

**Adelphia Gateway, LLC**  
**Adelphia Project**

DOCKET NO. CP18-\_\_-000

**Appendix 9C**

Construction Emissions Estimates

## Adelphia Gateway Project

**Table 9-C-1. Criteria Pollutant Emissions Summary, Quakertown Compressor Station Construction**

Source	2018 Construction Emissions (tpy)						
	NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Construction Equipment Engines	6.47	9.66	0.46	1.03	0.86	0.86	2,107.20
On-Road Vehicle Travel	0.05	1.80	0.00	0.05	0.00	0.00	51.92
Off-Road Vehicle Travel	--	--	--	--	1.30	0.13	--
Earthmoving Fugitives	--	--	--	--	0.58	0.29	--
Pile Erosion	--	--	--	--	0.02	0.00	--
<b>TOTAL:</b>	<b>6.52</b>	<b>11.46</b>	<b>0.46</b>	<b>1.09</b>	<b>2.76</b>	<b>1.28</b>	<b>2,159.12</b>

## Adelphia Gateway Project

**Table 9-C-2. HAP Emissions Summary, Quakertown Compressor Station Construction**

Source	2018 Construction Emissions (tpy)					Total HAPs
	Acetaldehyde	Acrolein	Benzene	1,3-Butadiene	Formaldehyde	
Construction Equipment Engines	5.47E-02	3.10E-03	2.06E-02	2.06E-03	1.22E-01	2.02E-01
On-Road Vehicle Travel	1.91E-04	2.47E-05	2.45E-03	2.72E-04	4.98E-04	3.43E-03
Off-Road Vehicle Travel	--	--	--	--	--	--
Earthmoving Fugitives	--	--	--	--	--	--
Pile Erosion	--	--	--	--	--	--
<b>TOTAL:</b>	<b>5.49E-02</b>	<b>3.12E-03</b>	<b>2.31E-02</b>	<b>2.34E-03</b>	<b>1.22E-01</b>	<b>2.06E-01</b>

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Table 9-C-3. Criteria Pollutant Emissions from Construction Engines, Quakertown Compressor Station Construction

Equipment Type	SCC	Max. Engine Rating (hp)	Average Engine Load (hp)	Operations			2018 Construction Year Emissions (tpy)							
				Load Factor <sup>3</sup>	Quantity	(hr/week)	(weeks/yr)	NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Air Compressor A	2270006015	310	133.3	0.43	1	60	24	0.38	0.08	0.03	0.04	0.04	0.04	112.25
Air Compressor B	2270006015	310	133.3	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All Terrain Vehicle (ATV) <sup>1</sup>	2282005015	18	3.78	0.21	1	60	27	0.05	1.06	0.00	0.09	0.00	0.00	8.69
Asphalt Paver	2270002003	153	90.27	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backhoe	2265002066	75	36	0.48	1	60	27	0.08	0.79	0.00	0.02	0.00	0.00	44.94
Bobcat <sup>2</sup>	2265003040	150	81	0.54	1	60	22	0.17	1.87	0.00	0.06	0.01	0.01	82.47
Booster/Pumps	2270006010	370	159.1	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bucket Truck	2270002051	300	177	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chain Saw	2260004020	3	2.1	0.7	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cherry Picker	2270002081	160	94.4	0.59	1	60	27	0.38	0.35	0.03	0.04	0.06	0.06	100.37
Chipper/Shredder	2270004066	20	8.6	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor	2270002009	300	129	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor, Vibratory	2270002009	100	43	0.43	3	60	14	0.55	0.29	0.02	0.06	0.04	0.04	70.34
Concrete Mixer Truck ( main pours )	2270002042	150	64.5	0.43	1	10	10	0.03	0.01	0.00	0.00	0.00	0.00	4.19
Concrete Mixer Truck ( small pours )	2270002042	150	64.5	0.43	1	2	20	0.01	0.01	0.00	0.00	0.00	0.00	1.68
Concrete Pumps	2270006010	300	129	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Crawler	2270002069	450	265.5	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled ( 20 ton )	2270002045	150	64.5	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (250 ton ) A	2270002045	715	307.45	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (250 ton ) B	2270002045	715	307.45	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cuttings Cleaner System	2270002081	300	177	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Digger Derrick	2270002033	300	129	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozers	2270002069	410	241.9	0.59	1	60	18	0.30	0.09	0.04	0.04	0.06	0.06	154.46
Drill Engine	2270002081	20	11.8	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Drilling Rig	2270002033	950	408.5	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	2270002078	325	68.25	0.21	1	60	27	0.51	0.29	0.02	0.08	0.07	0.07	76.12
Excavator	2270002036	138	81.42	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fork Lift	2270003020	120	70.8	0.59	1	60	27	0.06	0.06	0.02	0.02	0.03	0.03	75.32
Front End Loaders	2270002066	196	41.16	0.21	1	60	27	0.25	0.14	0.01	0.04	0.04	0.04	45.93
Generators	2270006005	430	184.9	0.43	2	60	27	2.24	0.59	0.10	0.19	0.17	0.17	350.08
Grader	2270002048	140	82.6	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDD Rig	2270002033	600	258	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heavy Lift Crane	2270002045	340	146.2	0.43	1	10	3	0.01	0.00	0.00	0.00	0.00	0.00	2.57
Hydrotest Truck	2270002051	100	59	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jack Hammer	2270003040	405	174.15	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Light Tower	2270002081	50	29.5	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Man Lift A	2270003010	50	10.5	0.21	1	60	20	0.07	0.07	0.00	0.02	0.01	0.01	9.61
Man Lift B	2270003010	50	10.5	0.21	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mudd Unit	2270002081	400	236	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Trucks	2270002051	250	147.5	0.59	4	60	27	0.50	0.20	0.13	0.14	0.20	0.20	565.15
Pile Driver	2270002081	350	206.5	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipe Beveling Machine	2270002081	20	11.8	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipe Tractor Trailer	2265002066	400	192	0.48	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Portable Pipe Bender	2270003040	75	32.25	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rigging Loft	2265003010	10	4.6	0.46	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller	2270002015	300	177	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scissor Lift	2270003010	20	4.2	0.21	1	60	3	0.00	0.01	0.00	0.00	0.00	0.00	0.58
School Bus	2270002051	100	59	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scraper	2270002018	488	287.92	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SideBoom	2270002069	240	141.6	0.59	0	0	0	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Skid Steer Loader	2270002072	75	15.75	0.21	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stake Bed	2270002081	200	118	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sweeper	2270003030	12	5.16	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tamper	2260002006	4	2.2	0.55	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tandem Truck	2270002069	200	118	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trackhoe	2265002066	320	153.6	0.48	1	60	27	0.34	3.39	0.51	0.10	0.02	0.02	191.75
Trenching Machines	2270002030	200	118	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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Table 9-C-3. Criteria Pollutant Emissions from Construction Engines, Quakertown Compressor Station Construction

Equipment Type	SCC	Max. Engine Rating (hp)	Average Engine Load (hp)	Load Factor <sup>3</sup>	Operations			2018 Construction Year						
								Quantity	(hr/week)	(weeks/yr)	Emissions (tpy)			
								NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Trowel	2270002081	8	4.72	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water / Fuel Truck	2270002051	250	147.5	0.59	1	60	27	0.12	0.05	0.03	0.04	0.05	0.05	141.29
Welder	2270006025	35	7.35	0.21	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Welding Machine	2270006025	35	7.35	0.21	4	60	27	0.27	0.25	0.01	0.05	0.04	0.04	36.37
Welding Rig	2270002051	10	5.9	0.59	4	60	27	0.11	0.03	0.01	0.01	0.01	0.01	22.60
X-Ray Truck/Machine	2270002051	50	29.5	0.59	1	30	20	0.05	0.01	0.00	0.00	0.00	0.00	10.46

<sup>1</sup>NONROAD2008a Model does not contain Emission Factors for All Terrain Vehicles (ATVs). Used Emission Factors for Personal Watercraft as a substitution.

<sup>2</sup>NONROAD2008a Model does not contain Emission Factors for Bobcat vehicle type. Used Emission Factors for Other Industrial Equipment vehicle type as a substitution.

<sup>3</sup> Load factors as recommended for estimation of emissions using NONROAD emission factors in EPA420-P-04-005 Revised April 2004

## Adelphia Gateway Project

**Table 9-C-4. HAP Emissions from Construction Engines, Quakertown Compressor Station Construction**

Pollutant	2018 Emissions (tpy)
Acetaldehyde	5.47E-02
Acrolein	3.10E-03
Benzene	2.06E-02
1,3-Butadiene	2.06E-03
Formaldehyde	1.22E-01

1. Emissions of HAPs are estimated based on total VOC emissions for the construction year and Table 3.1-3 Air Toxic Fractions of VOC in EPA's guidance document *Final Regulatory Analysis and Control of Emissions from Nonroad Diesel Engines*, EPA420-R-04-007, May 2004.

Pollutant	Fraction of VOC
Acetaldehyde	0.053
Acrolein	0.003
Benzene	0.020
1,3-Butadiene	0.002
Formaldehyde	0.118

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**Table 9-C-5. On-Road Engine Emission Factors, Quakertown Compressor Station Construction**

Pollutant	2018 Emission Factors (grams/mile)				
	LDGV	LDGT	LDDT	COM BUS	HDDV
NO <sub>x</sub>	3.28E-01	3.69E-01	4.06E-01	6.38E+00	2.71E+00
CO	1.28E+01	1.25E+01	4.77E-01	8.85E-01	5.15E-01
SO <sub>2</sub>	6.80E-03	8.80E-03	4.10E-03	1.12E-02	1.06E-02
VOC	3.83E-01	4.53E-01	2.12E-01	3.28E-01	2.38E-01
PM <sub>10</sub>	2.47E-02	2.48E-02	4.02E-02	3.71E-02	7.62E-02
PM <sub>2.5</sub>	1.12E-02	1.13E-02	2.55E-02	2.06E-02	4.66E-02
CO <sub>2</sub>	3.68E+02	4.79E+02	5.99E+02	1.65E+03	1.54E+03
Acetaldehyde	1.36E-03	1.55E-03	2.62E-03	9.90E-03	7.19E-03
Acrolein	1.75E-04	2.00E-04	7.40E-04	1.21E-03	8.75E-04
Benzene	1.74E-02	1.98E-02	4.26E-03	3.61E-03	2.62E-03
1,3-Butadiene	1.93E-03	2.20E-03	1.92E-03	2.10E-03	1.52E-03
Formaldehyde	3.53E-03	4.02E-03	8.21E-03	2.69E-02	1.95E-02

1. The emission factors were calculated using EPA's Mobile6.2 Vehicle Emission Modeling Software. Emission factors for each calendar year are based on average of Mobile6.2 generated factors for winter and summer of that year.

2. Temperatures for winter were based on average temperatures in December, January, and February, and the temperatures for summer were based on average temperatures in June, July, and August. The data was extracted from United States Environmental Protection Agency Outdoor Air Quality Data website (<https://www.epa.gov/outdoor-air-quality-data/monitor-values-report>)

3. Fuel assumptions included conventional gasoline, with an average RVP limit of 9 psig, and diesel with average sulfur content of 11 ppm.

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**Table 9-C-6. On-Road Vehicle Travel, Quakertown Compressor Station Construction**

Vehicle Type	2018			Total Miles Per Year
	Round Trip (miles)	Trips per Day	Days/Year	
Commuter Bus	0	0	0	0
Light-Duty Diesel Truck	0	0	0	0
Light-Duty Gasoline Truck	0	0	0	0
Light-Duty Gasoline Vehicle	40	20	160	128,000
Heavy Duty Diesel Vehicle	0	0	0	0
Fuel Delivery	0	0	0	0



## Adelphia Gateway Project

**Table 9-C-7. On-Road Engine Emissions, Quakertown Compressor Station Construction**

Pollutant	2018 Annual Emissions (tpy)				
	LDGV	LDGT	LDDT	COM BUS	HDDV
NO <sub>x</sub>	4.62E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO	1.80E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SO <sub>2</sub>	9.59E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOC	5.40E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PM <sub>10</sub>	3.49E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PM <sub>2.5</sub>	1.58E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO <sub>2</sub>	5.19E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	1.91E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acrolein	2.47E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	2.45E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-Butadiene	2.72E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Formaldehyde	4.98E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00

## Adelphia Gateway Project

**Table 9-C-8. Off-Road Vehicle Travel, Quakertown Compressor Station Construction**

Vehicle Type	2018			Total Miles Per Year
	Round Trip (miles)	Trips per Day	Days/Year	
All Terrain Vehicle (ATV)	0	0	0	0
Dump Trucks	0	0	0	0
Light Duty Trucks	40	2	160	12,800
Medium Duty Trucks	0	0	0	0
School Bus	0	0	0	0
Water / Fuel Truck	40	0.14	160	914

## Adelphia Gateway Project

**Table 9-C-9. Off-Road Engine Emissions, Quakertown Compressor Station Construction**

Vehicle Type	Mean Vehicle Weight (tons)	Emission Factor <sup>1</sup>		Control Efficiency <sup>2</sup> (%)	2018 Annual Emissions	
		PM <sub>10</sub> (lb/VMT)	PM <sub>2.5</sub> (lb/VMT)		PM <sub>10</sub> (tpy)	PM <sub>2.5</sub> (tpy)
All Terrain Vehicle (ATV)	0.25	0.24	0.02	75%	0.00	0.00
Dump Trucks	20	1.75	0.17	75%	0.00	0.00
Light Duty Trucks	2.5	0.69	0.07	75%	1.10	0.11
Medium Duty Trucks	5	0.94	0.09	75%	0.00	0.00
School Bus	15	1.54	0.15	75%	0.00	0.00
Water / Fuel Truck	20	1.75	0.17	75%	0.20	0.02

1. Emission factors calculated in accordance with AP-42 Section 13.2.2:

$$\text{Unpaved Roads: } E = k(s/12)^a(W/3)^b \cdot [(365-p)/365]$$

k Factor (PM <sub>10</sub> , PM <sub>2.5</sub> ) (lb/VMT)	1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	8.5	%	AP-42 Table 13.2.2-1 (Final, 11/06)
Number of Rain Days, p	118		AP-42 Figure 13.2.2-1 (Final, 11/06)
a (PM <sub>10</sub> , PM <sub>2.5</sub> )	0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b (PM <sub>10</sub> , PM <sub>2.5</sub> )	0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

2. Assumed average dust control efficiency for road watering from AP-42 Section 13.2.2 and related background documents.

## Adelphia Gateway Project

**Table 9-C-10. Fugitive Emissions from Earthmoving, Quakertown Compressor Station Construction**

On-Site Activity	Emission Factors <sup>1</sup>			Operation <sup>2</sup>		PM <sub>10</sub> Emissions (tpy)	PM <sub>2.5</sub> Emissions (tpy)
	PM <sub>10</sub>	PM <sub>2.5</sub>	Units of Measure	2018	Units of Measure	2018	2018
Bulldozing	1.03E+00	5.31E-01	lb/hr	1080	hr/yr	5.56E-01	2.87E-01
Grading	1.96E+00	2.24E-01	lb/VMT	28.2	VMT/yr	2.76E-02	3.17E-03

1. Emissions were calculated using emission factor equations from Table 11.9-1, Compilation of Air Pollutant Emission Factors, USEPA AP-42, Fifth Edition, 10/98.

For bulldozing:

$$PM_{10} \text{ emissions factor (lb/hr)} = 0.75 * [1.0 (s)^{1.5} / (M)^{1.4}]$$

$$PM_{2.5} \text{ emission factor (lb/hr)} = 0.105 * [5.7(s)^{1.2} / (M)^{1.3}]$$

For grading:

$$PM_{10} \text{ emission factor (lb/VMT)} = 0.60 * [0.051 (S)^{2.0}]$$

$$PM_{2.5} \text{ emission factor (lb/VMT)} = 0.031 * [0.040 (S)^{2.5}]$$

Where:

$$s \text{ (Silt Content)} = 8.5$$

$$M \text{ (Moisture Content)} = 7.9$$

$$S \text{ (Vehicle Speed)} = 8$$

2. Vehicle miles traveled for grading calculate based on amount of land disturbed during construction each year, as follows:

	2018
Land Disturbed (acres):	5.7
Square Miles:	0.009
Miles in 1 Direction:	0.094
Feet in 1 Direction:	498
Clearance of Grader (ft):	5
Number of Trips for 1 Grade:	100
Miles to Clear 1 Direction:	9.405
Miles with 50% Safety Factor:	14.1
Number of Times to Go Over Surface:	2
Total Travel (VMT/yr):	28.215

## Adelphia Gateway Project

**Table 9-C-11. Fugitive Emissions from Soil Pile Wind Erosion, Quakertown Compressor Station Construction**

Material Pile Description	Size (acres) <sup>3</sup>	Emission Control Method	Control Efficiency <sup>4</sup>	Emission Factor <sup>1</sup>			Unit	2018 Emissions (tpy) <sup>5</sup>		
				PM	PM <sub>10</sub>	PM <sub>2.5</sub>		PM	PM <sub>10</sub>	PM <sub>2.5</sub>
Quakertown Compressor Station Stockpiles	0.115	Mulch/seeding	75%	5.06	2.53	0.38	lb/day/acre	0.05	0.02	0.00
<b>Compressor Station Total</b>	0.115	Mulch/seeding	75%	--	--	--	--	0.05	0.02	0.00
<b>Total Stockpile Erosion Emissions</b>								<b>0.05</b>	<b>0.02</b>	<b>0.00</b>

<sup>1</sup>USEPA, 1992 (Fugitive Dust Background and Technical Information Document for Best Available Control Measures, Section 2.3.1.3.3, Wind Emissions from Continuously Active Piles). USEPA, 2006 13.2.5 for k factors:

$$EF \text{ (lb/day/acre)} = k \times 1.7 \times (s/1.5) \times ((365 - p)/235) \times (f/15) \times (1 - \% \text{ Control Efficiency})$$

<sup>2</sup>Total PM assumed to be equal to PM < 30 μm

	Quaker Compressor Station
Days of precipitation greater than or equal to 0.01 inch (p)	118
Time (%) that unobstructed wind speed exceeds 12 mph at mean pile height (f)	30.0

Silt Content (%), (s)	8.5
Particle Size multiplier (k)	1 (for PM < 30 μm) 0.5 (for PM < 10 μm) 0.075 (for PM < 2.5 μm)

<sup>3</sup>Soil Pile Areas:

Quaker Compressor Station Stockpile Area:	1 stockpiles 50 ft. wide 100 ft. wide <b>0.115 acres</b>
---	---

<sup>4</sup>Engineering estimate for control efficiency from use of mulch/seeding to control erosion.

<sup>5</sup>Emissions are based on the construction schedule below:

2018	Location	
(days)	Quaker Compressor Station	
160		

## Adelphia Gateway Project

**Table 9-C-12. Criteria Pollutant Emissions Summary, Quakertown Meter Station Construction**

Source	2018 Construction Emissions (tpy)						
	NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Construction Equipment Engines	2.91	6.17	0.23	0.55	0.43	0.43	1,134.75
On-Road Vehicle Travel	0.02	0.62	0.00	0.02	0.00	0.00	17.85
Off-Road Vehicle Travel	--	--	--	--	0.89	0.09	--
Earthmoving Fugitives	--	--	--	--	0.00	0.00	--
Pile Erosion	--	--	--	--	0.01	0.00	--
<b>TOTAL:</b>	<b>2.93</b>	<b>6.79</b>	<b>0.23</b>	<b>0.56</b>	<b>1.34</b>	<b>0.52</b>	<b>1,152.60</b>

## Adelphia Gateway Project

**Table 9-C-13. HAP Emissions Summary, Quakertown Meter Station Construction**

Source	2018 Construction Emissions (tpy)					
	Acetaldehyde	Acrolein	Benzene	1,3-Butadiene	Formaldehyde	Total HAPs
Construction Equipment Engines	2.89E-02	1.64E-03	1.09E-02	1.09E-03	6.43E-02	1.07E-01
On-Road Vehicle Travel	6.57E-05	8.49E-06	8.42E-04	9.34E-05	1.71E-04	1.18E-03
Off-Road Vehicle Travel	--	--	--	--	--	--
Earthmoving Fugitives	--	--	--	--	--	--
Pile Erosion	--	--	--	--	--	--
<b>TOTAL:</b>	<b>2.90E-02</b>	<b>1.64E-03</b>	<b>1.17E-02</b>	<b>1.18E-03</b>	<b>6.45E-02</b>	<b>1.08E-01</b>

# Adelphia Gateway Project

Table 9-C-14. Criteria Pollutant Emissions from Construction Engines, Quakertown Meter Station Construction

Equipment Type	SCC	Max. Engine Rating (hp)	Average Engine Load (hp)	Load Factor <sup>3</sup>	Operations			2018 Construction Year Emissions (tpy)						
					Quantity	(hr/week)	(weeks/yr)	NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Air Compressor A	2270006015	310	133.3	0.43	1	60	18	0.28	0.06	0.02	0.03	0.03	0.03	84.18
Air Compressor B	2270006015	310	133.3	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All Terrain Vehicle (ATV) <sup>1</sup>	2282005015	18	3.78	0.21	1	60	18	0.03	0.71	0.00	0.06	0.00	0.00	5.79
Asphalt Paver	2270002003	153	90.27	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backhoe	2265002066	75	36	0.48	1	60	18	0.05	0.53	0.00	0.02	0.00	0.00	29.96
Bobcat <sup>2</sup>	2265003040	150	81	0.54	1	60	18	0.14	1.53	0.00	0.05	0.01	0.01	67.48
Booster/Pumps	2270006010	370	159.1	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bucket Truck	2270002051	300	177	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chain Saw	2260004020	3	2.1	0.7	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cherry Picker	2270002081	160	94.4	0.59	1	60	18	0.25	0.24	0.02	0.03	0.04	0.04	66.92
Chipper/Shredder	2270004066	20	8.6	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor	2270002009	300	129	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor, Vibratory	2270002009	100	43	0.43	2	60	1	0.03	0.01	0.00	0.00	0.00	0.00	3.35
Concrete Mixer Truck ( main pours )	2270002042	150	64.5	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Mixer Truck ( small pours )	2270002042	150	64.5	0.43	1	2	10	0.01	0.00	0.00	0.00	0.00	0.00	0.84
Concrete Pumps	2270006010	300	129	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Crawler	2270002069	450	265.5	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheelled ( 20 ton )	2270002045	150	64.5	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheelled (250 ton ) A	2270002045	715	307.45	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheelled (250 ton ) B	2270002045	715	307.45	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cuttings Cleaner System	2270002081	300	177	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Digger Derrick	2270002033	300	129	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozers	2270002069	410	241.9	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Drill Engine	2270002081	20	11.8	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Drilling Rig	2270002033	950	408.5	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	2270002078	325	68.25	0.21	1	60	18	0.34	0.19	0.01	0.05	0.04	0.04	50.74
Excavator	2270002036	138	81.42	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fork Lift	2270003020	120	70.8	0.59	1	60	18	0.04	0.04	0.01	0.01	0.02	0.02	50.21
Front End Loaders	2270002066	196	41.16	0.21	1	60	18	0.16	0.10	0.01	0.03	0.02	0.02	30.62
Generators	2270006005	430	184.9	0.43	1	60	18	0.75	0.20	0.03	0.06	0.06	0.06	116.69
Grader	2270002048	140	82.6	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDD Rig	2270002033	600	258	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heavy Lift Crane	2270002045	340	146.2	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrotest Truck	2270002051	100	59	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jack Hammer	2270003040	405	174.15	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Light Tower	2270002081	50	29.5	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Man Lift A	2270003010	50	10.5	0.21	1	60	10	0.04	0.03	0.00	0.01	0.01	0.01	4.81
Man Lift B	2270003010	50	10.5	0.21	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mudd Unit	2270002081	400	236	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Trucks	2270002051	250	147.5	0.59	4	60	18	0.33	0.14	0.08	0.09	0.14	0.14	376.77
Pile Driver	2270002081	350	206.5	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipe Beveling Machine	2270002081	20	11.8	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipe Tractor Trailer	2265002066	400	192	0.48	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Portable Pipe Bender	2270003040	75	32.25	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rigging Loft	2265003010	10	4.6	0.46	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller	2270002015	300	177	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scissor Lift	2270003010	20	4.2	0.21	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
School Bus	2270002051	100	59	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scrapper	2270002018	488	287.92	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SideBoom	2270002069	240	141.6	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Skid Steer Loader	2270002072	75	15.75	0.21	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stake Bed	2270002081	200	118	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sweeper	2270003030	12	5.16	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tamper	2260002006	4	2.2	0.55	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tandem Truck	2270002069	200	118	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trackhoe	2265002066	320	153.6	0.48	1	60	18	0.23	2.26	0.01	0.07	0.01	0.01	127.83
Trenching Machines	2270002030	200	118	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trowel	2270002081	8	4.72	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water / Fuel Truck	2270002051	250	147.5	0.59	1	60	18	0.08	0.03	0.02	0.02	0.03	0.03	94.19
Welder	2270006025	35	7.35	0.21	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00



# Adelphia Gateway Project

**Table 9-C-14. Criteria Pollutant Emissions from Construction Engines, Quakertown Meter Station Construction**

Equipment Type	SCC	Max. Engine Rating (hp)	Average Engine Load (hp)	Load Factor <sup>3</sup>	Operations			2018 Construction Year Emissions (tpy)						
					Quantity	(hr/week)	(weeks/yr)	NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Welding Machine	2270006025	35	7.35	0.21	2	60	18	0.09	0.08	0.00	0.02	0.01	0.01	12.12
Welding Rig	2270002051	10	5.9	0.59	2	60	18	0.04	0.01	0.00	0.00	0.00	0.00	7.53
X-Ray Truck/Machine	2270002051	50	29.5	0.59	1	30	9	0.02	0.01	0.00	0.00	0.00	0.00	4.71

<sup>1</sup>NONROAD2008a Model does not contain Emission Factors for All Terrain Vehicles (ATVs). Used Emission Factors for Personal Watercraft as a substitution.

<sup>2</sup>NONROAD2008a Model does not contain Emission Factors for Bobcat vehicle type. Used Emission Factors for Other Industrial Equipment vehicle type as a substitution.

<sup>3</sup> Load factors as recommended for estimation of emissions using NONROAD emission factors in EPA420-P-04-005 Revised April 2004

## Adelphia Gateway Project

**Table 9-C-15. HAP Emissions from Construction Engines, Quakertown Meter Station Construction**

Pollutant	2018 Emissions (tpy)
Acetaldehyde	2.89E-02
Acrolein	1.64E-03
Benzene	1.09E-02
1,3-Butadiene	1.09E-03
Formaldehyde	6.43E-02

1. Emissions of HAPs are estimated based on total VOC emissions for the construction year and Table 3.1-3 Air Toxic Fractions of VOC in EPA's guidance document *Final Regulatory Analysis and Control of Emissions from Nonroad Diesel Engines*, EPA420-R-04-007, May 2004.

Pollutant	Fraction of VOC
Acetaldehyde	0.053
Acrolein	0.003
Benzene	0.020
1,3-Butadiene	0.002
Formaldehyde	0.118

## Adelphia Gateway Project

**Table 9-C-16. On-Road Engine Emission Factors, Quakertown Meter Station Construction**

Pollutant	2018 Emission Factors (grams/mile)				
	LDGV	LDGT	LDDT	COM BUS	HDDV
NO <sub>x</sub>	3.28E-01	3.69E-01	4.06E-01	6.38E+00	2.71E+00
CO	1.28E+01	1.25E+01	4.77E-01	8.85E-01	5.15E-01
SO <sub>2</sub>	6.80E-03	8.80E-03	4.10E-03	1.12E-02	1.06E-02
VOC	3.83E-01	4.53E-01	2.12E-01	3.28E-01	2.38E-01
PM <sub>10</sub>	2.47E-02	2.48E-02	4.02E-02	3.71E-02	7.62E-02
PM <sub>2.5</sub>	1.12E-02	1.13E-02	2.55E-02	2.06E-02	4.66E-02
CO <sub>2</sub>	3.68E+02	4.79E+02	5.99E+02	1.65E+03	1.54E+03
Acetaldehyde	1.36E-03	1.55E-03	2.62E-03	9.90E-03	7.19E-03
Acrolein	1.75E-04	2.00E-04	7.40E-04	1.21E-03	8.75E-04
Benzene	1.74E-02	1.98E-02	4.26E-03	3.61E-03	2.62E-03
1,3-Butadiene	1.93E-03	2.20E-03	1.92E-03	2.10E-03	1.52E-03
Formaldehyde	3.53E-03	4.02E-03	8.21E-03	2.69E-02	1.95E-02

1. The emission factors were calculated using EPA's Mobile6.2 Vehicle Emission Modeling Software. Emission factors for each calendar year are based on average of Mobile6.2 generated factors for winter and summer of that year.
2. Temperatures for winter were based on average temperatures in December, January, and February, and the temperatures for summer were based on average temperatures in June, July, and August. The data was extracted from United States Environmental Protection Agency Outdoor Air Quality Data website (<https://www.epa.gov/outdoor-air-quality-data/monitor-values-report>)
3. Fuel assumptions included conventional gasoline, with an average RVP limit of 9 psi, and diesel with average sulfur content of 11 ppm.

## Adelphia Gateway Project

**Table 9-C-17. On-Road Vehicle Travel, Quakertown Meter Station Construction**

Vehicle Type	2018			Total Miles Per Year
	Round Trip (miles)	Trips per Day	Days/Year	
Commuter Bus	0	0	0	0
Light-Duty Diesel Truck	0	0	0	0
Light-Duty Gasoline Truck	0	0	0	0
Light-Duty Gasoline Vehicle	40	10	110	44,000
Heavy Duty Diesel Vehicle	0	0	0	0
Fuel Delivery	0	0	0	0

## Adelphia Gateway Project

**Table 9-C-18. On-Road Engine Emissions, Quakertown Meter Station Construction**

Pollutant	2018 Annual Emissions (tpy)				
	LDGV	LDGT	LDDT	COM BUS	HDDV
NO <sub>x</sub>	1.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO	6.19E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SO <sub>2</sub>	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOC	1.86E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PM <sub>10</sub>	1.20E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PM <sub>2.5</sub>	5.43E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO <sub>2</sub>	1.78E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	6.57E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acrolein	8.49E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	8.42E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-Butadiene	9.34E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Formaldehyde	1.71E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00

## Adelphia Gateway Project

**Table 9-C-19. Off-Road Vehicle Travel, Quakertown Meter Station Construction**

Vehicle Type	2018			Total Miles Per Year
	Round Trip (miles)	Trips per Day	Days/Year	
All Terrain Vehicle (ATV)	0	0	0	0
Dump Trucks	0	0	0	0
Light Duty Trucks	40	2	110	8,800
Medium Duty Trucks	0	0	0	0
School Bus	0	0	0	0
Water / Fuel Truck	40	0.14	110	629

## Adelphia Gateway Project

**Table 9-C-20. Off-Road Engine Emissions, Quakertown Meter Station Construction**

Vehicle Type	Mean Vehicle Weight (tons)	Emission Factor <sup>1</sup>		Control Efficiency <sup>2</sup> (%)	2018 Annual Emissions	
		PM <sub>10</sub> (lb/VMT)	PM <sub>2.5</sub> (lb/VMT)		PM <sub>10</sub> (tpy)	PM <sub>2.5</sub> (tpy)
All Terrain Vehicle (ATV)	0.25	0.24	0.02	75%	0.00	0.00
Dump Trucks	20	1.75	0.17	75%	0.00	0.00
Light Duty Trucks	2.5	0.69	0.07	75%	0.75	0.08
Medium Duty Trucks	5	0.94	0.09	75%	0.00	0.00
School Bus	15	1.54	0.15	75%	0.00	0.00
Water / Fuel Truck	20	1.75	0.17	75%	0.14	0.01

1. Emission factors calculated in accordance with AP-42 Section 13.2.2:

$$\text{Unpaved Roads: } E = k(s/12)^a(W/3)^b * [(365-p)/365]$$

k Factor (PM <sub>10</sub> , PM <sub>2.5</sub> ) (lb/VMT)	1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	8.5	%	AP-42 Table 13.2.2-1 (Final, 11/06)
Number of Rain Days, p	118		AP-42 Figure 13.2.2-1 (Final, 11/06)
a (PM <sub>10</sub> , PM <sub>2.5</sub> )	0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b (PM <sub>10</sub> , PM <sub>2.5</sub> )	0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

2. Assumed average dust control efficiency for road watering from AP-42 Section 13.2.2 and related background documents.

## Adelphia Gateway Project

**Table 9-C-21. Fugitive Emissions from Earthmoving, Quakertown Meter Station Construction**

On-Site Activity	Emission Factors <sup>1</sup>			Operation <sup>2</sup>		PM <sub>10</sub> Emissions (tpy)	PM <sub>2.5</sub> Emissions (tpy)
	PM <sub>10</sub>	PM <sub>2.5</sub>	Units of Measure	2018	Units of Measure	2018	2018
Bulldozing	1.03E+00	5.31E-01	lb/hr	0	hr/yr	0.00E+00	0.00E+00
Grading	1.96E+00	2.24E-01	lb/VMT	5.0	VMT/yr	4.85E-03	5.56E-04

1. Emissions were calculated using emission factor equations from Table 11.9-1, Compilation of Air Pollutant Emission Factors, USEPA AP-42, Fifth Edition, 10/98.

For bulldozing:

$$\text{PM}_{10} \text{ emissions factor (lb/hr)} = 0.75 * [1.0 (s)^{1.5} / (M)^{1.4}]$$

$$\text{PM}_{2.5} \text{ emission factor (lb/hr)} = 0.105 * [5.7(s)^{1.2} / (M)^{1.3}]$$

For grading:

$$\text{PM}_{10} \text{ emission factor (lb/VMT)} = 0.60 * [0.051 (S)^{2.0}]$$

$$\text{PM}_{2.5} \text{ emission factor (lb/VMT)} = 0.031 * [0.040 (S)^{2.5}]$$

Where:

$$s \text{ (Silt Content)} = 8.5$$

$$M \text{ (Moisture Content)} = 7.9$$

$$S \text{ (Vehicle Speed)} = 8$$

2. Vehicle miles traveled for grading calculate based on amount of land disturbed during construction each year, as follows:

	2018
Land Disturbed (acres):	1
Square Miles:	0.002
Miles in 1 Direction:	0.040
Feet in 1 Direction:	209
Clearance of Grader (ft):	5
Number of Trips for 1 Grade:	42
Miles to Clear 1 Direction:	1.65
Miles with 50% Safety Factor:	2.5
Number of Times to Go Over Surface:	2
Total Travel (VMT/yr):	4.95



# Adelphia Gateway Project

**Table 9-C-22. Fugitive Emissions from Soil Pile Wind Erosion, Quakertown Meter Station Construction**

Material Pile Description	Size (acres) <sup>3</sup>	Emission Control Method	Control Efficiency <sup>4</sup>	Emission Factor <sup>1</sup>			Unit	2018 Emissions (tpy) <sup>5</sup>		
				PM	PM <sub>10</sub>	PM <sub>2.5</sub>		PM	PM <sub>10</sub>	PM <sub>2.5</sub>
Quaker Meter Station Stockpiles	0.057	Mulch/seeding	75%	5.06	2.53	0.38	lb/day/acre	0.02	0.01	0.00
<b>Quaker Meter Station Total</b>	0.057	Mulch/seeding	75%	--	--	--	--	0.02	0.01	0.00
<b>Total Stockpile Erosion Emissions</b>								<b>0.02</b>	<b>0.01</b>	<b>0.00</b>

<sup>1</sup>USEPA, 1992 (Fugitive Dust Background and Technical Information Document for Best Available Control Measures, Section 2.3.1.3.3, Wind Emissions from Continuously Active Piles). USEPA, 2006 13.2.5 for k factors:

$$EF \text{ (lb/day/acre)} = k \times 1.7 \times (s/1.5) \times ((365 - p)/235) \times (f/15) \times (1 - \% \text{ Control Efficiency})$$

<sup>2</sup>Total PM assumed to be equal to PM < 30 μm

	Quakertown MS
Days of precipitation greater than or equal to 0.01 inch (p)	118
Time (%) that unobstructed wind speed exceeds 5.4 m/s at mean pile height (f)	30.0

Silt Content (%), (s)	8.5
Particle Size multiplier (k)	1 (for PM < 30 μm) 0.5 (for PM < 10 μm) 0.075 (for PM < 2.5 μm)

<sup>3</sup>Soil Pile Areas:

	1 stockpiles
Quaker Meter Stations Stockpile Area:	50 ft. wide 50 ft. wide <b>0.057 acres</b>

<sup>4</sup>Engineering estimate for control efficiency from use of mulch/seeding to control erosion.

<sup>5</sup>Emissions are based on the construction schedule below:

Start	End	2018 days	Location
		110	Adelphia Meter Station

## Adelphia Gateway Project

**Table 9-C-23. Criteria Pollutant Emissions Summary, Marcus Hook Compressor Station Construction**

Source	2018 Construction Emissions (tpy)						
	NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Construction Equipment Engines	6.44	9.71	0.46	1.03	0.86	0.86	2,107.20
On-Road Vehicle Travel	0.04	1.52	0.00	0.05	0.00	0.00	51.92
Off-Road Vehicle Travel	--	--	--	--	1.30	0.13	--
Earthmoving Fugitives	--	--	--	--	0.57	0.29	--
Pile Erosion	--	--	--	--	0.02	0.00	--
<b>TOTAL:</b>	<b>6.49</b>	<b>11.23</b>	<b>0.46</b>	<b>1.08</b>	<b>2.74</b>	<b>1.28</b>	<b>2,159.12</b>

## Adelphia Gateway Project

**Table 9-C-24. HAP Emissions Summary, Marcus Hook Compressor Station Construction**

Source	2018 Construction Emissions (tpy)					Total HAPs
	Acetaldehyde	Acrolein	Benzene	1,3-Butadiene	Formaldehyde	
Construction Equipment Engines	5.46E-02	3.09E-03	2.06E-02	2.06E-03	1.22E-01	2.02E-01
On-Road Vehicle Travel	1.80E-04	2.33E-05	2.29E-03	2.55E-04	4.67E-04	3.22E-03
Off-Road Vehicle Travel	--	--	--	--	--	--
Earthmoving Fugitives	--	--	--	--	--	--
Pile Erosion	--	--	--	--	--	--
<b>TOTAL:</b>	<b>5.48E-02</b>	<b>3.11E-03</b>	<b>2.29E-02</b>	<b>2.31E-03</b>	<b>1.22E-01</b>	<b>2.05E-01</b>

# Adelphia Gateway Project

Table 9-C-25. Criteria Pollutant Emissions from Construction Engines, Marcus Hook Compressor Station Construction

Equipment Type	SCC	Max. Engine Rating (hp)	Average Engine Load (hp)	Operations			2018 Construction Year Emissions (tpy)							
				Load Factor <sup>3</sup>	Quantity	(hr/week)	(weeks/yr)	NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Air Compressor A	2270006015	310	133.3	0.43	1	60	24	0.38	0.08	0.03	0.04	0.04	0.04	112.25
Air Compressor B	2270006015	310	133.3	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All Terrain Vehicle (ATV) <sup>1</sup>	2282005015	18	3.78	0.21	1	60	27	0.05	1.06	0.00	0.09	0.00	0.00	8.69
Asphalt Paver	2270002003	153	90.27	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backhoe	2265002066	75	36	0.48	1	60	27	0.08	0.80	0.00	0.02	0.00	0.00	44.94
Bobcat <sup>2</sup>	2265003040	150	81	0.54	1	60	22	0.17	1.88	0.00	0.06	0.01	0.01	82.47
Booster/Pumps	2270006010	370	159.1	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bucket Truck	2270002051	300	177	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chain Saw	2260004020	3	2.1	0.7	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cherry Picker	2270002081	160	94.4	0.59	1	60	27	0.38	0.35	0.03	0.04	0.06	0.06	100.37
Chipper/Shredder	2270004066	20	8.6	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor	2270002009	300	129	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor, Vibratory	2270002009	100	43	0.43	3	60	14	0.55	0.29	0.02	0.06	0.04	0.04	70.34
Concrete Mixer Truck ( main pours )	2270002042	150	64.5	0.43	1	10	10	0.03	0.01	0.00	0.00	0.00	0.00	4.19
Concrete Mixer Truck ( small pours )	2270002042	150	64.5	0.43	1	2	20	0.01	0.01	0.00	0.00	0.00	0.00	1.68
Concrete Pumps	2270006010	300	129	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Crawler	2270002069	450	265.5	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled ( 20 ton )	2270002045	150	64.5	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (250 ton ) A	2270002045	715	307.45	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (250 ton ) B	2270002045	715	307.45	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cuttings Cleaner System	2270002081	300	177	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Digger Derrick	2270002033	300	129	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozers	2270002069	410	241.9	0.59	1	60	18	0.30	0.09	0.04	0.04	0.06	0.06	154.46
Drill Engine	2270002081	20	11.8	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Drilling Rig	2270002033	950	408.5	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	2270002078	325	68.25	0.21	1	60	27	0.51	0.29	0.02	0.08	0.07	0.07	76.12
Excavator	2270002036	138	81.42	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fork Lift	2270003020	120	70.8	0.59	1	60	27	0.06	0.06	0.02	0.02	0.03	0.03	75.32
Front End Loaders	2270002066	196	41.16	0.21	1	60	27	0.25	0.14	0.01	0.04	0.04	0.04	45.93
Generators	2270006005	430	184.9	0.43	2	60	27	2.24	0.59	0.10	0.19	0.17	0.17	350.08
Grader	2270002048	140	82.6	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDD Rig	2270002033	600	258	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heavy Lift Crane	2270002045	340	146.2	0.43	1	10	3	0.01	0.00	0.00	0.00	0.00	0.00	2.57
Hydrotest Truck	2270002051	100	59	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jack Hammer	2270003040	405	174.15	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Light Tower	2270002081	50	29.5	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Man Lift A	2270003010	50	10.5	0.21	1	60	20	0.07	0.07	0.00	0.02	0.01	0.01	9.61
Man Lift B	2270003010	50	10.5	0.21	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mudd Unit	2270002081	400	236	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Trucks	2270002051	250	147.5	0.59	4	60	27	0.50	0.20	0.13	0.14	0.20	0.20	565.15
Pile Driver	2270002081	350	206.5	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipe Beveling Machine	2270002081	20	11.8	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipe Tractor Trailer	2265002066	400	192	0.48	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Portable Pipe Bender	2270003040	75	32.25	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rigging Loft	2265003010	10	4.6	0.46	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller	2270002015	300	177	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scissor Lift	2270003010	20	4.2	0.21	1	60	3	0.00	0.01	0.00	0.00	0.00	0.00	0.58
School Bus	2270002051	100	59	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scraper	2270002018	488	287.92	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SideBoom	2270002069	240	141.6	0.59	0	0	0	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Skid Steer Loader	2270002072	75	15.75	0.21	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stake Bed	2270002081	200	118	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sweeper	2270003030	12	5.16	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tamper	2260002006	4	2.2	0.55	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tandem Truck	2270002069	200	118	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trackhoe	2265002066	320	153.6	0.48	1	60	27	0.33	3.42	0.01	0.10	0.02	0.02	191.75
Trenching Machines	2270002030	200	118	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

# Adelphia Gateway Project

Table 9-C-25. Criteria Pollutant Emissions from Construction Engines, Marcus Hook Compressor Station Construction

Equipment Type	SCC	Max. Engine Rating (hp)	Average Engine Load (hp)	Load Factor <sup>3</sup>	Operations			2018 Construction Year						
								Quantity	(hr/week)	(weeks/yr)	Emissions (tpy)			
								NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Trowel	2270002081	8	4.72	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water / Fuel Truck	2270002051	250	147.5	0.59	1	60	27	0.12	0.05	0.03	0.04	0.05	0.05	141.29
Welder	2270006025	35	7.35	0.21	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Welding Machine	2270006025	35	7.35	0.21	4	60	27	0.27	0.25	0.01	0.05	0.04	0.04	36.37
Welding Rig	2270002051	10	5.9	0.59	4	60	27	0.11	0.03	0.01	0.01	0.01	0.01	22.60
X-Ray Truck/Machine	2270002051	50	29.5	0.59	1	30	20	0.05	0.01	0.00	0.00	0.00	0.00	10.46

<sup>1</sup>NONROAD2008a Model does not contain Emission Factors for All Terrain Vehicles (ATVs). Used Emission Factors for Personal Watercraft as a substitution.

<sup>2</sup>NONROAD2008a Model does not contain Emission Factors for Bobcat vehicle type. Used Emission Factors for Other Industrial Equipment vehicle type as a substitution.

<sup>3</sup> Load factors as recommended for estimation of emissions using NONROAD emission factors in EPA420-P-04-005 Revised April 2004

## Adelphia Gateway Project

**Table 9-C-26. HAP Emissions from Construction Engines, Marcus Hook Compressor Station Construction**

Pollutant	2018 Emissions (tpy)
Acetaldehyde	5.46E-02
Acrolein	3.09E-03
Benzene	2.06E-02
1,3-Butadiene	2.06E-03
Formaldehyde	1.22E-01

1. Emissions of HAPs are estimated based on total VOC emissions for the construction year and Table 3.1-3 Air Toxic Fractions of VOC in EPA's guidance document *Final Regulatory Analysis and Control of Emissions from Nonroad Diesel Engines*, EPA420-R-04-007, May 2004.

Pollutant	Fraction of VOC
Acetaldehyde	0.053
Acrolein	0.003
Benzene	0.020
1,3-Butadiene	0.002
Formaldehyde	0.118

## Adelphia Gateway Project

**Table 9-C-27. On-Road Engine Emission Factors, Marcus Hook Compressor Station Construction**

Pollutant	2018 Emission Factors (grams/mile)				
	LDGV	LDGT	LDDT	COM BUS	HDDV
NO <sub>x</sub>	3.08E-01	3.45E-01	3.08E-01	4.77E+00	2.07E+00
CO	1.08E+01	1.06E+01	4.56E-01	8.16E-01	4.75E-01
SO <sub>2</sub>	6.80E-03	8.80E-03	5.60E-03	1.53E-02	1.44E-02
VOC	3.80E-01	4.46E-01	2.20E-01	3.48E-01	2.53E-01
PM <sub>10</sub>	2.47E-02	2.48E-02	4.03E-02	3.71E-02	7.64E-02
PM <sub>2.5</sub>	1.12E-02	1.13E-02	2.56E-02	2.06E-02	4.69E-02
CO <sub>2</sub>	3.68E+02	4.79E+02	5.99E+02	1.65E+03	1.54E+03
Acetaldehyde	1.28E-03	1.46E-03	2.71E-03	1.05E-02	7.62E-03
Acrolein	1.65E-04	1.85E-04	7.70E-04	1.28E-03	9.25E-04
Benzene	1.62E-02	1.85E-02	4.40E-03	3.83E-03	2.78E-03
1,3-Butadiene	1.81E-03	2.07E-03	1.98E-03	2.23E-03	1.62E-03
Formaldehyde	3.31E-03	3.77E-03	8.49E-03	2.85E-02	2.07E-02

1. The emission factors were calculated using EPA's Mobile6.2 Vehicle Emission Modeling Software. Emission factors for each calendar year are based on average of Mobile6.2 generated factors for winter and summer of that year.

2. Temperatures for winter were based on average temperatures in December, January, and February, and the temperatures for summer were based on average temperatures in June, July, and August. The data was extracted from United States Environmental Protection Agency Outdoor Air Quality Data website (<https://www.epa.gov/outdoor-air-quality-data/monitor-values-report>)

3. Fuel assumptions included conventional gasoline, with an average RVP limit of 9 psig, and diesel with average sulfur content of 15 ppm.

## Adelphia Gateway Project

**Table 9-C-28. On-Road Vehicle Travel, Marcus Hook Compressor Station Construction**

Vehicle Type	2018			Total Miles Per Year
	Round Trip (miles)	Trips per Day	Days/Year	
Commuter Bus	0	0	0	0
Light-Duty Diesel Truck	0	0	0	0
Light-Duty Gasoline Truck	0	0	0	0
Light-Duty Gasoline Vehicle	40	20	160	128,000
Heavy Duty Diesel Vehicle	0	0	0	0
Fuel Delivery	0	0	0	0



## Adelphia Gateway Project

**Table 9-C-29. On-Road Engine Emissions, Marcus Hook Compressor Station Construction**

Pollutant	2018 Annual Emissions (tpy)				
	LDGV	LDGT	LDDT	COM BUS	HDDV
NO <sub>x</sub>	4.35E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO	1.52E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SO <sub>2</sub>	9.59E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOC	5.35E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PM <sub>10</sub>	3.49E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PM <sub>2.5</sub>	1.58E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO <sub>2</sub>	5.19E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	1.80E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acrolein	2.33E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	2.29E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-Butadiene	2.55E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Formaldehyde	4.67E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00

## Adelphia Gateway Project

**Table 9-C-30. Off-Road Vehicle Travel, Marcus Hook Compressor Station Construction**

Vehicle Type	2018			Total Miles Per Year
	Round Trip (miles)	Trips per Day	Days/Year	
All Terrain Vehicle (ATV)	0	0	0	0
Dump Trucks	0	0	0	0
Light Duty Trucks	40	2	160	12,800
Medium Duty Trucks	0	0	0	0
School Bus	0	0	0	0
Water / Fuel Truck	40	0.14	160	914

## Adelphia Gateway Project

**Table 9-C-31. Off-Road Engine Emissions, Marcus Hook Compressor Station Construction**

Vehicle Type	Mean Vehicle Weight (tons)	Emission Factor <sup>1</sup>		Control Efficiency <sup>2</sup> (%)	2018 Annual Emissions	
		PM <sub>10</sub> (lb/VMT)	PM <sub>2.5</sub> (lb/VMT)		PM <sub>10</sub> (tpy)	PM <sub>2.5</sub> (tpy)
All Terrain Vehicle (ATV)	0.25	0.24	0.02	75%	0.00	0.00
Dump Trucks	20	1.75	0.17	75%	0.00	0.00
Light Duty Trucks	2.5	0.69	0.07	75%	1.10	0.11
Medium Duty Trucks	5	0.94	0.09	75%	0.00	0.00
School Bus	15	1.54	0.15	75%	0.00	0.00
Water / Fuel Truck	20	1.75	0.17	75%	0.20	0.02

1. Emission factors calculated in accordance with AP-42 Section 13.2.2:

$$\text{Unpaved Roads: } E = k(s/12)^a(W/3)^b * [(365-p)/365]$$

k Factor (PM <sub>10</sub> , PM <sub>2.5</sub> ) (lb/VMT)	1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	8.5	%	AP-42 Table 13.2.2-1 (Final, 11/06)
Number of Rain Days, p	118		AP-42 Figure 13.2.2-1 (Final, 11/06)
a (PM <sub>10</sub> , PM <sub>2.5</sub> )	0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b (PM <sub>10</sub> , PM <sub>2.5</sub> )	0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

2. Assumed average dust control efficiency for road watering from AP-42 Section 13.2.2 and related background documents.

## Adelphia Gateway Project

**Table 9-C-32. Fugitive Emissions from Earthmoving, Marcus Hook Compressor Station Construction**

On-Site Activity	Emission Factors <sup>1</sup>			Operation <sup>2</sup>		PM <sub>10</sub> Emissions (tpy)	PM <sub>2.5</sub> Emissions (tpy)
	PM <sub>10</sub>	PM <sub>2.5</sub>	Units of Measure	2018	Units of Measure	2018	2018
Bulldozing	1.03E+00	5.31E-01	lb/hr	1080	hr/yr	5.56E-01	2.87E-01
Grading	1.96E+00	2.24E-01	lb/VMT	9.9	VMT/yr	9.69E-03	1.11E-03

1. Emissions were calculated using emission factor equations from Table 11.9-1, Compilation of Air Pollutant Emission Factors, USEPA AP-42, Fifth Edition, 10/98.

For bulldozing:

$$PM_{10} \text{ emissions factor (lb/hr)} = 0.75 * [1.0 (s)^{1.5} / (M)^{1.4}]$$

$$PM_{2.5} \text{ emission factor (lb/hr)} = 0.105 * [5.7(s)^{1.2} / (M)^{1.3}]$$

For grading:

$$PM_{10} \text{ emission factor (lb/VMT)} = 0.60 * [0.051 (S)^{2.0}]$$

$$PM_{2.5} \text{ emission factor (lb/VMT)} = 0.031 * [0.040 (S)^{2.5}]$$

Where:

$$s \text{ (Silt Content)} = 8.5$$

$$M \text{ (Moisture Content)} = 7.9$$

$$S \text{ (Vehicle Speed)} = 8$$

2. Vehicle miles traveled for grading calculate based on amount of land disturbed during construction each year, as follows:

	2018
Land Disturbed (acres):	2
Square Miles:	0.003
Miles in 1 Direction:	0.056
Feet in 1 Direction:	295
Clearance of Grader (ft):	5
Number of Trips for 1 Grade:	59
Miles to Clear 1 Direction:	3.3
Miles with 50% Safety Factor:	5.0
Number of Times to Go Over Surface:	2
Total Travel (VMT/yr):	9.9

## Adelphia Gateway Project

**Table 9-C-33. Fugitive Emissions from Soil Pile Wind Erosion, Marcus Hook Compressor Station Construction**

Material Pile Description	Size (acres) <sup>3</sup>	Emission Control Method	Control Efficiency <sup>4</sup>	Emission Factor <sup>1</sup>			Unit	2018 Emissions (tpy) <sup>5</sup>		
				PM	PM <sub>10</sub>	PM <sub>2.5</sub>		PM	PM <sub>10</sub>	PM <sub>2.5</sub>
Marcus Hook Compressor Station Stockpiles	0.115	Mulch/seeding	75%	5.06	2.53	0.38	lb/day/acre	0.05	0.02	0.00
<b>Total Stockpile Erosion Emissions</b>								<b>0.05</b>	<b>0.02</b>	<b>0.00</b>

<sup>1</sup>USEPA, 1992 (Fugitive Dust Background and Technical Information Document for Best Available Control Measures, Section 2.3.1.3.3, Wind Emissions from Continuously Active Piles). USEPA, 2006 13.2.5 for k factors:

$$EF \text{ (lb/day/acre)} = k \times 1.7 \times (s/1.5) \times ((365 - p)/235) \times (f/15) \times (1 - \% \text{ Control Efficiency})$$

<sup>2</sup>Total PM assumed to be equal to PM < 30 μm

	Marcus Hook Compressor Station
Days of precipitation greater than or equal to 0.01 inch (p)	118
Time (%) that unobstructed wind speed exceeds 12 mph at mean pile height (f)	30.0

Silt Content (%), (s) 8.5  
 Particle Size multiplier (k) 1 (for PM < 30 μm)  
 0.5 (for PM < 10 μm)  
 0.075 (for PM < 2.5 μm)

<sup>3</sup>Soil Pile Areas:

1 stockpiles  
 50 ft. wide  
 100 ft. wide  
**0.115 acres**

<sup>4</sup>Engineering estimate for control efficiency from use of mulch/seeding to control erosion.

<sup>5</sup>Emissions are based on the construction schedule below:

2018	
(days)	Location
160	Marcus Hook Compressor Station

## Adelphia Gateway Project

**Table 9-C-34. Criteria Pollutant Emissions Summary, Tilghman Lateral Pipeline Construction**

Source	2018 Construction Emissions (tpy)						
	NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Construction Equipment Engines	3.69	7.54	0.28	0.68	0.54	0.54	1,388.33
On-Road Vehicle Travel	0.01	0.46	0.00	0.02	0.00	0.00	15.82
Off-Road Vehicle Travel	--	--	--	--	0.79	0.08	--
Earthmoving Fugitives	--	--	--	--	0.01	0.00	--
Pile Erosion	--	--	--	--	0.08	0.01	--
<b>TOTAL:</b>	<b>3.70</b>	<b>8.00</b>	<b>0.28</b>	<b>0.69</b>	<b>1.42</b>	<b>0.63</b>	<b>1,404.15</b>

## Adelphia Gateway Project

**Table 9-C-35. HAP Emissions Summary, Tilghman Lateral Pipeline Construction**

Source	2018 Construction Emissions (tpy)					
	Acetaldehyde	Acrolein	Benzene	1,3-Butadiene	Formaldehyde	Total HAPs
Construction Equipment Engines	3.58E-02	2.03E-03	1.35E-02	1.35E-03	7.97E-02	1.32E-01
On-Road Vehicle Travel	5.48E-05	7.09E-06	6.98E-04	7.78E-05	1.42E-04	9.80E-04
Off-Road Vehicle Travel	--	--	--	--	--	--
Earthmoving Fugitives	--	--	--	--	--	--
Pile Erosion	--	--	--	--	--	--
<b>TOTAL:</b>	<b>3.58E-02</b>	<b>2.03E-03</b>	<b>1.42E-02</b>	<b>1.43E-03</b>	<b>7.98E-02</b>	<b>1.33E-01</b>

# Adelphia Gateway Project

Table 9-C-36. Criteria Pollutant Emissions from Construction Engines, Tilghman Lateral Pipeline Construction

Equipment Type	SCC	Max. Engine Rating		Average Engine Load (hp)	Operations			2018 Construction Year Emissions (tpy)						
		(hp)	Load Factor <sup>3</sup>		Quantity	(hr/week)	(weeks/yr)	NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Air Compressor A	2270006015	310	0.43	133.3	1	60	22	3.38E-01	7.49E-02	2.56E-02	3.31E-02	3.57E-02	3.57E-02	1.01E+02
Air Compressor B	2270006015	310	0.43	133.3	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicle (ATV) <sup>1</sup>	2282005015	18	0.21	3.78	1	60	22	3.68E-02	8.43E-01	3.36E-04	7.09E-02	6.72E-04	6.72E-04	6.92E+00
Asphalt Paver	2270002003	153	0.59	90.27	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Backhoe	2265002066	75	0.48	36	1	60	22	6.12E-02	6.37E-01	1.74E-03	1.86E-02	3.57E-03	3.57E-03	3.58E+01
Bobcat <sup>2</sup>	2265003040	150	0.54	81	1	60	22	1.63E-01	1.84E+00	3.92E-03	5.40E-02	8.21E-03	8.21E-03	8.06E+01
Booster/Pumps	2270006010	370	0.43	159.1	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bucket Truck	2270002051	300	0.59	177	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chain Saw	2260004020	3	0.7	2.1	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cherry Picker	2270002081	160	0.59	94.4	1	60	22	3.02E-01	2.82E-01	2.08E-02	3.10E-02	5.17E-02	5.17E-02	7.99E+01
Chipper/Shredder	2270004066	20	0.43	8.6	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Compactor	2270002009	300	0.43	129	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Compactor, Vibratory	2270002009	100	0.43	43	2	60	9	2.27E-01	1.20E-01	8.98E-03	2.38E-02	1.85E-02	1.85E-02	2.93E+01
Concrete Mixer Truck ( main pours )	2270002042	150	0.43	64.5	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Concrete Mixer Truck ( small pours )	2270002042	150	0.43	64.5	1	2	16	8.64E-03	4.56E-03	3.61E-04	9.26E-04	9.40E-04	9.40E-04	1.30E+00
Concrete Pumps	2270006010	300	0.43	129	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Crane, Crawler	2270002069	450	0.59	265.5	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Crane, Wheeled ( 20 ton )	2270002045	150	0.43	64.5	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Crane, Wheeled (250 ton ) A	2270002045	715	0.43	307.45	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Crane, Wheeled (250 ton ) B	2270002045	715	0.43	307.45	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cuttings Cleaner System	2270002081	300	0.59	177	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Digger Derrick	2270002033	300	0.43	129	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dozers	2270002069	410	0.59	241.9	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Drill Engine	2270002081	20	0.59	11.8	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Drilling Rig	2270002033	950	0.43	408.5	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dump Truck	2270002078	325	0.21	68.25	1	60	22	4.04E-01	2.31E-01	1.69E-02	6.13E-02	5.34E-02	5.34E-02	6.06E+01
Excavator	2270002036	138	0.59	81.42	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fork Lift	2270003020	120	0.59	70.8	1	60	22	4.89E-02	5.13E-02	1.33E-02	1.35E-02	2.18E-02	2.18E-02	6.00E+01
Front End Loaders	2270002066	196	0.21	41.16	1	60	22	1.96E-01	1.15E-01	9.97E-03	3.04E-02	2.87E-02	2.87E-02	3.66E+01
Generators	2270006005	430	0.43	184.9	1	60	22	8.91E-01	2.35E-01	3.81E-02	7.53E-02	6.60E-02	6.60E-02	1.39E+02
Grader	2270002048	140	0.59	82.6	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HDD Rig	2270002033	600	0.43	258	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Heavy Lift Crane	2270002045	340	0.43	146.2	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hydrotest Truck	2270002051	100	0.59	59	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Jack Hammer	2270003040	405	0.43	174.15	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Light Tower	2270002081	50	0.59	29.5	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Man Lift A	2270003010	50	0.21	10.5	1	60	16	5.48E-02	5.40E-02	2.10E-03	1.37E-02	8.80E-03	8.80E-03	7.45E+00
Man Lift B	2270003010	50	0.21	10.5	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mudd Unit	2270002081	400	0.59	236	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pickup Trucks	2270002051	250	0.59	147.5	4	60	22	3.96E-01	1.61E-01	1.00E-01	1.13E-01	1.61E-01	1.61E-01	4.50E+02



# Adelphia Gateway Project

**Table 9-C-36. Criteria Pollutant Emissions from Construction Engines, Tilghman Lateral Pipeline Construction**

Equipment Type	SCC	Max. Engine		Average Engine Load (hp)	Operations			2018 Construction Year Emissions (tpy)							
		Rating (hp)	Load Factor <sup>3</sup>		Quantity	(hr/week)	(weeks/yr)	NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	
Pile Driver	2270002081	350	0.59	206.5	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pipe Beveling Machine	2270002081	20	0.59	11.8	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pipe Tractor Trailer	2265002066	400	0.48	192	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Portable Pipe Bender	2270003040	75	0.43	32.25	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Rigging Loft	2265003010	10	0.46	4.6	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Roller	2270002015	300	0.59	177	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scissor Lift	2270003010	20	0.21	4.2	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
School Bus	2270002051	100	0.59	59	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scraper	2270002018	488	0.59	287.92	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SideBoom	2270002069	240	0.59	141.6	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Skid Steer Loader	2270002072	75	0.21	15.75	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Stake Bed	2270002081	200	0.59	118	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sweeper	2270003030	12	0.43	5.16	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tamper	2260002006	4	0.55	2.2	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tandem Truck	2270002069	200	0.59	118	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trackhoe	2265002066	320	0.48	153.6	1	60	22	2.61E-01	2.72E+00	7.43E-03	7.92E-02	1.52E-02	1.52E-02	1.53E+02	
Trenching Machines	2270002030	200	0.59	118	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trowel	2270002081	8	0.59	4.72	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Water / Fuel Truck	2270002051	250	0.59	147.5	1	60	22	9.89E-02	4.03E-02	2.50E-02	2.82E-02	4.03E-02	4.03E-02	1.13E+02	
Welder	2270006025	35	0.21	7.35	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Welding Machine	2270006025	35	0.21	7.35	2	60	22	1.08E-01	9.88E-02	4.44E-03	2.11E-02	1.39E-02	1.39E-02	1.45E+01	
Welding Rig	2270002051	10	0.59	5.9	2	60	22	4.31E-02	1.18E-02	2.05E-03	3.33E-03	3.91E-03	3.91E-03	9.00E+00	
X-Ray Truck/Machine	2270002051	50	0.59	29.5	1	30	22	5.39E-02	1.48E-02	2.56E-03	4.16E-03	4.88E-03	4.88E-03	1.12E+01	

<sup>1</sup>NONROAD2008a Model does not contain Emission Factors for All Terrain Vehicles (ATVs). Used Emission Factors for Personal Watercraft as a substitution.

<sup>2</sup>NONROAD2008a Model does not contain Emission Factors for Bobcat vehicle type. Used Emission Factors for Other Industrial Equipment vehicle type as a substitution.

<sup>3</sup> Load factors as recommended for estimation of emissions using NONROAD emission factors in EPA420-P-04-005 Revised April 2004

## Adelphia Gateway Project

**Table 9-C-37. HAP Emissions from Construction Engines, Tilghman Lateral Pipeline Construction**

Pollutant	2018 Emissions (tpy)
Acetaldehyde	3.58E-02
Acrolein	2.03E-03
Benzene	1.35E-02
1,3-Butadiene	1.35E-03
Formaldehyde	7.97E-02

1. Emissions of HAPs are estimated based on total VOC emissions for the construction year and Table 3.1-3 Air Toxic Fractions of VOC in EPA's guidance document *Final Regulatory Analysis and Control of Emissions from Nonroad Diesel Engines*, EPA420-R-04-007, May 2004.

Pollutant	Fraction of VOC
Acetaldehyde	0.053
Acrolein	0.003
Benzene	0.020
1,3-Butadiene	0.002
Formaldehyde	0.118

## Adelphia Gateway Project

**Table 9-C-38. On-Road Engine Emission Factors, Tilghman Lateral Pipeline Construction**

Pollutant	2018 Emission Factors (grams/mile)				
	LDGV	LDGT	LDDT	COM BUS	HDDV
NO <sub>x</sub>	3.08E-01	3.45E-01	3.08E-01	4.77E+00	2.07E+00
CO	1.08E+01	1.06E+01	4.56E-01	8.16E-01	4.75E-01
SO <sub>2</sub>	6.80E-03	8.80E-03	4.10E-03	1.12E-02	1.06E-02
VOC	3.80E-01	4.46E-01	2.20E-01	3.48E-01	2.53E-01
PM <sub>10</sub>	2.47E-02	2.48E-02	4.02E-02	3.71E-02	7.62E-02
PM <sub>2.5</sub>	1.12E-02	1.13E-02	2.55E-02	2.06E-02	4.66E-02
CO <sub>2</sub>	3.68E+02	4.79E+02	5.99E+02	1.65E+03	1.54E+03
Acetaldehyde	1.28E-03	1.46E-03	2.71E-03	1.05E-02	7.62E-03
Acrolein	1.65E-04	1.85E-04	7.70E-04	1.28E-03	9.25E-04
Benzene	1.62E-02	1.85E-02	4.40E-03	3.83E-03	2.78E-03
1,3-Butadiene	1.81E-03	2.07E-03	1.98E-03	2.23E-03	1.62E-03
Formaldehyde	3.31E-03	3.77E-03	8.49E-03	2.85E-02	2.07E-02

1. The emission factors were calculated using EPA's Mobile6.2 Vehicle Emission Modeling Software. Emission factors for each calendar year are based on average of Mobile6.2 generated factors for winter and summer of that year.
2. Temperatures for winter were based on average temperatures in December, January, and February, and the temperatures for summer were based on average temperatures in June, July, and August. The data was extracted from United States Environmental Protection Agency Outdoor Air Quality Data website (<https://www.epa.gov/outdoor-air-quality-data/monitor-values-report>)
3. Fuel assumptions included conventional gasoline, with an average RVP limit of 9 psi, and diesel with average sulfur content of 15 ppm.

## Adelphia Gateway Project

**Table 9-C-39. On-Road Vehicle Travel, Tilghman Lateral Pipeline Construction**

Vehicle Type	2018			Total Miles Per Year
	Round Trip (miles)	Trips per Day	Days/Year	
Commuter Bus	0	0	0	0
Light-Duty Diesel Truck	0	0.00	0	0
Light-Duty Gasoline Truck	0	0	0	0
Light-Duty Gasoline Vehicle	40	7.5	130	39,000
Heavy Duty Diesel Vehicle	0	0.0	0	0
Fuel Delivery	0	0	0	0

## Adelphia Gateway Project

**Table 9-C-40. On-Road Engine Emissions, Tilghman Lateral Pipeline Construction**

Pollutant	2018 Annual Emissions (tpy)				
	LDGV	LDGT	LDDT	COM BUS	HDDV
NO <sub>x</sub>	1.32E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO	4.64E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SO <sub>2</sub>	2.92E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOC	1.63E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PM <sub>10</sub>	1.06E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PM <sub>2.5</sub>	4.81E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO <sub>2</sub>	1.58E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	5.48E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acrolein	7.09E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	6.98E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-Butadiene	7.78E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Formaldehyde	1.42E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00

## Adelphia Gateway Project

**Table 9-C-41. Off-Road Vehicle Travel, Tilghman Lateral Pipeline Construction**

Vehicle Type	2018			Total Miles Per Year
	Round Trip (miles)	Trips per Day	Days/Year	
All Terrain Vehicle (ATV)	0	0	0	0
Dump Trucks	0	0	0	0
Light Duty Trucks	40	1.5	130	7,800
Medium Duty Trucks	0	0	0	0
School Bus	0	0	0	0
Water / Fuel Truck	40	0.1	130	557

## Adelphia Gateway Project

**Table 9-C-42. Off-Road Engine Emissions, Tilghman Lateral Pipeline Construction**

Vehicle Type	Mean Vehicle Weight (tons)	Emission Factor <sup>1</sup>		Control Efficiency <sup>2</sup> (%)	2018 Annual Emissions	
		PM <sub>10</sub> (lb/VMT)	PM <sub>2.5</sub> (lb/VMT)		PM <sub>10</sub> (tpy)	PM <sub>2.5</sub> (tpy)
All Terrain Vehicle (ATV)	0.25	0.24	0.02	75%	0.00	0.0000
Dump Trucks	20	1.75	0.17	75%	0.00	0.000
Light Duty Trucks	2.5	0.69	0.069	75%	0.67	0.067
Medium Duty Trucks	5	0.94	0.094	75%	0.00	0.00
School Bus	15	1.54	0.15	75%	0.00	0.00
Water / Fuel Truck	20	1.75	0.17	75%	0.12	0.01

1. Emission factors calculated in accordance with AP-42 Section 13.2.2:

$$\text{Unpaved Roads: } E = k(s/12)^a(W/3)^b * [(365-p)/365]$$

k Factor (PM <sub>10</sub> , PM <sub>2.5</sub> ) (lb/VMT)	1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	8.5	%	AP-42 Table 13.2.2-1 (Final, 11/06)
Number of Rain Days, p	118		AP-42 Figure 13.2.2-1 (Final, 11/06)
a (PM <sub>10</sub> , PM <sub>2.5</sub> )	0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b (PM <sub>10</sub> , PM <sub>2.5</sub> )	0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

2. Assumed average dust control efficiency for road watering from AP-42 Section 13.2.2 and related background documents.

## Adelphia Gateway Project

**Table 9-C-43. Fugitive Emissions from Earthmoving, Tilghman Lateral Pipeline Construction**

On-Site Activity	Emission Factors <sup>1</sup>			Units of Measure		PM <sub>10</sub> Emissions (tpy)	PM <sub>2.5</sub> Emissions (tpy)
	PM <sub>10</sub>	PM <sub>2.5</sub>	Units of Measure	2018	Units of Measure	2018	2018
Bulldozing	1.03E+00	5.31E-01	lb/hr	0	hr/yr	0.00E+00	0.00E+00
Grading	1.96E+00	2.24E-01	lb/VMT	9.9	VMT/yr	9.69E-03	1.11E-03
Excavating	4.25E-03	2.42E-04	lb/yd <sup>3</sup>	29431.1	yd <sup>3</sup>	6.25E-02	3.56E-03

1. Emissions were calculated using emission factor equations from Table 11.9-1, Compilation of Air Pollutant Emission Factors, USEPA AP-42, Fifth Edition, 10/98.

For bulldozing:

$$PM_{10} \text{ emissions factor (lb/hr)} = 0.75 * [1.0 (s)^{1.5} / (M)^{1.4}]$$

$$PM_{2.5} \text{ emission factor (lb/hr)} = 0.105 * [5.7(s)^{1.2} / (M)^{1.3}]$$

For grading:

$$PM_{10} \text{ emission factor (lb/VMT)} = 0.60 * [0.051 (S)^{2.0}]$$

$$PM_{2.5} \text{ emission factor (lb/VMT)} = 0.031 * [0.040 (S)^{2.5}]$$

For Excavating:

$$PM_{10} \text{ Emission factor (lb/yd}^3) = 0.75 * [0.0021 (d)^{0.7} / (M)^{0.3}]$$

$$PM_{2.5} \text{ Emission factor (lb/yd}^3) = 0.017 * [0.0021 (d)^{1.1} / (M)^{0.3}]$$

Where:

s (Silt Content) =	8.5	% (AP-42 Table 13.2.2-1)
M (Moisture Content) =	7.9	% (AP-42 Table 11.9-3)
S (Vehicle Speed) =	8	mph (Engineering Estimate)
d (Drop Height) =	10	

2. Vehicle miles traveled for grading calculate based on amount of land disturbed during construction each year, as follows:

	2018
Land Disturbed (acres):	2
Square Miles:	0.003
Miles in 1 Direction:	0.056
Feet in 1 Direction:	295
Clearance of Grader (ft):	5
Number of Trips for 1 Grade:	59
Miles to Clear 1 Direction:	3.3
Miles with 50% Safety Factor:	5.0
Number of Times to Go Over Surface:	2
Total Travel (VMT/yr):	9.9



## Adelphia Gateway Project

**Table 9-C-44. Fugitive Emissions from Soil Pile Wind Erosion, Tilghman Lateral Pipeline Construction**

Material Pile Description	Size (acres) <sup>3</sup>	Emission Control Method	Control Efficiency <sup>4</sup>	Emission Factor <sup>1</sup>			Unit	2018 Emissions (tpy) <sup>5</sup>		
				PM	PM <sub>10</sub>	PM <sub>2.5</sub>		PM	PM <sub>10</sub>	PM <sub>2.5</sub>
Tilghman Lateral Pipeline Total	0.5	Mulch/seeding	75%	5.06	2.53	0.38	lb/day/acre	0.16	0.08	0.012
<b>Total Stockpile Erosion Emissions</b>								<b>0.16</b>	<b>0.08</b>	<b>0.01</b>

<sup>1</sup>USEPA, 1992 (Fugitive Dust Background and Technical Information Document for Best Available Control Measures, Section 2.3.1.3.3, Wind Emissions from Continuously Active Piles). USEPA, 2006 13.2.5 for k factors:

$$EF \text{ (lb/day/acre)} = k \times 1.7 \times (s/1.5) \times ((365 - p)/235) \times (f/15) \times (1 - \% \text{ Control Efficiency})$$

<sup>2</sup>Total PM assumed to be equal to PM < 30 μm

	Tilghman Lateral Pipeline
Days of precipitation greater than or equal to 0.01 inch (p)	118
Time (%) that unobstructed wind speed exceeds 5.4 m/s at mean pile height (f)	30.0

Silt Content (%), (s)	8.5
Particle Size multiplier (k)	1 (for PM < 30 μm) 0.5 (for PM < 10 μm) 0.075 (for PM < 2.5 μm)

<sup>3</sup>Soil Pile Areas:

Pipeline Soil Pile Area:	1 pile per spread 0 ft. wide (topsoil) 10 ft. wide (subsoil) 0.39 miles long <b>0.5 acres</b>	Tilghman Lateral Pipeline - Delaware County, PA
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<sup>4</sup>Engineering estimate for control efficiency from use of mulch/seeding to control erosion.

<sup>5</sup>Emissions are based on the construction schedule below:

2018 days	Location
130	Tilghman Lateral Pipeline

## Adelphia Gateway Project

**Table 9-C-45. Criteria Pollutant Emissions Summary, Parkway Lateral Meter Station Construction**

Source	2018 Construction Emissions (tpy)						
	NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Construction Equipment Engines	1.82	2.97	0.27	0.33	0.13	0.13	691.25
On-Road Vehicle Travel	0.01	0.21	0.00	0.01	0.00	0.00	7.57
Off-Road Vehicle Travel	--	--	--	--	0.38	0.04	--
Earthmoving Fugitives	--	--	--	--	0.00	0.00	--
Pile Erosion	--	--	--	--	0.01	0.00	--
<b>TOTAL:</b>	<b>1.82</b>	<b>3.18</b>	<b>0.27</b>	<b>0.34</b>	<b>0.52</b>	<b>0.17</b>	<b>698.82</b>

## Adelphia Gateway Project

**Table 9-C-46. HAP Emissions Summary, Parkway Lateral Meter Station Construction**

Source	2018 Construction Emissions (tpy)					
	Acetaldehyde	Acrolein	Benzene	1,3-Butadiene	Formaldehyde	Total HAPs
Construction Equipment Engines	1.74E-02	9.86E-04	6.57E-03	6.57E-04	3.88E-02	6.44E-02
On-Road Vehicle Travel	2.64E-05	3.40E-06	3.37E-04	3.76E-05	6.87E-05	4.73E-04
Off-Road Vehicle Travel	--	--	--	--	--	--
Earthmoving Fugitives	--	--	--	--	--	--
Pile Erosion	--	--	--	--	--	--
<b>TOTAL:</b>	<b>1.74E-02</b>	<b>9.89E-04</b>	<b>6.91E-03</b>	<b>6.95E-04</b>	<b>3.88E-02</b>	<b>6.49E-02</b>

# Adelphia Gateway Project

Table 9-C-47. Criteria Pollutant Emissions from Construction Engines, Parkway Lateral Meter Station Construction

Equipment Type	SCC	Max. Engine Rating (hp)	Average Engine Load (hp)	Load Factor <sup>3</sup>	Operations		2018 Construction Year							
					Quantity	(hr/week) (weeks/yr)	NO <sub>x</sub>	CO	SO <sub>2</sub>	Emissions (tpy)				
							CO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>			
Air Compressor A	2270006015	310	133.3	0.43	1	60	12	0.19	0.04	0.00	0.02	0.01	0.01	56.12
Air Compressor B	2270006015	310	133.3	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All Terrain Vehicle (ATV) <sup>1</sup>	2282005015	18	3.78	0.21	1	60	12	0.02	0.47	0.01	0.04	0.00	0.00	3.86
Asphalt Paver	2270002003	153	90.27	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backhoe	2265002066	75	36	0.48	1	60	12	0.03	0.36	0.06	0.01	0.00	0.00	19.97
Bobcat <sup>2</sup>	2265003040	150	81	0.54	1	60	12	0.09	1.03	0.14	0.03	0.00	0.00	44.98
Booster/Pumps	2270006010	370	159.1	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bucket Truck	2270002051	300	177	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chain Saw	2260004020	3	2.1	0.7	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cherry Picker	2270002081	160	94.4	0.59	1	60	12	0.17	0.16	0.00	0.02	0.02	0.02	44.61
Chipper/Shredder	2270004066	20	8.6	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor	2270002009	300	129	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor, Vibratory	2270002009	100	43	0.43	2	60	1	0.02	0.01	0.00	0.00	0.00	0.00	2.23
Concrete Mixer Truck ( main pours )	2270002042	150	64.5	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Mixer Truck ( small pours )	2270002042	150	64.5	0.43	1	2	7	0.00	0.00	0.00	0.00	0.00	0.00	0.56
Concrete Pumps	2270006010	300	129	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Crawler	2270002069	450	265.5	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled ( 20 ton )	2270002045	150	64.5	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (250 ton ) A	2270002045	715	307.45	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (250 ton ) B	2270002045	715	307.45	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cuttings Cleaner System	2270002081	300	177	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Digger Derrick	2270002033	300	129	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozers	2270002069	410	241.9	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Drill Engine	2270002081	25	14.75	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Drilling Rig	2270002033	950	408.5	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	2270002078	325	68.25	0.21	1	60	12	0.23	0.13	0.00	0.03	0.03	0.03	33.83
Excavator	2270002036	138	81.42	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fork Lift	2270003020	120	70.8	0.59	1	60	12	0.03	0.03	0.00	0.01	0.00	0.00	33.47
Front End Loaders	2270002066	196	41.16	0.21	1	60	12	0.11	0.06	0.00	0.02	0.01	0.01	20.41
Generators	2270006005	430	184.9	0.43	1	60	12	0.50	0.13	0.00	0.04	0.03	0.03	77.80
Grader	2270002048	140	82.6	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDD Rig	2270002033	600	258	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heavy Lift Crane	2270002045	340	146.2	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrotest Truck	2270002051	100	59	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jack Hammer	2270003040	405	174.15	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Light Tower	2270002081	50	29.5	0.59	0	0	0	0.00	0.00	0.00	0.00	29.00	0.00	0.00
Man Lift A	2270003010	50	10.5	0.21	1	60	7	0.02	0.02	0.00	0.01	0.00	0.00	3.20
Man Lift B	2270003010	50	10.5	0.21	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mudd Unit	2270002081	400	236	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Trucks	2270002051	250	147.5	0.59	4	60	12	0.22	0.09	0.00	0.06	0.01	0.01	251.18
Pile Driver	2270002081	350	206.5	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipe Beveling Machine	2270002081	25	14.75	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipe Tractor Trailer	2265002066	100	48	0.48	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Portable Pipe Bender	2270003040	75	32.25	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rigging Loft	2265003010	10	4.6	0.46	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller	2270002015	300	177	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scissor Lift	2270003010	20	4.2	0.21	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
School Bus	2270002051	100	59	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scraper	2270002018	488	287.92	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SideBoom	2270002069	240	141.6	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Skid Steer Loader	2270002072	75	15.75	0.21	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stake Bed	2270002081	200	118	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sweeper	2270003030	12	5.16	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tamper	2260002006	4	2.2	0.55	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tandem Truck	2270002069	200	118	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trackhoe	2265002066	75	36	0.48	1	60	12	0.03	0.36	0.06	0.01	0.00	0.00	19.97
Trenching Machines	2270002030	200	118	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trowel	2270002081	8	4.72	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water / Fuel Truck	2270002051	250	147.5	0.59	1	60	12	0.06	0.02	0.00	0.02	0.00	0.00	62.79
Welder	2270006025	35	7.35	0.21	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Welding Machine	2270006025	35	7.35	0.21	2	60	12	0.06	0.06	0.00	0.01	0.01	0.01	8.08
Welding Rig	2270002051	10	5.9	0.59	2	60	12	0.02	0.01	0.00	0.00	0.00	0.00	5.02
X-Ray Truck/Machine	2270002051	50	29.5	0.59	1	30	6	0.02	0.00	0.00	0.00	0.00	0.00	3.14

<sup>1</sup>NONROAD2008a Model does not contain Emission Factors for All Terrain Vehicles (ATVs). Used Emission Factors for Personal Watercraft as a substitution.

<sup>2</sup>NONROAD2008a Model does not contain Emission Factors for Bobcat vehicle type. Used Emission Factors for Other Industrial Equipment vehicle type as a substitution.

<sup>3</sup> Load factors as recommended for estimation of emissions using NONROAD emission factors in EPA420-P-04-005 Revised April 2004

## Adelphia Gateway Project

**Table 9-C-48. HAP Emissions from Construction Engines, Parkway Lateral Meter Station Construction**

Pollutant	2018 Emissions (tpy)
Acetaldehyde	1.74E-02
Acrolein	9.86E-04
Benzene	6.57E-03
1,3-Butadiene	6.57E-04
Formaldehyde	3.88E-02

1. Emissions of HAPs are estimated based on total VOC emissions for the construction year and Table 3.1-3 Air Toxic Fractions of VOC in EPA's guidance document *Final Regulatory Analysis and Control of Emissions from Nonroad Diesel Engines*, EPA420-R-04-007, May 2004.

Pollutant	Fraction of VOC
Acetaldehyde	0.053
Acrolein	0.003
Benzene	0.020
1,3-Butadiene	0.002
Formaldehyde	0.118

## Adelphia Gateway Project

**Table 9-C-49. On-Road Engine Emission Factors, Parkway Lateral Meter Station Construction**

Pollutant	2018 Emission Factors (grams/mile)				
	LDGV	LDGT	LDDT	COM BUS	HDDV
NO <sub>x</sub>	3.00E-01	3.35E-01	2.76E-01	4.24E+00	1.86E+00
CO	1.02E+01	9.98E+00	4.73E-01	8.70E-01	5.07E-01
SO <sub>2</sub>	6.80E-03	8.80E-03	5.60E-03	1.53E-02	1.44E-02
VOC	3.94E-01	4.59E-01	2.36E-01	3.93E-01	2.86E-01
PM <sub>10</sub>	2.47E-02	2.48E-02	4.03E-02	3.71E-02	7.64E-02
PM <sub>2.5</sub>	1.12E-02	1.13E-02	2.56E-02	2.06E-02	4.69E-02
CO <sub>2</sub>	3.68E+02	4.79E+02	5.99E+02	1.65E+03	1.54E+03
Acetaldehyde	1.29E-03	1.48E-03	2.91E-03	1.19E-02	8.62E-03
Acrolein	1.65E-04	1.90E-04	8.30E-04	1.44E-03	1.05E-03
Benzene	1.64E-02	1.87E-02	4.74E-03	4.33E-03	3.15E-03
1,3-Butadiene	1.83E-03	2.09E-03	2.13E-03	2.52E-03	1.83E-03
Formaldehyde	3.34E-03	3.81E-03	9.14E-03	3.22E-02	2.34E-02

1. The emission factors were calculated using EPA's Mobile6.2 Vehicle Emission Modeling Software. Emission factors for each calendar year are based on average of Mobile6.2 generated factors for winter and summer of that year.
2. Temperatures for winter were based on average temperatures in December, January, and February, and the temperatures for summer were based on average temperatures in June, July, and August. The data was extracted from United States Environmental Protection Agency Outdoor Air Quality Data website (<https://www.epa.gov/outdoor-air-quality-data/monitor-values-report>)
3. Fuel assumptions included conventional gasoline, with an average RVP limit of 9 psi, and diesel with average sulfur content of 15 ppm.

## Adelphia Gateway Project

**Table 9-C-50. On-Road Vehicle Travel, Parkway Lateral Meter Station Construction**

Vehicle Type	2018			Total Miles Per Year
	Round Trip (miles)	Trips per Day	Days/Year	
Commuter Bus	0	0	0	0
Light-Duty Diesel Truck	0	0	0	0
Light-Duty Gasoline Truck	0	0	0	0
Light-Duty Gasoline Vehicle	40	6.67	70	18,667
Heavy Duty Diesel Vehicle	0	0	0	0
Fuel Delivery	0	0	0	0

## Adelphia Gateway Project

**Table 9-C-51. On-Road Engine Emissions, Parkway Lateral Meter Station Construction**

Pollutant	2018 Annual Emissions (tpy)				
	LDGV	LDGT	LDDT	COM BUS	HDDV
NO <sub>x</sub>	6.16E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO	2.10E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SO <sub>2</sub>	1.40E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOC	8.11E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PM <sub>10</sub>	5.08E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PM <sub>2.5</sub>	2.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO <sub>2</sub>	7.57E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	2.64E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acrolein	3.40E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	3.37E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-Butadiene	3.76E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Formaldehyde	6.87E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00



## Adelphia Gateway Project

**Table 9-C-52. Off-Road Vehicle Travel, Parkway Lateral Meter Station Construction**

Vehicle Type	2018			Total Miles Per Year
	Round Trip (miles)	Trips per Day	Days/Year	
All Terrain Vehicle (ATV)	0	0	0	0
Dump Trucks	0	0	0	0
Light Duty Trucks	40	1.33	70	3,733
Medium Duty Trucks	0	0	0	0
School Bus	0	0	0	0
Water / Fuel Truck	40	0.10	70	267

## Adelphia Gateway Project

**Table 9-C-53. Off-Road Engine Emissions, Parkway Lateral Meter Station Construction**

Vehicle Type	Mean Vehicle Weight (tons)	Emission Factor <sup>1</sup>		Control Efficiency <sup>2</sup> (%)	2018 Annual Emissions	
		PM <sub>10</sub> (lb/VMT)	PM <sub>2.5</sub> (lb/VMT)		PM <sub>10</sub> (tpy)	PM <sub>2.5</sub> (tpy)
All Terrain Vehicle (ATV)	0.25	0.24	0.02	75%	0.00	0.00
Dump Trucks	20	1.75	0.17	75%	0.00	0.00
Light Duty Trucks	2.5	0.69	0.07	75%	0.32	0.03
Medium Duty Trucks	5	0.94	0.09	75%	0.00	0.00
School Bus	15	1.54	0.15	75%	0.00	0.00
Water / Fuel Truck	20	1.75	0.17	75%	0.06	0.01

1. Emission factors calculated in accordance with AP-42 Section 13.2.2:

$$\text{Unpaved Roads: } E = k(s/12)^a(W/3)^b * [(365-p)/365]$$

k Factor (PM <sub>10</sub> , PM <sub>2.5</sub> ) (lb/VMT)	1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	8.5	%	AP-42 Table 13.2.2-1 (Final, 11/06)
Number of Rain Days, p	118		AP-42 Figure 13.2.2-1 (Final, 11/06)
a (PM <sub>10</sub> , PM <sub>2.5</sub> )	0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b (PM <sub>10</sub> , PM <sub>2.5</sub> )	0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

2. Assumed average dust control efficiency for road watering from AP-42 Section 13.2.2 and related background documents.

## Adelphia Gateway Project

**Table 9-C-54. Fugitive Emissions from Earthmoving, Parkway Lateral Meter Station Construction**

On-Site Activity	Emission Factors <sup>1</sup>			Operation <sup>2</sup>		PM <sub>10</sub> Emissions (tpy)	PM <sub>2.5</sub> Emissions (tpy)
	PM <sub>10</sub>	PM <sub>2.5</sub>	Units of Measure	2018	Units of Measure	2018	2018
Bulldozing	1.03E+00	5.31E-01	lb/hr	0	hr/yr	0.00E+00	0.00E+00
Grading	1.96E+00	2.24E-01	lb/VMT	5.0	VMT/yr	4.85E-03	5.56E-04

1. Emissions were calculated using emission factor equations from Table 11.9-1, Compilation of Air Pollutant Emission Factors, USEPA AP-42, Fifth Edition, 10/98.

For bulldozing:

$$\text{PM}_{10} \text{ emissions factor (lb/hr)} = 0.75 * [1.0 (s)^{1.5} / (M)^{1.4}]$$

$$\text{PM}_{2.5} \text{ emission factor (lb/hr)} = 0.105 * [5.7(s)^{1.2} / (M)^{1.3}]$$

For grading:

$$\text{PM}_{10} \text{ emission factor (lb/VMT)} = 0.60 * [0.051 (S)^{2.0}]$$

$$\text{PM}_{2.5} \text{ emission factor (lb/VMT)} = 0.031 * [0.040 (S)^{2.5}]$$

Where:

$$s \text{ (Silt Content)} = 8.5$$

$$M \text{ (Moisture Content)} = 7.9$$

$$S \text{ (Vehicle Speed)} = 8$$

2. Vehicle miles traveled for grading calculate based on amount of land disturbed during construction each year, as follows:

	2018
Land Disturbed (acres):	1
Square Miles:	0.002
Miles in 1 Direction:	0.040
Feet in 1 Direction:	209
Clearance of Grader (ft):	5
Number of Trips for 1 Grade:	42
Miles to Clear 1 Direction:	1.65
Miles with 50% Safety Factor:	2.5
Number of Times to Go Over Surface:	2
Total Travel (VMT/yr):	4.95

## Adelphia Gateway Project

**Table 9-C-55. Fugitive Emissions from Soil Pile Wind Erosion, Parkway Lateral Meter Station Construction**

Material Pile Description	Size (acres) <sup>3</sup>	Emission Control Method	Control Efficiency <sup>4</sup>	Emission Factor <sup>1</sup>			2018 Emissions (tpy) <sup>5</sup>		
				PM	PM <sub>10</sub>	PM <sub>2.5</sub>	PM	PM <sub>10</sub>	PM <sub>2.5</sub>
Marcus Hook Meter Station Stockpiles	0.057	Mulch/seeding	75%	5.06	2.53	0.38	0.01	0.01	0.00
<b>Total Stockpile Erosion Emissions</b>							<b>0.01</b>	<b>0.01</b>	<b>0.00</b>

<sup>1</sup>USEPA, 1992 (Fugitive Dust Background and Technical Information Document for Best Available Control Measures, Section 2.3.1.3.3, Wind Emissions from Continuously Active Piles). USEPA, 2006 13.2.5 for k factors:

$$EF \text{ (lb/day/acre)} = k \times 1.7 \times (s/1.5) \times ((365 - p)/235) \times (f/15) \times (1 - \% \text{ Control Efficiency})$$

<sup>2</sup>Total PM assumed to be equal to PM < 30 μm

	Marcu Hook Lateral 1 Meter Station
Days of precipitation greater than or equal to 0.01 inch (p)	118
Time (%) that unobstructed wind speed exceeds 5.4 m/s at mean pile height (f)	30.0

Silt Content (%), (s) 8.5  
 Particle Size multiplier (k) 1 (for PM < 30 μm)  
 0.5 (for PM < 10 μm)  
 0.075 (for PM < 2.5 μm)

<sup>3</sup>Soil Pile Areas:

1 stockpiles  
 Parkway Lateral Meter Stockpile Area:  
 50 ft. wide  
 50 ft. wide  
**0.057 acres**

<sup>4</sup>Engineering estimate for control efficiency from use of mulch/seeding to control erosion.

<sup>5</sup>Emissions are based on the construction schedule below:

2018 days	Location
70	Parkway Lateral Meter Station

## Adelphia Gateway Project

**Table 9-C-56. Criteria Pollutant Emissions Summary, Parkway Lateral Pipeline Construction**

Source	2018 Construction Emissions (tpy)						
	NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Construction Equipment Engines	2.72	4.46	0.41	0.49	0.20	0.20	1,036.88
On-Road Vehicle Travel	0.01	0.49	0.00	0.02	0.00	0.00	17.85
Off-Road Vehicle Travel	--	--	--	--	0.89	0.09	--
Earthmoving Fugitives	--	--	--	--	0.00	0.00	--
Pile Erosion	--	--	--	--	0.05	0.01	--
<b>TOTAL:</b>	<b>2.74</b>	<b>4.96</b>	<b>0.41</b>	<b>0.51</b>	<b>1.15</b>	<b>0.30</b>	<b>1,054.72</b>

## Adelphia Gateway Project

**Table 9-C-57. HAP Emissions Summary, Parkway Lateral Pipeline Construction**

Source	2018 Construction Emissions (tpy)					Total HAPs
	Acetaldehyde	Acrolein	Benzene	1,3-Butadiene	Formaldehyde	
Construction Equipment Engines	2.61E-02	1.48E-03	9.86E-03	9.86E-04	5.82E-02	9.66E-02
On-Road Vehicle Travel	6.23E-05	8.00E-06	7.94E-04	8.85E-05	1.62E-04	1.11E-03
Off-Road Vehicle Travel	--	--	--	--	--	--
Earthmoving Fugitives	--	--	--	--	--	--
Pile Erosion	--	--	--	--	--	--
<b>TOTAL:</b>	<b>2.62E-02</b>	<b>1.49E-03</b>	<b>1.07E-02</b>	<b>1.07E-03</b>	<b>5.83E-02</b>	<b>9.77E-02</b>

## Adelphia Gateway Project

**Table 9-C-58. Criteria Pollutant Emissions from Construction Engines, Parkway Lateral Pipeline Construction**

Equipment Type	SCC	Max. Engine		Average Engine Load (hp)	Operations			2018 Construction Year						
		Rating (hp)	Load Factor <sup>3</sup>		Quantity	(hr/week)	(weeks/yr)	Emissions (tpy)						
								NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Air Compressor A	2270006015	310	0.43	133.3	1	60	18	2.83E-01	6.27E-02	6.43E-04	2.77E-02	1.31E-02	1.31E-02	8.42E+01
Air Compressor B	2270006015	310	0.43	133.3	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicle (ATV) <sup>1</sup>	2282005015	18	0.21	3.78	1	60	18	3.08E-02	7.06E-01	1.76E-02	5.94E-02	5.63E-04	5.63E-04	5.79E+00
Asphalt Paver	2270002003	153	0.59	90.27	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Backhoe	2265002066	75	0.48	36	1	60	18	5.12E-02	5.34E-01	9.11E-02	1.55E-02	2.98E-03	2.98E-03	3.00E+01
Bobcat <sup>2</sup>	2265003040	150	0.54	81	1	60	18	1.36E-01	1.54E+00	2.05E-01	4.52E-02	6.87E-03	6.87E-03	6.75E+01
Booster/Pumps	2270006010	370	0.43	159.1	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bucket Truck	2270002051	300	0.59	177	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chain Saw	2260004020	3	0.7	2.1	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cherry Picker	2270002081	160	0.59	94.4	1	60	18	2.52E-01	2.36E-01	5.22E-04	2.60E-02	3.12E-02	3.12E-02	6.69E+01
Chipper/Shredder	2270004066	20	0.43	8.6	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Compactor	2270002009	300	0.43	129	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Compactor, Vibratory	2270002009	100	0.43	43	2	60	1	2.60E-02	1.37E-02	3.08E-05	2.72E-03	2.03E-03	2.03E-03	3.35E+00
Concrete Mixer Truck ( main pours )	2270002042	150	0.43	64.5	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Concrete Mixer Truck ( small pours )	2270002042	150	0.43	64.5	1	2	10	5.58E-03	2.94E-03	6.99E-06	5.97E-04	5.06E-04	5.06E-04	8.38E-01
Concrete Pumps	2270006010	300	0.43	129	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Crane, Crawler	2270002069	450	0.59	265.5	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Crane, Wheeled ( 20 ton )	2270002045	150	0.43	64.5	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Crane, Wheeled (250 ton ) A	2270002045	715	0.43	307.45	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Crane, Wheeled (250 ton ) B	2270002045	715	0.43	307.45	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cuttings Cleaner System	2270002081	300	0.59	177	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Digger Derrick	2270002033	300	0.43	129	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dozers	2270002069	410	0.59	241.9	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Drill Engine	2270002081	25	0.59	14.75	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Drilling Rig	2270002033	950	0.43	408.5	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dump Truck	2270002078	325	0.21	68.25	1	60	18	3.38E-01	1.94E-01	4.23E-04	5.13E-02	3.86E-02	3.86E-02	5.07E+01
Excavator	2270002036	138	0.59	81.42	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fork Lift	2270003020	120	0.59	70.8	1	60	18	4.09E-02	4.30E-02	3.34E-04	1.13E-02	2.62E-03	2.62E-03	5.02E+01
Front End Loaders	2270002066	196	0.21	41.16	1	60	18	1.64E-01	9.60E-02	2.50E-04	2.54E-02	1.98E-02	1.98E-02	3.06E+01
Generators	2270006005	430	0.43	184.9	1	60	18	7.46E-01	1.97E-01	9.57E-04	6.30E-02	3.94E-02	3.94E-02	1.17E+02
Grader	2270002048	140	0.59	82.6	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HDD Rig	2270002033	600	0.43	258	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Heavy Lift Crane	2270002045	340	0.43	146.2	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hydrotest Truck	2270002051	100	0.59	59	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Jack Hammer	2270003040	405	0.43	174.15	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Light Tower	2270002081	50	0.59	29.5	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Man Lift A	2270003010	50	0.21	10.5	1	60	10	3.54E-02	3.49E-02	4.06E-05	8.84E-03	5.15E-03	5.15E-03	4.81E+00
Man Lift B	2270003010	50	0.21	10.5	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mudd Unit	2270002081	400	0.59	236	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pickup Trucks	2270002051	250	0.59	147.5	4	60	18	3.31E-01	1.35E-01	2.51E-03	9.44E-02	1.87E-02	1.87E-02	3.77E+02
Pile Driver	2270002081	350	0.59	206.5	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

## Adelphia Gateway Project

Equipment Type	SCC	Max. Engine Rating		Average Engine Load (hp)	Operations			2018 Construction Year Emissions (tpy)							
		(hp)	Load Factor <sup>3</sup>		Quantity	(hr/week)	(weeks/yr)	NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	
Pipe Beveling Machine	2270002081	25	0.59	14.75	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pipe Tractor Trailer	2265002066	100	0.48	48	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Portable Pipe Bender	2270003040	75	0.43	32.25	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Rigging Loft	2265003010	10	0.46	4.6	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Roller	2270002015	300	0.59	177	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scissor Lift	2270003010	20	0.21	4.2	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
School Bus	2270002051	100	0.59	59	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scraper	2270002018	488	0.59	287.92	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SideBoom	2270002069	240	0.59	141.6	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Skid Steer Loader	2270002072	75	0.21	15.75	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Stake Bed	2270002081	200	0.59	118	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sweeper	2270003030	12	0.43	5.16	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tamper	2260002006	4	0.55	2.2	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tandem Truck	2270002069	200	0.59	118	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trackhoe	2265002066	75	0.48	36	1	60	18	5.12E-02	5.34E-01	9.11E-02	1.55E-02	2.98E-03	2.98E-03	3.00E+01	3.00E+01
Trenching Machines	2270002030	200	0.59	118	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trowel	2270002081	8	0.59	4.72	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Water / Fuel Truck	2270002051	250	0.59	147.5	1	60	18	8.28E-02	3.38E-02	6.29E-04	2.36E-02	4.67E-03	4.67E-03	9.42E+01	9.42E+01
Welder	2270006025	35	0.21	7.35	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Welding Machine	2270006025	35	0.21	7.35	2	60	18	9.05E-02	8.27E-02	1.11E-04	1.77E-02	1.14E-02	1.14E-02	1.21E+01	1.21E+01
Welding Rig	2270002051	10	0.59	5.9	2	60	18	3.61E-02	9.89E-03	5.14E-05	2.79E-03	1.07E-03	1.07E-03	7.53E+00	7.53E+00
X-Ray Truck/Machine	2270002051	50	0.59	29.5	1	30	9	2.26E-02	6.18E-03	3.21E-05	1.74E-03	6.69E-04	6.69E-04	4.71E+00	4.71E+00

<sup>1</sup>NONROAD2008a Model does not contain Emission Factors for All Terrain Vehicles (ATVs). Used Emission Factors for Personal Watercraft as a substitution.

<sup>2</sup>NONROAD2008a Model does not contain Emission Factors for Bobcat vehicle type. Used Emission Factors for Other Industrial Equipment vehicle type as a substitution.

<sup>3</sup> Load factors as recommended for estimation of emissions using NONROAD emission factors in EPA420-P-04-005 Revised April 2004



## Adelphia Gateway Project

**Table 9-C-59. HAP Emissions from Construction Engines, Parkway Lateral Pipeline Construction**

Pollutant	2018 Emissions (tpy)
Acetaldehyde	2.61E-02
Acrolein	1.48E-03
Benzene	9.86E-03
1,3-Butadiene	9.86E-04
Formaldehyde	5.82E-02

1. Emissions of HAPs are estimated based on total VOC emissions for the construction year and Table 3.1-3 Air Toxic Fractions of VOC in EPA's guidance document *Final Regulatory Analysis and Control of Emissions from Nonroad Diesel Engines*, EPA420-R-04-007, May 2004.

Pollutant	Fraction of VOC
Acetaldehyde	0.053
Acrolein	0.003
Benzene	0.020
1,3-Butadiene	0.002
Formaldehyde	0.118

## Adelphia Gateway Project

**Table 9-C-60. On-Road Engine Emission Factors, Parkway Lateral Pipeline Construction**

Pollutant	2018 Emission Factors (grams/mile)				
	LDGV	LDGT	LDDT	COM BUS	HDDV
NO <sub>x</sub>	3.00E-01	3.35E-01	2.76E-01	4.24E+00	1.86E+00
CO	1.02E+01	9.98E+00	4.73E-01	8.70E-01	5.07E-01
SO <sub>2</sub>	6.80E-03	8.80E-03	5.60E-03	1.53E-02	1.44E-02
VOC	3.94E-01	4.59E-01	2.36E-01	3.93E-01	2.86E-01
PM <sub>10</sub>	2.47E-02	2.48E-02	4.03E-02	3.71E-02	7.64E-02
PM <sub>2.5</sub>	1.12E-02	1.13E-02	2.56E-02	2.06E-02	4.69E-02
CO <sub>2</sub>	3.68E+02	4.79E+02	5.99E+02	1.65E+03	1.54E+03
Acetaldehyde	1.29E-03	1.48E-03	2.91E-03	1.19E-02	8.62E-03
Acrolein	1.65E-04	1.90E-04	8.30E-04	1.44E-03	1.05E-03
Benzene	1.64E-02	1.87E-02	4.74E-03	4.33E-03	3.15E-03
1,3-Butadiene	1.83E-03	2.09E-03	2.13E-03	2.52E-03	1.83E-03
Formaldehyde	3.34E-03	3.81E-03	9.14E-03	3.22E-02	2.34E-02

1. The emission factors were calculated using EPA's Mobile6.2 Vehicle Emission Modeling Software. Emission factors for each calendar year are based on average of Mobile6.2 generated factors for winter and summer of that year.

2. Temperatures for winter were based on average temperatures in December, January, and February, and the temperatures for summer were based on average temperatures in June, July, and August. The data was extracted from United States Environmental Protection Agency Outdoor Air Quality Data website (<https://www.epa.gov/outdoor-air-quality-data/monitor-values-report>)

3. Fuel assumptions included conventional gasoline, with an average RVP limit of 9 psi, and diesel with average sulfur content of 15 ppm.

## Adelphia Gateway Project

**Table 9-C-61. On-Road Vehicle Travel, Parkway Lateral Pipeline Construction**

Vehicle Type	2018			Total Miles Per Year
	Round Trip (miles)	Trips per Day	Days/Year	
Commuter Bus	0	0	0	0
Light-Duty Diesel Truck	0	0	0	0
Light-Duty Gasoline Truck	0	0	0	0
Light-Duty Gasoline Vehicle	40	10	110	44,000
Heavy Duty Diesel Vehicle	0	0.0	0	0
Fuel Delivery	0	0	0	0

## Adelphia Gateway Project

**Table 9-C-62. On-Road Engine Emissions, Parkway Lateral Pipeline Construction**

Pollutant	2018 Annual Emissions (tpy)				
	LDGV	LDGT	LDDT	COM BUS	HDDV
NO <sub>x</sub>	1.45E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO	4.95E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SO <sub>2</sub>	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOC	1.91E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PM <sub>10</sub>	1.20E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PM <sub>2.5</sub>	5.43E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO <sub>2</sub>	1.78E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	6.23E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acrolein	8.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	7.94E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-Butadiene	8.85E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Formaldehyde	1.62E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00

## Adelphia Gateway Project

**Table 9-C-63. Off-Road Vehicle Travel, Parkway Lateral Pipeline Construction**

Vehicle Type	2018			Total Miles Per Year
	Round Trip (miles)	Trips per Day	Days/Year	
All Terrain Vehicle (ATV)	0	0	0	0
Dump Trucks	0	0	0	0
Light Duty Trucks	40	2	110	8,800
Medium Duty Trucks	0	0	0	0
School Bus	0	0	0	0
Water / Fuel Truck	40	0.1	110	629

## Adelphia Gateway Project

**Table 9-C-64. Off-Road Engine Emissions, Parkway Lateral Pipeline Construction**

Vehicle Type	Mean Vehicle Weight (tons)	Emission Factor <sup>1</sup>		Control Efficiency <sup>2</sup> (%)	2018 Annual Emissions	
		PM <sub>10</sub> (lb/VMT)	PM <sub>2.5</sub> (lb/VMT)		PM <sub>10</sub> (tpy)	PM <sub>2.5</sub> (tpy)
All Terrain Vehicle (ATV)	0.25	0.24	0.02	75%	0.00	0.0000
Dump Trucks	20	1.75	0.17	75%	0.00	0.000
Light Duty Trucks	2.5	0.69	0.069	75%	0.75	0.075
Medium Duty Trucks	5	0.94	0.094	75%	0.00	0.00
School Bus	15	1.54	0.15	75%	0.00	0.00
Water / Fuel Truck	20	1.75	0.17	75%	0.14	0.01

1. Emission factors calculated in accordance with AP-42 Section 13.2.2:

$$\text{Unpaved Roads: } E = k(s/12)^a(W/3)^b * [(365-p)/365]$$

k Factor (PM <sub>10</sub> , PM <sub>2.5</sub> ) (lb/VMT)	1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	8.5	%	AP-42 Table 13.2.2-1 (Final, 11/06)
Number of Rain Days, p	118		AP-42 Figure 13.2.2-1 (Final, 11/06)
a (PM <sub>10</sub> , PM <sub>2.5</sub> )	0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b (PM <sub>10</sub> , PM <sub>2.5</sub> )	0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

2. Assumed average dust control efficiency for road watering from AP-42 Section 13.2.2 and related background documents.

## Adelphia Gateway Project

**Table 9-C-65. Fugitive Emissions from Earthmoving, Parkway Lateral Pipeline Construction**

On-Site Activity	Emission Factors <sup>1</sup>			2018	Units of Measure	PM <sub>10</sub> Emissions (tpy)	PM <sub>2.5</sub> Emissions (tpy)
	PM <sub>10</sub>	PM <sub>2.5</sub>	Units of Measure			2018	2018
Bulldozing	1.03E+00	5.31E-01	lb/hr	0	hr/yr	0.00E+00	0.00E+00
Grading	1.96E+00	2.24E-01	lb/VMT	5.0	VMT/yr	4.85E-03	5.56E-04
Excavating	4.25E-03	2.42E-04	lb/yd <sup>3</sup>	2053.3	yd <sup>3</sup>	4.36E-03	2.48E-04

1. Emissions were calculated using emission factor equations from Table 11.9-1, Compilation of Air Pollutant Emission Factors, USEPA AP-42, Fifth Edition, 10/98.

For bulldozing:

$$PM_{10} \text{ emissions factor (lb/hr)} = 0.75 * [1.0 (s)^{1.5} / (M)^{1.4}]$$

$$PM_{2.5} \text{ emission factor (lb/hr)} = 0.105 * [5.7(s)^{1.2} / (M)^{1.3}]$$

For grading:

$$PM_{10} \text{ emission factor (lb/VMT)} = 0.60 * [0.051 (S)^{2.0}]$$

$$PM_{2.5} \text{ emission factor (lb/VMT)} = 0.031 * [0.040 (S)^{2.5}]$$

For Excavating:

$$PM_{10} \text{ Emission factor (lb/yd}^3) = 0.75 * [0.0021 (d)^{0.7} / (M)^{0.3}]$$

$$PM_{2.5} \text{ Emission factor (lb/yd}^3) = 0.017 * [0.0021 (d)^{1.1} / (M)^{0.3}]$$

Where:

s (Silt Content) =	8.5	% (AP-42 Table 13.2.2-1)
M (Moisture Content) =	7.9	% (AP-42 Table 11.9-3)
S (Vehicle Speed) =	8	mph (Engineering Estimate)
d (Drop Height) =	10	

2. Vehicle miles traveled for grading calculate based on amount of land disturbed during construction each year, as follows:

	2018
Land Disturbed (acres):	1
Square Miles:	0.002
Miles in 1 Direction:	0.040
Feet in 1 Direction:	209
Clearance of Grader (ft):	5
Number of Trips for 1 Grade:	42
Miles to Clear 1 Direction:	1.65
Miles with 50% Safety Factor:	2.5
Number of Times to Go Over Surface:	2
Total Travel (VMT/yr):	4.95

# Adelphia Gateway Project

**Table 9-C-66. Fugitive Emissions from Soil Pile Wind Erosion, Parkway Lateral Pipeline Construction**

Material Pile Description	Size (acres) <sup>3</sup>	Emission Control Method	Control Efficiency <sup>4</sup>	Emission Factor <sup>1</sup>			Unit	2018 Emissions (tpy) <sup>5</sup>		
				PM	PM <sub>10</sub>	PM <sub>2.5</sub>		PM	PM <sub>10</sub>	PM <sub>2.5</sub>
Parkway Lateral Pipeline Total	0.4	Mulch/seeding	75%	5.06	2.53	0.38	lb/day/acre	0.10	0.05	0.008
<b>Total Stockpile Erosion Emissions</b>								<b>0.10</b>	<b>0.05</b>	<b>0.01</b>

<sup>1</sup>USEPA, 1992 (Fugitive Dust Background and Technical Information Document for Best Available Control Measures, Section 2.3.1.3.3, Wind Emissions from Continuously Active Piles). USEPA, 2006 13.2.5 for k factors:

$$EF \text{ (lb/day/acre)} = k \times 1.7 \times (s/1.5) \times ((365 - p)/235) \times (f/15) \times (1 - \% \text{ Control Efficiency})$$

<sup>2</sup>Total PM assumed to be equal to PM < 30 μm

	Marcus Hook Lateral 1 Pipeline
Days of precipitation greater than or equal to 0.01 inch (p)	118
Time (%) that unobstructed wind speed exceeds 5.4 m/s at mean pile height (f)	30.0

Silt Content (%), (s)	8.5
Particle Size multiplier (k)	1 (for PM < 30 μm) 0.5 (for PM < 10 μm) 0.075 (for PM < 2.5 μm)

<sup>3</sup>Soil Pile Areas:

Pipeline Soil Pile Area:	1 pile per spread 0 ft. wide (topsoil) 10 ft. wide (subsoil) 0.3 miles long <b>0.4 acres</b>	Parkway Lateral Pipeline - Newcastle County, DE
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<sup>4</sup>Engineering estimate for control efficiency from use of mulch/seeding to control erosion.

<sup>5</sup>Emissions are based on the construction schedule below:

2018 days	Location
110	Parkway Lateral Pipeline



## Adelphia Gateway Project

**Table 9-C-67. Criteria Pollutant Emissions Summary, Ridge Lateral Meter Station Construction**

Source	2018 Construction Emissions (tpy)						
	NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Construction Equipment Engines	2.89	6.20	0.23	0.54	0.43	0.43	1,134.75
On-Road Vehicle Travel	0.01	0.52	0.00	0.02	0.00	0.00	17.85
Off-Road Vehicle Travel	--	--	--	--	0.89	0.09	--
Earthmoving Fugitives	--	--	--	--	0.00	0.00	--
Pile Erosion	--	--	--	--	0.01	0.00	--
<b>TOTAL:</b>	<b>2.91</b>	<b>6.73</b>	<b>0.23</b>	<b>0.56</b>	<b>1.34</b>	<b>0.52</b>	<b>1,152.60</b>

## Adelphia Gateway Project

**Table 9-C-68. HAP Emissions Summary, Ridge Lateral Meter Station Construction**

Source	2018 Construction Emissions (tpy)					
	Acetaldehyde	Acrolein	Benzene	1,3-Butadiene	Formaldehyde	Total HAPs
Construction Equipment Engines	2.88E-02	1.63E-03	1.09E-02	1.09E-03	6.42E-02	1.07E-01
On-Road Vehicle Travel	6.18E-05	8.00E-06	7.87E-04	8.78E-05	1.61E-04	1.11E-03
Off-Road Vehicle Travel	--	--	--	--	--	--
Earthmoving Fugitives	--	--	--	--	--	--
Pile Erosion	--	--	--	--	--	--
<b>TOTAL:</b>	<b>2.89E-02</b>	<b>1.64E-03</b>	<b>1.17E-02</b>	<b>1.18E-03</b>	<b>6.43E-02</b>	<b>1.08E-01</b>

# Adelphia Gateway Project

Table 9-C-69. Criteria Pollutant Emissions from Construction Engines, Ridge Lateral Meter Station Construction

Equipment Type	SCC	Max. Engine Rating (hp)	Load Factor <sup>3</sup>	Average Engine Load (hp)	Operations			2018 Construction Year Emissions (tpy)						
					Quantity	(hr/week)	(weeks/yr)	NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Air Compressor A	2270006015	310	0.43	133.3	1	60	18	0.28	0.06	0.02	0.03	0.03	0.03	84.18
Air Compressor B	2270006015	310	0.43	133.3	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All Terrain Vehicle (ATV) <sup>1</sup>	2282005015	18	0.21	3.78	1	60	18	0.03	0.71	0.00	0.06	0.00	0.00	5.79
Asphalt Paver	2270002003	153	0.59	90.27	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backhoe	2265002066	75	0.48	36	1	60	18	0.05	0.53	0.00	0.02	0.00	0.00	29.96
Bobcat <sup>2</sup>	2265003040	150	0.54	81	1	60	18	0.14	1.54	0.00	0.05	0.01	0.01	67.48
Booster/Pumps	2270006010	370	0.43	159.1	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bucket Truck	2270002051	300	0.59	177	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chain Saw	2260004020	3	0.7	2.1	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cherry Picker	2270002081	160	0.59	94.4	1	60	18	0.25	0.24	0.02	0.03	0.04	0.04	66.92
Chipper/Shredder	2270004066	20	0.43	8.6	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor	2270002009	300	0.43	129	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor, Vibratory	2270002009	100	0.43	43	2	60	1	0.03	0.01	0.00	0.00	0.00	0.00	3.35
Concrete Mixer Truck ( main pours )	2270002042	150	0.43	64.5	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Mixer Truck ( small pours )	2270002042	150	0.43	64.5	1	2	10	0.01	0.00	0.00	0.00	0.00	0.00	0.84
Concrete Pumps	2270006010	300	0.43	129	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Crawler	2270002069	450	0.59	265.5	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled ( 20 ton )	2270002045	150	0.43	64.5	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (250 ton ) A	2270002045	715	0.43	307.45	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (250 ton ) B	2270002045	715	0.43	307.45	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cuttings Cleaner System	2270002081	300	0.59	177	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Digger Derrick	2270002033	300	0.43	129	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozers	2270002069	410	0.59	241.9	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Drill Engine	2270002081	20	0.59	11.8	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Drilling Rig	2270002033	950	0.43	408.5	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	2270002078	325	0.21	68.25	1	60	18	0.34	0.19	0.01	0.05	0.04	0.04	50.74
Excavator	2270002036	138	0.59	81.42	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fork Lift	2270003020	120	0.59	70.8	1	60	18	0.04	0.04	0.01	0.01	0.02	0.02	50.21
Front End Loaders	2270002066	196	0.21	41.16	1	60	18	0.16	0.10	0.01	0.03	0.02	0.02	30.62
Generators	2270006005	430	0.43	184.9	1	60	18	0.75	0.20	0.03	0.06	0.06	0.06	116.69
Grader	2270002048	140	0.59	82.6	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDD Rig	2270002033	600	0.43	258	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heavy Lift Crane	2270002045	340	0.43	146.2	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrotest Truck	2270002051	100	0.59	59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jack Hammer	2270003040	405	0.43	174.15	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Light Tower	2270002081	50	0.59	29.5	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Man Lift A	2270003010	50	0.21	10.5	1	60	10	0.04	0.03	0.00	0.01	0.01	0.01	4.81
Man Lift B	2270003010	50	0.21	10.5	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mudd Unit	2270002081	400	0.59	236	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Trucks	2270002051	250	0.59	147.5	4	60	18	0.33	0.14	0.08	0.09	0.14	0.14	376.77
Pile Driver	2270002081	350	0.59	206.5	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipe Beveling Machine	2270002081	20	0.59	11.8	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipe Tractor Trailer	2265002066	400	0.48	192	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Portable Pipe Bender	2270003040	75	0.43	32.25	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rigging Loft	2265003010	10	0.46	4.6	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller	2270002015	300	0.59	177	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scissor Lift	2270003010	20	0.21	4.2	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
School Bus	2270002051	100	0.59	59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scraper	2270002018	488	0.59	287.92	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

# Adelphia Gateway Project

Table 9-C-69. Criteria Pollutant Emissions from Construction Engines, Ridge Lateral Meter Station Construction

Equipment Type	SCC	Max. Engine Rating (hp)	Load Factor <sup>3</sup>	Average Engine Load (hp)	Operations			2018 Construction Year Emissions (tpy)							
					Quantity	(hr/week)	(weeks/yr)	NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	
SideBoom	2270002069	240	0.59	141.6	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Skid Steer Loader	2270002072	75	0.21	15.75	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stake Bed	2270002081	200	0.59	118	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sweeper	2270003030	12	0.43	5.16	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tamper	2260002006	4	0.55	2.2	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tandem Truck	2270002069	200	0.59	118	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trackhoe	2265002066	320	0.48	153.6	1	60	18	0.22	2.28	0.01	0.07	0.01	0.01	127.83	
Trenching Machines	2270002030	200	0.59	118	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Trowel	2270002081	8	0.59	4.72	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Water / Fuel Truck	2270002051	250	0.59	147.5	1	60	18	0.08	0.03	0.02	0.02	0.03	0.03	94.19	
Welder	2270006025	35	0.21	7.35	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Welding Machine	2270006025	35	0.21	7.35	2	60	18	0.09	0.08	0.00	0.02	0.01	0.01	12.12	
Welding Rig	2270002051	10	0.59	5.9	2	60	18	0.04	0.01	0.00	0.00	0.00	0.00	7.53	
X-Ray Truck/Machine	2270002051	50	0.59	29.5	1	30	9	0.02	0.01	0.00	0.00	0.00	0.00	4.71	

<sup>1</sup>NONROAD2008a Model does not contain Emission Factors for All Terrain Vehicles (ATVs). Used Emission Factors for Personal Watercraft as a substitution.

<sup>2</sup>NONROAD2008a Model does not contain Emission Factors for Bobcat vehicle type. Used Emission Factors for Other Industrial Equipment vehicle type as a substitution.

<sup>3</sup> Load factors as recommended for estimation of emissions using NONROAD emission factors in EPA420-P-04-005 Revised April 2004

## Adelphia Gateway Project

**Table 9-C-70. HAP Emissions from Construction Engines, Ridge Lateral Meter Station Construction**

Pollutant	2018 Emissions (tpy)
Acetaldehyde	2.88E-02
Acrolein	1.63E-03
Benzene	1.09E-02
1,3-Butadiene	1.09E-03
Formaldehyde	6.42E-02

1. Emissions of HAPs are estimated based on total VOC emissions for the construction year and Table 3.1-3 Air Toxic Fractions of VOC in EPA's guidance document *Final Regulatory Analysis and Control of Emissions from Nonroad Diesel Engines*, EPA420-R-04-007, May 2004.

Pollutant	Fraction of VOC
Acetaldehyde	0.053
Acrolein	0.003
Benzene	0.020
1,3-Butadiene	0.002
Formaldehyde	0.118

## Adelphia Gateway Project

**Table 9-C-71. On-Road Engine Emission Factors, Ridge Lateral Meter Station Construction**

Pollutant	2018 Emission Factors (grams/mile)				
	LDGV	LDGT	LDDT	COM BUS	HDDV
NO <sub>x</sub>	3.08E-01	3.45E-01	3.08E-01	4.77E+00	2.07E+00
CO	1.08E+01	1.06E+01	4.56E-01	8.16E-01	4.75E-01
SO <sub>2</sub>	6.80E-03	8.80E-03	4.10E-03	1.12E-02	1.06E-02
VOC	3.80E-01	4.46E-01	2.20E-01	3.48E-01	2.53E-01
PM <sub>10</sub>	2.47E-02	2.48E-02	4.02E-02	3.71E-02	7.62E-02
PM <sub>2.5</sub>	1.12E-02	1.13E-02	2.55E-02	2.06E-02	4.66E-02
CO <sub>2</sub>	3.68E+02	4.79E+02	5.99E+02	1.65E+03	1.54E+03
Acetaldehyde	1.28E-03	1.46E-03	2.71E-03	1.05E-02	7.62E-03
Acrolein	1.65E-04	1.85E-04	7.70E-04	1.28E-03	9.25E-04
Benzene	1.62E-02	1.85E-02	4.40E-03	3.83E-03	2.78E-03
1,3-Butadiene	1.81E-03	2.07E-03	1.98E-03	2.23E-03	1.62E-03
Formaldehyde	3.31E-03	3.77E-03	8.49E-03	2.85E-02	2.07E-02

1. The emission factors were calculated using EPA's Mobile6.2 Vehicle Emission Modeling Software. Emission factors for each calendar year are based on average of Mobile6.2 generated factors for winter and summer of that year.
2. Temperatures for winter were based on average temperatures in December, January, and February, and the temperatures for summer were based on average temperatures in June, July, and August. The data was extracted from United States Environmental Protection Agency Outdoor Air Quality Data website (<https://www.epa.gov/outdoor-air-quality-data/monitor-values-report>)
3. Fuel assumptions included conventional gasoline, with an average RVP limit of 9 psi, and diesel with average sulfur content of 15 ppm.

## Adelphia Gateway Project

**Table 9-C-72. On-Road Vehicle Travel, Ridge Lateral Meter Station Construction**

Vehicle Type	2018			Total Miles Per Year
	Round Trip (miles)	Trips per Day	Days/Year	
Commuter Bus	0	0	0	0
Light-Duty Diesel Truck	0	0	0	0
Light-Duty Gasoline Truck	0	0	0	0
Light-Duty Gasoline Vehicle	40	10.00	110	44,000
Heavy Duty Diesel Vehicle	0	0	0	0
Fuel Delivery	0	0	0	0

## Adelphia Gateway Project

**Table 9-C-73. On-Road Engine Emissions, Ridge Lateral Meter Station Construction**

Pollutant	2018 Annual Emissions (tpy)				
	LDGV	LDGT	LDDT	COM BUS	HDDV
NO <sub>x</sub>	1.49E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO	5.23E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SO <sub>2</sub>	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOC	1.84E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PM <sub>10</sub>	1.20E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PM <sub>2.5</sub>	5.43E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO <sub>2</sub>	1.78E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	6.18E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acrolein	8.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	7.87E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-Butadiene	8.78E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Formaldehyde	1.61E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00



## Adelphia Gateway Project

**Table 9-C-74. Off-Road Vehicle Travel, Ridge Lateral Meter Station Construction**

Vehicle Type	2018			Total Miles Per Year
	Round Trip (miles)	Trips per Day	Days/Year	
All Terrain Vehicle (ATV)	0	0	0	0
Dump Trucks	0	0	0	0
Light Duty Trucks	40	2.00	110	8,800
Medium Duty Trucks	0	0	0	0
School Bus	0	0	0	0
Water / Fuel Truck	40	0.14	110	629

## Adelphia Gateway Project

**Table 9-C-75. Off-Road Engine Emissions, Ridge Lateral Meter Station Construction**

Vehicle Type	Mean Vehicle Weight (tons)	Emission Factor <sup>1</sup>		Control Efficiency <sup>2</sup> (%)	2018 Annual Emissions	
		PM <sub>10</sub> (lb/VMT)	PM <sub>2.5</sub> (lb/VMT)		PM <sub>10</sub> (tpy)	PM <sub>2.5</sub> (tpy)
All Terrain Vehicle (ATV)	0.25	0.24	0.02	75%	0.00	0.00
Dump Trucks	20	1.75	0.17	75%	0.00	0.00
Light Duty Trucks	2.5	0.69	0.07	75%	0.75	0.08
Medium Duty Trucks	5	0.94	0.09	75%	0.00	0.00
School Bus	15	1.54	0.15	75%	0.00	0.00
Water / Fuel Truck	20	1.75	0.17	75%	0.14	0.01

1. Emission factors calculated in accordance with AP-42 Section 13.2.2:

$$\text{Unpaved Roads: } E = k(s/12)^a(W/3)^b \cdot [(365-p)/365]$$

k Factor (PM <sub>10</sub> , PM <sub>2.5</sub> ) (lb/VMT)	1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	8.5	%	AP-42 Table 13.2.2-1 (Final, 11/06)
Number of Rain Days, p	118		AP-42 Figure 13.2.2-1 (Final, 11/06)
a (PM <sub>10</sub> , PM <sub>2.5</sub> )	0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b (PM <sub>10</sub> , PM <sub>2.5</sub> )	0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

2. Assumed average dust control efficiency for road watering from AP-42 Section 13.2.2 and related background documents.

## Adelphia Gateway Project

**Table 9-C-76. Fugitive Emissions from Earthmoving, Ridge Lateral Meter Station Construction**

On-Site Activity	Emission Factors <sup>1</sup>			Operation <sup>2</sup>		PM <sub>10</sub> Emissions (tpy)	PM <sub>2.5</sub> Emissions (tpy)
	PM <sub>10</sub>	PM <sub>2.5</sub>	Units of Measure	2018	Units of Measure	2018	2018
Bulldozing	1.03E+00	5.31E-01	lb/hr	0	hr/yr	0.00E+00	0.00E+00
Grading	1.96E+00	2.24E-01	lb/VMT	5.0	VMT/yr	4.85E-03	5.56E-04

1. Emissions were calculated using emission factor equations from Table 11.9-1, Compilation of Air Pollutant Emission Factors, USEPA AP-42, Fifth Edition, 10/98.

For bulldozing:

$$PM_{10} \text{ emissions factor (lb/hr)} = 0.75 * [1.0 (s)^{1.5} / (M)^{1.4}]$$

$$PM_{2.5} \text{ emission factor (lb/hr)} = 0.105 * [5.7(s)^{1.2} / (M)^{1.3}]$$

For grading:

$$PM_{10} \text{ emission factor (lb/VMT)} = 0.60 * [0.051 (S)^{2.0}]$$

$$PM_{2.5} \text{ emission factor (lb/VMT)} = 0.031 * [0.040 (S)^{2.5}]$$

Where:

$$s \text{ (Silt Content)} = 8.5$$

$$M \text{ (Moisture Content)} = 7.9$$

$$S \text{ (Vehicle Speed)} = 8$$

2. Vehicle miles traveled for grading calculate based on amount of land disturbed during construction each year, as follows:

	2018
Land Disturbed (acres):	1
Square Miles:	0.002
Miles in 1 Direction:	0.040
Feet in 1 Direction:	209
Clearance of Grader (ft):	5
Number of Trips for 1 Grade:	42
Miles to Clear 1 Direction:	1.65
Miles with 50% Safety Factor:	2.5
Number of Times to Go Over Surface:	2
Total Travel (VMT/yr):	4.95

## Adelphia Gateway Project

**Table 9-C-77. Fugitive Emissions from Soil Pile Wind Erosion, Ridge Lateral Meter Station Construction**

Material Pile Description	Size (acres) <sup>3</sup>	Emission Control Method	Control Efficiency <sup>4</sup>	Emission Factor <sup>1</sup>			2018 Emissions (tpy) <sup>5</sup>		
				PM	PM <sub>10</sub>	PM <sub>2.5</sub>	PM	PM <sub>10</sub>	PM <sub>2.5</sub>
Ridge Lateral Meter Station Stockpiles	0.057	Mulch/seeding	75%	5.06	2.53	0.38	0.02	0.01	0.00
<b>Total Stockpile Erosion Emissions</b>							<b>0.02</b>	<b>0.01</b>	<b>0.00</b>

<sup>1</sup>USEPA, 1992 (Fugitive Dust Background and Technical Information Document for Best Available Control Measures, Section 2.3.1.3.3, Wind Emissions from Continuously Active Piles). USEPA, 2006 13.2.5 for k factors:

$$EF \text{ (lb/day/acre)} = k \times 1.7 \times (s/1.5) \times ((365 - p)/235) \times (f/15) \times (1 - \% \text{ Control Efficiency})$$

<sup>2</sup>Total PM assumed to be equal to PM < 30 μm

	Marcus Hook Lateral 2 Meter Station
Days of precipitation greater than or equal to 0.01 inch (p)	118
Time (%) that unobstructed wind speed exceeds 5.4 m/s at mean pile height (f)	30.0

Silt Content (%), (s)	8.5
Particle Size multiplier (k)	1 (for PM < 30 μm) 0.5 (for PM < 10 μm) 0.075 (for PM < 2.5 μm)

<sup>3</sup>Soil Pile Areas:

Compressor Stations Stockpile Area:	1 stockpiles 50 ft. wide 50 ft. wide <b>0.057 acres</b>
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<sup>4</sup>Engineering estimate for control efficiency from use of mulch/seeding to control erosion.

<sup>5</sup>Emissions are based on the construction schedule below:

2018 days	Location
110	Ridge Lateral Meter Station

## Adelphia Gateway Project

**Table 9-C-78. Criteria Pollutant Emissions Summary, Ridge Lateral Pipeline Construction**

Source	2018 Construction Emissions (tpy)						
	NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Construction Equipment Engines	2.13	4.81	0.15	0.41	0.27	0.27	854.59
On-Road Vehicle Travel	0.01	0.29	0.00	0.01	0.00	0.00	9.74
Off-Road Vehicle Travel	--	--	--	--	0.49	0.05	--
Earthmoving Fugitives	--	--	--	--	0.00	0.00	--
Pile Erosion	--	--	--	--	0.05	0.01	--
<b>TOTAL:</b>	<b>2.14</b>	<b>5.10</b>	<b>0.15</b>	<b>0.42</b>	<b>0.81</b>	<b>0.33</b>	<b>864.33</b>

## Adelphia Gateway Project

**Table 9-C-79. HAP Emissions Summary, Ridge Lateral Pipeline Construction**

Source	2018 Construction Emissions (tpy)					
	Acetaldehyde	Acrolein	Benzene	1,3-Butadiene	Formaldehyde	Total HAPs
Construction Equipment Engines	2.15E-02	1.22E-03	8.12E-03	8.12E-04	4.79E-02	7.95E-02
On-Road Vehicle Travel	3.37E-05	4.37E-06	4.29E-04	4.79E-05	8.76E-05	6.03E-04
Off-Road Vehicle Travel	--	--	--	--	--	--
Earthmoving Fugitives	--	--	--	--	--	--
Pile Erosion	--	--	--	--	--	--
<b>TOTAL:</b>	<b>2.15E-02</b>	<b>1.22E-03</b>	<b>8.55E-03</b>	<b>8.59E-04</b>	<b>4.80E-02</b>	<b>8.01E-02</b>

# Adelphia Gateway Project

**Table 9-C-80. Criteria Pollutant Emissions from Construction Engines, Ridge Lateral Pipeline Construction**

Equipment Type	SCC	Max. Engine Rating		Average Engine Load (hp)	Operations			2018 Construction Year						
		(hp)	Load Factor <sup>3</sup>		Quantity	(hr/week)	(weeks/yr)	Emissions (tpy)						
								NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Air Compressor A	2270006015	310	0.43	133.3	1	60	14	2.12E-01	4.70E-02	1.13E-02	2.08E-02	1.86E-02	1.86E-02	6.31E+01
Air Compressor B	2270006015	310	0.43	133.3	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicle (ATV) <sup>1</sup>	2282005015	18	0.21	3.78	1	60	14	2.25E-02	5.37E-01	8.95E-04	4.46E-02	4.22E-04	4.22E-04	4.34E+00
Asphalt Paver	2270002003	153	0.59	90.27	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Backhoe	2265002066	75	0.48	36	1	60	14	3.20E-02	4.18E-01	4.63E-03	1.13E-02	2.24E-03	2.24E-03	2.25E+01
Bobcat <sup>2</sup>	2265003040	150	0.54	81	1	60	14	8.51E-02	1.21E+00	1.04E-02	3.27E-02	5.15E-03	5.15E-03	5.06E+01
Booster/Pumps	2270006010	370	0.43	159.1	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bucket Truck	2270002051	300	0.59	177	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chain Saw	2260004020	3	0.7	2.1	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cherry Picker	2270002081	160	0.59	94.4	1	60	14	1.89E-01	1.77E-01	9.17E-03	1.95E-02	2.97E-02	2.97E-02	5.02E+01
Chipper/Shredder	2270004066	20	0.43	8.6	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Compactor	2270002009	300	0.43	129	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Compactor, Vibratory	2270002009	100	0.43	43	2	60	1	1.95E-02	1.03E-02	5.40E-04	2.04E-03	1.56E-03	1.56E-03	2.51E+00
Concrete Mixer Truck ( main pours )	2270002042	150	0.43	64.5	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Concrete Mixer Truck ( small pours )	2270002042	150	0.43	64.5	1	2	8	4.18E-03	2.20E-03	1.23E-04	4.48E-04	4.32E-04	4.32E-04	6.28E-01
Concrete Pumps	2270006010	300	0.43	129	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Crane, Crawler	2270002069	450	0.59	265.5	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Crane, Wheeled ( 20 ton )	2270002045	150	0.43	64.5	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Crane, Wheeled (250 ton ) A	2270002045	715	0.43	307.45	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Crane, Wheeled (250 ton ) B	2270002045	715	0.43	307.45	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cuttings Cleaner System	2270002081	300	0.59	177	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Digger Derrick	2270002033	300	0.43	129	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dozers	2270002069	410	0.59	241.9	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Drill Engine	2270002081	20	0.59	11.8	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Drilling Rig	2270002033	950	0.43	408.5	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dump Truck	2270002078	325	0.21	68.25	1	60	14	2.54E-01	1.45E-01	7.43E-03	3.85E-02	3.21E-02	3.21E-02	3.81E+01
Excavator	2270002036	138	0.59	81.42	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fork Lift	2270003020	120	0.59	70.8	1	60	14	3.07E-02	3.22E-02	5.87E-03	8.49E-03	1.01E-02	1.01E-02	3.77E+01
Front End Loaders	2270002066	196	0.21	41.16	1	60	14	1.23E-01	7.20E-02	4.39E-03	1.91E-02	1.70E-02	1.70E-02	2.30E+01
Generators	2270006005	430	0.43	184.9	1	60	14	5.59E-01	1.48E-01	1.68E-02	4.73E-02	3.78E-02	3.78E-02	8.75E+01
Grader	2270002048	140	0.59	82.6	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HDD Rig	2270002033	600	0.43	258	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Heavy Lift Crane	2270002045	340	0.43	146.2	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hydrotest Truck	2270002051	100	0.59	59	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Jack Hammer	2270003040	405	0.43	174.15	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Light Tower	2270002081	50	0.59	29.5	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Man Lift A	2270003010	50	0.21	10.5	1	60	8	2.65E-02	2.61E-02	7.12E-04	6.63E-03	4.14E-03	4.14E-03	3.60E+00
Man Lift B	2270003010	50	0.21	10.5	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mudd Unit	2270002081	400	0.59	236	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pickup Trucks	2270002051	250	0.59	147.5	4	60	14	2.48E-01	1.01E-01	4.41E-02	7.08E-02	7.45E-02	7.45E-02	2.83E+02

# Adelphia Gateway Project

**Table 9-C-80. Criteria Pollutant Emissions from Construction Engines, Ridge Lateral Pipeline Construction**

Equipment Type	SCC	Max. Engine		Average Engine Load (hp)	Operations			2018 Construction Year						
		Rating (hp)	Load Factor <sup>3</sup>		Quantity	(hr/week)	(weeks/yr)	Emissions (tpy)						
								NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Pile Driver	2270002081	350	0.59	206.5	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pipe Beveling Machine	2270002081	20	0.59	11.8	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pipe Tractor Trailer	2265002066	400	0.48	192	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Portable Pipe Bender	2270003040	75	0.43	32.25	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Rigging Loft	2265003010	10	0.46	4.6	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Roller	2270002015	300	0.59	177	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scissor Lift	2270003010	20	0.21	4.2	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
School Bus	2270002051	100	0.59	59	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scraper	2270002018	488	0.59	287.92	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SideBoom	2270002069	240	0.59	141.6	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Skid Steer Loader	2270002072	75	0.21	15.75	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Stake Bed	2270002081	200	0.59	118	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sweeper	2270003030	12	0.43	5.16	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tamper	2260002006	4	0.55	2.2	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tandem Truck	2270002069	200	0.59	118	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trackhoe	2265002066	320	0.48	153.6	1	60	14	1.36E-01	1.78E+00	1.98E-02	4.80E-02	9.55E-03	9.55E-03	9.59E+01
Trenching Machines	2270002030	200	0.59	118	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trowel	2270002081	8	0.59	4.72	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Water / Fuel Truck	2270002051	250	0.59	147.5	1	60	14	6.21E-02	2.53E-02	1.10E-02	1.77E-02	1.86E-02	1.86E-02	7.06E+01
Welder	2270006025	35	0.21	7.35	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Welding Machine	2270006025	35	0.21	7.35	2	60	14	6.78E-02	6.20E-02	1.96E-03	1.33E-02	8.69E-03	8.69E-03	9.09E+00
Welding Rig	2270002051	10	0.59	5.9	2	60	14	2.71E-02	7.42E-03	9.02E-04	2.09E-03	1.95E-03	1.95E-03	5.65E+00
X-Ray Truck/Machine	2270002051	50	0.59	29.5	1	30	14	3.39E-02	9.27E-03	1.13E-03	2.61E-03	2.43E-03	2.43E-03	7.06E+00

<sup>1</sup>NONROAD2008a Model does not contain Emission Factors for All Terrain Vehicles (ATVs). Used Emission Factors for Personal Watercraft as a substitution.

<sup>2</sup>NONROAD2008a Model does not contain Emission Factors for Bobcat vehicle type. Used Emission Factors for Other Industrial Equipment vehicle type as a substitution.

<sup>3</sup> Load factors as recommended for estimation of emissions using NONROAD emission factors in EPA420-P-04-005 Revised April 2004



## Adelphia Gateway Project

**Table 9-C-81. HAP Emissions from Construction Engines, Ridge Lateral Pipeline Construction**

Pollutant	2018 Emissions (tpy)
Acetaldehyde	2.15E-02
Acrolein	1.22E-03
Benzene	8.12E-03
1,3-Butadiene	8.12E-04
Formaldehyde	4.79E-02

1. Emissions of HAPs are estimated based on total VOC emissions for the construction year and Table 3.1-3 Air Toxic Fractions of VOC in EPA's guidance document *Final Regulatory Analysis and Control of Emissions from Nonroad Diesel Engines*, EPA420-R-04-007, May 2004.

Pollutant	Fraction of VOC
Acetaldehyde	0.053
Acrolein	0.003
Benzene	0.020
1,3-Butadiene	0.002
Formaldehyde	0.118

## Adelphia Gateway Project

**Table 9-C-82. On-Road Engine Emission Factors, Ridge Lateral Pipeline Construction**

Pollutant	2018 Emission Factors (grams/mile)				
	LDGV	LDGT	LDDT	COM BUS	HDDV
NO <sub>x</sub>	3.08E-01	3.45E-01	3.08E-01	4.77E+00	2.07E+00
CO	1.08E+01	1.06E+01	4.56E-01	8.16E-01	4.75E-01
SO <sub>2</sub>	6.80E-03	8.80E-03	4.10E-03	1.12E-02	1.06E-02
VOC	3.80E-01	4.46E-01	2.20E-01	3.48E-01	2.53E-01
PM <sub>10</sub>	2.47E-02	2.48E-02	4.02E-02	3.71E-02	7.62E-02
PM <sub>2.5</sub>	1.12E-02	1.13E-02	2.55E-02	2.06E-02	4.66E-02
CO <sub>2</sub>	3.68E+02	4.79E+02	5.99E+02	1.65E+03	1.54E+03
Acetaldehyde	1.28E-03	1.46E-03	2.71E-03	1.05E-02	7.62E-03
Acrolein	1.65E-04	1.85E-04	7.70E-04	1.28E-03	9.25E-04
Benzene	1.62E-02	1.85E-02	4.40E-03	3.83E-03	2.78E-03
1,3-Butadiene	1.81E-03	2.07E-03	1.98E-03	2.23E-03	1.62E-03
Formaldehyde	3.31E-03	3.77E-03	8.49E-03	2.85E-02	2.07E-02

1. The emission factors were calculated using EPA's Mobile6.2 Vehicle Emission Modeling Software. Emission factors for each calendar year are based on average of Mobile6.2 generated factors for winter and summer of that year.
2. Temperatures for winter were based on average temperatures in December, January, and February, and the temperatures for summer were based on average temperatures in June, July, and August. The data was extracted from United States Environmental Protection Agency Outdoor Air Quality Data website (<https://www.epa.gov/outdoor-air-quality-data/monitor-values-report>)
3. Fuel assumptions included conventional gasoline, with an average RVP limit of 9 psi, and diesel with average sulfur content of 15 ppm.

## Adelphia Gateway Project

**Table 9-C-83. On-Road Vehicle Travel, Ridge Lateral Pipeline Construction**

Vehicle Type	2018			Total Miles Per Year
	Round Trip (miles)	Trips per Day	Days/Year	
Commuter Bus	0	0	0	0
Light-Duty Diesel Truck	0	0.00	0	0
Light-Duty Gasoline Truck	0	0	0	0
Light-Duty Gasoline Vehicle	40	7.5	80	24,000
Heavy Duty Diesel Vehicle	0	0.0	0	0
Fuel Delivery	0	0	0	0

## Adelphia Gateway Project

**Table 9-C-84. On-Road Engine Emissions, Ridge Lateral Pipeline Construction**

Pollutant	2018 Annual Emissions (tpy)				
	LDGV	LDGT	LDDT	COM BUS	HDDV
NO <sub>x</sub>	8.15E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO	2.85E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SO <sub>2</sub>	1.80E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOC	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PM <sub>10</sub>	6.53E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PM <sub>2.5</sub>	2.96E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO <sub>2</sub>	9.74E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	3.37E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acrolein	4.37E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	4.29E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-Butadiene	4.79E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Formaldehyde	8.76E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00

## Adelphia Gateway Project

**Table 9-C-85. Off-Road Vehicle Travel, Ridge Lateral Pipeline Construction**

Vehicle Type	2018			Total Miles Per Year
	Round Trip (miles)	Trips per Day	Days/Year	
All Terrain Vehicle (ATV)	0	0	0	0
Dump Trucks	0	0	0	0
Light Duty Trucks	40	1.5	80	4,800
Medium Duty Trucks	0	0	0	0
School Bus	0	0	0	0
Water / Fuel Truck	40	0.1	80	343

## Adelphia Gateway Project

**Table 9-C-86. Off-Road Engine Emissions, Ridge Lateral Pipeline Construction**

Vehicle Type	Mean Vehicle Weight (tons)	Emission Factor <sup>1</sup>		Control Efficiency <sup>2</sup> (%)	2018 Annual Emissions	
		PM <sub>10</sub> (lb/VMT)	PM <sub>2.5</sub> (lb/VMT)		PM <sub>10</sub> (tpy)	PM <sub>2.5</sub> (tpy)
All Terrain Vehicle (ATV)	0.25	0.24	0.02	75%	0.00	0.0000
Dump Trucks	20	1.75	0.17	75%	0.00	0.000
Light Duty Trucks	2.5	0.69	0.069	75%	0.41	0.041
Medium Duty Trucks	5	0.94	0.094	75%	0.00	0.00
School Bus	15	1.54	0.15	75%	0.00	0.00
Water / Fuel Truck	20	1.75	0.17	75%	0.07	0.01

1. Emission factors calculated in accordance with AP-42 Section 13.2.2:

$$\text{Unpaved Roads: } E = k(s/12)^a(W/3)^b * [(365-p)/365]$$

k Factor (PM <sub>10</sub> , PM <sub>2.5</sub> ) (lb/VMT)	1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	8.5	%	AP-42 Table 13.2.2-1 (Final, 11/06)
Number of Rain Days, p	118		AP-42 Figure 13.2.2-1 (Final, 11/06)
a (PM <sub>10</sub> , PM <sub>2.5</sub> )	0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b (PM <sub>10</sub> , PM <sub>2.5</sub> )	0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

2. Assumed average dust control efficiency for road watering from AP-42 Section 13.2.2 and related background documents.

## Adelphia Gateway Project

**Table 9-C-87. Fugitive Emissions from Earthmoving, Ridge Lateral Pipeline Construction**

On-Site Activity	Emission Factors <sup>1</sup>			Units of Measure		PM <sub>10</sub> Emissions (tpy)	PM <sub>2.5</sub> Emissions (tpy)
	PM <sub>10</sub>	PM <sub>2.5</sub>	Units of Measure	2018	Units of Measure	2018	2018
Bulldozing	1.03E+00	5.31E-01	lb/hr	0	hr/yr	0.00E+00	0.00E+00
Grading	1.96E+00	2.24E-01	lb/VMT	5.0	VMT/yr	4.85E-03	5.56E-04
Excavating	4.25E-03	2.42E-04	lb/yd <sup>3</sup>	3422.2	yd <sup>3</sup>	7.27E-03	4.14E-04

1. Emissions were calculated using emission factor equations from Table 11.9-1, Compilation of Air Pollutant Emission Factors, USEPA AP-42, Fifth Edition, 10/98.

For bulldozing:

$$PM_{10} \text{ emissions factor (lb/hr)} = 0.75 * [1.0 (s)^{1.5} / (M)^{1.4}]$$

$$PM_{2.5} \text{ emission factor (lb/hr)} = 0.105 * [5.7(s)^{1.2} / (M)^{1.3}]$$

For grading:

$$PM_{10} \text{ emission factor (lb/VMT)} = 0.60 * [0.051 (S)^{2.0}]$$

$$PM_{2.5} \text{ emission factor (lb/VMT)} = 0.031 * [0.040 (S)^{2.5}]$$

For Excavating:

$$PM_{10} \text{ Emission factor (lb/yd}^3) = 0.75 * [0.0021 (d)^{0.7} / (M)^{0.3}]$$

$$PM_{2.5} \text{ Emission factor (lb/yd}^3) = 0.017 * [0.0021 (d)^{1.1} / (M)^{0.3}]$$

Where:

s (Silt Content) =	8.5	% (AP-42 Table 13.2.2-1)
M (Moisture Content) =	7.9	% (AP-42 Table 11.9-3)
S (Vehicle Speed) =	8	mph (Engineering Estimate)
d (Drop Height) =	10	

2. Vehicle miles traveled for grading calculate based on amount of land disturbed during construction each year, as follows:

	2018
Land Disturbed (acres):	1
Square Miles:	0.002
Miles in 1 Direction:	0.040
Feet in 1 Direction:	209
Clearance of Grader (ft):	5
Number of Trips for 1 Grade:	42
Miles to Clear 1 Direction:	1.65
Miles with 50% Safety Factor:	2.5
Number of Times to Go Over Surface:	2
Total Travel (VMT/yr):	4.95

## Adelphia Gateway Project

**Table 9-C-88. Fugitive Emissions from Soil Pile Wind Erosion, Ridge Lateral Pipeline Construction**

Material Pile Description	Size (acres) <sup>3</sup>	Emission Control Method	Control Efficiency <sup>4</sup>	Emission Factor <sup>1</sup>			Unit	2018 Emissions (tpy) <sup>5</sup>		
				PM	PM <sub>10</sub>	PM <sub>2.5</sub>		PM	PM <sub>10</sub>	PM <sub>2.5</sub>
Ridge Lateral Pipeline Total	0.5	Mulch/seeding	75%	5.06	2.53	0.38	lb/day/acre	0.10	0.05	0.007
<b>Total Stockpile Erosion Emissions</b>								<b>0.10</b>	<b>0.05</b>	<b>0.01</b>

<sup>1</sup>USEPA, 1992 (Fugitive Dust Background and Technical Information Document for Best Available Control Measures, Section 2.3.1.3.3, Wind Emissions from Continuously Active Piles). USEPA, 2006 13.2.5 for k factors:

$$EF \text{ (lb/day/acre)} = k \times 1.7 \times (s/1.5) \times ((365 - p)/235) \times (f/15) \times (1 - \% \text{ Control Efficiency})$$

<sup>2</sup>Total PM assumed to be equal to PM < 30 μm

	Marcus Hook Lateral 2 Pipeline
Days of precipitation greater than or equal to 0.01 inch (p)	118
Time (%) that unobstructed wind speed exceeds 5.4 m/s at mean pile height (f)	30.0

Silt Content (%), (s)	8.5
Particle Size multiplier (k)	1 (for PM < 30 μm) 0.5 (for PM < 10 μm) 0.075 (for PM < 2.5 μm)

<sup>3</sup>Soil Pile Areas:

Pipeline Soil Pile Area:	1 pile per spread 0 ft. wide (topsoil) 10 ft. wide (subsoil) 0.39 miles long <b>0.5 acres</b>	Ridge Lateral Pipeline - Delaware County, PA
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<sup>4</sup>Engineering estimate for control efficiency from use of mulch/seeding to control erosion.

<sup>5</sup>Emissions are based on the construction schedule below:

2018 days	80	Location	Ridge Lateral Pipeline
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## Adelphia Gateway Project

**Table 9-C-89. Criteria Pollutant Emissions Summary, Tilghman Lateral Meter Station Construction**

Source	2018 Construction Emissions (tpy)						
	NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Construction Equipment Engines	2.89	6.20	0.23	0.54	0.43	0.43	1,134.75
On-Road Vehicle Travel	0.01	0.52	0.00	0.02	0.00	0.00	17.85
Off-Road Vehicle Travel	--	--	--	--	0.89	0.09	--
Earthmoving Fugitives	--	--	--	--	0.00	0.00	--
Pile Erosion	--	--	--	--	0.01	0.00	--
<b>TOTAL:</b>	<b>2.91</b>	<b>6.73</b>	<b>0.23</b>	<b>0.56</b>	<b>1.34</b>	<b>0.52</b>	<b>1,152.60</b>

## Adelphia Gateway Project

**Table 9-C-90. HAP Emissions Summary, Tilghman Lateral Meter Station Construction**

Source	2018 Construction Emissions (tpy)					
	Acetaldehyde	Acrolein	Benzene	1,3-Butadiene	Formaldehyde	Total HAPs
Construction Equipment Engines	2.88E-02	1.63E-03	1.09E-02	1.09E-03	6.42E-02	1.07E-01
On-Road Vehicle Travel	6.18E-05	8.00E-06	7.87E-04	8.78E-05	1.61E-04	1.11E-03
Off-Road Vehicle Travel	--	--	--	--	--	--
Earthmoving Fugitives	--	--	--	--	--	--
Pile Erosion	--	--	--	--	--	--
<b>TOTAL:</b>	<b>2.89E-02</b>	<b>1.64E-03</b>	<b>1.17E-02</b>	<b>1.18E-03</b>	<b>6.43E-02</b>	<b>1.08E-01</b>

# Adelphia Gateway Project

Table 9-C-91. Criteria Pollutant Emissions from Construction Engines, Tilghman Lateral Meter Station Construction

Equipment Type	SCC	Max. Engine Rating (hp)	Load Factor <sup>3</sup>	Average Engine Load (hp)	Operations			2018 Construction Year Emissions (tpy)						
					Quantity	(hr/week)	(weeks/yr)	NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Air Compressor A	2270006015	310	0.43	133.3	1	60	18	0.28	0.06	0.02	0.03	0.03	0.03	84.18
Air Compressor B	2270006015	310	0.43	133.3	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All Terrain Vehicle (ATV) <sup>1</sup>	2282005015	18	0.21	3.78	1	60	18	0.03	0.71	0.00	0.06	0.00	0.00	5.79
Asphalt Paver	2270002003	153	0.59	90.27	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backhoe	2265002066	75	0.48	36	1	60	18	0.05	0.53	0.00	0.02	0.00	0.00	29.96
Bobcat <sup>2</sup>	2265003040	150	0.54	81	1	60	18	0.14	1.54	0.00	0.05	0.01	0.01	67.48
Booster/Pumps	2270006010	370	0.43	159.1	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bucket Truck	2270002051	300	0.59	177	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chain Saw	2260004020	3	0.7	2.1	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cherry Picker	2270002081	160	0.59	94.4	1	60	18	0.25	0.24	0.02	0.03	0.04	0.04	66.92
Chipper/Shredder	2270004066	20	0.43	8.6	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor	2270002009	300	0.43	129	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor, Vibratory	2270002009	100	0.43	43	2	60	1	0.03	0.01	0.00	0.00	0.00	0.00	3.35
Concrete Mixer Truck ( main pours )	2270002042	150	0.43	64.5	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Mixer Truck ( small pours )	2270002042	150	0.43	64.5	1	2	10	0.01	0.00	0.00	0.00	0.00	0.00	0.84
Concrete Pumps	2270006010	300	0.43	129	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Crawler	2270002069	450	0.59	265.5	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled ( 20 ton )	2270002045	150	0.43	64.5	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (250 ton ) A	2270002045	715	0.43	307.45	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (250 ton ) B	2270002045	715	0.43	307.45	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cuttings Cleaner System	2270002081	300	0.59	177	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Digger Derrick	2270002033	300	0.43	129	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozers	2270002069	410	0.59	241.9	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Drill Engine	2270002081	20	0.59	11.8	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Drilling Rig	2270002033	950	0.43	408.5	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	2270002078	325	0.21	68.25	1	60	18	0.34	0.19	0.01	0.05	0.04	0.04	50.74
Excavator	2270002036	138	0.59	81.42	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fork Lift	2270003020	120	0.59	70.8	1	60	18	0.04	0.04	0.01	0.01	0.02	0.02	50.21
Front End Loaders	2270002066	196	0.21	41.16	1	60	18	0.16	0.10	0.01	0.03	0.02	0.02	30.62
Generators	2270006005	430	0.43	184.9	1	60	18	0.75	0.20	0.03	0.06	0.06	0.06	116.69
Grader	2270002048	140	0.59	82.6	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDD Rig	2270002033	600	0.43	258	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heavy Lift Crane	2270002045	340	0.43	146.2	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrotest Truck	2270002051	100	0.59	59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jack Hammer	2270003040	405	0.43	174.15	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Light Tower	2270002081	50	0.59	29.5	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Man Lift A	2270003010	50	0.21	10.5	1	60	10	0.04	0.03	0.00	0.01	0.01	0.01	4.81
Man Lift B	2270003010	50	0.21	10.5	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mudd Unit	2270002081	400	0.59	236	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Trucks	2270002051	250	0.59	147.5	4	60	18	0.33	0.14	0.08	0.09	0.14	0.14	376.77
Pile Driver	2270002081	350	0.59	206.5	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipe Beveling Machine	2270002081	20	0.59	11.8	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipe Tractor Trailer	2265002066	400	0.48	192	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Portable Pipe Bender	2270003040	75	0.43	32.25	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rigging Loft	2265003010	10	0.46	4.6	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller	2270002015	300	0.59	177	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scissor Lift	2270003010	20	0.21	4.2	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
School Bus	2270002051	100	0.59	59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scraper	2270002018	488	0.59	287.92	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

# Adelphia Gateway Project

Table 9-C-91. Criteria Pollutant Emissions from Construction Engines, Tilghman Lateral Meter Station Construction

Equipment Type	SCC	Max. Engine Rating (hp)	Load Factor <sup>3</sup>	Average Engine Load (hp)	Operations			2018 Construction Year Emissions (tpy)							
					Quantity	(hr/week)	(weeks/yr)	NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	
SideBoom	2270002069	240	0.59	141.6	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Skid Steer Loader	2270002072	75	0.21	15.75	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stake Bed	2270002081	200	0.59	118	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sweeper	2270003030	12	0.43	5.16	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tamper	2260002006	4	0.55	2.2	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tandem Truck	2270002069	200	0.59	118	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trackhoe	2265002066	320	0.48	153.6	1	60	18	0.22	2.28	0.01	0.07	0.01	0.01	127.83	
Trenching Machines	2270002030	200	0.59	118	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Trowel	2270002081	8	0.59	4.72	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Water / Fuel Truck	2270002051	250	0.59	147.5	1	60	18	0.08	0.03	0.02	0.02	0.03	0.03	94.19	
Welder	2270006025	35	0.21	7.35	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Welding Machine	2270006025	35	0.21	7.35	2	60	18	0.09	0.08	0.00	0.02	0.01	0.01	12.12	
Welding Rig	2270002051	10	0.59	5.9	2	60	18	0.04	0.01	0.00	0.00	0.00	0.00	7.53	
X-Ray Truck/Machine	2270002051	50	0.59	29.5	1	30	9	0.02	0.01	0.00	0.00	0.00	0.00	4.71	

<sup>1</sup>NONROAD2008a Model does not contain Emission Factors for All Terrain Vehicles (ATVs). Used Emission Factors for Personal Watercraft as a substitution.

<sup>2</sup>NONROAD2008a Model does not contain Emission Factors for Bobcat vehicle type. Used Emission Factors for Other Industrial Equipment vehicle type as a substitution.

<sup>3</sup> Load factors as recommended for estimation of emissions using NONROAD emission factors in EPA420-P-04-005 Revised April 2004

## Adelphia Gateway Project

**Table 9-C-92. HAP Emissions from Construction Engines, Tilghman Lateral Meter Station Construction**

Pollutant	2018 Emissions (tpy)
Acetaldehyde	2.88E-02
Acrolein	1.63E-03
Benzene	1.09E-02
1,3-Butadiene	1.09E-03
Formaldehyde	6.42E-02

1. Emissions of HAPs are estimated based on total VOC emissions for the construction year and Table 3.1-3 Air Toxic Fractions of VOC in EPA's guidance document *Final Regulatory Analysis and Control of Emissions from Nonroad Diesel Engines*, EPA420-R-04-007, May 2004.

Pollutant	Fraction of VOC
Acetaldehyde	0.053
Acrolein	0.003
Benzene	0.020
1,3-Butadiene	0.002
Formaldehyde	0.118

## Adelphia Gateway Project

**Table 9-C-93. On-Road Engine Emission Factors, Tilghman Lateral Meter Station Construction**

Pollutant	2018 Emission Factors (grams/mile)				
	LDGV	LDGT	LDDT	COM BUS	HDDV
NO <sub>x</sub>	3.08E-01	3.45E-01	3.08E-01	4.77E+00	2.07E+00
CO	1.08E+01	1.06E+01	4.56E-01	8.16E-01	4.75E-01
SO <sub>2</sub>	6.80E-03	8.80E-03	4.10E-03	1.12E-02	1.06E-02
VOC	3.80E-01	4.46E-01	2.20E-01	3.48E-01	2.53E-01
PM <sub>10</sub>	2.47E-02	2.48E-02	4.02E-02	3.71E-02	7.62E-02
PM <sub>2.5</sub>	1.12E-02	1.13E-02	2.55E-02	2.06E-02	4.66E-02
CO <sub>2</sub>	3.68E+02	4.79E+02	5.99E+02	1.65E+03	1.54E+03
Acetaldehyde	1.28E-03	1.46E-03	2.71E-03	1.05E-02	7.62E-03
Acrolein	1.65E-04	1.85E-04	7.70E-04	1.28E-03	9.25E-04
Benzene	1.62E-02	1.85E-02	4.40E-03	3.83E-03	2.78E-03
1,3-Butadiene	1.81E-03	2.07E-03	1.98E-03	2.23E-03	1.62E-03
Formaldehyde	3.31E-03	3.77E-03	8.49E-03	2.85E-02	2.07E-02

1. The emission factors were calculated using EPA's Mobile6.2 Vehicle Emission Modeling Software. Emission factors for each calendar year are based on average of Mobile6.2 generated factors for winter and summer of that year.
2. Temperatures for winter were based on average temperatures in December, January, and February, and the temperatures for summer were based on average temperatures in June, July, and August. The data was extracted from United States Environmental Protection Agency Outdoor Air Quality Data website (<https://www.epa.gov/outdoor-air-quality-data/monitor-values-report>)
3. Fuel assumptions included conventional gasoline, with an average RVP limit of 9 psi, and diesel with average sulfur content of 15 ppm.

## Adelphia Gateway Project

**Table 9-C-94. On-Road Vehicle Travel, Tilghman Lateral Meter Station Construction**

Vehicle Type	2018			Total Miles Per Year
	Round Trip (miles)	Trips per Day	Days/Year	
Commuter Bus	0	0	0	0
Light-Duty Diesel Truck	0	0	0	0
Light-Duty Gasoline Truck	0	0	0	0
Light-Duty Gasoline Vehicle	40	10.00	110	44,000
Heavy Duty Diesel Vehicle	0	0	0	0
Fuel Delivery	0	0	0	0

## Adelphia Gateway Project

**Table 9-C-95. On-Road Engine Emissions, Tilghman Lateral Meter Station Construction**

Pollutant	2018 Annual Emissions (tpy)				
	LDGV	LDGT	LDDT	COM BUS	HDDV
NO <sub>x</sub>	1.49E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO	5.23E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SO <sub>2</sub>	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOC	1.84E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PM <sub>10</sub>	1.20E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PM <sub>2.5</sub>	5.43E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO <sub>2</sub>	1.78E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	6.18E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acrolein	8.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	7.87E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-Butadiene	8.78E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Formaldehyde	1.61E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00



## Adelphia Gateway Project

**Table 9-C-96. Off-Road Vehicle Travel, Tilghman Lateral Meter Station Construction**

Vehicle Type	2018			Total Miles Per Year
	Round Trip (miles)	Trips per Day	Days/Year	
All Terrain Vehicle (ATV)	0	0	0	0
Dump Trucks	0	0	0	0
Light Duty Trucks	40	2.00	110	8,800
Medium Duty Trucks	0	0	0	0
School Bus	0	0	0	0
Water / Fuel Truck	40	0.14	110	629

## Adelphia Gateway Project

**Table 9-C-97. Off-Road Engine Emissions, Tilghman Lateral Meter Station Construction**

Vehicle Type	Mean Vehicle Weight (tons)	Emission Factor <sup>1</sup>		Control Efficiency <sup>2</sup> (%)	2018 Annual Emissions	
		PM <sub>10</sub> (lb/VMT)	PM <sub>2.5</sub> (lb/VMT)		PM <sub>10</sub> (tpy)	PM <sub>2.5</sub> (tpy)
All Terrain Vehicle (ATV)	0.25	0.24	0.02	75%	0.00	0.00
Dump Trucks	20	1.75	0.17	75%	0.00	0.00
Light Duty Trucks	2.5	0.69	0.07	75%	0.75	0.08
Medium Duty Trucks	5	0.94	0.09	75%	0.00	0.00
School Bus	15	1.54	0.15	75%	0.00	0.00
Water / Fuel Truck	20	1.75	0.17	75%	0.14	0.01

1. Emission factors calculated in accordance with AP-42 Section 13.2.2:

$$\text{Unpaved Roads: } E = k(s/12)^a(W/3)^b \cdot [(365-p)/365]$$

k Factor (PM <sub>10</sub> , PM <sub>2.5</sub> ) (lb/VMT)	1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	8.5	%	AP-42 Table 13.2.2-1 (Final, 11/06)
Number of Rain Days, p	118		AP-42 Figure 13.2.2-1 (Final, 11/06)
a (PM <sub>10</sub> , PM <sub>2.5</sub> )	0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b (PM <sub>10</sub> , PM <sub>2.5</sub> )	0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

2. Assumed average dust control efficiency for road watering from AP-42 Section 13.2.2 and related background documents.

## Adelphia Gateway Project

**Table 9-C-98. Fugitive Emissions from Earthmoving, Tilghman Lateral Meter Station Construction**

On-Site Activity	Emission Factors <sup>1</sup>			Operation <sup>2</sup>		PM <sub>10</sub> Emissions (tpy)	PM <sub>2.5</sub> Emissions (tpy)
	PM <sub>10</sub>	PM <sub>2.5</sub>	Units of Measure	2018	Units of Measure	2018	2018
Bulldozing	1.03E+00	5.31E-01	lb/hr	0	hr/yr	0.00E+00	0.00E+00
Grading	1.96E+00	2.24E-01	lb/VMT	5.0	VMT/yr	4.85E-03	5.56E-04

1. Emissions were calculated using emission factor equations from Table 11.9-1, Compilation of Air Pollutant Emission Factors, USEPA AP-42, Fifth Edition, 10/98.

For bulldozing:

$$\text{PM}_{10} \text{ emissions factor (lb/hr)} = 0.75 * [1.0 (s)^{1.5} / (M)^{1.4}]$$

$$\text{PM}_{2.5} \text{ emission factor (lb/hr)} = 0.105 * [5.7(s)^{1.2} / (M)^{1.3}]$$

For grading:

$$\text{PM}_{10} \text{ emission factor (lb/VMT)} = 0.60 * [0.051 (S)^{2.0}]$$

$$\text{PM}_{2.5} \text{ emission factor (lb/VMT)} = 0.031 * [0.040 (S)^{2.5}]$$

Where:

$$\begin{aligned} s \text{ (Silt Content)} &= 8.5 \\ M \text{ (Moisture Content)} &= 7.9 \\ S \text{ (Vehicle Speed)} &= 8 \end{aligned}$$

2. Vehicle miles traveled for grading calculate based on amount of land disturbed during construction each year, as follows:

	2018
Land Disturbed (acres):	1
Square Miles:	0.002
Miles in 1 Direction:	0.040
Feet in 1 Direction:	209
Clearance of Grader (ft):	5
Number of Trips for 1 Grade:	42
Miles to Clear 1 Direction:	1.65
Miles with 50% Safety Factor:	2.5
Number of Times to Go Over Surface:	2
Total Travel (VMT/yr):	4.95

## Adelphia Gateway Project

**Table 9-C-99. Fugitive Emissions from Soil Pile Wind Erosion, Tilghman Lateral Meter Station Construction**

Material Pile Description	Size (acres) <sup>3</sup>	Emission Control Method	Control Efficiency <sup>4</sup>	Emission Factor <sup>1</sup>			2018 Emissions (tpy) <sup>5</sup>		
				PM	PM <sub>10</sub>	PM <sub>2.5</sub>	PM	PM <sub>10</sub>	PM <sub>2.5</sub>
Tilghman Lateral Meter Station Stockpiles	0.057	Mulch/seeding	75%	5.06	2.53	0.38	0.02	0.01	0.00
<b>Total Stockpile Erosion Emissions</b>							<b>0.02</b>	<b>0.01</b>	<b>0.00</b>

<sup>1</sup>USEPA, 1992 (Fugitive Dust Background and Technical Information Document for Best Available Control Measures, Section 2.3.1.3.3, Wind Emissions from Continuously Active Piles). USEPA, 2006 13.2.5 for k factors:

$$EF \text{ (lb/day/acre)} = k \times 1.7 \times (s/1.5) \times ((365 - p)/235) \times (f/15) \times (1 - \% \text{ Control Efficiency})$$

<sup>2</sup>Total PM assumed to be equal to PM < 30 μm

	Tilghman Lateral Meter Station
Days of precipitation greater than or equal to 0.01 inch (p)	118
Time (%) that unobstructed wind speed exceeds 5.4 m/s at mean pile height (f)	30.0

Silt Content (%), (s)	8.5
Particle Size multiplier (k)	1 (for PM < 30 μm) 0.5 (for PM < 10 μm) 0.075 (for PM < 2.5 μm)

<sup>3</sup>Soil Pile Areas:

Compressor Stations Stockpile Area:	1 stockpiles 50 ft. wide 50 ft. wide <b>0.057 acres</b>
-------------------------------------	--

<sup>4</sup>Engineering estimate for control efficiency from use of mulch/seeding to control erosion.

<sup>5</sup>Emissions are based on the construction schedule below:

2018 days	Location
110	Tilghman Lateral Meter Station

## Adelphia Gateway Project

**Table 9-C-100. Criteria Pollutant Emissions Summary, Skippack Meter Station Construction**

Source	2018 Construction Emissions (tpy)						
	NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Construction Equipment Engines	2.91	6.17	0.23	0.55	0.43	0.43	1,134.75
On-Road Vehicle Travel	0.02	0.62	0.00	0.02	0.00	0.00	17.85
Off-Road Vehicle Travel	--	--	--	--	0.89	0.09	--
Earthmoving Fugitives	--	--	--	--	0.00	0.00	--
Pile Erosion	--	--	--	--	0.01	0.00	--
<b>TOTAL:</b>	<b>2.93</b>	<b>6.79</b>	<b>0.23</b>	<b>0.56</b>	<b>1.34</b>	<b>0.52</b>	<b>1,152.60</b>

## Adelphia Gateway Project

**Table 9-C-101. HAP Emissions Summary, Skippack Meter Station Construction**

Source	2018 Construction Emissions (tpy)					
	Acetaldehyde	Acrolein	Benzene	1,3-Butadiene	Formaldehyde	Total HAPs
Construction Equipment Engines	2.89E-02	1.64E-03	1.09E-02	1.09E-03	6.43E-02	1.07E-01
On-Road Vehicle Travel	6.57E-05	8.49E-06	8.42E-04	9.34E-05	1.71E-04	1.18E-03
Off-Road Vehicle Travel	--	--	--	--	--	--
Earthmoving Fugitives	--	--	--	--	--	--
Pile Erosion	--	--	--	--	--	--
<b>TOTAL:</b>	<b>2.90E-02</b>	<b>1.64E-03</b>	<b>1.17E-02</b>	<b>1.18E-03</b>	<b>6.45E-02</b>	<b>1.08E-01</b>

# Adelphia Gateway Project

Table 9-C-102. Criteria Pollutant Emissions from Construction Engines, Skippack Meter Station Construction

Equipment Type	SCC	Max. Engine Rating (hp)	Average Engine Load (hp)	Load Factor <sup>3</sup>	Operations			2018 Construction Year Emissions (tpy)						
					Quantity	(hr/week)	(weeks/yr)	NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Air Compressor A	2270006015	310	133.3	0.43	1	60	18	0.28	0.06	0.02	0.03	0.03	0.03	84.18
Air Compressor B	2270006015	310	133.3	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All Terrain Vehicle (ATV) <sup>1</sup>	2282005015	18	3.78	0.21	1	60	18	0.03	0.71	0.00	0.06	0.00	0.00	5.79
Asphalt Paver	2270002003	153	90.27	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backhoe	2265002066	75	36	0.48	1	60	18	0.05	0.53	0.00	0.02	0.00	0.00	29.96
Bobcat <sup>2</sup>	2265003040	150	81	0.54	1	60	18	0.14	1.53	0.00	0.05	0.01	0.01	67.48
Booster/Pumps	2270006010	370	159.1	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bucket Truck	2270002051	300	177	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chain Saw	2260004020	3	2.1	0.7	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cherry Picker	2270002081	160	94.4	0.59	1	60	18	0.25	0.24	0.02	0.03	0.04	0.04	66.92
Chipper/Shredder	2270004066	20	8.6	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor	2270002009	300	129	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor, Vibratory	2270002009	100	43	0.43	2	60	1	0.03	0.01	0.00	0.00	0.00	0.00	3.35
Concrete Mixer Truck ( main pours )	2270002042	150	64.5	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Mixer Truck ( small pours )	2270002042	150	64.5	0.43	1	2	10	0.01	0.00	0.00	0.00	0.00	0.00	0.84
Concrete Pumps	2270006010	300	129	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Crawler	2270002069	450	265.5	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled ( 20 ton )	2270002045	150	64.5	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (250 ton ) A	2270002045	715	307.45	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (250 ton ) B	2270002045	715	307.45	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cuttings Cleaner System	2270002081	300	177	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Digger Derrick	2270002033	300	129	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozers	2270002069	410	241.9	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Drill Engine	2270002081	20	11.8	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Drilling Rig	2270002033	950	408.5	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	2270002078	325	68.25	0.21	1	60	18	0.34	0.19	0.01	0.05	0.04	0.04	50.74
Excavator	2270002036	138	81.42	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fork Lift	2270003020	120	70.8	0.59	1	60	18	0.04	0.04	0.01	0.01	0.02	0.02	50.21
Front End Loaders	2270002066	196	41.16	0.21	1	60	18	0.16	0.10	0.01	0.03	0.02	0.02	30.62
Generators	2270006005	430	184.9	0.43	1	60	18	0.75	0.20	0.03	0.06	0.06	0.06	116.69
Grader	2270002048	140	82.6	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDD Rig	2270002033	600	258	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heavy Lift Crane	2270002045	340	146.2	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrotest Truck	2270002051	100	59	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jack Hammer	2270003040	405	174.15	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Light Tower	2270002081	50	29.5	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Man Lift A	2270003010	50	10.5	0.21	1	60	10	0.04	0.03	0.00	0.01	0.01	0.01	4.81
Man Lift B	2270003010	50	10.5	0.21	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mudd Unit	2270002081	400	236	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Trucks	2270002051	250	147.5	0.59	4	60	18	0.33	0.14	0.08	0.09	0.14	0.14	376.77
Pile Driver	2270002081	350	206.5	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipe Beveling Machine	2270002081	20	11.8	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipe Tractor Trailer	2265002066	400	192	0.48	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Portable Pipe Bender	2270003040	75	32.25	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rigging Loft	2265003010	10	4.6	0.46	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller	2270002015	300	177	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scissor Lift	2270003010	20	4.2	0.21	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
School Bus	2270002051	100	59	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scrapper	2270002018	488	287.92	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SideBoom	2270002069	240	141.6	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Skid Steer Loader	2270002072	75	15.75	0.21	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stake Bed	2270002081	200	118	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sweeper	2270003030	12	5.16	0.43	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tamper	2260002006	4	2.2	0.55	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tandem Truck	2270002069	200	118	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trackhoe	2265002066	320	153.6	0.48	1	60	18	0.23	2.26	0.01	0.07	0.01	0.01	127.83
Trenching Machines	2270002030	200	118	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trowel	2270002081	8	4.72	0.59	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water / Fuel Truck	2270002051	250	147.5	0.59	1	60	18	0.08	0.03	0.02	0.02	0.03	0.03	94.19
Welder	2270006025	35	7.35	0.21	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

# Adelphia Gateway Project

**Table 9-C-102. Criteria Pollutant Emissions from Construction Engines, Skippack Meter Station Construction**

Equipment Type	SCC	Max. Engine Rating (hp)	Average Engine Load (hp)	Load Factor <sup>3</sup>	Operations			2018 Construction Year Emissions (tpy)						
					Quantity	(hr/week)	(weeks/yr)	NO <sub>x</sub>	CO	SO <sub>2</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Welding Machine	2270006025	35	7.35	0.21	2	60	18	0.09	0.08	0.00	0.02	0.01	0.01	12.12
Welding Rig	2270002051	10	5.9	0.59	2	60	18	0.04	0.01	0.00	0.00	0.00	0.00	7.53
X-Ray Truck/Machine	2270002051	50	29.5	0.59	1	30	9	0.02	0.01	0.00	0.00	0.00	0.00	4.71

<sup>1</sup>NONROAD2008a Model does not contain Emission Factors for All Terrain Vehicles (ATVs). Used Emission Factors for Personal Watercraft as a substitution.

<sup>2</sup>NONROAD2008a Model does not contain Emission Factors for Bobcat vehicle type. Used Emission Factors for Other Industrial Equipment vehicle type as a substitution.

<sup>3</sup> Load factors as recommended for estimation of emissions using NONROAD emission factors in EPA420-P-04-005 Revised April 2004



## Adelphia Gateway Project

**Table 9-C-103. HAP Emissions from Construction Engines, Skippack Meter Station Construction**

Pollutant	2018 Emissions (tpy)
Acetaldehyde	2.89E-02
Acrolein	1.64E-03
Benzene	1.09E-02
1,3-Butadiene	1.09E-03
Formaldehyde	6.43E-02

1. Emissions of HAPs are estimated based on total VOC emissions for the construction year and Table 3.1-3 Air Toxic Fractions of VOC in EPA's guidance document *Final Regulatory Analysis and Control of Emissions from Nonroad Diesel Engines*, EPA420-R-04-007, May 2004.

Pollutant	Fraction of VOC
Acetaldehyde	0.053
Acrolein	0.003
Benzene	0.020
1,3-Butadiene	0.002
Formaldehyde	0.118

## Adelphia Gateway Project

**Table 9-C-104. On-Road Engine Emission Factors, Skippack Meter Station Construction**

Pollutant	2018 Emission Factors (grams/mile)				
	LDGV	LDGT	LDDT	COM BUS	HDDV
NO <sub>x</sub>	3.28E-01	3.69E-01	4.06E-01	6.38E+00	2.71E+00
CO	1.28E+01	1.25E+01	4.77E-01	8.85E-01	5.15E-01
SO <sub>2</sub>	6.80E-03	8.80E-03	4.10E-03	1.12E-02	1.06E-02
VOC	3.83E-01	4.53E-01	2.12E-01	3.28E-01	2.38E-01
PM <sub>10</sub>	2.47E-02	2.48E-02	4.02E-02	3.71E-02	7.62E-02
PM <sub>2.5</sub>	1.12E-02	1.13E-02	2.55E-02	2.06E-02	4.66E-02
CO <sub>2</sub>	3.68E+02	4.79E+02	5.99E+02	1.65E+03	1.54E+03
Acetaldehyde	1.36E-03	1.55E-03	2.62E-03	9.90E-03	7.19E-03
Acrolein	1.75E-04	2.00E-04	7.40E-04	1.21E-03	8.75E-04
Benzene	1.74E-02	1.98E-02	4.26E-03	3.61E-03	2.62E-03
1,3-Butadiene	1.93E-03	2.20E-03	1.92E-03	2.10E-03	1.52E-03
Formaldehyde	3.53E-03	4.02E-03	8.21E-03	2.69E-02	1.95E-02

1. The emission factors were calculated using EPA's Mobile6.2 Vehicle Emission Modeling Software. Emission factors for each calendar year are based on average of Mobile6.2 generated factors for winter and summer of that year.
2. Temperatures for winter were based on average temperatures in December, January, and February, and the temperatures for summer were based on average temperatures in June, July, and August. The data was extracted from United States Environmental Protection Agency Outdoor Air Quality Data website (<https://www.epa.gov/outdoor-air-quality-data/monitor-values-report>)
3. Fuel assumptions included conventional gasoline, with an average RVP limit of 9 psi, and diesel with average sulfur content of 11 ppm.

## Adelphia Gateway Project

**Table 9-C-105. On-Road Vehicle Travel, Skippack Meter Station Construction**

Vehicle Type	2018			Total Miles Per Year
	Round Trip (miles)	Trips per Day	Days/Year	
Commuter Bus	0	0	0	0
Light-Duty Diesel Truck	0	0	0	0
Light-Duty Gasoline Truck	0	0	0	0
Light-Duty Gasoline Vehicle	40	10	110	44,000
Heavy Duty Diesel Vehicle	0	0	0	0
Fuel Delivery	0	0	0	0

## Adelphia Gateway Project

**Table 9-C-106. On-Road Engine Emissions, Skippack Meter Station Construction**

Pollutant	2018 Annual Emissions (tpy)				
	LDGV	LDGT	LDDT	COM BUS	HDDV
NO <sub>x</sub>	1.59E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO	6.19E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SO <sub>2</sub>	3.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOC	1.86E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PM <sub>10</sub>	1.20E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PM <sub>2.5</sub>	5.43E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO <sub>2</sub>	1.78E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	6.57E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acrolein	8.49E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	8.42E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-Butadiene	9.34E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Formaldehyde	1.71E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00

## Adelphia Gateway Project

**Table 9-C-107. Off-Road Vehicle Travel, Skippack Meter Station Construction**

Vehicle Type	2018			Total Miles Per Year
	Round Trip (miles)	Trips per Day	Days/Year	
All Terrain Vehicle (ATV)	0	0	0	0
Dump Trucks	0	0	0	0
Light Duty Trucks	40	2	110	8,800
Medium Duty Trucks	0	0	0	0
School Bus	0	0	0	0
Water / Fuel Truck	40	0.14	110	629

## Adelphia Gateway Project

**Table 9-C-108. Off-Road Engine Emissions, Skippack Meter Station Construction**

Vehicle Type	Mean Vehicle Weight (tons)	Emission Factor <sup>1</sup>		Control Efficiency <sup>2</sup> (%)	2018 Annual Emissions	
		PM <sub>10</sub> (lb/VMT)	PM <sub>2.5</sub> (lb/VMT)		PM <sub>10</sub> (tpy)	PM <sub>2.5</sub> (tpy)
All Terrain Vehicle (ATV)	0.25	0.24	0.02	75%	0.00	0.00
Dump Trucks	20	1.75	0.17	75%	0.00	0.00
Light Duty Trucks	2.5	0.69	0.07	75%	0.75	0.08
Medium Duty Trucks	5	0.94	0.09	75%	0.00	0.00
School Bus	15	1.54	0.15	75%	0.00	0.00
Water / Fuel Truck	20	1.75	0.17	75%	0.14	0.01

1. Emission factors calculated in accordance with AP-42 Section 13.2.2:

$$\text{Unpaved Roads: } E = k(s/12)^a(W/3)^b \cdot [(365-p)/365]$$

k Factor (PM <sub>10</sub> , PM <sub>2.5</sub> ) (lb/VMT)	1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	8.5	%	AP-42 Table 13.2.2-1 (Final, 11/06)
Number of Rain Days, p	118		AP-42 Figure 13.2.2-1 (Final, 11/06)
a (PM <sub>10</sub> , PM <sub>2.5</sub> )	0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b (PM <sub>10</sub> , PM <sub>2.5</sub> )	0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

2. Assumed average dust control efficiency for road watering from AP-42 Section 13.2.2 and related background documents.

## Adelphia Gateway Project

**Table 9-C-109. Fugitive Emissions from Earthmoving, Skippack Meter Station Construction**

On-Site Activity	Emission Factors <sup>1</sup>			Operation <sup>2</sup>		PM <sub>10</sub> Emissions (tpy)	PM <sub>2.5</sub> Emissions (tpy)
	PM <sub>10</sub>	PM <sub>2.5</sub>	Units of Measure	2018	Units of Measure	2018	2018
Bulldozing	1.03E+00	5.31E-01	lb/hr	0	hr/yr	0.00E+00	0.00E+00
Grading	1.96E+00	2.24E-01	lb/VMT	5.0	VMT/yr	4.85E-03	5.56E-04

1. Emissions were calculated using emission factor equations from Table 11.9-1, Compilation of Air Pollutant Emission Factors, USEPA AP-42, Fifth Edition, 10/98.

For bulldozing:

$$PM_{10} \text{ emissions factor (lb/hr)} = 0.75 * [1.0 (s)^{1.5} / (M)^{1.4}]$$

$$PM_{2.5} \text{ emission factor (lb/hr)} = 0.105 * [5.7(s)^{1.2} / (M)^{1.3}]$$

For grading:

$$PM_{10} \text{ emission factor (lb/VMT)} = 0.60 * [0.051 (S)^{2.0}]$$

$$PM_{2.5} \text{ emission factor (lb/VMT)} = 0.031 * [0.040 (S)^{2.5}]$$

Where:

$$s \text{ (Silt Content)} = 8.5$$

$$M \text{ (Moisture Content)} = 7.9$$

$$S \text{ (Vehicle Speed)} = 8$$

2. Vehicle miles traveled for grading calculate based on amount of land disturbed during construction each year, as follows:

	2018
Land Disturbed (acres):	1
Square Miles:	0.002
Miles in 1 Direction:	0.040
Feet in 1 Direction:	209
Clearance of Grader (ft):	5
Number of Trips for 1 Grade:	42
Miles to Clear 1 Direction:	1.65
Miles with 50% Safety Factor:	2.5
Number of Times to Go Over Surface:	2
Total Travel (VMT/yr):	4.95

# Adelphia Gateway Project

**Table 9-C-110. Fugitive Emissions from Soil Pile Wind Erosion, Skippack Meter Station Construction**

Material Pile Description	Size (acres) <sup>3</sup>	Emission Control Method	Control Efficiency <sup>4</sup>	Emission Factor <sup>1</sup>			Unit	2018 Emissions (tpy) <sup>5</sup>		
				PM	PM <sub>10</sub>	PM <sub>2.5</sub>		PM	PM <sub>10</sub>	PM <sub>2.5</sub>
Skippack Meter Station Stockpiles	0.057	Mulch/seeding	75%	5.06	2.53	0.38	lb/day/acre	0.02	0.01	0.00
<b>Skippack Meter Station Total</b>	0.057	Mulch/seeding	75%	--	--	--	--	0.02	0.01	0.00
<b>Total Stockpile Erosion Emissions</b>								<b>0.02</b>	<b>0.01</b>	<b>0.00</b>

<sup>1</sup>USEPA, 1992 (Fugitive Dust Background and Technical Information Document for Best Available Control Measures, Section 2.3.1.3.3, Wind Emissions from Continuously Active Piles). USEPA, 2006 13.2.5 for k factors:

$$EF \text{ (lb/day/acre)} = k \times 1.7 \times (s/1.5) \times ((365 - p)/235) \times (f/15) \times (1 - \% \text{ Control Efficiency})$$

<sup>2</sup>Total PM assumed to be equal to PM < 30 μm

	Skippack MS
Days of precipitation greater than or equal to 0.01 inch (p)	118
Time (%) that unobstructed wind speed exceeds 5.4 m/s at mean pile height (f)	30.0

Silt Content (%), (s) 8.5  
 Particle Size multiplier (k) 1 (for PM < 30 μm)  
 0.5 (for PM < 10 μm)  
 0.075 (for PM < 2.5 μm)

<sup>3</sup>Soil Pile Areas:

Skippack Meter Stations Stockpile Area: 1 stockpiles  
 50 ft. wide  
 50 ft. wide  
**0.057 acres**

<sup>4</sup>Engineering estimate for control efficiency from use of mulch/seeding to control erosion.

<sup>5</sup>Emissions are based on the construction schedule below:

Start	End	2018 days	Location
		110	Adelphia Meter Station