2270006010	Diesel	80	2	112	16	10	96	6	1,152	0.408	0.43
Trucks: Dump, Water, Fuel, Rigs	Off-Highway Trucks	2270002051	Diesel	400	13	112	16	10	96	6	7,488	0.371	0.59
BH/LDR, Forklift, Bush Hog	Rubber Tire Dozers	2270002063	Diesel	68	4	112	16	10	96	6	2,304	0.412	0.59
Hydro Ax, Skid Truck	Rubber Tire Dozers	2270002063	Diesel	100	3	112	16	10	96	6	1,728	0.412	0.59
Auger, Rockpiker, Loader	Rubber Tire Dozers	2270002063	Diesel	180	3	112	16	10	96	6	1,728	0.371	0.59
Grader	Rubber Tire Dozers	2270002063	Diesel	240	2	112	16	10	96	6	1,152	0.371	0.59
Skidder, Trencher, Boring	Tracked excavator	2270002036	Diesel	150	5	112	16	10	96	6	2,880	0.371	0.59
Rock Drill	Tracked excavator	2270002036	Diesel	175	6	112	16	10	96	6	3,456	0.371	0.59
583 Sideboom, Pipe Benders	Tracked excavator	2270002036	Diesel	235	17	112	16	10	96	6	9,792	0.371	0.59
D7 Tack Rig	Tracked excavator	2270002036	Diesel	240	1	112	16	10	96	6	576	0.371	0.59
DB Dozers (Winch, Ripper)	Tracked excavator	2270002036	Diesel	300	22	112	16	10	96	6	12,672	0.371	0.59
345 Backhoe/Hammer	Tracked excavator	2270002036	Diesel	345	18	112	16	10	96	6	10,368	0.371	0.59
Vac Lift/Sideboom 594	Tracked excavator	2270002036	Diesel	385	4	112	16	10	96	6	2,304	0.371	0.59
Padder, Trencher, Backhoes	Tracked excavator	2270002036	Diesel	400	14	112	16	10	96	6	8,064	0.371	0.59
	TOTAL (Tons)												

NOTES:

Note 1: SCC code based on Appendix A of "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", April 2004, EPA-420-P-04-005.

Note 2: Brake-specific fuel consumption and load factor are from EPA's MOVES2014 model (Non-road sources run for 2016, Luzerne County, PA)

Table L2-3.1

PennEast Pipeline Company, LLC
Construction Emissions - Off-road Engines - Pipeline Spread 1

HAPS Emissions Estimates

Description	HAP Emissions (Tons) ⁴							
	Benzene	Toluene	Xylenes	Acrolein	PAHs	1,3-Butadiene	Formaldehyde	Acetaldehyde
Chipper	7.30E-04	3.20E-04	2.23E-04	7.24E-05	1.32E-04	3.06E-05	9.24E-04	6.00E-04
Air Compressors	1.85E-04	8.09E-05	5.64E-05	1.83E-05	3.32E-05	7.73E-06	2.33E-04	1.52E-04
Pumps	2.21E-04	9.71E-05	6.76E-05	2.20E-05	3.99E-05	9.28E-06	2.80E-04	1.82E-04
Welding Rigs	7.07E-04	3.10E-04	2.16E-04	7.01E-05	1.27E-04	2.96E-05	8.94E-04	5.81E-04
Hydro Mulcher/Seeder	1.48E-04	6.47E-05	4.51E-05	1.46E-05	2.66E-05	6.19E-06	1.87E-04	1.21E-04
Trucks: Dump, Water, Fuel, Rigs	5.99E-03	2.62E-03	1.83E-03	5.94E-04	1.08E-03	2.51E-04	7.57E-03	4.92E-03
BH/LDR, Forklift, Bush Hog	3.48E-04	1.52E-04	1.06E-04	3.45E-05	6.26E-05	1.46E-05	4.40E-04	2.86E-04
Hydro Ax, Skid Truck	3.84E-04	1.68E-04	1.17E-04	3.80E-05	6.91E-05	1.61E-05	4.85E-04	3.15E-04
Auger, Rockpiker, Loader	6.22E-04	2.73E-04	1.90E-04	6.16E-05	1.12E-04	2.61E-05	7.86E-04	5.11E-04
Grader	5.53E-04	2.42E-04	1.69E-04	5.48E-05	9.95E-05	2.32E-05	6.99E-04	4.54E-04
Skidder, Trencher, Boring	8.63E-04	3.79E-04	2.64E-04	8.56E-05	1.55E-04	3.62E-05	1.09E-03	7.10E-04
Rock Drill	1.21E-03	5.30E-04	3.69E-04	1.20E-04	2.18E-04	5.07E-05	1.53E-03	9.94E-04
583 Sideboom, Pipe Benders	4.60E-03	2.02E-03	1.40E-03	4.56E-04	8.28E-04	1.93E-04	5.82E-03	3.78E-03
D7 Tack Rig	2.76E-04	1.21E-04	8.44E-05	2.74E-05	4.98E-05	1.16E-05	3.49E-04	2.27E-04
DB Dozers (Winch, Ripper)	7.60E-03	3.33E-03	2.32E-03	7.53E-04	1.37E-03	3.18E-04	9.61E-03	6.25E-03
345 Backhoe/Hammer	7.15E-03	3.13E-03	2.18E-03	7.09E-04	1.29E-03	3.00E-04	9.04E-03	5.88E-03
Vac Lift/Sideboom 594	1.77E-03	7.77E-04	5.42E-04	1.76E-04	3.19E-04	7.43E-05	2.24E-03	1.46E-03
Padder, Trencher, Backhoes	6.45E-03	2.83E-03	1.97E-03	6.39E-04	1.16E-03	2.70E-04	8.15E-03	5.30E-03
	3.98E-02	1.74E-02	1.22E-02	3.95E-03	7.17E-03	1.67E-03	5.03E-02	3.27E-02

Emission Factor ³	≤ 600 HP	> 600 HP
	lb/MMBtu	lb/MMBtu
Benzene	9.33E-04	7.76E-04
Toluene	4.09E-04	2.81E-04
Xylenes	2.85E-04	1.93E-04
Acrolein	9.25E-05	7.88E-06
PAHs	1.68E-04	2.12E-04
1,3-Butadiene	3.91E-05	
Formaldehyde	1.18E-03	7.89E-05
Acetaldehyde	7.67E-04	2.52E-05

Total All HAPS	0.17
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NOTES:

Note 3: Emission factors from AP-42 Section 3.3, Table 3.3-2 for engines ≤600 HP and AP-42 Section 3.4, Tables 3.4-3 and 3.4-4 for engines >600 HP.

Note 4: Emissions estimates are based on a higher heating value of 138,000 Btu/gallon and a density of 7.05 lb/gallon.

Table L2-3.2

PennEast Pipeline Company, LLC
Construction Emissions - Off-road Engines - Pipeline Spread 2 HAPS Emissions Estimates

Description	Equipment category based on NONROAD classification	SCC ¹	Fuel Type	Equipment HP	Number of Equipment	Total Days	Total Weeks	Total Months	Total Working Days	Hours per Day	Total Working hrs	BSFC ²	Load Factor ²
												lb/hp-hr	
Chipper	Crushing/Proc. Equipment	2270002054	Diesel	440	2	112	16	10	96	6	1,152	0.367	0.43
Air Compressors	Light Comm. Air Comp.	2270006015	Diesel	50	4	112	16	10	96	6	2,304	0.408	0.43
Pumps	Light Commercial Pumps	2270006010	Diesel	40	6	112	16	10	96	6	3,456	0.408	0.43
Welding Rigs	Light Commercial Welders	2270006025	Diesel	35	40	112	16	10	96	6	23,040	0.481	0.21
Hydro Mulcher/Seeder	Light Commercial Pumps	2270006010	Diesel	80	2	112	16	10	96	6	1,152	0.408	0.43
Trucks: Dump, Water, Fuel, Rigs	Off-Highway Trucks	2270002051	Diesel	400	13	112	16	10	96	6	7,488	0.371	0.59
BH/LDR, Forklift, Bush Hog	Rubber Tire Dozers	2270002063	Diesel	68	4	112	16	10	96	6	2,304	0.412	0.59
Hydro Ax, Skid Truck	Rubber Tire Dozers	2270002063	Diesel	100	3	112	16	10	96	6	1,728	0.412	0.59
Auger, Rockpiker, Loader	Rubber Tire Dozers	2270002063	Diesel	180	3	112	16	10	96	6	1,728	0.371	0.59
Grader	Rubber Tire Dozers	2270002063	Diesel	240	2	112	16	10	96	6	1,152	0.371	0.59
Skidder, Trencher, Boring	Tracked excavator	2270002036	Diesel	150	5	112	16	10	96	6	2,880	0.371	0.59
Rock Drill	Tracked excavator	2270002036	Diesel	175	8	112	16	10	96	6	4,608	0.371	0.59
583 Sideboom, Pipe Benders	Tracked excavator	2270002036	Diesel	235	18	112	16	10	96	6	10,368	0.371	0.59
D7 Tack Rig	Tracked excavator	2270002036	Diesel	240	1	112	16	10	96	6	576	0.371	0.59
DB Dozers (Winch, Ripper)	Tracked excavator	2270002036	Diesel	300	25	112	16	10	96	6	14,400	0.371	0.59
345 Backhoe/Hammer	Tracked excavator	2270002036	Diesel	345	20	112	16	10	96	6	11,520	0.371	0.59
Vac Lift/Sideboom 594	Tracked excavator	2270002036	Diesel	385	4	112	16	10	96	6	2,304	0.371	0.59
Padder, Trencher, Backhoes	Tracked excavator	2270002036	Diesel	400	18	112	16	10	96	6	10,368	0.371	0.59
	TOTAL (Tons)												

NOTES:

Note 1: SCC code based on Appendix A of "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", April 2004, EPA-420-P-04-005.

Note 2: Brake-specific fuel consumption and load factor are from EPA's MOVES2014 model (Non-road sources run for 2016, Luzerne County, PA)

Table L2-3.2

PennEast Pipeline Company, LLC
Construction Emissions - Off-road Engines - Pipeline Spread 2

HAPS Emissions Estimates

Description	HAP Emissions (Tons) ⁴							
	Benzene	Toluene	Xylenes	Acrolein	PAHs	1,3-Butadiene	Formaldehyde	Acetaldehyde
Chipper	7.30E-04	3.20E-04	2.23E-04	7.24E-05	1.32E-04	3.06E-05	9.24E-04	6.00E-04
Air Compressors	1.85E-04	8.09E-05	5.64E-05	1.83E-05	3.32E-05	7.73E-06	2.33E-04	1.52E-04
Pumps	2.21E-04	9.71E-05	6.76E-05	2.20E-05	3.99E-05	9.28E-06	2.80E-04	1.82E-04
Welding Rigs	7.44E-04	3.26E-04	2.27E-04	7.37E-05	1.34E-04	3.12E-05	9.41E-04	6.11E-04
Hydro Mulcher/Seeder	1.48E-04	6.47E-05	4.51E-05	1.46E-05	2.66E-05	6.19E-06	1.87E-04	1.21E-04
Trucks: Dump, Water, Fuel, Rigs	5.99E-03	2.62E-03	1.83E-03	5.94E-04	1.08E-03	2.51E-04	7.57E-03	4.92E-03
BH/LDR, Forklift, Bush Hog	3.48E-04	1.52E-04	1.06E-04	3.45E-05	6.26E-05	1.46E-05	4.40E-04	2.86E-04
Hydro Ax, Skid Truck	3.84E-04	1.68E-04	1.17E-04	3.80E-05	6.91E-05	1.61E-05	4.85E-04	3.15E-04
Auger, Rockpiker, Loader	6.22E-04	2.73E-04	1.90E-04	6.16E-05	1.12E-04	2.61E-05	7.86E-04	5.11E-04
Grader	5.53E-04	2.42E-04	1.69E-04	5.48E-05	9.95E-05	2.32E-05	6.99E-04	4.54E-04
Skidder, Trencher, Boring	8.63E-04	3.79E-04	2.64E-04	8.56E-05	1.55E-04	3.62E-05	1.09E-03	7.10E-04
Rock Drill	1.61E-03	7.07E-04	4.92E-04	1.60E-04	2.90E-04	6.75E-05	2.04E-03	1.33E-03
583 Sideboom, Pipe Benders	4.87E-03	2.13E-03	1.49E-03	4.83E-04	8.77E-04	2.04E-04	6.16E-03	4.00E-03
D7 Tack Rig	2.76E-04	1.21E-04	8.44E-05	2.74E-05	4.98E-05	1.16E-05	3.49E-04	2.27E-04
DB Dozers (Winch, Ripper)	8.63E-03	3.79E-03	2.64E-03	8.56E-04	1.55E-03	3.62E-04	1.09E-02	7.10E-03
345 Backhoe/Hammer	7.94E-03	3.48E-03	2.43E-03	7.88E-04	1.43E-03	3.33E-04	1.00E-02	6.53E-03
Vac Lift/Sideboom 594	1.77E-03	7.77E-04	5.42E-04	1.76E-04	3.19E-04	7.43E-05	2.24E-03	1.46E-03
Padder, Trencher, Backhoes	8.29E-03	3.63E-03	2.53E-03	8.22E-04	1.49E-03	3.47E-04	1.05E-02	6.81E-03
	4.42E-02	1.94E-02	1.35E-02	4.38E-03	7.96E-03	1.85E-03	5.59E-02	3.63E-02

Total All HAPS	0.18
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Emission Factor ³	≤ 600 HP	> 600 HP
	lb/MMBtu	lb/MMBtu
Benzene	9.33E-04	7.76E-04
Toluene	4.09E-04	2.81E-04
Xylenes	2.85E-04	1.93E-04
Acrolein	9.25E-05	7.88E-06
PAHs	1.68E-04	2.12E-04
1,3-Butadiene	3.91E-05	
Formaldehyde	1.18E-03	7.89E-05
Acetaldehyde	7.67E-04	2.52E-05

NOTES:

Note 3: Emission factors from AP-42 Section 3.3, Table 3.3-2 for engines ≤600 HP and AP-42 Section 3.4, Tables 3.4-3 and 3.4-4 for engines >600 HP.

Note 4: Emissions estimates are based on a higher heating value of 138,000 Btu/gallon and a density of 7.05 lb/gallon.

Table L2-3.3

PennEast Pipeline Company, LLC
Construction Emissions - Off-road Engines - Pipeline Spread 3 HAPS Emissions Estimates

Description	Equipment category based on NONROAD classification	SCC ¹	Fuel Type	Equipment HP	Number of Equipment	Total Days	Total Weeks	Total Months	Total Working Days	Hours per Day	Total Working hrs	BSFC ²	Load Factor ²
												lb/hp-hr	
Chipper	Crushing/Proc. Equipment	2270002054	Diesel	440	2	112	16	10	96	6	1,152	0.367	0.43
Air Compressors	Light Comm. Air Comp.	2270006015	Diesel	50	4	112	16	10	96	6	2,304	0.408	0.43
Pumps	Light Commercial Pumps	2270006010	Diesel	40	6	112	16	10	96	6	3,456	0.408	0.43
Welding Rigs	Light Commercial Welders	2270006025	Diesel	35	40	112	16	10	96	6	23,040	0.481	0.21
Hydro Mulcher/Seeder	Light Commercial Pumps	2270006010	Diesel	80	2	112	16	10	96	6	1,152	0.408	0.43
Trucks: Dump, Water, Fuel, Rigs	Off-Highway Trucks	2270002051	Diesel	400	13	112	16	10	96	6	7,488	0.371	0.59
BH/LDR, Forklift, Bush Hog	Rubber Tire Dozers	2270002063	Diesel	68	4	112	16	10	96	6	2,304	0.412	0.59
Hydro Ax, Skid Truck	Rubber Tire Dozers	2270002063	Diesel	100	3	112	16	10	96	6	1,728	0.412	0.59
Auger, Rockpiker, Loader	Rubber Tire Dozers	2270002063	Diesel	180	3	112	16	10	96	6	1,728	0.371	0.59
Grader	Rubber Tire Dozers	2270002063	Diesel	240	2	112	16	10	96	6	1,152	0.371	0.59
Skidder, Trencher, Boring	Tracked excavator	2270002036	Diesel	150	5	112	16	10	96	6	2,880	0.371	0.59
Rock Drill	Tracked excavator	2270002036	Diesel	175	8	112	16	10	96	6	4,608	0.371	0.59
583 Sideboom, Pipe Benders	Tracked excavator	2270002036	Diesel	235	18	112	16	10	96	6	10,368	0.371	0.59
D7 Tack Rig	Tracked excavator	2270002036	Diesel	240	1	112	16	10	96	6	576	0.371	0.59
DB Dozers (Winch, Ripper)	Tracked excavator	2270002036	Diesel	300	24	112	16	10	96	6	13,824	0.371	0.59
345 Backhoe/Hammer	Tracked excavator	2270002036	Diesel	345	20	112	16	10	96	6	11,520	0.371	0.59
Vac Lift/Sideboom 594	Tracked excavator	2270002036	Diesel	385	4	112	16	10	96	6	2,304	0.371	0.59
Padder, Trencher, Backhoes	Tracked excavator	2270002036	Diesel	400	17	112	16	10	96	6	9,792	0.371	0.59
	TOTAL (Tons)												

NOTES:

Note 1: SCC code based on Appendix A of "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", April 2004, EPA-420-P-04-005.

Note 2: Brake-specific fuel consumption and load factor are from EPA's MOVES2014 model (Non-road sources run for 2016, Luzerne County, PA)

Table L2-3.3

PennEast Pipeline Company, LLC
Construction Emissions - Off-road Engines - Pipeline Spread 3

HAPS Emissions Estimates

Description	HAP Emissions (Tons) ⁴							
	Benzene	Toluene	Xylenes	Acrolein	PAHs	1,3-Butadiene	Formaldehyde	Acetaldehyde
Chipper	7.30E-04	3.20E-04	2.23E-04	7.24E-05	1.32E-04	3.06E-05	9.24E-04	6.00E-04
Air Compressors	1.85E-04	8.09E-05	5.64E-05	1.83E-05	3.32E-05	7.73E-06	2.33E-04	1.52E-04
Pumps	2.21E-04	9.71E-05	6.76E-05	2.20E-05	3.99E-05	9.28E-06	2.80E-04	1.82E-04
Welding Rigs	7.44E-04	3.26E-04	2.27E-04	7.37E-05	1.34E-04	3.12E-05	9.41E-04	6.11E-04
Hydro Mulcher/Seeder	1.48E-04	6.47E-05	4.51E-05	1.46E-05	2.66E-05	6.19E-06	1.87E-04	1.21E-04
Trucks: Dump, Water, Fuel, Rigs	5.99E-03	2.62E-03	1.83E-03	5.94E-04	1.08E-03	2.51E-04	7.57E-03	4.92E-03
BH/LDR, Forklift, Bush Hog	3.48E-04	1.52E-04	1.06E-04	3.45E-05	6.26E-05	1.46E-05	4.40E-04	2.86E-04
Hydro Ax, Skid Truck	3.84E-04	1.68E-04	1.17E-04	3.80E-05	6.91E-05	1.61E-05	4.85E-04	3.15E-04
Auger, Rockpiker, Loader	6.22E-04	2.73E-04	1.90E-04	6.16E-05	1.12E-04	2.61E-05	7.86E-04	5.11E-04
Grader	5.53E-04	2.42E-04	1.69E-04	5.48E-05	9.95E-05	2.32E-05	6.99E-04	4.54E-04
Skidder, Trencher, Boring	8.63E-04	3.79E-04	2.64E-04	8.56E-05	1.55E-04	3.62E-05	1.09E-03	7.10E-04
Rock Drill	1.61E-03	7.07E-04	4.92E-04	1.60E-04	2.90E-04	6.75E-05	2.04E-03	1.33E-03
583 Sideboom, Pipe Benders	4.87E-03	2.13E-03	1.49E-03	4.83E-04	8.77E-04	2.04E-04	6.16E-03	4.00E-03
D7 Tack Rig	2.76E-04	1.21E-04	8.44E-05	2.74E-05	4.98E-05	1.16E-05	3.49E-04	2.27E-04
DB Dozers (Winch, Ripper)	8.29E-03	3.63E-03	2.53E-03	8.22E-04	1.49E-03	3.47E-04	1.05E-02	6.81E-03
345 Backhoe/Hammer	7.94E-03	3.48E-03	2.43E-03	7.88E-04	1.43E-03	3.33E-04	1.00E-02	6.53E-03
Vac Lift/Sideboom 594	1.77E-03	7.77E-04	5.42E-04	1.76E-04	3.19E-04	7.43E-05	2.24E-03	1.46E-03
Padder, Trencher, Backhoes	7.83E-03	3.43E-03	2.39E-03	7.76E-04	1.41E-03	3.28E-04	9.90E-03	6.44E-03
	4.34E-02	1.90E-02	1.33E-02	4.30E-03	7.81E-03	1.82E-03	5.49E-02	3.57E-02

Emission Factor ³	≤ 600 HP	> 600 HP
	lb/MMBtu	lb/MMBtu
Benzene	9.33E-04	7.76E-04
Toluene	4.09E-04	2.81E-04
Xylenes	2.85E-04	1.93E-04
Acrolein	9.25E-05	7.88E-06
PAHs	1.68E-04	2.12E-04
1,3-Butadiene	3.91E-05	
Formaldehyde	1.18E-03	7.89E-05
Acetaldehyde	7.67E-04	2.52E-05

Total All HAPS	0.18
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NOTES:

Note 3: Emission factors from AP-42 Section 3.3, Table 3.3-2 for engines ≤600 HP and AP-42 Section 3.4, Tables 3.4-3 and 3.4-4 for engines >600 HP.

Note 4: Emissions estimates are based on a higher heating value of 138,000 Btu/gallon and a density of 7.05 lb/gallon.

Table L2-5

PennEast Pipeline Company, LLC
 Construction Emissions - Off-road Engines - Kidder Compressor Station HAPs Emissions

Description	Equipment category based on NONROAD classification	SCC ¹	Fuel Type	Equipment HP	Number of Equipment	HAPs Emissions							Load Factor ²
						Total Days	Total Weeks	Total Months	Total Working Days	Hours per Day	Total Working hrs	BSFC ² lb/hp-hr	
Welding Rigs	Light Commercial Welders	2270006025	Diesel	35	9	154	22	5	132	10	11880	0.481	0.21
8,000 Lb All-Terrain Fork Truck	Rubber Tire Dozers	2270002063	Diesel	100	1	245	35	8	210	3	630	0.412	0.59
D-7 LGP Caterpillar or Equivalent	Tracked Excavator	2270002036	Diesel	240	2	245	35	8	210	10	4200	0.371	0.59
325 Caterpillar or Equivalent	Tracked Excavator	2270002036	Diesel	180	2	154	22	5	132	10	2640	0.371	0.59
330 Caterpillar with Vacuworks & Shoes	Tracked Excavator	2270002036	Diesel	270	3	154	22	5	132	10	3960	0.371	0.59
Cat Rubber Tire Backhoe	Rubber Tire Dozers	2270006005	Diesel	100	3	245	35	8	210	10	6300	0.412	0.43
583 Caterpillar Pipelayer	Tracked Excavator	2270002036	Diesel	347	1	154	22	5	132	10	1320	0.371	0.59
594 Caterpillar Pipelayer	Tracked excavator	2270002036	Diesel	385	1	154	22	5	132	10	1320	0.371	0.59
300 Ton Hydraulic Crane	Tracked excavator	2270002036	Diesel	296	1	14	2	0.5	12	10	120	0.371	0.59
60 Ton Mantis	Tracked excavator	2270002036	Diesel	240	1	91	13	3	78	10	780	0.371	0.59
Power Generator	Light Comm. Gen. Sets	2270006005	Diesel	35	1	245	35	8	210	10	2100	0.408	0.43
TOTAL (Tons)													

AECOM assumed engines tiers for construction based on start date and length of time from effective dates of engine tiers

NOTES:

Note 1: SCC code based on Appendix A of "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", April 2004, EPA-420-P-04-005.

Note 2: Brake-specific fuel consumption and load factor are from EPA's MOVES2014 model (Non-road sources run for 2016, Luzerne County, PA)

Table L2-5

PennEast Pipeline Company, LLC
Construction Emissions - Off-road Engines - Kidder Compressor Station

HAPs Emissions

Description	HAP Emissions (Tons) ⁴							
	Benzene	Toluene	Xylenes	Acrolein	PAHs	1,3-Butadiene	Formaldehyde	Acetaldehyde
Welding Rigs	3.84E-04	1.68E-04	1.17E-04	3.80E-05	6.91E-05	1.61E-05	4.85E-04	3.15E-04
8,000 Lb All-Terrain Fork Truck	1.40E-04	6.13E-05	4.27E-05	1.39E-05	2.52E-05	5.86E-06	1.77E-04	1.15E-04
D-7 LGP Caterpillar or Equivalent	2.01E-03	8.83E-04	6.15E-04	2.00E-04	3.63E-04	8.44E-05	2.55E-03	1.66E-03
325 Caterpillar or Equivalent	9.50E-04	4.16E-04	2.90E-04	9.42E-05	1.71E-04	3.98E-05	1.20E-03	7.81E-04
330 Caterpillar with Vacuworks & Shoes	2.14E-03	9.37E-04	6.53E-04	2.12E-04	3.85E-04	8.96E-05	2.70E-03	1.76E-03
Cat Rubber Tire Backhoe	1.02E-03	4.47E-04	3.11E-04	1.01E-04	1.84E-04	4.27E-05	1.29E-03	8.38E-04
583 Caterpillar Pipelayer	9.16E-04	4.01E-04	2.80E-04	9.08E-05	1.65E-04	3.84E-05	1.16E-03	7.53E-04
594 Caterpillar Pipelayer	1.02E-03	4.45E-04	3.10E-04	1.01E-04	1.83E-04	4.26E-05	1.28E-03	8.35E-04
300 Ton Hydraulic Crane	7.10E-05	3.11E-05	2.17E-05	7.04E-06	1.28E-05	2.98E-06	8.98E-05	5.84E-05
60 Ton Mantis	3.74E-04	1.64E-04	1.14E-04	3.71E-05	6.74E-05	1.57E-05	4.73E-04	3.08E-04
Power Generator	1.18E-04	5.16E-05	3.60E-05	1.17E-05	2.12E-05	4.93E-06	1.49E-04	9.68E-05
	9.14E-03	4.01E-03	2.79E-03	9.06E-04	1.65E-03	3.83E-04	1.16E-02	7.51E-03

Emission Factor ³	≤ 600 HP	> 600 HP
	lb/MMBtu	lb/MMBtu
Benzene	9.33E-04	7.76E-04
Toluene	4.09E-04	2.81E-04
Xylenes	2.85E-04	1.93E-04
Acrolein	9.25E-05	7.88E-06
PAHs	1.68E-04	2.12E-04
1,3-Butadiene	3.91E-05	
Formaldehyde	1.18E-03	7.89E-05
Acetaldehyde	7.67E-04	2.52E-05

Total All HAPS	0.04
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NOTES:

Note 3: Emission factors from AP-42 Section 3.3, Table 3.3-2 for engines ≤600 HP and AP-42 Section 3.4, Tables 3.4-3 and 3.4-4 for engines >600 HP.

Note 4: Emissions estimates are based on a higher heating value of 138,000 Btu/gallon and a density of 7.05 lb/gallon.

Table L2-6
PennEast Pipeline Company, LLC
Pipeline Construction Emissions - On-road Vehicles

Description	Category Based on MOVES2014 Classification	Number of Equipment	Total Days	Total Weeks	Total Months	Working Days	Miles per Day	Calc. VMT ¹
Gas Pickup Trucks - Spread 1	31 - Passenger Truck - Gas	94	112	16	10	96	50	451,200
Gas Pickup Trucks - Spread 2	31 - Passenger Truck - Gas	105	112	16	10	96	50	504,000
Gas Pickup Trucks - Spread 3	31 - Passenger Truck - Gas	103	112	16	10	96	50	494,400
Gas Pickup Trucks - Spread 4	31 - Passenger Truck - Gas	104	112	16	10	96	50	499,200
Float, Lowboy, Tractor Trucks Spread 1	52 - Single Unit Short-Haul Truck - Diesel	21	112	16	10	96	50	100,800
Float, Lowboy, Tractor Trucks Spread 2	52 - Single Unit Short-Haul Truck - Diesel	21	112	16	10	96	50	100,800
Float, Lowboy, Tractor Trucks Spread 3	52 - Single Unit Short-Haul Truck - Diesel	21	112	16	10	96	50	100,800
Float, Lowboy, Tractor Trucks Spread 4	52 - Single Unit Short-Haul Truck - Diesel	22	112	16	10	96	50	105,600
Diesel Parts Vans - Spread 1	32 - Light Commercial Truck - Diesel	8	112	16	10	96	50	38,400
Diesel Parts Vans - Spread 2	32 - Light Commercial Truck - Diesel	8	112	16	10	96	50	38,400
Diesel Parts Vans - Spread 3	32 - Light Commercial Truck - Diesel	8	112	16	10	96	50	38,400
Diesel Parts Vans - Spread 4	32 - Light Commercial Truck - Diesel	8	112	16	10	96	50	38,400
Bus - Spread 1	32 - Light Commercial Truck - Diesel	10	112	16	10	96	50	48,000
Bus - Spread 2	32 - Light Commercial Truck - Diesel	11	112	16	10	96	50	52,800
Bus - Spread 3	32 - Light Commercial Truck - Diesel	11	112	16	10	96	50	52,800
Bus - Spread 4	32 - Light Commercial Truck - Diesel	11	112	16	10	96	50	52,800

Description	Category Based on MOVES2014 Classification	VOC ² g/VMT	CO ² g/VMT	PM ₁₀ ² g/VMT	PM _{2.5} ² g/VMT	SO ₂ ² g/VMT	NOx ² g/VMT	CO ₂ ² g/VMT	CH ₄ ² g/VMT	N ₂ O ² g/VMT	GHG ³ g CO ₂ e /VMT	HAPs ^{2,4} g/VMT
Gas Pickup Trucks - Spread 1	31 - Passenger Truck - Gas	0.98	9.51	0.06	0.03	0.01	1.31	470.04	0.03	0.03	478.69	0.05
Gas Pickup Trucks - Spread 2	31 - Passenger Truck - Gas	0.98	9.51	0.06	0.03	0.01	1.31	470.04	0.03	0.03	478.69	0.05
Gas Pickup Trucks - Spread 3	31 - Passenger Truck - Gas	0.98	9.51	0.06	0.03	0.01	1.31	470.04	0.03	0.03	478.69	0.05
Gas Pickup Trucks - Spread 4	31 - Passenger Truck - Gas	0.98	9.51	0.06	0.03	0.01	1.31	470.04	0.03	0.03	478.69	0.05
Float, Lowboy, Tractor Trucks Spread 1	52 - Single Unit Short-Haul Truck - Diesel	0.39	1.47	0.23	0.16	0.01	3.02	912.36	0.05	0.00	914.26	0.06
Float, Lowboy, Tractor Trucks Spread 2	52 - Single Unit Short-Haul Truck - Diesel	0.39	1.47	0.23	0.16	0.01	3.02	912.36	0.05	0.00	914.26	0.06
Float, Lowboy, Tractor Trucks Spread 3	52 - Single Unit Short-Haul Truck - Diesel	0.39	1.47	0.23	0.16	0.01	3.02	912.36	0.05	0.00	914.26	0.06
Float, Lowboy, Tractor Trucks Spread 4	52 - Single Unit Short-Haul Truck - Diesel	0.39	1.47	0.23	0.16	0.01	3.02	912.36	0.05	0.00	914.26	0.06
Diesel Parts Vans - Spread 1	32 - Light Commercial Truck - Diesel	0.63	4.42	0.14	0.10	0.01	2.12	628.28	0.06	0.002	630.30	0.09
Diesel Parts Vans - Spread 2	32 - Light Commercial Truck - Diesel	0.63	4.42	0.14	0.10	0.01	2.12	628.28	0.06	0.002	630.30	0.09
Diesel Parts Vans - Spread 3	32 - Light Commercial Truck - Diesel	0.63	4.42	0.14	0.10	0.01	2.12	628.28	0.06	0.002	630.30	0.09
Diesel Parts Vans - Spread 4	32 - Light Commercial Truck - Diesel	0.63	4.42	0.14	0.10	0.01	2.12	628.28	0.06	0.002	630.30	0.09
Bus - Spread 1	32 - Light Commercial Truck - Diesel	0.63	4.42	0.14	0.10	0.01	2.12	628.28	0.06	0.002	630.30	0.09
Bus - Spread 2	32 - Light Commercial Truck - Diesel	0.63	4.42	0.14	0.10	0.01	2.12	628.28	0.06	0.002	630.30	0.09
Bus - Spread 3	32 - Light Commercial Truck - Diesel	0.63	4.42	0.14	0.10	0.01	2.12	628.28	0.06	0.002	630.30	0.09
Bus - Spread 4	32 - Light Commercial Truck - Diesel	0.63	4.42	0.14	0.10	0.01	2.12	628.28	0.06	0.002	630.30	0.09

PennEast Pipeline Company, LLC
Pipeline Construction Emissions - On-road Vehicles

Description	Category Based on MOVES2014 Classification	VOC ton/yr	CO ton/yr	PM ₁₀ ton/yr	PM _{2.5} ton/yr	SO ₂ ton/yr	NOx ton/yr	CO ₂ ton/yr	CH ₄ ton/yr	N ₂ O ton/yr	GHG ton CO ₂ e /yr	HAPs ton/yr
Gas Pickup Trucks - Spread 1	31 - Passenger Truck - Gas	4.86E-01	4.73E+00	3.04E-02	1.27E-02	4.66E-03	6.50E-01	233.8	1.58E-02	1.31E-02	238.08	2.63E-02
Gas Pickup Trucks - Spread 2	31 - Passenger Truck - Gas	5.43E-01	5.28E+00	3.40E-02	1.42E-02	5.20E-03	7.26E-01	261.1	1.77E-02	1.46E-02	265.95	2.94E-02
Gas Pickup Trucks - Spread 3	31 - Passenger Truck - Gas	5.33E-01	5.18E+00	3.33E-02	1.39E-02	5.11E-03	7.12E-01	256.2	1.74E-02	1.44E-02	260.88	2.89E-02
Gas Pickup Trucks - Spread 4	31 - Passenger Truck - Gas	5.38E-01	5.23E+00	3.37E-02	1.40E-02	5.15E-03	7.19E-01	258.7	1.75E-02	1.45E-02	263.41	2.91E-02
Float, Lowboy, Tractor Trucks Spread 1	52 - Single Unit Short-Haul Truck - Diesel	4.32E-02	1.64E-01	2.52E-02	1.80E-02	8.92E-04	3.36E-01	101.4	5.48E-03	2.48E-04	101.59	6.26E-03
Float, Lowboy, Tractor Trucks Spread 2	52 - Single Unit Short-Haul Truck - Diesel	4.32E-02	1.64E-01	2.52E-02	1.80E-02	8.92E-04	3.36E-01	101.4	5.48E-03	2.48E-04	101.59	6.26E-03
Float, Lowboy, Tractor Trucks Spread 3	52 - Single Unit Short-Haul Truck - Diesel	4.32E-02	1.64E-01	2.52E-02	1.80E-02	8.92E-04	3.36E-01	101.4	5.48E-03	2.48E-04	101.59	6.26E-03
Float, Lowboy, Tractor Trucks Spread 4	52 - Single Unit Short-Haul Truck - Diesel	4.53E-02	1.71E-01	2.64E-02	1.88E-02	9.35E-04	3.52E-01	106.2	5.74E-03	2.60E-04	106.42	6.56E-03
Diesel Parts Vans - Spread 1	32 - Light Commercial Truck - Diesel	2.68E-02	1.87E-01	6.13E-03	4.34E-03	2.38E-04	8.96E-02	26.6	2.36E-03	8.87E-05	26.68	3.84E-03
Diesel Parts Vans - Spread 2	32 - Light Commercial Truck - Diesel	2.68E-02	1.87E-01	6.13E-03	4.34E-03	2.38E-04	8.96E-02	26.6	2.36E-03	8.87E-05	26.68	3.84E-03
Diesel Parts Vans - Spread 3	32 - Light Commercial Truck - Diesel	2.68E-02	1.87E-01	6.13E-03	4.34E-03	2.38E-04	8.96E-02	26.6	2.36E-03	8.87E-05	26.68	3.84E-03
Diesel Parts Vans - Spread 4	32 - Light Commercial Truck - Diesel	2.68E-02	1.87E-01	6.13E-03	4.34E-03	2.38E-04	8.96E-02	26.6	2.36E-03	8.87E-05	26.68	3.84E-03
Bus - Spread 1	32 - Light Commercial Truck - Diesel	3.35E-02	2.34E-01	7.67E-03	5.43E-03	2.97E-04	1.12E-01	33.2	2.94E-03	1.11E-04	33.35	4.80E-03
Bus - Spread 2	32 - Light Commercial Truck - Diesel	3.68E-02	2.57E-01	8.43E-03	5.97E-03	3.27E-04	1.23E-01	36.6	3.24E-03	1.22E-04	36.68	5.28E-03
Bus - Spread 3	32 - Light Commercial Truck - Diesel	3.68E-02	2.57E-01	8.43E-03	5.97E-03	3.27E-04	1.23E-01	36.6	3.24E-03	1.22E-04	36.68	5.28E-03
Bus - Spread 4	32 - Light Commercial Truck - Diesel	3.68E-02	2.57E-01	8.43E-03	5.97E-03	3.27E-04	1.23E-01	36.6	3.24E-03	1.22E-04	36.68	5.28E-03
Total		2.53	22.84	0.29	0.17	0.026	5.01	1669	0.11	0.06	1690	0.18

Project Element Subtotals	VOC ton/yr	CO ton/yr	PM ₁₀ ton/yr	PM _{2.5} ton/yr	SO ₂ ton/yr	NOx ton/yr	CO ₂ ton/yr	CH ₄ ton/yr	N ₂ O ton/yr	GHG ton CO ₂ e /yr	HAPs ton/yr
Pipeline Construction - Spread 1	0.590	5.314	0.069	0.040	0.006	1.19	395	0.027	0.014	400	0.041
Pipeline Construction - Spread 2	0.650	5.891	0.074	0.042	0.007	1.27	426	0.029	0.015	431	0.045
Pipeline Construction - Spread 3	0.640	5.790	0.073	0.042	0.007	1.26	421	0.028	0.015	426	0.044
Pipeline Construction - Spread 4	0.647	5.848	0.075	0.043	0.007	1.28	428	0.029	0.015	433	0.045
Total Pipeline On-Road Emissions	2.53	22.84	0.29	0.17	0.026	5.01	1669	0.11	0.06	1690	0.18

NOTES:

Note 1: Vehicle Miles Traveled (VMT) = (Number of Equipment) * (Working Days) * (Miles per day)

Note 2: Emissions estimates are based on EPA's MOVES2014 motor vehicle emissions estimation program. Year 2016 is used as the base year for EFs. Factors are based on county data from Luzerne County, PA.

Note 3: Greenhouse gasses (GHG) are converted to carbon dioxide equivalents (CO₂) using 40 CFR 98 Subpart A global warming potentials as follows:

CO₂ = 1, CH₄ = 25, N₂O = 298

Note 4: HAPs are aggregated for benzene, 1,3-butadiene, formaldehyde, acetaldehyde, and acrolein

Table L2-7
PennEast Pipeline Company, LLC
Kidder Compressor Station Construction Emissions - On-road Vehicles

Description	Category Based on MOVES2014 Classification	Number of Equipment	Total Days	Total Weeks	Total Months	Working Days	Miles per Day	Calc. VMT ¹
Gas Pickup Trucks - Supervisors/Inspectors	31 - Passenger Truck - Gas	10	245	35	8	210	50	105,000
Gas Pickup Trucks - Operators	31 - Passenger Truck - Gas	6	245	35	8	210	50	63,000
Diesel 1-Ton Trucks with Tools	32 - Light Commercial Truck - Diesel	3	245	35	5	210	50	31,500

Description	Category Based on MOVES2014 Classification	VOC ² g/VMT	CO ² g/VMT	PM ₁₀ ² g/VMT	PM _{2.5} ² g/VMT	SO ₂ ² g/VMT	NOx ² g/VMT	CO ₂ ² g/VMT	CH ₄ ² g/VMT	N ₂ O ² g/VMT	GHG ³ g CO ₂ e /VMT	HAPs ^{2,4} g/VMT
Gas Pickup Trucks - Supervisors/Inspectors	31 - Passenger Truck - Gas	0.98	9.51	0.06	0.03	0.01	1.31	470.04	0.03	0.03	478.69	0.05
Gas Pickup Trucks - Operators	31 - Passenger Truck - Gas	0.98	9.51	0.06	0.03	0.01	1.31	470.04	0.03	0.03	478.69	0.05
Diesel 1-Ton Trucks with Tools	32 - Light Commercial Truck - Diesel	0.63	4.42	0.14	0.10	0.01	2.12	628.28	0.06	0.002	630.30	0.09

Description	Category Based on MOVES2014 Classification	VOC ton/yr	CO ton/yr	PM ₁₀ ton/yr	PM _{2.5} ton/yr	SO ₂ ton/yr	NOx ton/yr	CO ₂ ton/yr	CH ₄ ton/yr	N ₂ O ton/yr	GHG ton CO ₂ e /yr	HAPs ton/yr
Gas Pickup Trucks - Supervisors/Inspectors	31 - Passenger Truck - Gas	1.13E-01	1.10E+00	7.08E-03	2.95E-03	1.08E-03	1.51E-01	54.4	3.69E-03	3.05E-03	55.41	6.13E-03
Gas Pickup Trucks - Operators	31 - Passenger Truck - Gas	6.79E-02	6.60E-01	4.25E-03	1.77E-03	6.51E-04	9.07E-02	32.6	2.21E-03	1.83E-03	33.24	3.68E-03
Diesel 1-Ton Trucks with Tools	32 - Light Commercial Truck - Diesel	2.20E-02	1.53E-01	5.03E-03	3.56E-03	1.95E-04	7.35E-02	21.8	1.93E-03	7.28E-05	21.89	3.15E-03
Total		0.20	1.91	0.02	0.01	0.002	0.32	109	0.01	0.00	111	0.01

Project Element Subtotals	VOC ton/yr	CO ton/yr	PM ₁₀ ton/yr	PM _{2.5} ton/yr	SO ₂ ton/yr	NOx ton/yr	CO ₂ ton/yr	CH ₄ ton/yr	N ₂ O ton/yr	GHG ton CO ₂ e /yr	HAPs ton/yr
Kidder Station Construction	0.20	1.91	0.02	0.01	0.00	0.32	108.86	0.01	0.00	110.53	0.013
Total Station On-Road Emissions	0.20	1.91	0.02	0.01	0.002	0.32	109	0.01	0.00	111	0.01

NOTES:

Note 1: Vehicle Miles Traveled (VMT) = (Number of Equipment) * (Working Days) * (Miles per day)

Note 2: Emissions estimates are based on EPA's MOVES2014 motor vehicle emissions estimation program. Year 2016 is used as the base year for EFs. Factors are based on county data from Luzerne County, PA.

Note 3: Greenhouse gasses (GHG) are converted to carbon dioxide equivalents (CO₂) using 40 CFR 98 Subpart A global warming potentials as follows:

CO₂ = 1, CH₄ = 25, N₂O = 298

Note 4: HAPs are aggregated for benzene, 1,3-butadiene, formaldehyde, acetaldehyde, and acrolein

Table L2-8

**PennEast Pipeline Company, LLC
Construction Emissions - Fugitive Dust from Roadways**

Vehicle Type	Daily Onsite Vehicular Traffic ^[1]	Construction Days ^[1]	Average Daily Travel Distance per Vehicle ^[1] (VMT/vehicle/day)		Distance Traveled ^[2] (VMT)		Estimated Vehicle Weight	
	(Veh)		Paved	Unpaved	Paved	Unpaved	(lbs)	(tons)
Combined Pickup Trucks and Vans - Spread 1	102	96	40	10	391,680	97,920	5000	2.5
Combined Pickup Trucks and Vans - Spread 2	113	96	40	10	433,920	108,480	5000	2.5
Combined Pickup Trucks and Vans - Spread 3	111	96	40	10	426,240	106,560	5000	2.5
Combined Pickup Trucks and Vans - Spread 4	112	96	40	10	430,080	107,520	5000	2.5
Float, Lowboy, Tractor Trucks Spread 1	21	96	48	2	96,768	4,032	50000	25.0
Float, Lowboy, Tractor Trucks Spread 2	21	96	48	2	96,768	4,032	50000	25.0
Float, Lowboy, Tractor Trucks Spread 3	21	96	48	2	96,768	4,032	50000	25.0
Float, Lowboy, Tractor Trucks Spread 4	22	96	48	2	101,376	4,224	50000	25.0
Bus - Spread 1	10	96	45	5	43,200	4,800	20000	10.0
Bus - Spread 2	11	96	45	5	47,520	5,280	20000	10.0
Bus - Spread 3	11	96	45	5	47,520	5,280	20000	10.0
Bus - Spread 4	11	96	45	5	47,520	5,280	20000	10.0
TOTALS (VMT)					2,259,360	457,440		
WEIGHTED AVERAGE VEHICLE WEIGHT (tons)							Paved	3.64
							Unpaved	4.45

Parameter	PM10			PM2.5		
	Paved	Unpaved	Total	Paved	Unpaved	Total
Uncontrolled Emission Factor (lb/VMT) ^{[3],[4]}	0.05	0.71	--	0.01	0.07	--
Control Efficiency for dust suppression activities	0%	50%	--	0%	50%	--
Controlled Emission Factor (lb/VMT)	0.05	0.35	--	0.01	0.04	--
Fugitive Roadways Emissions (tons) ^[5]	51.54	80.86	132.39	12.65	8.09	20.74

[1] Based on 6 days of operation per week.

[2] VMT = Vehicles x Construction Days x Daily Distance Traveled per Vehicle.

[3] The emission factor for paved roads was estimated using USEPA's AP-42 (1/11) Section 13.2.1 "Paved Roads" and the following:

- A. Emission factor (E) is calculated using Equation (2) in Section 13.2.1: $E = (k \times (sL)^{0.91} \times (W)^{1.02}) \times (1 - P/4N)$
- B. Table 13.2.1-1 specifies that for PM-10, k is 0.0022 lb/VMT and for PM-2.5, k is 0.00054 lb/VMT.
- C. Table 13.2.1-3 specifies that the typical mean silt loading value (sL) for a municipal solid waste landfill is 7.4 g/m², which is assumed to represent the construction site condition.
- D. Figure 13.2.1-2 estimates that days of precipitation >0.01 inch per year (P) is approximately 150; N is 365 days.

[4] The emission factor for unpaved roads was estimated using USEPA's AP-42 (11/06) Section 13.2.2 "Unpaved Roads" and the following:

- A. Emission factor (E) is calculated using Equations (1a) and (2) in Section 13.2.2: $E = (k \times (s/12)^a \times (W/3)^b) \times ((365-P)/365)$
- B. Table 13.2.2-1 specifies that the typical mean silt content value (s) for a construction site is 8.5%.
- C. Table 13.2.2-2 specifies that for PM-10, k is 1.5 lb/VMT, a is 0.9, and b is 0.45, and for PM-2.5, k is 0.15 lb/VMT, a is 0.9, and b is 0.45.
- D. Figure 13.2.2-1 estimates that days of precipitation >0.01 inch per year (P) is approximately 150.

[5] Dust suppression by water spray at construction site is conservatively assumed to have a control efficiency of 50%.

Table L2-8

PennEast Pipeline Company, LLC

Construction Emissions - Fugitive Dust from Roadways

Vehicle Type	Daily Onsite Vehicular Traffic ^[1] (Veh)	Construction Days ^[1]	Average Daily Travel Distance per Vehicle ^[1] (VMT/vehicle/day)		Distance Traveled ^[2] (VMT)		Estimated Vehicle Weight	
			Paved	Unpaved	Paved	Unpaved	(lbs)	(tons)
Gas Pickup Trucks - Supervisors/Inspectors	10	210	40	10	84,000	21,000	5000	2.5
Gas Pickup Trucks - Operators	6	210	40	10	50,400	12,600	5000	2.5
Diesel 1-Ton Trucks with Tools	3	210	45	5	28,350	3,150	6000	3.0
			0	0	0	0		0.0
TOTALS (VMT)					162,750	36,750		
WEIGHTED AVERAGE VEHICLE WEIGHT (tons)							Paved	0.47
							Unpaved	1.00

Parameter	PM10			PM2.5		
	Paved	Unpaved	Total	Paved	Unpaved	Total
Uncontrolled Emission Factor (lb/VMT) ^{[3],[4]}	0.01	0.28	--	0.00	0.03	--
Control Efficiency for dust suppression activities	0%	50%	--	0%	50%	--
Controlled Emission Factor (lb/VMT)	0.01	0.14	--	0.00	0.01	--
Fugitive Roadways Emissions (tons) ^[5]	0.46	2.59	3.06	0.11	0.26	0.37

[1] Based on 6 days of operation per week.

[2] VMT = Vehicles x Construction Days x Daily Distance Traveled per Vehicle.

[3] The emission factor for paved roads was estimated using USEPA's AP-42 (1/11) Section 13.2.1 "Paved Roads" and the following:

- A. Emission factor (E) is calculated using Equation (2) in Section 13.2.1: $E = (k \times (sL)^{0.91} \times (W)^{1.02}) \times (1 - P/4N)$
- B. Table 13.2.1-1 specifies that for PM-10, k is 0.0022 lb/VMT and for PM-2.5, k is 0.00054 lb/VMT.
- C. Table 13.2.1-3 specifies that the typical mean silt loading value (sL) for a municipal solid waste landfill is 7.4 g/m², which is assumed to represent the construction site condition.
- D. Figure 13.2.1-2 estimates that days of precipitation >0.01 inch per year (P) is approximately 150; N is 365 days.

[4] The emission factor for unpaved roads was estimated using USEPA's AP-42 (11/06) Section 13.2.2 "Unpaved Roads" and the following:

- A. Emission factor (E) is calculated using Equations (1a) and (2) in Section 13.2.2: $E = (k \times (s/12)^a \times (W/3)^b) \times ((365-P)/365)$
- B. Table 13.2.2-1 specifies that the typical mean silt content value (s) for a construction site is 8.5%.
- C. Table 13.2.2-2 specifies that for PM-10, k is 1.5 lb/VMT, a is 0.9, and b is 0.45, and for PM-2.5, k is 0.15 lb/VMT, a is 0.9, and b is 0.45.
- D. Figure 13.2.2-1 estimates that days of precipitation >0.01 inch per year (P) is approximately 150.

[5] Dust suppression by water spray at construction site is conservatively assumed to have a control efficiency of 50%.

Table L2-9
PennEast Pipeline Company, LLC
Construction Emissions - Fugitive dust from construction activities

Updated 09-16-2016
 Revised 05-18-2017 (see Note 1)

Expanded details from RR1 Table 1	County	Area of Land Disturbance ¹ (acres):	Months of Construction Activity ² :	PM2.5 ton/period	PM10 ton/period
Total Pipeline Acres	Luzerne	321.4	6.5	38	256
Total Access Roads Acres	Luzerne	62.6	3	3	23
Pipeyards	Luzerne	39.7	3	2	15
Aboveground Facilities	Luzerne	13.0	6.5	2	10
Staging Areas	Luzerne	2.8	10	1	3
Total PM Emissions	Luzerne			46	307
Total Pipeline Acres	Carbon	399.3	6.5	54	361
Total Access Roads Acres	Carbon	44.7	3	3	19
Pipeyards	Carbon	50.5	3	3	21
Kidder Compressor Station	Carbon	27.3	6	3	23
Aboveground Facilities	Carbon	1.1	6.5	0	1
Staging Areas	Carbon	19.8	10	4	28
Total PM Emissions	Carbon			68	452
Total Pipeline Acres	Northampton	386.4	6.5	58	387
Total Access Roads Acres	Northampton	14.6	3	1	7
Pipeyards	Northampton	207.9	3	14	96
Aboveground Facilities	Northampton	3.3	6.5	0	3
Staging Areas	Northampton	12.7	10	3	20
Total PM Emissions	Northampton			77	512
Total Pipeline Acres	Bucks	24.7	6.5	4	10
Total Access Roads Acres	Bucks	2.7	3	0	3
Pipeyards	Bucks	0	3	0	3
Aboveground Facilities	Bucks	0	6.5	0	7
Staging Areas	Bucks	0.0	10	0	10
Total PM Emissions	Bucks			4	33
Total Pipeline Acres	Hunterdon	419.4	6.5	55	365
Total Access Roads Acres	Hunterdon	20.7	3	1	8
Pipeyards	Hunterdon	36.4	3	2	15
Aboveground Facilities	Hunterdon	16.8	6.5	2	15
Staging Areas	Hunterdon	0.0	10	0	0
Total PM Emissions	Hunterdon			60	403
Total Pipeline Acres	Mercer	138.8	6.5	21	139
Total Access Roads Acres	Mercer	6.0	3	0	3
Pipeyards	Mercer	26.3	3	2	12
Aboveground Facilities	Mercer	4.5	6.5	1	5
Staging Areas	Mercer	0.0	10	0	0
Total PM Emissions	Mercer			24	158
Total ⁽¹⁾		2303.4		279	1865
Pipeline Only		2276.1		275	1842

Table L2-9
PennEast Pipeline Company, LLC
Construction Emissions - Fugitive dust from construction activities

Updated 09-16-2016
 Revised 05-18-2017 (see Note 1)

Emission Factor Equations³

PM10 Emission Factor = 0.42 x (1 - CE) x SAE x SMA

PM2.5 Emission Factor = PM10 Emission Factor x Ratio

Project Area Specific PM Emission Factors

Base PM10 Emission Factor(tons/acre-month)	0.42
Ratio of PM2.5 to PM10 (Ratio)	0.15
Construction Dust Plan Control Efficiency Factor	50%

Silt Adjustment Factor (SAF):	3.67	(SAF = Project Value/ 9%)
Basis (original Studies value, see Note 3)	9%	
Average Dry Silt Percent of Project Soils	33%	Weighted Average by Area of Soil

Soil Moisture Adjustment Factor (per Climate Divisions of Project Area)

<u>Thornthwaite's Precipitation-Evaporation Index⁵</u>			Soil Moisture	Adjusted Emission Factors	
Basis (Arid Southwest US)	See Note 3	24	Adjustment (SMA)	PM2.5	PM10
	Luzerne County	151	0.16	0.0184	0.1224
	Carbon County	133	0.18	0.0208	0.1389
	Northampton	120	0.20	0.0231	0.1540
	Bucks	120	0.20	0.0231	0.1540
	Hunterdon	138	0.17	0.0201	0.1339
	Mercer	120	0.20	0.0231	0.1540

NOTES:

[1] Acres per County are calculated from Project Details (as presented in RR1) in Table L2-10, revised with September 2016 reroute data. The Totals for Tons per period (year) for PM2.5 and PM10 were revised in a May 2017 version. The previous versions incorrectly included the subtotals in the totals. This 2017 version is correctly summing the totals.

[2] The entire construction activity duration is expected to be 8 to 10 months; however, based on crew activity type and phasing, the emission causing Months of Heavy Construction Activity is used in the emission calculations as shown above. Travel on unpaved roads for crews not using heavy equipment are accounted for in Off-Road travel.

[3] Estimating Particulate Matter Emissions From Construction Operations, Final Report, Eastern Research Group, Inc., September 30, 1999, EPA Contract 68-D7-0068, Section 5.6. It is assumed that the factor and methodology for adjusting the factor for Roadway Construction Emissions are similar in nature to the pipeline construction.

[4] Required and effective fugitive dust control measures will be determined at the site during construction activity. Application of water to mitigate fugitive dust will be used as one of the primary control measure. Mitigation of fugitive dust by the use of water application and other measures is reflected in the 50% control efficiency recommended in the referenced EPA Contract 68-D7-0068 Document.

[5] Thornthwaite's Precipitation-Evaporation Index values are taken from the map on page 5-12 of cited EPA Contract 68-D7-0068 Document.

PennEast Pipeline Company, LLC

Supporting Information for Fugitive Dust from Construction Activities

Expanded details from RR1 Table 1.3-1

Land Requirements for Pipeline Facilities

Facility ¹	Approximate Length (miles)/Area (acres)	Percents	Total Workspace for Construction (acres)	County to Assign Acres for Construction Emissions Allocation
PennEast Mainline Route Pipeline²	116.0		1633.5	Total
Mainline Miles in Luzerne County	22.8	20%	321.4	Luzerne
Mainline Miles in Carbon County	28.3	24%	399.3	Carbon
Mainline Miles in Northampton County	25.3	22%	356.6	Northampton
Mainline Miles in Bucks County	1.8	2%	24.7	Bucks
Mainline Miles in Hunterdon County	27.9	24%	392.7	Hunterdon
Mainline Miles in Mercer County	9.9	8%	138.8	Mercer
Hellertown 24-inch Lateral	2.10		29.8	Northampton
Gilbert 12-inch Lateral	0.60		3.6	Hunterdon
Lambertville 36-inch Lateral	1.50		23.1	Hunterdon
Total Pipeline (and Laterals)	120.2		1690.0	Total
Totals Below Include the Laterals				
Total Acres in Luzerne County			321.4	Luzerne
Total Acres in Carbon County			399.3	Carbon
Total Acres in Northampton County			386.4	Northampton
Total Acres in Bucks County			24.7	Bucks
Total Acres in Hunterdon County			419.4	Hunterdon
Total Acres in Mercer County			138.8	Mercer
Access Roads (per Table 8.2-5)			151.3	Total
Access Roads Miles in Luzerne County			62.6	Luzerne
Access Roads Miles in Carbon County			44.7	Carbon
Access Roads Miles Northampton Cnty			14.6	Northampton
Access Roads Miles in Bucks County			2.7	Bucks
Access Roads Miles in Hunterdon County			20.7	Hunterdon
Access Roads Miles in Mercer County			6.0	Mercer
Pipeyards (from Table 1.3-5)			360.8	Total
Pipeyards in Luzerne County			39.70	Luzerne
Pipeyards in Carbon County			50.50	Carbon
Pipeyards in Northampton County			207.90	Northampton
Pipeyards in Hunterdon County			36.40	Hunterdon
Pipeyards in Mercer County			26.30	Mercer
Aboveground Facilities (Table 1.3-6)			38.7	Total
Aboveground Facilities in Luzerne			13.0	Luzerne
Aboveground Facilities in Carbon ⁵			1.1	Carbon
Aboveground Facilities in Northampton			3.3	Northampton
Aboveground Facilities in Hunterdon			16.8	Hunterdon
Aboveground Facilities in Mercer			4.5	Mercer
Staging Areas⁴			35.3	Total
Stageing Areas in Luzerne			2.8	Luzerne
Stageing Areas in Carbon County			19.8	Carbon
Stageing Areas Northampton County			12.7	Northampton
Total Project			2276.1	

Notes:

1. The totals shown on this table may not equal the sum of addends due to rounding.
2. The total miles and/or Area and Construction Workspace acres for Pipeline and Laterals are from Table 1.3-1, Land Requirements for Pipeline Facilities, values for other construction areas are from the listed tables. The Total Workspace for Construction (acres) per County for the Main Pipeline is proportioned based on miles of main pipeline per county.
3. This table does not specify valves and launcher/receivers that will be constructed on the pipeline segments since the land requirements for these facilities are within the land requirements for the pipeline segments.
4. Total disturbed area for Staging Areas is obtained from Table 1.3-1. Per county values are estimated based on ratio of the Total Workspace acres for these 3 counties.
5. Aboveground Facilities in Carbon County do not include the Kidder Compressor Station because this is considered separate from the Pipeline Facilities in Table L2-9

Table L2-11

PennEast Pipeline Company, LLC

Updated 09-15-2016

Percent of Spread Construction per County

† Pipeline and Lateral Miles from Tables 1.2-1 and 1.2-2 of RR1

Township	Miles in Township	County	State
Dallas Township	1.2	Luzerne	PA
Kingston Township	3.0	Luzerne	PA
West Wyoming Borough	1.9	Luzerne	PA
Wyoming Borough	1.1	Luzerne	PA
Jenkins Township	1.0	Luzerne	PA
Plains Township	4.2	Luzerne	PA
Laflin Borough	0.0	Luzerne	PA
Bear Creek Township	10.4	Luzerne	PA
Main Miles in Luzerne County	22.8		
Kidder Township	10.2	Carbon	PA
Penn Forest Township	7.7	Carbon	PA
Towamensing Township	6.4	Carbon	PA
Lower Towamensing Township	4.1	Carbon	PA
Main Miles in Carbon County	28.3		
Lehigh Township	2.7	Northampton	PA
Moore Township	6.9	Northampton	PA
East Allen Township	0.8	Northampton	PA
Upper Nazareth Township	2.8	Northampton	PA
Lower Nazareth Township	3.1	Northampton	PA
Bethlehem Township	3.9	Northampton	PA
Easton City	0.1	Northampton	PA
Lower Saucon Township	1.3	Northampton	PA
Williams Township	3.6	Northampton	PA
Main Miles in Northampton County	25.3		
Laterals in Northampton County	2.10	Hellertown 24-inch	
Durham Township	1.5	Bucks	PA
Riegelsville Borough	0.2	Bucks	PA
Main Miles in Bucks County	1.8		

PennEast Construction Spreads
from Table 1.5-1 of RR1 (Approximate)

Spread	Total			
	1	2	3	4
From MP	0	17.8	48.1	77.7
To MP	17.8	48.1	77.7	114.0
Main Miles	17.8	30.3	29.6	36.3
Plus Laterals		2.10	2.1	
Total Spread Miles	17.8	32.4	31.7	36.3

Total Main Line Per Spread Per County					Total
Luzerne	17.8	5.1			22.8
Carbon		23.3	5.1		28.3
Northampton		2.0	23.3		25.3
Bucks			1.8		1.8
Hunterdon			0.2	27.7	27.9
Mercer				9.9	9.9

Total Laterals Per Spread Per County				
Luzerne				
Carbon				
Northampton		2.10		
Bucks				
Hunterdon			2.10	
Mercer				

Total Mains and Laterals Per Spread Per County					
Luzerne	17.8	5.1			22.8
Carbon		23.3	5.1		28.3
Northampton		4.1	23.3		27.4
Bucks			1.8		1.8
Hunterdon			2.3	27.7	30.0
Mercer				9.9	9.9

120.2

Table L2-11

PennEast Pipeline Company, LLC

Updated 09-15-2016

Percent of Spread Construction per County

Holland Township	8.1	Hunterdon	NJ
Alexandria Township	3.0	Hunterdon	NJ
Kingwood Township	6.7	Hunterdon	NJ
Delaware Township	6.0	Hunterdon	NJ
West Amwell Township	4.1	Hunterdon	NJ
Main Miles in Hunterdon County	27.9		
Laterals in Hunterdon County	2.1	Gilbert 12", Lambertville 36"	
Hopewell Township	9.9	Mercer	
Miles in Mercer County	9.9		NJ
Total Line	116.0		
Total Laterals	4.2		
Total	120.2		
Total Rounding errors	0		

PennEast Construction Spreads

Percent of Spread Construction Per County

Spread	1	2	3	4
Luzerne	100%	16%		
Carbon		72%	16%	
Northampton		13%	74%	
Bucks			6%	
Hunterdon			7%	76%
Mercer				27%
		100.0%	102.3%	103.3%

Note: Total for Spread 4 does not equal 100% due to various rounding in the inputs