2019 Annual Air Emissions Inventory

Supporting Documentation

The University of North Carolina at Chapel Hill
Chapel Hill, North Carolina

Facility ID # 6800043
Permit # 03069T35

Prepared for:

The University of North Carolina at Chapel Hill
Department of Environment, Health, and Safety
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Chapel Hill, North Carolina 27599-1650

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ES ID	Source/Operating Scenario Description
ES-007-ES-008	Two Blackstart Generators at the Cogeneration Facility
ES-T-003, 004	Two 184,200 gallon Fuel Oil Tanks at Manning Drive
IES-SBs	Fifteen (15) Small Boilers/Hotwater Heaters
IES-Gen	Grouped Small Emergency Generators
ES-010	Enclosed Railcar Dump Pits
ES-1, ES-2	Coal Storage Silos
ES-3.1 - ES-3.5	Silo Conveyors
T-001	Fuel Oil Storage Tank
T-002	Fuel Oil Storage Tank
ES-001	Boiler #6
	- Coal Firing
	- Natural Gas Firing
	- No. 2 Fuel Oil Firing
	- Wood Pellet Firing
ES-002	Boiler #7
	- Coal Firing
	- Natural Gas Firing
	- No. 2 Fuel Oil Firing
	- Wood Pellet Firing
ES-003	Boiler #8
	- Natural Gas Firing
	- No. 2 Fuel Oil Firing
ES-004	Boiler #9
	- No. 2 Fuel Oil Firing
	- Natural Gas Firing
ES-005	Boiler #10
	- No. 2 Fuel Oil Firing
	- Natural Gas Firing
ES-010A	Coal Crusher/Conveyor Building
ES-030	Ash Silo with Loadout
ES-030A	Wet Ash Loadout
ES-EG#1	EPA Building Emergency Generator
ES-EG#10	Bondurant Hall Emergency Generator
ES-EG#11	Burnett-Womack Building Emergency Generator
ES-EG#12	Mary Ellen Jones Building Emergency Generator
ES-EG#13	Genetic Medicine Building Emergency Generator
ES-EG#14	440 W. Franklin Building Emergency Generator
ES-EG#15	Rams Head Center Emergency Generator
ES-EG#16	ITS Building Emergency Generator
ES-EG#17	Brinkhous-Bullitt Building Emergency Generator
ES-EG#18	Venable Hall Emergency Generator
ES-EG#19	Imaging Research Building Emergency Generator
ES-EG#2	Thurston Bowles Building Emergency Generator
ES-EG#20	Genomic Science Building Emergency Generator

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2019 Annual Emissions Inventory **Facility Summary**

Pollutant	Units	Boiler #6				Boiler #6	Boiler #7				Boiler #7	Boiler #8		Boiler #8	Boiler #9		Boiler #9	Boiler #10		Boiler #10	Railcar Dump Pits	Coal Storage Silos	Coal Silo Conveyors	Sorbent Railcar Dump Pit	Ash Silo w/ Loadout	Coal Conveyor & Crusher Building	Blackstart Generators G1 & G2	Sterilizers located at Dental School	Grouped Small Emergency Generators (No. 2 Fuel Oil)	EPA Building Emergency Generator	Bondurant Emergency Generator	New East Emergency Generator
		Natural Gas	Fuel Oil	Wood	Coal	Total	Natural Gas	Fuel Oil	Wood	Coal	Total	Natural Gas	Fuel Oil	Total	Natural Gas	Fuel Oil	Total	Natural Gas	Fuel Oil	Total												
Criteria Pollutants																																
PM	tpy	1.44	0.00E+00	0.00E+00	3.40	4.84	1.17	0.00E+00		2.64	3.81	0.223	0.00E+00	0.223	0.549	0.000	0.549	0.395	0.000	0.395	3.84E-03	0.0026	0.0026	1.06E-02	1.14	0.41	0.05		0.167	1.23E-03	7.70E-03	
PM-10	tpy	1.44	0.00E+00	0.00E+00	3.40	4.84	1.17	0.00E+00		2.64	3.81	0.223	0.00E+00	0.223	0.549	0.000	0.549	0.395	0.000	0.395	1.81E-03	0.0026	0.0026	4.99E-03	1.14	0.41	0.05		0.167	1.23E-03	7.70E-03	
PM-2.5	tpy	1.44	0.00E+00	0.00E+00	1.96	3.40	1.17	0.00E+00		1.52	2.69	0.223	0.00E+00	0.223	0.549	0.000	0.549	0.395	0.000	0.395	5.70E-04	0.0025	0.0025	1.57E-03	1.08	0.39	0.05		0.167	1.23E-03	7.70E-03	
NOx	tpy	35.13	0.00E+00	0.00E+00	72.75	107.88	37.85	0.00E+00		75.11	112.96	1.631	0.00E+00	1.631	3.026	0.000	3.026	2.533	0.000	2.533							0.90		2.37	2.33E-02	1.46E-01	
VOC	tpy	1.04	0.00E+00	0.00E+00	0.19	1.23	0.85	0.00E+00		0.14	0.99	0.161	0.00E+00	0.161	0.397	0.000	0.397	0.286	0.000	0.286							0.04	0.00	0.193	1.01E-03	6.31E-03	
CO	tpy	15.91	0.00E+00	0.00E+00	13.72	29.62	12.91	0.00E+00		10.67	23.58	2.465	0.00E+00	2.465	6.068	0.000	6.068	4.367	0.000	4.367							0.12		0.51	1.04E-02	6.55E-02	
SO2	tpy	0.00	0.00E+00		157.10	157.10	0.00	0.00E+00		118.05	118.05	0.018	0.00E+00	0.018	0.043	0.000	0.043	0.031	0.000	0.031							0.02		0.03	6.20E-04	3.89E-03	
Greenhouse Gases																																
CO2	tpy	27,634	0.00	0.00	100,594	128,228	22,546	0.00E+00		78,652	101,198	1,505	0	1,505	10,346	0	10,346	7,573	0	7,573							77.40		87.63	2.00	12.56	
Methane	tpy	0.43	0.00E+00	0.00E+00	9.8	10.18	0.35	0.00E+00		7.59	7.94	0.066	0.00E+00	0.066	0.163	0.000	0.163	0.118	0.000	0.118							0.003		3.55E-03	8.13E-05	5.10E-04	
Nitrous Oxide	tpy	0.043	0.00E+00	0.00E+00	1.4	1.46	3.48E-02	0.00E+00		1.10	1.14	0.007	0.00E+00	0.007	0.016	0.000	0.016	0.012	0.000	0.012							0.0006		7.11E-04	1.63E-05	1.02E-04	
HAPs/TAPs																																
1,3 Butadiene	lb/yr					0					0			0			0			0									4.20E-02			
2,3,7,8-TCDD	lb/yr			0.00E+00	4.68E-07	4.68E-07				3.63E-07	3.63E-07			0			0			0												
2,4-Dinitrotoluene	lb/yr				9.16E-03	9.16E-03				0.01	0.01			0			0			0												
2-Chloroacetophenone	lb/yr				0.23	0.23				0.18	0.17757873			0			0			0												
Acetaldehyde	lb/yr			0.00E+00	18.65	18.65				14.46	14.46			0			0			0							0.02		8.24E-01	6.19E-04	3.88E-03	
Acetic Acid	lb/yr					0					0			0			0			0												
Acetophenone	lb/yr			0.00E+00	0.49	0.49				0.38	0.38			0			0			0												
Acrolein	lb/yr			0.00E+00	9.49	9.49				7.36	7.36			0			0			0							0.01		9.94E-02	1.94E-04	1.21E-03	
Antimony	lb/yr		0.00E+00	0.00E+00	0.26	0.26		0.00E+00		0.20	0.20			0			0			0												
Arsenic	lb/yr	0.08	0.00E+00	0.00E+00	0.24	0.32	6.15E-02	0.00E+00		0.19	0.25	0.012	0.00E+00	0.012	0.029	0.000	0.029	0.021	0.000	0.021									4.30E-03	9.83E-05	6.16E-04	
Benzene	lb/yr	0.8	0.00E+00	0.00E+00	42.53	43.33	6.46E-01	0.00E+00		32.98	33.62	0.123	0.00E+00	0.123	0.303	0.000	0.303	0.218	0.000	0.218							0.74		1.00E+00	1.91E-02	1.20E-01	
Benzo(a)pyrene	lb/yr			0.00E+00	1.24E-03	1.24E-03				0.00	9.64E-04			0			0			0									2.02E-04	6.31E-06	3.96E-05	
Benzyl Chloride	lb/yr				22.90	22.901963				17.76	17.76			0			0			0												
Beryllium	lb/yr		0.00E+00	0.00E+00	0.04	0.04		0.00E+00		0.03	0.03		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00									3.22E-03	7.37E-05	4.62E-04	
Biphenyl	lb/yr				5.56E-02	0.06				4.31E-02	0.04			0			0			0												
Bis(2-ethylhexyl)phthalate (DEHP)	lb/yr				2.39	2.39				1.85	1.85			0			0			0												
Bromine	lb/yr				6.60	6.60				5.13	5.13			0			0			0												
Bromoform	lb/yr				1.28	1.28				0.99	0.99			0			0			0												
Cadmium	lb/yr	0.42	0.00E+00	0.00E+00	1.12E-01	0.53	3.38E-01	0.00E+00		8.70E-02	0.43	0.065	0.00E+00	0.065	0.159	0.000	0.159	0.114	0.000	0.114									3.22E-03	7.37E-05	4.62E-04	
Carbon Disulfide	lb/yr				4.25	4.25				3.30	3.30			0			0			0												
Chlorine	lb/yr			0.00E+00	86.89	86.89				67.60	67.60																					
Chlorobenzene	lb/yr			0.00E+00	0.72	0.72				0.56	0.56			0			0			0												
Chloroform	lb/yr			0.00E+00	1.93	1.93				1.50	1.50			0			0			0												
Chromium	lb/yr	0.53	0.00E+00	0.00E+00	3.86	4.39	4.30E-01	0.00E+00		3.00	3.43	0.082	0.00E+00	0.082	0.202	0.000	0.202	0.146	0.000	0.146									3.22E-03	7.37E-05	4.62E-04	
Chromium VI	lb/yr	0.53	0.00E+00		0.01	0.54	4.30E-01	0.00E+00		0.01	0.44	0.082	0.00E+00	0.082	0.202	0.000	0.202	0.146	0.000	0.146												
Cobalt	lb/yr		0.00E+00	0.00E+00	0.22	0.22		0.00E+00		0.17	0.17			0			0			0												
Cumene	lb/yr				0.17	0.17				0.13	0.13			0			0			0												
Cyanide	lb/yr				81.79	81.79				63.42	63.42			0			0			0												
Dibenzofurans	lb/yr				6.58E-03	0.01				5.10E-03	0.01			0			0			0												
Dichlorobenzene	lb/yr	0.45				0.45446971	3.69E-01				3.69E-01	0.070		0.070	0.173		0.173	0.125		0.125												
Dimethyl Sulfate	lb/yr				1.57	1.57				1.22	1.22			0			0			0												
Ethyl Benzene	lb/yr		0.00E+00	0.00E+00	3.08	3.08		0.00E+00		2.38	2.38		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00												
Ethyl Chloride	lb/yr				1.37	1.37				1.07	1.07			0			0			0												
Ethylene Dibromide	lb/yr				3.93E-02	0.04				3.04E-02	0.03			0			0			0												
Ethylene Dichloride	lb/yr			0.00E+00	1.31	1.31				1.01	1.01			0			0			0												
Ethylene Glycol	lb/yr					0					0			0			0			0												
Ethylene Oxide	lb/yr					0					0			0			0			0								9.09				
Flouride	lb/yr		0.00E+00			0.00		0.00E+00			0.00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00												
Formaldehyde	lb/yr	28.40	0.00E+00	0.00E+00	52.94	81.35	2.31E+01	0.00E+00		41.18	64.24	4.402	0.00E+00	4.402	10.835	0.00E+00	10.835	7.798	0.00E+00	7.798							0.07		1.27E+00	1.94E-03	1.22E-02	
Glycol Ethers	lb/yr					0					0			0			0			0												
Hexane	lb/yr	681.70			2.19	683.90	5.53E+02			1.70	555.06	105.638		105.638	260.046		260.046	187.146		187.146												
Hydrogen Chloride	lb/yr			0.00E+00	16,091.57	16,091.57				12642.96	12642.96			0			0			0												
Hydrogen Fluoride	lb/yr				185.05	185.05				143.95	143.95			0			0			0												
Isophorone	lb/yr				18.98	18.98				14.71	14.71			0			0			0												
Lead	lb/yr	0.19	0.00E+00	0.00E+00	1.42	1.61	1.54E-01	0.00E+00		1.10	1.26	0.029	0.00E+00	0.029	0.072	0.000	0.072	0.052	0.000	0.052									9.67E-03	2.21E-04	1.39E-03	
Manganese	lb/yr	0.14	0.00E+00	0.00E+00	9.65	9.80	1.17E-01	0.00E+00		7.51	7.63	0.022	0.00E+00	0.022	0.055	0.000	0.055	0.040	0.000	0.040									6.45E-03	1.47E-04	9.24E-04	
Mercury	lb/yr	0.10	0.00E+00	0.00E+00	0.67	0.77	7.99E-02	0.00E+00		0.52	0.60	0.015	0.00E+00	0.015	0.038	0.000	0.038	0.027	0.000	0.027									3.22E-03	7.37E-05	4.62E-04	
Methly Chloride	lb/yr			0.00E+00	17.34	17.34				13.45	13.45			0			0			0												
Methly Ethyl Ketone	lb/yr			0.00E+00	12.76	12.76				9.89	9.89			0			0			0												
Methyl Bromide	lb/yr				5.23	5.23				4.06	4.06			0			0			0												
Methyl Chloroform	lb/yr		0.00E+00	0.00E+00		0.00E+00		0.00E+00			0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00												
Methyl Hydrazine	lb/yr				5.56	5.56				4.31	4.31			0			0			0												
Methyl Methacrylate	lb/yr				0.65	0.65				0.51	0.51			0			0			0												
Methyl Tert Butyl Ether	lb/yr				1.15	1.15				0.89	0.89			0			0			0												
Methylene Chloride	lb/yr			0.00E+00	9.49	9.49				7.36	7.36			0			0			0												
Napthalene	lb/yr	0.23	0.00E+00	0.00E+00	0.43	0.66	1.88E-01	0.00E+00		0.33	0.52	0.036	0.00E+00	0.036	0.088	0.000	0.088	0.063	0.000	0.063							0.12		9.11E-02	3.19E-03	2.00E-02	
Nickel	lb/yr	0.80	0.00E+00	0.00E+00	7.86	8.66	6.46E-01	0.00E+00		6.11	6.76	0.123	0.00E+00	0.123	0.303	0.000	0.303	0.218	0.000	0.218									3.22E-03	7.37E-05	4.62E-04	
PAH	lb/yr					0					0			0			0			0									1.81E-01	5.21E-03	3.27E-02	
Phenol	lb/yr			0.00E+00	0.52	0.52				0.41	0.41			0			0			0												
Phosphorus	lb/yr			0.00E+00	1.17	1.17				0.91	0.91																					
POM	lb/yr	0.25	0.00E+00	0.00E+00	1.80	2.05	2.03E-01	0.00E+00		1.40	1.61	0.039	0.00E+00	0.039	0.096	0.000	0.096	0.069	0.000	0.069												
Propionaldehyde	lb/yr			0.00E+00	12.43	12.43				9.64	9.64			0			0			0												
Propylene	lb/yr					0					0			0			0			0							0.20					
Selenium	lb/yr		0.00E+00	0.00E+00	0.17	0.17		0.00E+00		0.13	0.13		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00									1.61E-02	3.69E-04	2.31E-03	
Styrene	lb/yr			0.00E+00	0.82	0.82				0.63	0.63			0			0			0												
Tetrachloroethane	lb/yr				1.41	1.41				1.09	1.09			0			0			0												
Toluene	lb/yr	1.29	0.00E+00	0.00E+00	7.85	9.14	1.05E+00	0.00E+00		6.09	7.13	0.200	0.00E+00	0.200	0.491	0.000	0.491	0.353	0.000	0.353							0.27		4.40E-01	6.90E-03	4.33E-02	
Vinyl Acetate	lb/yr				0.25	0.25				0.19	0.19			0			0			0												
Xylenes	lb/yr		0.00E+00	0.00E+00	1.21	1.21		0.00E+00		0.94	0.94		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00							0.18		3.06E-01	4.74E-03	2.97E-02	

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Pollutant	Units	Burnett-Womack Building Emergency Generator	Mary Ellen Jones Building Emergency Generator	Genetic Medicine Building Emergency Generator	440 W. Franklin Emergency Generator	Rams Head Emergency Generator	ITS Emergency Generator	Brinkhous-Bullitt Emergency Generator	Venable Emergency Generator	IRB Emergency Generator	Thurston Bowles Building Emergency Generator	Genomic Science Building Emergency Generator	Dental Research Building Emergency Generator	Lineberger Emergency Generator	Taylor Hall Emergency Generator	Old Dental School Emergency Generator	Neuroscience Research Emergency Generator	MBRB Emergency Generator	Michael Hooker Bldg. Emergency Generator	Chapman Hall Emergency Generator	Caudill Labs Emergency Generator	Kenan Fire Pump	McColl Fire Pump	Davis Library Fire Pump	Davie Hall Emergency Generator	Ambulatory Care Emergency Generator
Criteria Pollutants																										
PM	tpy	1.40E-02	1.34E-02	1.50E-02	1.87E-02	1.29E-02	1.80E-02	7.70E-03	1.10E-02	1.90E-02	1.11E-02	1.50E-02	1.10E-02	6.85E-03	6.96E-03		6.82E-03	1.44E-02	5.35E-03	6.85E-03	9.10E-03	1.90E-03	1.01E-03	7.48E-04	2.42E-03	6.26E-03
PM-10	tpy	1.40E-02	1.34E-02	1.50E-02	1.87E-02	1.29E-02	1.80E-02	7.70E-03	1.10E-02	1.90E-02	1.11E-02	1.50E-02	1.10E-02	6.85E-03	6.96E-03		6.82E-03	1.44E-02	5.35E-03	6.85E-03	9.10E-03	1.90E-03	1.01E-03	7.48E-04	2.42E-03	6.26E-03
PM-2.5	tpy	1.40E-02	1.34E-02	1.50E-02	1.87E-02	1.29E-02	1.80E-02	7.70E-03	1.10E-02	1.90E-02	1.11E-02	1.50E-02	1.10E-02	6.85E-03	6.96E-03		6.82E-03	1.44E-02	5.35E-03	6.85E-03	9.10E-03	1.90E-03	1.01E-03	7.48E-04	2.42E-03	6.26E-03
NOx	tpy	2.67E-01	2.54E-01	2.85E-01	3.56E-01	2.46E-01	3.42E-01	1.46E-01	2.09E-01	3.61E-01	2.11E-01	2.85E-01	2.09E-01	1.30E-01	1.32E-01	1.06E-02	1.30E-01	2.74E-01	1.02E-01	1.30E-01	1.73E-01	2.71E-02	1.43E-02	1.06E-02	4.60E-02	1.19E-01
VOC	tpy	1.15E-02	1.10E-02	1.23E-02	1.53E-02	1.06E-02	1.47E-02	6.31E-03	9.03E-03	1.56E-02	9.11E-03	1.23E-02	8.99E-03	5.61E-03	5.70E-03	7.76E-04	5.58E-03	1.18E-02	4.38E-03	5.61E-03	7.45E-03	2.21E-03	1.17E-03	8.69E-04	1.98E-03	5.13E-03
CO	tpy	1.19E-01	1.14E-01	1.27E-01	1.59E-01	1.10E-01	1.53E-01	6.55E-02	9.37E-02	1.61E-01	9.46E-02	1.27E-01	9.33E-02	5.83E-02	5.91E-02	4.41E-03	5.79E-02	1.23E-01	4.55E-02	5.82E-02	7.73E-02	5.84E-03	3.09E-03	2.29E-03	2.06E-02	5.32E-02
SO2	tpy	7.09E-03	6.75E-03	2.27E-04	9.46E-03	6.54E-03	9.08E-03	1.17E-04	1.67E-04	2.88E-04	5.62E-03	2.27E-04	1.66E-04	3.46E-03	3.51E-03	3.51E-07	3.44E-03	7.29E-03	2.70E-03	3.46E-03	4.59E-03	9.31E-06	1.64E-04	1.22E-04	1.22E-03	9.48E-05
Greenhouse Gases																										
CO2	tpy	22.90	21.81	24.43	30.54	21.11	29.31	12.56	17.97	30.97	18.14	24.43	17.90	11.18	11.34	0.48	11.11	23.55	8.72	11.17	14.83	1.00	0.53	0.39	3.95	10.21
Methane	tpy	9.29E-04	8.85E-04	9.91E-04	1.24E-03	8.56E-04	1.19E-03	5.10E-04	7.29E-04	1.26E-03	7.36E-04	9.91E-04	7.26E-04	4.53E-04	4.60E-04	9.08E-06	4.51E-04	9.55E-04	3.54E-04	4.53E-04	6.02E-04	4.06E-05	2.15E-05	1.60E-05	1.60E-04	4.14E-04
Nitrous Oxide	tpy	1.86E-04	1.77E-04	1.98E-04	2.48E-04	1.71E-04	2.38E-04	1.02E-04	1.46E-04	2.51E-04	1.47E-04	1.98E-04	1.45E-04	9.07E-05	9.20E-05	9.08E-07	9.02E-05	1.91E-04	7.08E-05	9.06E-05	1.20E-04	8.13E-06	4.30E-06	3.19E-06	3.21E-05	8.28E-05
HAPs/TAPs																										
1,3 Butadiene	lb/yr																					4.80E-04	2.54E-04	1.89E-04		
2,3,7,8-TCDD	lb/yr																									
2,4-Dinitrotoluene	lb/yr																									
2-Chloroacetophenone	lb/yr																									
Acetaldehyde	lb/yr	7.08E-03	6.74E-03	7.55E-03	9.44E-03	6.53E-03	9.06E-03	3.88E-03	5.55E-03	9.57E-03	5.61E-03	7.55E-03	5.53E-03	3.45E-03	3.51E-03		3.44E-03	7.28E-03	2.70E-03	3.45E-03	4.58E-03	9.42E-03	4.98E-03	3.70E-03	1.22E-03	3.15E-03
Acetic Acid	lb/yr																									
Acetophenone	lb/yr																									
Acrolein	lb/yr	2.21E-03	2.11E-03	2.36E-03	2.95E-03	2.04E-03	2.83E-03	1.21E-03	1.74E-03	2.99E-03	1.75E-03	2.36E-03	1.73E-03	1.08E-03	1.10E-03		1.07E-03	2.28E-03	8.43E-04	1.08E-03	1.43E-03	1.14E-03	6.01E-04	4.47E-04	3.82E-04	9.87E-04
Antimony	lb/yr																									
Arsenic	lb/yr	1.12E-03	1.07E-03	1.20E-03	1.50E-03	1.04E-03	1.44E-03	6.16E-04	8.82E-04	1.52E-03	8.90E-04	1.20E-03	8.78E-04	5.48E-04	5.56E-04		5.45E-04	1.16E-03	4.28E-04	5.48E-04	7.28E-04	4.92E-05	2.60E-05	1.93E-05	1.94E-04	5.01E-04
Benzene	lb/yr	2.18E-01	2.08E-01	2.32E-01	2.91E-01	2.01E-01	2.79E-01	1.20E-01	1.71E-01	2.95E-01	1.73E-01	2.32E-01	1.70E-01	1.06E-01	1.08E-01		1.06E-01	2.24E-01	8.30E-02	1.06E-01	1.41E-01	1.15E-02	6.06E-03	4.50E-03	3.76E-02	9.71E-02
Benzo(a)pyrene	lb/yr	7.22E-05	6.87E-05	7.70E-05	9.63E-05	6.65E-05	9.24E-05	3.96E-05	5.66E-05	9.76E-05	5.72E-05	7.70E-05	5.64E-05	3.52E-05	3.57E-05		3.50E-05	7.42E-05	2.75E-05	3.52E-05	4.67E-05	2.31E-06	1.22E-06	9.08E-07	1.25E-05	3.22E-05
Benzyl Chloride	lb/yr																									
Beryllium	lb/yr	8.43E-04	8.03E-04	8.99E-04	1.12E-03	7.77E-04	1.08E-03	4.62E-04	6.61E-04	1.14E-03	6.68E-04	8.99E-04	6.59E-04	4.11E-04	4.17E-04		4.09E-04	8.67E-04	3.21E-04	4.11E-04	5.46E-04	3.69E-05	1.95E-05	1.45E-05	1.45E-04	3.76E-04
Biphenyl	lb/yr																									
Bis(2-ethylhexyl)phthalate (DEHP)	lb/yr																									
Bromine	lb/yr																									
Bromoform	lb/yr																									
Cadmium	lb/yr	8.43E-04	8.03E-04	8.99E-04	1.12E-03	7.77E-04	1.08E-03	4.62E-04	6.61E-04	1.14E-03	6.68E-04	8.99E-04	6.59E-04	4.11E-04	4.17E-04		4.09E-04	8.67E-04	3.21E-04	4.11E-04	5.46E-04	3.69E-05	1.95E-05	1.45E-05	1.45E-04	3.76E-04
Carbon Disulfide	lb/yr																									
Chlorine	lb/yr																									
Chlorobenzene	lb/yr																									
Chloroform	lb/yr																									
Chromium	lb/yr	8.43E-04	8.03E-04	8.99E-04	1.12E-03	7.77E-04	1.08E-03	4.62E-04	6.61E-04	1.14E-03	6.68E-04	8.99E-04	6.59E-04	4.11E-04	4.17E-04		4.09E-04	8.67E-04	3.21E-04	4.11E-04	5.46E-04	3.69E-05	1.95E-05	1.45E-05	1.45E-04	3.76E-04
Chromium VI	lb/yr																									
Cobalt	lb/yr																									
Cumene	lb/yr																									
Cyanide	lb/yr																									
Dibenzofurans	lb/yr																									
Dichlorobenzene	lb/yr																									
Dimethyl Sulfate	lb/yr																									
Ethyl Benzene	lb/yr																									
Ethyl Chloride	lb/yr																									
Ethylene Dibromide	lb/yr																									
Ethylene Dichloride	lb/yr																									
Ethylene Glycol	lb/yr																									
Ethylene Oxide	lb/yr																									
Flouride	lb/yr																									
Formaldehyde	lb/yr	2.22E-02	2.11E-02	2.36E-02	2.96E-02	2.04E-02	2.84E-02	1.22E-02	1.74E-02	3.00E-02	1.76E-02	2.36E-02	1.73E-02	1.08E-02	1.10E-02		1.08E-02	2.28E-02	8.44E-03	1.08E-02	1.44E-02	1.45E-02	7.66E-03	5.70E-03	3.82E-03	9.88E-03
Glycol Ethers	lb/yr																									
Hexane	lb/yr																									
Hydrogen Chloride	lb/yr																									
Hydrogen Fluoride	lb/yr																									
Isophorone	lb/yr																									
Lead	lb/yr	2.53E-03	2.41E-03	2.70E-03	3.37E-03	2.33E-03	3.24E-03	1.39E-03	1.98E-03	3.42E-03	2.00E-03	2.70E-03	1.98E-03	1.23E-03	1.25E-03		1.23E-03	2.60E-03	9.63E-04	1.23E-03	1.64E-03	1.11E-04	5.85E-05	4.34E-05	4.36E-04	1.13E-03
Manganese	lb/yr	1.69E-03	1.61E-03	1.80E-03	2.25E-03	1.55E-03	2.16E-03	9.24E-04	1.32E-03	2.28E-03	1.34E-03	1.80E-03	1.32E-03	8.23E-04	8.35E-04		8.18E-04	1.73E-03	6.42E-04	8.22E-04	1.09E-03	7.37E-05	3.90E-05	2.90E-05	2.91E-04	7.51E-04
Mercury	lb/yr	8.43E-04	8.03E-04	8.99E-04	1.12E-03	7.77E-04	1.08E-03	4.62E-04	6.61E-04	1.14E-03	6.68E-04	8.99E-04	6.59E-04	4.11E-04	4.17E-04		4.09E-04	8.67E-04	3.21E-04	4.11E-04	5.46E-04	3.69E-05	1.95E-05	1.45E-05	1.45E-04	3.76E-04
Methly Chloride	lb/yr																									
Methly Ethyl Ketone	lb/yr																									
Methyl Bromide	lb/yr																									
Methyl Chloroform	lb/yr																									
Methyl Hydrazine	lb/yr																									
Methyl Methacrylate	lb/yr																									
Methyl Tert Butyl Ether	lb/yr																									
Methylene Chloride	lb/yr																									
Napthalene	lb/yr	3.65E-02	3.48E-02	3.89E-02	4.87E-02	3.37E-02	4.67E-02	2.00E-02	2.87E-02	4.94E-02	2.89E-02	3.89E-02	2.85E-02	1.78E-02	1.81E-02		1.77E-02	3.76E-02	1.39E-02	1.78E-02	2.36E-02	1.04E-03	5.51E-04	4.09E-04	6.30E-03	1.63E-02
Nickel	lb/yr	8.43E-04	8.03E-04	8.99E-04	1.12E-03	7.77E-04	1.08E-03	4.62E-04	6.61E-04	1.14E-03	6.68E-04	8.99E-04	6.59E-04	4.11E-04	4.17E-04		4.09E-04	8.67E-04	3.21E-04	4.11E-04	5.46E-04	3.69E-05	1.95E-05	1.45E-05	1.45E-04	3.76E-04
PAH	lb/yr	5.95E-02	5.67E-02	6.35E-02	7.94E-02	5.49E-02	7.62E-02	3.27E-02	4.67E-02	8.05E-02	4.72E-02	6.35E-02	4.65E-02	2.91E-02	2.95E-02		2.89E-02	6.12E-02	2.27E-02	2.90E-02	3.86E-02	2.06E-03	1.09E-03	8.11E-04	1.03E-02	2.65E-02
Phenol	lb/yr																									
Phosphorus	lb/yr																									
POM	lb/yr																									
Propionaldehyde	lb/yr																									
Propylene	lb/yr																									
Selenium	lb/yr	4.21E-03	4.01E-03	4.49E-03	5.62E-03	3.88E-03	5.39E-03	2.31E-03	3.31E-03	5.70E-03	3.34E-03	4.49E-03	3.29E-03	2.06E-03	2.09E-03		2.04E-03	4.33E-03	1.61E-03	2.05E-03	2.73E-03	1.84E-04	9.74E-05	7.24E-05	7.27E-04	1.88E-03
Styrene	lb/yr																									
Tetrachloroethane	lb/yr																									
Toluene	lb/yr	7.89E-02	7.52E-02	8.42E-02	1.05E-01	7.28E-02	1.01E-01	4.33E-02	6.19E-02	1.07E-01	6.25E-02	8.42E-02	6.17E-02	3.85E-02	3.91E-02		3.83E-02	8.12E-02	3.01E-02	3.85E-02	5.11E-02	5.03E-03	2.66E-03	1.97E-03	1.36E-02	3.52E-02
Vinyl Acetate	lb/yr																									
Xylenes	lb/yr	5.42E-02	5.16E-02	5.78E-02	7.23E-02	5.00E-02	6.94E-02	2.97E-02	4.25E-02	7.33E-02	4.30E-02	5.78E-02	4.24E-02	2.65E-02	2.68E-02		2.63E-02	5.58E-02	2.07E-02	2.64E-02	3.51E-02	3.50E-03	1.85E-03	1.38E-03	9.36E-03	2.42E-02

University of North Carolina at Chapel I
Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Pollutant	Units	Old Dental School Emergency Generator	Lineberger Addition Emergency Generator	Morehead Planetarium Emergency Generator	Phillips Hall Emergency Generator	Med B Emergency Generator	Kenan Stadium Electric Fire Pump	Beard Hall Emergency Generator	Bioinformatics Emergency Generator	Glaxo Emergency Generator	Northeast Chiller Emergency Generator	Carmichael Auditorium Emergency Generator	Hinton James Emergency Generator #2	POB Emergency Generator	Bell Tower PD Emergency Generator	Grouped Insignificant SBs	Davie Hall Small Boiler SB-6	Fuel Oil Storage Tanks Manning	Fuel Oil Storage Tanks Cogen	Total
Criteria Pollutants																				
PM	tpy		5.09E-03		5.35E-03	2.24E-03	3.50E-03	5.14E-03	3.85E-03	3.48E-03	3.75E-03	8.36E-03	6.97E-03	5.22E-03	5.22E-03	4.97E-02	3.67E-03			12.0
PM-10	tpy		5.09E-03		5.35E-03	2.24E-03	3.50E-03	5.14E-03	3.85E-03	3.48E-03	3.75E-03	8.36E-03	6.97E-03	5.22E-03	5.22E-03	4.97E-02	3.67E-03			11.9
PM-2.5	tpy		5.09E-03		5.35E-03	2.24E-03	3.50E-03	5.14E-03	3.85E-03	3.48E-03	3.75E-03	8.36E-03	6.97E-03	5.22E-03	5.22E-03	4.97E-02	3.67E-03			9.3
NOx	tpy	1.06E-02	9.68E-02	1.25E-02	1.02E-01	3.19E-02	6.66E-02	9.76E-02	7.32E-02	6.61E-02	7.12E-02	1.19E-01	9.91E-02	7.43E-02	7.43E-02	6.54E-01	4.83E-02			237.6
VOC	tpy	7.76E-04	4.17E-03	9.20E-04	4.38E-03	2.60E-03	2.87E-03	4.21E-03	3.15E-03	2.85E-03	3.07E-03	9.71E-03	8.09E-03	6.07E-03	6.07E-03	3.60E-02	2.65E-03	0.017	0.22	3.8
CO	tpy	4.41E-03	4.33E-02	5.23E-03	4.55E-02	6.86E-03	2.98E-02	4.37E-02	3.27E-02	2.96E-02	3.18E-02	2.56E-02	2.13E-02	1.60E-02	1.60E-02	5.50E-01	4.05E-02			69.7
SO2	tpy	3.51E-07	2.57E-03	4.16E-07	2.70E-03	1.09E-05	5.31E-05	2.59E-03	1.95E-03	1.76E-03	1.89E-03	4.09E-05	3.40E-05	2.55E-05	2.55E-05	3.93E-03	2.90E-04			275.4
Greenhouse Gases																				
CO2	tpy	0.48	8.31	0.57	8.72	1.18	5.71	8.37	6.28	5.67	6.11	4.40	3.66	2.75	2.75	785.49	58.0			250,319
Methane	tpy	9.08E-06	3.37E-04	1.08E-05	3.54E-04	4.78E-05	2.32E-04	3.40E-04	2.55E-04	2.30E-04	2.48E-04	1.78E-04	1.49E-04	1.11E-04	1.11E-04	1.48E-02	1.09E-03			18.5
Nitrous Oxide	tpy	9.08E-07	6.74E-05	1.08E-06	7.08E-05	9.55E-06	4.64E-05	6.79E-05	5.10E-05	4.60E-05	4.95E-05	3.57E-05	2.97E-05	2.23E-05	2.23E-05	1.48E-03	1.09E-04			2.6
HAPs/TAPs																				
1,3 Butadiene	lb/yr					5.65E-04						2.11E-03	1.76E-03	1.32E-03	1.32E-03					0.1
2,3,7,8-TCDD	lb/yr																			0.0
2,4-Dinitrotoluene	lb/yr																			0.0
2-Chloroacetophenone	lb/yr																			0.4
Acetaldehyde	lb/yr		2.57E-03		2.70E-03	1.11E-02	1.77E-03	2.59E-03	1.94E-03	1.75E-03	1.89E-03	4.14E-02	3.45E-02	2.59E-02	2.59E-02					34.3
Acetic Acid	lb/yr																			0.0
Acetophenone	lb/yr																			0.9
Acrolein	lb/yr		8.03E-04		8.43E-04	1.34E-03	5.52E-04	8.09E-04	6.07E-04	5.48E-04	5.90E-04	4.99E-03	4.16E-03	3.12E-03	3.12E-03					17.0
Antimony	lb/yr																			0.5
Arsenic	lb/yr		4.08E-04		4.28E-04	5.78E-05	2.80E-04	4.11E-04	3.08E-04	2.78E-04	3.00E-04	2.16E-04	1.80E-04	1.35E-04	1.35E-04					0.7
Benzene	lb/yr		7.91E-02		8.30E-02	1.35E-02	5.44E-02	7.97E-02	5.98E-02	5.40E-02	5.81E-02	5.03E-02	4.19E-02	3.14E-02	3.14E-02	2.75E-02	2.03E-03			83.8
Benzo(a)pyrene	lb/yr		2.62E-05		2.75E-05	2.72E-06	1.80E-05	2.64E-05	1.98E-05	1.79E-05	1.92E-05	1.01E-05	8.45E-06	6.34E-06	6.34E-06	1.57E-05	1.16E-06			0.0
Benzyl Chloride	lb/yr																			40.7
Beryllium	lb/yr		3.06E-04		3.21E-04	4.33E-05	2.10E-04	3.08E-04	2.31E-04	2.09E-04	2.25E-04	1.62E-04	1.35E-04	1.01E-04	1.01E-04					0.1
Biphenyl	lb/yr																			0.1
Bis(2-ethylhexyl)phthalate (DEHP)	lb/yr																			4.2
Bromine	lb/yr																			11.7
Bromoform	lb/yr																			2.3
Cadmium	lb/yr		3.06E-04		3.21E-04	4.33E-05	2.10E-04	3.08E-04	2.31E-04	2.09E-04	2.25E-04	1.62E-04	1.35E-04	1.01E-04	1.01E-04					1.31
Carbon Disulfide	lb/yr																			7.6
Chlorine	lb/yr																			154.5
Chlorobenzene	lb/yr																			1.3
Chloroform	lb/yr																			3.4
Chromium	lb/yr		3.06E-04		3.21E-04	4.33E-05	2.10E-04	3.08E-04	2.31E-04	2.09E-04	2.25E-04	1.62E-04	1.35E-04	1.01E-04	1.01E-04					8.28
Chromium VI	lb/yr																			1.40
Cobalt	lb/yr															1.10E-03	8.11E-05			0.4
Cumene	lb/yr																			0.3
Cyanide	lb/yr																			145.2
Dibenzofurans	lb/yr																			0.0
Dichlorobenzene	lb/yr																			1.2
Dimethyl Sulfate	lb/yr																			2.8
Ethyl Benzene	lb/yr																			5.5
Ethyl Chloride	lb/yr																			2.4
Ethylene Dibromide	lb/yr																			0.1
Ethylene Dichloride	lb/yr																			2.3
Ethylene Glycol	lb/yr																			0.0
Ethylene Oxide	lb/yr																			9.1
Flouride	lb/yr																			0.0
Formaldehyde	lb/yr		8.04E-03		8.44E-03	1.70E-02	5.53E-03	8.10E-03	6.08E-03	5.49E-03	5.91E-03	6.36E-02	5.30E-02	3.98E-02	3.98E-02	9.82E-01	7.24E-02			171.7
Glycol Ethers	lb/yr																			0.0
Hexane	lb/yr															2.36E+01	1.74E+00			1817.1
Hydrogen Chloride	lb/yr																			28734.5
Hydrogen Fluoride	lb/yr																			329.0
Isophorone	lb/yr																			33.7
Lead	lb/yr		9.17E-04		9.63E-04	1.30E-04	6.31E-04	9.24E-04	6.93E-04	6.26E-04	6.74E-04	4.85E-04	4.04E-04	3.03E-04	3.03E-04	6.54E-03	4.83E-04			3.1
Manganese	lb/yr		6.11E-04		6.42E-04	8.67E-05	4.21E-04	6.16E-04	4.62E-04	4.17E-04	4.49E-04	3.24E-04	2.70E-04	2.02E-04	2.02E-04					17.6
Mercury	lb/yr		3.06E-04		3.21E-04	4.33E-05	2.10E-04	3.08E-04	2.31E-04	2.09E-04	2.25E-04	1.62E-04	1.35E-04	1.01E-04	1.01E-04					1.5
Methly Chloride	lb/yr																			30.8
Methly Ethyl Ketone	lb/yr																			22.7
Methyl Bromide	lb/yr																			9.3
Methyl Chloroform	lb/yr																			0.0
Methyl Hydrazine	lb/yr																			9.9
Methyl Methacrylate	lb/yr																			1.2
Methyl Tert Butyl Ether	lb/yr																			2.0
Methylene Chloride	lb/yr																			16.8
Napthalene	lb/yr		1.32E-02		1.39E-02	1.22E-03	9.11E-03	1.34E-02	1.00E-02	9.04E-03	9.74E-03	4.57E-03	3.81E-03	2.86E-03	2.86E-03	7.98E-03	5.89E-04			2.3
Nickel	lb/yr		3.06E-04		3.21E-04	4.33E-05	2.10E-04	3.08E-04	2.31E-04	2.09E-04	2.25E-04	1.62E-04	1.35E-04	1.01E-04	1.01E-04					16.1
PAH	lb/yr		2.16E-02		2.27E-02	2.43E-03	1.49E-02	2.18E-02	1.63E-02	1.47E-02	1.59E-02	9.06E-03	7.55E-03	5.66E-03	5.66E-03					1.4
Phenol	lb/yr																			0.9
Phosphorus	lb/yr																			2.1
POM	lb/yr																			3.9
Propionaldehyde	lb/yr																			22.1
Propylene	lb/yr																			0.2
Selenium	lb/yr		1.53E-03		1.61E-03	2.17E-04	1.05E-03	1.54E-03	1.16E-03	1.04E-03	1.12E-03	8.09E-04	6.74E-04	5.06E-04	5.06E-04	3.14E-04	2.32E-05			0.4
Styrene	lb/yr																			1.5
Tetrachloroethane	lb/yr																			2.5
Toluene	lb/yr		2.86E-02		3.01E-02	5.91E-03	1.97E-02	2.89E-02	2.16E-02	1.95E-02	2.10E-02	2.21E-02	1.84E-02	1.38E-02	1.38E-02	4.45E-02	3.28E-03			19.7
Vinyl Acetate	lb/yr																			0.4
Xylenes	lb/yr		1.97E-02		2.07E-02	4.12E-03	1.35E-02	1.98E-02	1.49E-02	1.34E-02	1.45E-02	1.54E-02	1.28E-02	9.61E-03	9.61E-03					3.7

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Facility Summary Information

University of North Carolina at Chapel Hill

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2019 Annual Emissions Inventory

Coal Usage Breakdown

Month	Boiler #6 Coal (tons)	Boiler #7 Coal (tons)
December 2019	2,977	3,025
January 2019	5,210	4,336
February 2019	4,578	4,072
1st Quarter Total	***12,765***	***11,433***
March 2019	4,415	3,894
April 2019	4,012	1,702
May 2019	3,908	0
2nd Quarter Total	***12,335***	***5,597***
June 2019	0	0
July 2019	0	0
August 2019	1,440	455
3rd Quarter Total	***1,440***	***455***
September 2019	2,430	2,205
October 2019	142	3,337
November 2019	3,605	2,342
4th Quarter Total	***6,177***	***7,884***
2019 TOTAL	**32,717**	**25,368**

Facility-Wide Coal Usage **58,085** **Tons/year**

Seasonal Coal Usage (%)

	Boiler #6	Boiler #7	Average (%)
Dec., Jan., Feb.	39.02%	45.07%	42.04%
Mar., Apr., May.	37.70%	22.06%	29.88%
June, July, Aug.	4.40%	1.79%	3.10%
Sept., Oct., Nov.	18.88%	31.08%	24.98%
	100%	100%	100%

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2019 Annual Emissions Inventory

Blackstart Generator Fuel Usage Breakdown

Month	DG1 & DG2 #2 Oil (gallons)
December 2019	217
January 2019	1402
February 2019	242
1st Quarter Total	***1,861***
March 2019	256
April 2019	146
May 2019	211
2nd Quarter Total	***613***
June 2019	245
July 2019	218
August 2019	217
3rd Quarter Total	***680***
September 2019	1,364
October 2019	987
November 2019	1,246
4th Quarter Total	***3,597***
2019 TOTAL	**6,750**

Seasonal Oil Usage (%)

	DG1 & DG2
Dec., Jan., Feb.	27.57%
Mar., Apr., May.	9.08%
June, July, Aug.	10.07%
Sept., Oct., Nov.	53.29%
	100%

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2019 Annual Emissions Inventory

Manning Drive Boilers

Seasonal Fuel Usage Breakdown

Month	Boiler #9		Boiler #10	
	Gas (1,000cf)	Oil (gallons)	Gas (1,000cf)	Oil (gallons)
December 2019	1,128	0	158	0
January 2019	5,341	0	2,501	0
February 2019	1,557	0	2,049	0
1st Quarter Total	*8,026*	*0*	*4,708*	*0*
March 2019	1,579	0	1,042	0
April 2019	6,435	0	1,778	0
May 2019	9,388	0	2,290	0
2nd Quarter Total	*17,402*	*0*	*5,110*	*0*
June 2019	44,771	0	36,882	0
July 2019	29,907	0	22,684	0
August 2019	7,531	0	22,066	0
3rd Quarter Total	*82,209*	*0*	*81,632*	*0*
September 2019	625	0	228	0
October 2019	12,342	0	10,708	0
November 2019	23,866	0	1,584	0
4th Quarter Total	*36,833*	*0*	*12,520*	*0*
2019 TOTAL	**144,470**	**0**	**103,970**	**0**

Seasonal Btu Breakdown

Natural Gas (btu/ft^3)	1,026	Fuel Oil (btu/gal)	139,417

Month					
	Gas	Oil	Gas	Oil	
December 2019	1.16E+09	0.00E+00	1.62E+08	0.00E+00	
January 2019	5.48E+09	0.00E+00	2.57E+09	0.00E+00	
February 2019	1.60E+09	0.00E+00	2.10E+09	0.00E+00	
1st Quarter Total	*8.23E+09*	*0.00E+00*	*4.83E+09*	*0.00E+00*	
March 2019	1.62E+09	0.00E+00	1.07E+09	0.00E+00	
April 2019	6.60E+09	0.00E+00	1.82E+09	0.00E+00	
May 2019	9.63E+09	0.00E+00	2.35E+09	0.00E+00	
2nd Quarter Total	*1.79E+10*	*0.00E+00*	*5.24E+09*	*0.00E+00*	
June 2019	4.59E+10	0.00E+00	3.78E+10	0.00E+00	
July 2019	3.07E+10	0.00E+00	2.33E+10	0.00E+00	
August 2019	7.73E+09	0.00E+00	2.26E+10	0.00E+00	
3rd Quarter Total	*8.43E+10*	*0.00E+00*	*8.38E+10*	*0.00E+00*	
September 2019	6.41E+08	0.00E+00	2.34E+08	0.00E+00	
October 2019	1.27E+10	0.00E+00	1.10E+10	0.00E+00	
November 2019	2.45E+10	0.00E+00	1.63E+09	0.00E+00	
4th Quarter Total	*3.78E+10*	*0.00E+00*	*1.28E+10*	*0.00E+00*	*Total*
2019 TOTAL	**1.48E+11**	**0.00E+00**	**1.07E+11**	**0.00E+00**	**2.55E+11**

Seasonal Total Fuel Usage (%)

	Boiler #9	Boiler #10
Dec., Jan., Feb.	5.6	4.5
Mar., Apr., May.	12.0	4.9
June, July, Aug.	56.9	78.5
Sept., Oct., Nov.	25.5	12.0
	100.0	100.0

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2019 Annual Emissions Inventory

DG No.1 and No.2 - Two 2,000 kW Generators
Cogeneration Facility

(ES-007 & ES-008)

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2019 Annual Emissions Inventory

Non-Emergency Generators G1 & G2
(ES-007 & ES-008)

Fuel Input Rates		
Hourly Fuel Usage (gallons):	**270**	(2-units)
Annual Fuel Usage (gallons):	**6,750**	(2-units)
Fuel Sulfur Content (%)	**0.0427**	
Heat Input Rates		
Fuel Heating Values (Btu/gallon)	**140,635**	
Hourly Fuel Usage (mmBtu):	37.97	
Annual Fuel Usage (mmBtu):	949.33	

70.00% CO control*
*Cat. Oxydizer

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	3.8E+00	9.5E+01	4.75E-02	1.00E-01
PM-10	3.8E+00	9.5E+01	4.75E-02	1.00E-01
PM-2.5	3.8E+00	9.5E+01	4.75E-02	1.00E-01
NOx	7.2E+01	1.8E+03	9.02E-01	1.90E+00
NMTOC, Total	3.1E+00	7.8E+01	3.89E-02	8.19E-02
CO*	9.7E+00	2.4E+02	1.21E-01	2.55E-01
SO_x	1.6E+00	4.1E+01	2.05E-02	4.31E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	9.6E-04	2.3E-02	2.39E-02	2.52E-05
Acrolein	3.0E-04	7.2E-03	7.48E-03	7.88E-06
Arsenic	1.5E-04	3.6E-03	3.80E-03	4.00E-06
Benzene	2.9E-02	7.1E-01	7.37E-01	7.76E-04
Benzo(a)pyrene	9.8E-06	2.3E-04	2.44E-04	2.57E-07
Beryllium	1.1E-04	2.7E-03	2.85E-03	3.00E-06
Cadmium	1.1E-04	2.7E-03	2.85E-03	3.00E-06
Chromium	1.1E-04	2.7E-03	2.85E-03	3.00E-06
Formaldehyde	3.0E-03	7.2E-02	7.49E-02	7.89E-05
Lead	3.4E-04	8.2E-03	8.54E-03	9.00E-06
Manganese	2.3E-04	5.5E-03	5.70E-03	6.00E-06
Mercury	1.1E-04	2.7E-03	2.85E-03	3.00E-06
Naphthalene	4.9E-03	1.2E-01	1.23E-01	1.30E-04
Nickel	1.1E-04	2.7E-03	2.85E-03	3.00E-06
PAH	8.0E-03	1.9E-01	2.01E-01	2.12E-04
Selenium	5.7E-04	1.4E-02	1.42E-02	1.50E-05
Toluene	1.1E-02	2.6E-01	2.67E-01	2.81E-04
Xylene	7.3E-03	1.8E-01	1.83E-01	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	6,191	154,790	77.40	163
Methane	2.5E-01	6.3E+00	3.14E-03	6.61E-03
Nitrous Oxide	5.0E-02	1.3E+00	6.28E-04	1.32E-03

Most emission factors are from DAQ spreadsheet for Large Stationary Diesel Engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

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2019 Annual Emissions Inventory

Manning Drive Steam Plant
Fuel Oil Storage Tanks

(T-003 and T-004)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
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2019 Annual Emissions Inventory

Summary of Emissions from Tanks T-003 & T-004

(ES-T-003 and ES-T-004)

VOC Emissions calculated with EPA TANKS 4.0 Program

T-003	17.20	lb/yr	0.009	Tons/yr
T-004	17.20	lb/yr	0.009	Tons/yr
Total	34.40	lb/yr	0.017	Tons/yr

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Tanks 003/004
City:	Chapel Hill
State:	North Carolina
Company:	UNC-CH
Type of Tank:	Vertical Fixed Roof Tank
Description:	1-184,200 gal No.2 Fuel Oil

Tank Dimensions

Shell Height (ft):	40.00
Diameter (ft):	30.00
Liquid Height (ft) :	34.83
Avg. Liquid Height (ft):	30.00
Volume (gallons):	184,170.07
Turnovers:	0.10
Net Throughput(gal/yr):	19,076.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Cone
Height (ft)	2.00
Slope (ft/ft) (Cone Roof)	0.13

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Raleigh, North Carolina (Avg Atmospheric Pressure = 14.53 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Tanks 003/004 - Vertical Fixed Roof Tank
Chapel Hill, North Carolina

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	61.17	55.60	66.73	59.30	0.0068	0.0056	0.0082	130.0000			188.00	Option 1: VP60 = .0065 VP70 = .009

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

Tanks 003/004 - Vertical Fixed Roof Tank
Chapel Hill, North Carolina

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	0.40	16.80	17.20

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2019 Annual Emissions Inventory

13 Grouped Insignificant Small Boilers/Hotwater Heaters
(IES-SB-1-5, 7-8, 11-14, 16-17))

STAND ALONE BOILERS/PSNC VENDOR
UNITS BILLED FY 2019
Natural Gas Use, Therms

ID	Boiler Location	Capacity Btu/hr	Meter Number	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Total
SB-1	Aycock Family Med Boiler #1 (01008701)	726,000	283425	5,141	5,244	4,319	5,069	4,076	3,977	4,461	4,978	5,208	4,859	4,837	5,334	57,503
SB-2	Aycock Family Med Boiler #2	726,000		-	-	-	-	-	-	-	-	-	-	-	-	-
SB-3	Aycock Family Med (DOMESTIC)	300,000		-	-	-	-	-	-	-	-	-	-	-	-	-
SB-4	Brooks Hall (01000101)	399,000	566875	602	622	542	435	405	283	310	263	268	291	-	528	4,549
SB-5	Cheek Clark (laundry bldg) (01032001)	1,441,560	509174	2,306	2,244	2,002	1,725	1,220	977	838	902	1,222	1,309	1,241	1,833	17,819
SB-6	Davie Hall (00504801)	2,520,000	313347	931	1,771	869	908	928	914	1,067	1,005	934	909	892	1,020	12,148
SB-7	Graham Memorial Boiler #1 (00502601)	420,000	454640	2,501	2,079	1,940	1,750	1,326	1,058	934	936	833	667	1,095	1,600	16,719
SB-8	Graham Memorial Boiler #2	420,000		-	-	-	-	-	-	-	-	-	-	-	-	-
SB-9	Henry Stadium Domestic Boiler #1 (01012051)	500,000		-	-	-	-	-	-	-	-	-	-	-	-	-
SB-10	Henry Stadium Heating Boiler #2	750,000		-	-	-	-	-	-	-	-	-	-	-	-	-
SB-11	Hickerson House (00503501)	450,000	384855	453	546	405	303	79	8	6	5	6	5	-	465	2,281
SB-12	Hill Commercial (00502101)	595,320	356144	231	126	-	-	-	-	-	-	-	-	-	-	357
SB-13	Hill Bldg Annex Under House (0050220)	270,000		-	-	-	-	-	-	-	-	-	-	-	0	-
SB-14	Med Res B (01006391)	500,000	313264	1,125	1,248	1,064	916	766	661	606	638	626	702	1,015	1,091	10,458
SB-15	Med Res D MRI	1,050,000		-	-	-	-	-	-	-	-	-	-	-	0	-
SB-16	McCaskill Soccer Center (01527601)	900,000	509409	1,077	2,264	1,034	744	627	433	453	385	450	481	734	1,168	9,850
SB-17	134 1/2 East Franklin (00502001)	900,000	402330	1,389	1,344	1,276	1,305	575	1,000	916	680	588	670	682	966	11,391
	Total	12,867,880		15,756	17,488	13,451	13,155	10,002	9,311	9,591	9,792	10,135	9,893	10,496	14,005	143,075

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2019 Annual Emissions Inventory

13 Insignificant Small Boilers/Hotwater Heaters

2019 Total Natural Gas Use	130,896	CCF
	13.09	10^6scf
	13,430	MMBtu

	Em. Factor	Emissions	
POLLUTANT	**lb/10^6scf**	**lb/yr**	**ton/yr**
NOX	100	1308.96	0.65
CO	84	1099.52	0.55
Lead	0.0005	0.007	3.27E-06
PM (Total)	7.6	99.48	0.05
PM (Condensable)	5.7	74.61	0.04
PM (Filterable)	1.9	24.87	0.01
SO2	0.6	7.85	0.00
TOC	11	143.99	0.07
VOC	5.5	71.99	0.04
Haps/Taps			
Benzene	2.10E-03	2.75E-02	1.37E-05
Benzopyrene	1.20E-06	1.57E-05	7.85E-09
Cobalt	8.40E-05	1.10E-03	5.50E-07
Formaldehyde	7.50E-02	9.82E-01	4.91E-04
Hexane	1.80E+00	2.36E+01	1.18E-02
Napthalene	6.10E-04	7.98E-03	3.99E-06
Selenium	2.40E-05	3.14E-04	1.57E-07
Toluene	3.40E-03	4.45E-02	2.23E-05
GHGs	**lb/mmBtu**		
Carbon dioxide	116.98	1,570,977	785.49
Methane	2.20E-03	2.96E+01	1.48E-02
Nitrous Oxide	2.20E-04	2.96E+00	1.48E-03

The University of North Carolina at Chapel Hill

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2019 Annual Emissions Inventory

Grouped Small Emergency Generators and Fire Pumps

These are small emergency generators and fire pumps that have been grouped in AERO. Other more recently permitted source emergency generators and fire pumps are included in the AERO data base as separate emission sources.

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
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2019 Annual Emissions Inventory

Diesel-Fired Emergency Generators/Fire Pumps
(Grouped Small Units Previously Listed as Insignificant Sources)

Total Fuel Usage for 2019

Location	Amount* (gallons)
Ackland Art Museum	27
Avery Dorm	24
Cheek/Clark Building	18
Carmichael Dorm	416
Carolina Inn	80
Carrington Building	210
Craige Parking Deck	134
Davis Library	233
Dogwood Deck	99
Fetzer Gym	138
Craige Dorm	495
Ehringhaus Dorm	396
Fordham Hall	130
Global Education Bldg.	128
Hamilton Hall (30 kW unit)	38
Health Sciences Library	161
Hill Alumni Center	95
Jackson Circle Deck	90
Joyner, Alexander Dorms	299
Kenan Center	72
Kenan Field (North)	22
Kenan Field (North - New)	26
Kenan Field (South)	19
Kenan Football Center	117
Knapp Building	102

Location	Amount* (gallons)
McGavran Greenberg Bldg.	713
McColl Bldg.	103
McIver, Kenan, Alderman Dorms	378
Morehead Chemistry Lab	159
Parker Dorm	56
Cardinal Deck	155
Security Services Bldg.1	31
Security Services Bldg.2	18
Dean Smith Center	110
Taylor Student Health Services	474
Hinton James Dorm 1	376
Tarrson Hall	349
Memorial Hall	153
Morrison Dorm	376
R.B. House Library	373
Tate-Turner-Kuralt Bldg.	239
Wilson Library Stacks	266
Center for Dramatic Art	20
Van Hecke - Wettach Hall	44
Total Fuel Used in E.G.	**7,962**

*Gallons of Diesel Fuel

Heating value of 135,000 Btu/gallon

Total Gallons of No. 2 Fuel Oil in E.G.	7,962
Heating Value of No. 2 Fuel Oil (Btu/gal)	135,000
Total Btu input to E.G. from No. 2 Fuel Oil (MMBtu)	1,075

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2019 Annual Emissions Inventory

Grouped Small Emergency Generators and Fire Pumps

Fuel Input Rates	
Hourly Fuel Usage (gallons):	**Variable**
Annual Fuel Usage (gallons):	**7,962**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	**135,000**
Hourly Fuel Usage (mmBtu):	**Variable**
Annual Fuel Usage (mmBtu):	1,074.86

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	NA	3.3E+02	1.67E-01	3.10E-01
PM-10	NA	3.3E+02	1.67E-01	3.10E-01
PM-2.5	NA	3.3E+02	1.67E-01	3.10E-01
NOx	NA	4.7E+03	2.37E+00	4.41E+00
NMTOC, Total	NA	3.9E+02	1.93E-01	3.60E-01
CO	NA	1.0E+03	5.11E-01	9.50E-01
SO_x	NA	5.4E+01	2.71E-02	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	NA	NA	8.24E-01	7.67E-04
Acrolein	NA	NA	9.94E-02	9.25E-05
Arsenic	NA	NA	4.30E-03	4.00E-06
Benzene	NA	NA	1.00E+00	9.33E-04
Benzo(a)pyrene	NA	NA	2.02E-04	1.88E-07
Beryllium	NA	NA	3.22E-03	3.00E-06
1,3-Butadiene	NA	NA	4.20E-02	3.91E-05
Cadmium	NA	NA	3.22E-03	3.00E-06
Chromium	NA	NA	3.22E-03	3.00E-06
Formaldehyde	NA	NA	1.27E+00	1.18E-03
Lead	NA	NA	9.67E-03	9.00E-06
Manganese	NA	NA	6.45E-03	6.00E-06
Mercury	NA	NA	3.22E-03	3.00E-06
Naphthalene	NA	NA	9.11E-02	8.48E-05
Nickel	NA	NA	3.22E-03	3.00E-06
PAH	NA	NA	1.81E-01	1.68E-04
Selenium	NA	NA	1.61E-02	1.50E-05
Toluene	NA	NA	4.40E-01	4.09E-04
Xylene	NA	NA	3.06E-01	2.85E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	NA	175,258	87.63	163
Methane	NA	7.1E+00	3.55E-03	6.61E-03
Nitrous Oxide	NA	1.4E+00	7.11E-04	1.32E-03

Most emission factors are from DAQ spreadsheet for small diesel engines <600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Three Enclosed Railcar Dump Pits
(ES-010)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Fugitive Losses from the unloading of coal from railcars into a dump pit.
(ES-010)

Boiler #6	-	Tons/yr
Boiler #7	-	Tons/yr
Total	58,085	Tons/yr

From section 13.2.4 of the AP-42, coal handling is well approximated by aggregate handling operations. The following equation represents the particulate emissions generated by the dropping of coal into the dump pit.

$$E = k\,(0.0032)\,\frac{(u/5)^{1.3}}{(m/2)^{1.4}}$$

E = Emission Factor (lb/ton)

k = Particle Size Multiplier
u = Mean Wind Speed (mph)
m = Material Moisture Content (%)

k Value	Particulate Size	Emission Factor (lb/ton)
0.74	PM	1.32E-04
0.35	PM-10	6.25E-05
0.11	PM-2.5	1.96E-05

Average moisture content of coal is 4.5%
The dump area is fully enclosed, therefore the minimum wind speed of 1.3 mph was used.

Total Coal **58,085 tons/yr**

Emissions from the unloading of coal:

	Emission Factor (lb/ton)	Emissions (lb/yr)	Emissions (ton/yr)
PM	1.32E-04	7.67	3.84E-03
PM-10	6.25E-05	3.63	1.81E-03
PM-2.5	1.96E-05	1.14	5.70E-04

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Coal Silos
(ES-1, ES-2)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Emissions from the loading of 2 coal storage silos. (ES-1, ES-2)

Boiler #6	-	Tons/yr
Boiler #7	-	Tons/yr
Total	58,085	Tons/yr

The bulk density of coal is 47 lb/ft^3

Total volume of coal transferred is = 2,471,723 ft^3/yr
(Volume of coal transferred = volume of displaced air through bin filter)

These emissions are routed through bin filters (baghouses). Emissions from the bin filters are conservatively estimated at 0.015 gr/acfm (displaced air through bin filters).

lb/yr = (volume of coal, ft^3/yr) (0.015 gr/acf) (1/7000 lb/gr)

Total Emissions from the silos	**37,076**	**gr/yr**
	5.297	**lb/yr**
	0.0026	**ton/yr**

100% of these emissions are PM-10
95% of these emissions are PM-2.5

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Silo Feed Conveyors
(ES-3)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Emissions from silo feed conveyors.
(ES-3)

Boiler #6	-	Tons/yr
Boiler #7	-	Tons/yr
Total	58,085	Tons/yr

The bulk density of coal is 47 lb/ft^3

Total volume of coal transferred is = 2,471,723 ft^3/yr
(Volume of coal transferred = volume of displaced air through bin filter)

These emissions are routed through bin filters (baghouses). Emissions from the bin filters are conservatively estimated at 0.015 gr/acfm (displaced air through bin filters).

lb/yr = (volume of coal, ft^3/yr) (0.015 gr/acf) (1/7000 lb/gr)

Total Emissions from the conveyors	**37,076**	**gr/yr**
	5.297	**lb/yr**
	0.0026	**ton/yr**

100% of these emissions are PM-10
95% of these emissions are PM-2.5

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Fuel Oil Storage Tanks

(T-001 and T-002)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Summary of Emissions from Tanks T-001 & T-002

(ES-T-001 and ES-T-002)

VOC Emissions calculated with EPA TANKS 4.0 Program

T-001	215.31	lb/yr	0.108	Tons/yr
T-002	215.31	lb/yr	0.108	Tons/yr
Total	430.62	lb/yr	0.215	Tons/yr

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Tanks 001/002
City:	Chapel Hill
State:	North Carolina
Company:	UCH-CH
Type of Tank:	Vertical Fixed Roof Tank
Description:	2-500,000 gal No.2 Oil

Tank Dimensions

Shell Height (ft):	47.20
Diameter (ft):	42.50
Liquid Height (ft) :	42.48
Avg. Liquid Height (ft):	20.00
Volume (gallons):	450,801.60
Turnovers:	0.08
Net Throughput(gal/yr):	34,481.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Medium
Shell Condition	Good
Roof Color/Shade:	Gray/Medium
Roof Condition:	Good

Roof Characteristics

Type:	Cone
Height (ft)	2.00
Slope (ft/ft) (Cone Roof)	0.09

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Raleigh, North Carolina (Avg Atmospheric Pressure = 14.53 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Tanks 001/002 - Vertical Fixed Roof Tank
Chapel Hill, North Carolina

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	68.49	57.95	79.03	62.36	0.0086	0.0061	0.0117	130.0000			188.00	Option 1: VP60 = .0065 VP70 = .009

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

Tanks 001/002 - Vertical Fixed Roof Tank
Chapel Hill, North Carolina

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	0.92	214.39	215.31

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Boiler #6
(ES-001-Boiler #6)

Operating Scenarios
#1 - Coal Firing
#2 - Natural Gas Firing
#4 - No.2 Fuel Oil Firing
#5 - Wood Pellet Firing
(#3 - No.6 Fuel Oil Firing is no longer permitted)

Boilers #6 and #7 are equipped with Continuous Emission Monitoring (CEMs) devices to measure SO2, NOx, and CO2 emissions from each of the boilers. The monthly averages presented in the attached spreadsheets are for the total emissions from firing all types of fuel. The 2019 Annual Emission Inventory forms require that the emissions be divided among the four possible operating scenarios.

NOx and CO_2 emissions have been divided between the four operating scenarios based on the percentage of total heat input by each fuel. These calculations are detailed in the attached spreadsheets.

SO_2 emissions from natural gas and wood pellet combustion are insignificant, therefore, SO_2 emissions have been divided between the fuel oil and coal operating scenarios based on the percentage of total heat input by each fuel. These calculations are detailed in the attached spreadsheets.

Emissions Calculations

SO_2, NOx, and CO_2 Emissions are taken from CEMs data
Other emission factors are from stack test or DAQ spreadsheets

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Boiler #6
(ES-001-Boiler #6)
Emissions Calculations

SO_2, NOx, and CO_2 Emissions are Taken from CEMs Data
Other emission factors are from stack test or DAQ spreadsheets

Bituminous Coal Combustion

2019 Annual Emissions Inventory

Facility **University of North Carolina at Chapel Hill**
City **Chapel Hill**
County **Orange County**

APP #/Fac ID **6800043**
Input By **ClimeCo**
Source ID **Boiler #6**
(ES-001-Boiler #6)

Operating Scenario #1

Data Input

Maximum Heat Input	323.17	mmBtu/hr
Boiler Size/Type	Large Industrial	
Actual Fuel Usage	32,717	ton/yr
or	or	
Hours of Operation		hr/yr
and	and	
Heating Value	12,296	Btu/lb
		ton/yr
Sulfur Content	2.03	%
Ash Content :	10.60	%
(B)ituminous or (S)ubbituminous?	B	(B/S)
Calcium to Sulfur Ratio	2.22	

Boiler Type: 7

1) Pulverized/Dry Bottom
2) Pulverized/Wet Bottom
3) Cyclone Furnace
4) Spreader Stoker
5) Overfeed Stoker
6) Underfeed Stoker
7) Fluidized Bed Cir.
8) Fluidized Bed Bub.
9) Hand Fed

Control Device Efficiencies:

PM	99.80	%
PM-10	98.00	%
PM-2.5	97.90	%
SOx*	90.00	%
NOx*	0.00	%
HCL	75.40	%

SOx and NOx emission estimates were calculated using CEMS data. Please refer to the SOx and NOx emissions data presented in the following CEMs spreadsheets.

HCl, HF, and Hg emissions based on stack test data.

Bituminous Coal Combustion

2019 Annual Emissions Inventory

Facility **University of North Carolina at Chapel Hill** APP #/Fac ID **6800043**
City **Chapel Hill** Input By **ClimeCo**
County **Orange County** Source ID **Boiler #6**
(ES-001-Boiler #6)

Operating Scenario #1

ACTUAL CRITERIA EMISSIONS

Pollutant	Factor (lb poll./ton coal)	Emission Rates (lb/hr)	(lb/yr)	(tpy)
*PM**	*0.21*	*2.73*	*6,803*	*3.40*
*PM-10**	*0.21*	*2.73*	*6,803*	*3.40*
*PM-2.5**	*0.12*	*1.58*	*3,922*	*1.96*
SO2	17.67	**	**	**
SO3	0.12	**	**	**
NOx	3.90	**	**	**
*VOC**	*0.01*	*0.15*	*370*	*0.19*
*CO**	*0.84*	*11.02*	*27,436*	*13.72*

ACTUAL TOXIC EMISSIONS

Pollutant	Factor (lb poll./ton coal)	Emission Rates (lb/hr)	(lb/yr)	(tpy)
Acetaldehyde	5.70E-04	7.49E-03	1.86E+01	9.32E-03
Acetophenone	1.50E-05	1.97E-04	4.91E-01	2.45E-04
Acrolein	2.90E-04	3.81E-03	9.49E+00	4.74E-03
*Antimony**	*7.94E-06*	*1.04E-04*	*2.60E-01*	*1.30E-04*
*Arsenic**	*7.40E-06*	*9.73E-05*	*2.42E-01*	*1.21E-04*
Benzene	1.30E-03	1.71E-02	4.25E+01	2.13E-02
Benzo(a)pyrene	3.80E-08	4.99E-07	1.24E-03	6.22E-07
Benzyl chloride	7.00E-04	9.20E-03	2.29E+01	1.15E-02
*Beryllium**	*1.30E-06*	*1.71E-05*	*4.25E-02*	*2.12E-05*
Biphenyl	1.70E-06	2.23E-05	5.56E-02	2.78E-05
Bis(2-ethylhexyl)phthalate (DEHP)	7.30E-05	9.59E-04	2.39E+00	1.19E-03
Bromine	1.01E-01	2.65E-03	6.60E+00	3.30E-03
Bromoform	3.90E-05	5.13E-04	1.28E+00	6.38E-04
*Cadmium**	*3.42E-06*	*4.49E-05*	*1.12E-01*	*5.59E-05*
Carbon disulfide	1.30E-04	1.71E-03	4.25E+00	2.13E-03
2-Chloroacetophenone	7.00E-06	9.20E-05	2.29E-01	1.15E-04
Chlorobenzene	2.20E-05	2.89E-04	7.20E-01	3.60E-04
*Chlorine**	*2.66E-03*	*3.49E-02*	*8.69E+01*	*4.34E-02*
Chloroform	5.90E-05	7.75E-04	1.93E+00	9.65E-04
*Chromium**	*1.18E-04*	*1.55E-03*	*3.86E+00*	*1.93E-03*
Chromium (VI)	1.18E-04	3.10E-06	7.72E-03	3.86E-06
*Cobalt**	*6.79E-06*	*8.92E-05*	*2.22E-01*	*1.11E-04*
Cumene	5.30E-06	6.96E-05	1.73E-01	8.67E-05
Cyanide	2.50E-03	3.29E-02	8.18E+01	4.09E-02
Dibenzofurans	2.01E-07	2.64E-06	6.58E-03	3.29E-06
Dimethyl sulfate	4.80E-05	6.31E-04	1.57E+00	7.85E-04
2,4-Dinitrotoluene	2.80E-07	3.68E-06	9.16E-03	4.58E-06
Ethyl benzene	9.40E-05	1.24E-03	3.08E+00	1.54E-03
Ethyl chloride	4.20E-05	5.52E-04	1.37E+00	6.87E-04
Ethylene dibromide	1.20E-06	1.58E-05	3.93E-02	1.96E-05
Ethylene dichloride	4.00E-05	5.26E-04	1.31E+00	6.54E-04
*Formaldehyde**	*1.62E-03*	*2.13E-02*	*5.29E+01*	*2.65E-02*
Hexane	6.70E-05	8.80E-04	2.19E+00	1.10E-03
*Hydrogen Chloride **	*4.92E-01*	*4.14E+00*	*1.61E+04*	*8.05E+00*
*Hydrogen Fluoride **	*5.66E-03*	*7.43E-02*	*1.85E+02*	*9.25E-02*
Isophorone	5.80E-04	7.62E-03	1.90E+01	9.49E-03
*Lead**	*4.33E-05*	*5.69E-04*	*1.42E+00*	*7.08E-04*

**SO_2 and NOx emissions were estimated using CEMS data, please refer to the attached data sheets entitled "Sulfur Dioxide Emissions from Boiler #6" and Nitrogen Dioxide Emissions from Boiler #6".

Bituminous Coal Combustion

2019 Annual Emissions Inventory

Facility **University of North Carolina at Chapel Hill** APP #/Fac ID **6800043**
City **Chapel Hill** Input By **ClimeCo**
County **Orange County** Source ID **Boiler #6**
(ES-001-Boiler #6)

Operating Scenario #1

ACTUAL TOXIC EMISSIONS (continued)

Pollutant	Factor (lb poll./ton coal)	Emission Rates (lb/hr)	(lb/yr)	(tpy)
*Manganese**	*2.95E-04*	*3.88E-03*	*9.65E+00*	*4.83E-03*
*Mercury**	*2.06E-05*	*2.70E-04*	*6.73E-01*	*3.37E-04*
Methyl bromide	1.60E-04	2.10E-03	5.23E+00	2.62E-03
Methyl chloride	5.30E-04	6.96E-03	1.73E+01	8.67E-03
Methyl ethyl ketone	3.90E-04	5.13E-03	1.28E+01	6.38E-03
Methyl hydrazine	1.70E-04	2.23E-03	5.56E+00	2.78E-03
Methyl methacrylate	2.00E-05	2.63E-04	6.54E-01	3.27E-04
Methyl tert butyl ether	3.50E-05	4.60E-04	1.15E+00	5.73E-04
Methylene chloride	2.90E-04	3.81E-03	9.49E+00	4.74E-03
Naphthalene	1.30E-05	1.71E-04	4.25E-01	2.13E-04
*Nickel**	*2.40E-04*	*3.16E-03*	*7.86E+00*	*3.93E-03*
Phenol	1.60E-05	2.10E-04	5.23E-01	2.62E-04
*Phosphorus**	*3.59E-05*	*4.72E-04*	*1.17E+00*	*5.87E-04*
POM	5.51E-05	7.24E-04	1.80E+00	9.01E-04
Propionaldehyde	3.80E-04	4.99E-03	1.24E+01	6.22E-03
*Selenium**	*5.29E-06*	*6.95E-05*	*1.73E-01*	*8.65E-05*
Styrene	2.50E-05	3.29E-04	8.18E-01	4.09E-04
2,3,7,8-TCDD	1.43E-11	1.88E-10	4.68E-07	2.34E-10
Tetrachloroethylene	4.30E-05	5.65E-04	1.41E+00	7.03E-04
Toluene	2.40E-04	3.15E-03	7.85E+00	3.93E-03
1,1,1-Trichloroethane	2.00E-05	2.63E-04	6.54E-01	3.27E-04
Vinyl acetate	7.60E-06	9.99E-05	2.49E-01	1.24E-04
Xylenes	3.70E-05	4.86E-04	1.21E+00	6.05E-04
Total HAPs		4.40	16,737.14	8.37

Greenhouse Gases

Pollutant	Factor (lb poll./ton coal)	Emission Rates (lb/hr)	(lb/yr)	(tpy)
Carbon dioxide		see attached CEMs-based calculations		
Methane	0.60	*0.12*	*19511.52*	*9.76*
Nitrous Oxide	0.09	1.14	2,838	1.42

Emission rates for pollutants in italics from August 2009 Section 114 test of Boiler #6.

****Emission rates for hydrogen chloride from September 2019 Boiler MACT compliance test of Boiler #6.***

Notes :

1) Emission factors are from Supplement B to the 5th edition of AP-42, unless otherwise noted
2) Emission calculations will be based on the hours of operation only when actual fuel usage is not supplied
3) Particulate controls affect PM, PM-10, PM-2.5, and all toxics that are regulated as particulates except Mercury
4) VOC = NMTOC = TOC * (1-%METHANE)
5) PM-2.5 and SO3 do not currently need to be reported
6) Dibenzofurans = Polychlorinated dibenzo-p-furans
7) The Br emission factor is based on a mass balance generated from a 3 year coal analysis for Duke Power (1990-1992 7 samples per year). The average concentration of bromine was 55.33 ppm (wet basis) and a heating value of 13,500 Btu/lb was assumed
8) For fluidized bed combustion the emission factor for underfeed stokers is utilized whenever the calcium-to-sulfur ratio is outside of the acceptable range of 1.5 to 7

Natural Gas Combustion Emissions Calculator NG2000 Revision C
2019 Annual Emissions Inventory

Boiler #6
(ES-001-Boiler #6)

Facility ID # 6800043
Permit # 03069T35

Operating Scenario #2

User Input

Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**323.17**
Fuel Input Capacity (10^6 scf/hr):	0.31
Annual Fuel Throughput (10^6 scf):	**378.72**
Latest Construction/Modification Date:	**N/A**

Enter the boiler type below ↘
2

Other NOx Control
4

Large Wall-Fired Boilers (=>100 mmBtu/hr)
1 = Uncontrolled (Pre-NSPS)
2 = Uncontrolled (Post-NSPS)
3 = Controlled - Low NOx burners
4 = Controlled - Flue gas recirculation (FGR)

Small Boilers (<100 mmBtu/hr)
5 = Uncontrolled
6 = Controlled - Low NOx burners
7 = Controlled - Low NOx burners/FGR

Tangential-Fired Boilers (All Sizes)
8 = Uncontrolled
9 = Controlled - FGR

Residential Furnaces (<0.3 mmBtu/hr)
10 = Uncontrolled

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmscf)
PM	2.4E+00	2.9E+03	1.4E+00	7.6E+00
PM-10	2.4E+00	2.9E+03	1.4E+00	7.6E+00
PM-2.5	2.4E+00	2.9E+03	1.4E+00	7.6E+00
NOx	see attached CEMs-based calculations			1.9E+02
VOC	1.7E+00	2.1E+03	1.0E+00	5.5E+00
CO	2.6E+01	3.2E+04	1.6E+01	8.4E+01
SO2	see attached CEMs-based calculations			6.0E-01
Total HAP	5.9E-01	7.2E+02	3.6E-01	1.9E+00
Largest HAP	5.7E-01	6.8E+02	3.4E-01	1.8E+00

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Arsenic	6.3E-05	NA	7.6E-02	2.0E-04
Benzene	6.6E-04	NA	8.0E-01	2.1E-03
Cadmium	3.5E-04	NA	4.2E-01	1.1E-03
Chromium	4.4E-04	NA	5.3E-01	1.4E-03
Chromium VI	4.4E-04	NA	5.3E-01	1.4E-03
Dichlorobenzene	3.8E-04	NA	4.5E-01	1.2E-03
Formaldehyde	2.4E-02	NA	2.8E+01	7.5E-02
Hexane	5.7E-01	1.4E+01	6.8E+02	1.8E+00
Lead	1.6E-04	NA	1.9E-01	5.0E-04
Manganese	1.2E-04	2.9E-03	1.4E-01	3.8E-04
Mercury	8.2E-05	2.0E-03	9.8E-02	2.6E-04
Naphthalene	1.9E-04	NA	2.3E-01	6.1E-04
Nickel	6.6E-04	1.6E-02	8.0E-01	2.1E-03
POM	2.1E-04	NA	2.5E-01	6.6E-04
Toluene	1.1E-03	2.6E-02	1.3E+00	3.4E-03

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	see attached CEMs-based calculations			116.98
Methane	0.71	856.64	4.28E-01	2.20E-03
Nitrous Oxide	0.071	85.66	4.28E-02	2.20E-04

Fuel Oil Combustion Emissions Calculator FO2000 Revision A
2019 Annual Emissions Inventory
Boiler #6
(ES-001-Boiler #6)
Facility ID # 6800043
Permit # 03069T35

Operating Scenario #4 - No.2 Fuel Oil

User Input	
Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**323.17**
Fuel Input Capacity (10^3 gal/hr):	2.30
Annual Fuel Throughput (1000 gal):	**0.000**
Maximum fuel sulfur content (%)	**0.04**
Latest Construction/Modification Date:	**N/A**

Enter the boiler type below ⇲	
15	

Boilers =>100 mmBtu/hr
1 = No. 6 oil fired, normal firing (U)
2 = No. 6 oil fired, normal firing (I)
3 = No. 6 oil fired, normal firing (C)
4 = No. 6 oil fired, normal firing, low NOx burner (U)
5 = No. 6 oil fired, normal firing, low NOx burner (I)
6 = No. 6 oil fired, normal firing, low NOx burner (C)
7 = No. 6 oil fired, tangential firing (U)
8 = No. 6 oil fired, tangential firing, low NOx burner (U)
9 = No. 5 oil fired, normal firing (U)
10 = No. 5 oil fired, normal firing (I)
11 = No. 5 oil fired, tangential firing (U)
12 = No. 4 oil fired, normal firing (U)
13 = No. 4 oil fired, normal firing (I)
14 = No. 4 oil fired, tangential firing (U)
15 = No. 2 oil fired (U,I)

Boilers =>100 mmBtu/hr (cont'd)
16 = No. 2 oil fired (C)
17 = No. 2 oil fired, LNB/FGR (U,I)
18 = No. 2 oil fired, LNB/FGR (C)

19 = Vertical fired utility boiler

Small Boilers (<100 mmBtu/hr)
20 = No. 6 oil fired (I)
21 = No. 6 oil fired (C)
22 = No. 5 oil fired (C)
23 = No. 4 oil fired (C)
24 = No. 2 oil fired (I)
25 = No. 2 oil fired (C)

26 = Residential Furnace

Fuel Oil Combustion Emissions Calculator FO2000 Revision A
2019 Annual Emissions Inventory
Boiler #6
(ES-001-Boiler #6)
Facility ID # 6800043
Permit # 03069T35

Operating Scenario #4 - No.2 Fuel Oil

User Input	
Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**323.17**
Fuel Input Capacity (10^3 gal/hr):	2.30
Annual Fuel Throughput (1000 gal):	**0.000**
Maximum fuel sulfur content (%)	**0.04**
Latest Construction/Modification Date:	**N/A**

Emission Controls

Particulate controls

Enter the control type below ↘	Message Area	Or enter a PM control efficiency below to override built in values.
3		User Input PM Cont. Effic.
		Message Area

Control Device	Avg. Cont. Effic.
0 = None/other	
1 = ESP	
2 = Scrubber	
3 = Bagfilter	99.0
4 = Multiple cyclone	

Postcombustion SO_2 controls

Enter the control type below ↘	Message Area	Or enter an SO_2 control efficiency below to override built in values.
0		User Input SO_2 Cont. Effic.
		90.0
		User entered control efficiency may be overestimated and should be documented.

Control Technology/Process	Avg. Cont. Effic.
0 = None/other	
1 = Wet scrubber, Lime/limestone	
2 = Wet scrubber, Sodium carbonate	0.0
3 = Wet scrubber, Magnesium oxide/hydroxide	
4 = Wet scrubber, Dual alkali	Remarks
5 = Spray drying, calcium hydroxide slurry, vap. in spray vessel	NA
6 = Furnace injection, Dry calcium carbonate/hydrate inj. in upper furn. cavity	
7 = Duct injection, Dry sorbent injection into duct, sometimes combined with water spray	

NO_x controls

Enter the control type below ↘	Message Area	Or enter a NO_x control efficiency below to override built in values.
5		User Input NO_x Cont. Effic.
		0.0
		Message Area

Control Technology/Process	Avg. Cont. Effic.
0 = None/other	
1 = Low excess air (LEA)	
2 = Staged combustion (SC)	39.0
3 = Burners out of service (BOOS)	
4 = Flue gas recirculation (FGR)	Remarks
5 = Flue gas recirculation plus staged combustion	Available for boilers with sufficient operational flexibility
6 = Low NOx burners (LNB)	
7 = Reduced air preheat (RAP)	
8 = Selective noncatalytic reduction (SNCR)	
9 = Conventional selective catalytic reduction (SCR)	

Fuel Oil Combustion Emissions Calculator FO2000 Revision A
2019 Annual Emissions Inventory
Boiler #6
(ES-001-Boiler #6)
Facility ID # 6800043
Permit # 03069T35

Operating Scenario #4 - No.2 Fuel Oil

User Input	
Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**323.17**
Fuel Input Capacity (10^3 gal/hr):	2.30
Annual Fuel Throughput (1000 gal):	**0.000**
Maximum fuel sulfur content (%)	**0.04**
Latest Construction/Modification Date:	**N/A**

Emissions Output (for operation 3.42 hr/yr)

Criteria Pollutants

Pollutant	lb/hr[2]	tpy	lb/yr[3]	Emission Factor[1] ($lb/10^3$ gal)
Total PM (FPM + CPM)	3.0	0.000	0	3.30E+00
Filterable PM (FPM) rates @ 99% control	0.0	0.000	0	2.00E+00
Condensable PM (CPM)[4]	3.0	0.000	0	1.30E+00
Filterable PM-10[5]	0.0	0.000	0	1.00E+00
Filterable PM-2.5[5]	0.0	0.000	0	2.50E-01
NOx rates @ 39% control	see attached CEMs-based calculations			2.40E+01
NMTOC	0	0.000	0	2.00E-01
CO	11	0.000	0	5.00E+00
SO2 rates @ 90% control	see attached CEMs-based calculations			2.98E+02
Total HAP[6]	4.15E-01	0.000	0	1.81E-01
Largest HAP[6]	1.83E-01	0.000	0	7.97E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr[2]	lb/day[7]	lb/yr[3]	Emission Factor[1] ($lb/10^3$ gal)
Antimony rates @ 99% control	0.00E+00	NA	0.00E+00	0.00E+00
Arsenic rates @ 99% control	1.29E-05	NA	0.00E+00	5.60E-04
Benzene	6.32E-03	NA	0.00E+00	2.75E-03
Beryllium rates @ 99% control	9.65E-06	NA	0.00E+00	4.20E-04
Cadmium rates @ 99% control	9.65E-06	NA	0.00E+00	4.20E-04
Chromium rates @ 99% control	9.65E-06	NA	0.00E+00	4.20E-04
Chromium VI rates @ 99% control	2.83E-06	NA	0.00E+00	1.23E-04
Cobalt rates @ 99% control	0.00E+00	NA	0.00E+00	0.00E+00
Ethylbenzene	1.88E-03	NA	0.00E+00	8.17E-04
Fluoride	8.57E-02	2.06E+00	0.00E+00	3.73E-02
Formaldehyde	1.10E-01	2.65E+00	0.00E+00	4.80E-02
Lead rates @ 99% control	2.90E-05	NA	0.00E+00	1.26E-03
Manganese rates @ 99% control	1.93E-05	4.63E-04	0.00E+00	8.40E-04
Mercury	9.65E-04	2.32E-02	0.00E+00	4.20E-04
Methyl chloroform (1,1,1-Trichloroethane)	5.42E-04	1.30E-02	0.00E+00	2.36E-04
Naphthalene	7.65E-04	NA	0.00E+00	3.33E-04
Nickel rates @ 99% control	9.65E-06	2.32E-04	0.00E+00	4.20E-04
POM rates @ 99% control	7.58E-05	NA	0.00E+00	3.30E-03
Selenium rates @ 99% control	4.83E-05	NA	0.00E+00	2.10E-03
Toluene	1.83E-01	4.39E+00	0.00E+00	7.97E-02
Xylene	3.22E-03	7.72E-02	0.00E+00	1.40E-03

Greenhouse Gases

Pollutant	lb/hr[2]	tpy	lb/yr[3]	Emission Factor ($lb/10^3$ gal)
Carbon dioxide	see attached CEMs-based calculations			22930.85
Methane	2.14E+00	0.00E+00	0.00E+00	0.930
Nitrous Oxide	4.27E-01	0.00E+00	0.00E+00	0.19

[1]Emission factors represent AP-42 uncontrolled values. Emission rates are reflective of controls where applicable.

Fuel Oil Combustion Emissions Calculator FO2000 Revision A
2019 Annual Emissions Inventory
Boiler #6
(ES-001-Boiler #6)
Facility ID # 6800043
Permit # 03069T35

Operating Scenario #4 - No.2 Fuel Oil

User Input	
Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**323.17**
Fuel Input Capacity (10^3 gal/hr):	2.30
Annual Fuel Throughput (1000 gal):	**0.000**
Maximum fuel sulfur content (%)	**0.04**
Latest Construction/Modification Date:	**N/A**

[2]Hourly emission rates for all pollutants are based on hourly rated capacity.

[3]Annual emission rates for all pollutants are based on maximum annual fuel throughput.

[4]Wet scrubbers are assumed to control CPM whereas other PM control devices are assumed to only control FPM.

[5]AP-42 assumes PM-10 and PM-2.5 assumes these pollutants are controlled with the same efficiency as total PM.

[6]Total and largest HAP factors and emission rates do not reflect control of metals. Individual metal emission rates are reflective of particulate matter controls where applicable.

[7]Daily emission rates are based on operation 24 hours per day at rated capacity.

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35
2019 Annual Emissions Inventory

Boiler # 6 Wood Pellet Combustion

0.0 ton/yr, wood pellets burned	0.00E+00 MMBtu/yr		
64.63 MMBtu/hr, HI from wood	99.8% PM control	99.6% Metals control	
8,125 Btu/lb, wood heating value	67.8% HCl efficiency*		
3.98 ton/hr, max. wood firing rate	92.3% Hg efficiency*		
8,760 hr/yr	*Calculated from August 2009 EPA Tests		

Pollutant	Emission Factor (lb/MMBtu)[1]	Emissions (lb/hr)	Emissions (lb/yr)	Emissions (ton/yr)
NOx	see attached CEMs-based calculations			
CO	0.17	10.99	0.0	0.00
SO_2	see attached CEMs-based calculations			
PM	0.417	0.054	0.00	0.00000
PM_{10}	0.377	0.049	0.00	0.00000
$PM_{2.5}$	0.327	0.042	0.00	0.00000
VOC	0.017	1.10	0.0	0.000
	lb/MMBtu			
Acetaldehyde	8.30E-04	5.36E-02	0.00E+00	0.00E+00
Acetophenone	3.20E-09	2.07E-07	0.00E+00	0.00E+00
Acrolein	4.00E-03	2.59E-01	0.00E+00	0.00E+00
Antimony	7.90E-06	2.04E-06	0.00E+00	0.00E+00
Arsenic	2.20E-05	5.69E-06	0.00E+00	0.00E+00
Benzene	4.20E-03	2.71E-01	0.00E+00	0.00E+00
Benzo(a)pyrene	2.60E-06	1.68E-04	0.00E+00	0.00E+00
Beryllium	1.10E-06	2.84E-07	0.00E+00	0.00E+00
Cadmium	4.10E-06	1.06E-06	0.00E+00	0.00E+00
Carbon tetrachloride	4.50E-05	2.91E-03	0.00E+00	0.00E+00
Chlorine	7.90E-04	5.11E-02	0.00E+00	0.00E+00
Chlorobenzene	3.30E-05	2.13E-03	0.00E+00	0.00E+00
Chloroform	2.80E-05	1.81E-03	0.00E+00	0.00E+00
Chromium	1.75E-05	4.52E-06	0.00E+00	0.00E+00
Cobalt	6.50E-06	1.68E-06	0.00E+00	0.00E+00
Di(2-ethylhexyl)phthalate	4.70E-08	3.04E-06	0.00E+00	0.00E+00
Dinitrophenol, 2,4-	1.80E-07	1.16E-05	0.00E+00	0.00E+00
Ethyl Benzene	3.10E-05	2.00E-03	0.00E+00	0.00E+00
Ethylene dichloride	2.90E-05	1.87E-03	0.00E+00	0.00E+00
Formaldehyde	4.40E-03	2.84E-01	0.00E+00	0.00E+00
Hexachlorodibenzo-p-dioxin	1.60E-06	1.03E-04	0.00E+00	0.00E+00
Hydrogen Chloride	1.90E-02	3.95E-01	0.00E+00	0.00E+00
Lead	4.80E-05	1.24E-05	0.00E+00	0.00E+00
Manganese	1.60E-03	4.14E-04	0.00E+00	0.00E+00
Mercury	3.50E-06	1.74E-05	0.00E+00	0.00E+00
Methyl bromide	1.50E-05	9.70E-04	0.00E+00	0.00E+00
Methyl chloride	2.30E-05	1.49E-03	0.00E+00	0.00E+00
Methyl chloroform	3.10E-05	2.00E-03	0.00E+00	0.00E+00
Methyl ethyl ketone	5.40E-06	3.49E-04	0.00E+00	0.00E+00
Methylene chloride	2.90E-04	1.87E-02	0.00E+00	0.00E+00
Naphthalene	9.70E-05	6.27E-03	0.00E+00	0.00E+00
Nickel	3.30E-05	8.53E-06	0.00E+00	0.00E+00
Nitrophenol, 4-	1.10E-07	7.11E-06	0.00E+00	0.00E+00
Pentachlorophenol	5.10E-08	3.30E-06	0.00E+00	0.00E+00
Perchloroethylene	3.80E-05	2.46E-03	0.00E+00	0.00E+00
Phenol	5.10E-05	3.30E-03	0.00E+00	0.00E+00
Phosphorus	2.70E-05	6.98E-06	0.00E+00	0.00E+00
Polychlorinated biphenyls	8.15E-09	5.27E-07	0.00E+00	0.00E+00
POM	1.25E-04	8.08E-03	0.00E+00	0.00E+00
Propionaldehyde	6.10E-05	3.94E-03	0.00E+00	0.00E+00
Propylene dichloride	3.30E-05	2.13E-03	0.00E+00	0.00E+00
Selenium	2.80E-06	7.24E-07	0.00E+00	0.00E+00
Styrene	1.90E-03	1.23E-01	0.00E+00	0.00E+00
2,3,7,8-TCDD	8.60E-12	5.56E-10	0.00E+00	0.00E+00
Toluene	9.20E-04	5.95E-02	0.00E+00	0.00E+00
Trichloroethylene	3.00E-05	1.94E-03	0.00E+00	0.00E+00
Trichlorofluoromethane	4.10E-05	2.65E-03	0.00E+00	0.00E+00
Trichlorophenol	2.20E-08	1.42E-06	0.00E+00	0.00E+00
Vinyl chloride	1.80E-05	1.16E-03	0.00E+00	0.00E+00
Xylenes	2.50E-05	1.62E-03	0.00E+00	0.00E+00
Carbon Dioxide	see attached CEMs-based calculations			
Methane	0.0159	1.026	0.0	0.0000
N_2O	0.00794	0.51	0.0	0.0000

1-Emission factors based on DAQ wood combustion spreadsheet

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Sulfur Dioxide Emissions from Boiler #6 (ES-001-Boiler #6)

The exhaust duct at Boiler #6 is equipped with a continuous emissions monitor (CEMs) for SO_2 emissions.
For the 2019 calendar year, 30 day facility averages for the SO2 emission rate measured by the CEM are as follows:

Month	30 day average CEM reading (lb/MMBtu)
January 2019	0.26
February 2019	0.26
March 2019	0.26
April 2019	0.26
May 2019	0.26
June 2019	0.26
July 2019	0.30
August 2019	0.30
September 2019	0.30
October 2019	0.30
November 2019	0.20
December 2019	0.20
Annual Average	***0.263***

This average includes SO_2 emissions from coal, wood, fuel oil, and natural gas from Boiler #6 over the entire year, representing a composite average for all fuels combusted.

Fuel Inputs to Boiler #6 for 2019

Boiler #6			
Coal Tons/yr	**Gas 1,000cf/yr**	**No. 2 Oil Gallons/yr**	**Wood Pellets, Tons/yr**
32,717	**378,725**	**0**	**0.0**
Coal (12,296 btu/lb)	Nat. Gas (1,026 btu/cf)	Oil (140,635 btu/gal)	Wood (8,185 btu/lb)
MMBtu/yr			
8.05E+05	3.89E+05	0.00E+00	0

Total for Boiler #6 (MMBtu/yr)	1.19E+06

Total SO_2 Emissions from Boiler #6 (lb/yr)	314,196
Total SO_2 Emissions from Boiler #6 (ton/yr)	**157.10**

SO_2 Emissions Associated with Coal Combustion (ton/yr)	**157.10**
SO_2 Emissions Associated with No. 2 Fuel Oil Combustion (ton/yr)	**0.00E+00**
SO_2 Emissions Associated with Natural Gas Combustion (ton/yr)	**0***
SO_2 Emissions Associated with Wood Pellet Combustion (ton/yr)	**0***

**All SO_2 measured by CEMS allocated to coal and No.2 fuel oil.*

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
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2019 Annual Emissions Inventory

Nitrogen Dioxide Emissions from Boiler #6 (ES-001-Boiler #6)

The exhaust duct at Boiler #6 is equipped with a continuous emissions monitor (CEMs) for NOx emissions.
For the 2019 calendar year, 30 day facility averages for the NOx emission rate measured by the CEM are as follows:

Month	30 day average CEM reading (lb/MMBtu)
January 2019	0.27
February 2019	0.23
March 2019	0.23
April 2019	0.22
May 2019	0.15
June 2019	0.12
July 2019	0.07
August 2019	0.12
September 2019	0.18
October 2019	0.17
November 2019	0.20
December 2019	0.21
Annual Average	***0.181***

This average includes NOx emissions from coal, fuel oil, and natural gas from Boiler #6 over the entire year, representing a composite average for all fuels combusted.

Fuel Inputs to Boiler #6 for 2019

Boiler #6			
Coal Tons/yr	**Gas 1,000cf/yr**	**No. 2 Oil Gallons/yr**	**Wood Pellets, Tons/yr**
32,717	**378,725**	**0**	**0.0**
Coal (12,296 btu/lb)	Nat. Gas (1,026 btu/cf)	Oil (140,635 btu/gal)	Wood (8,185 btu/lb)
MMBtu/yr			
8.05E+05	3.89E+05	0.00E+00	0

Total for Boiler #6 (MMBtu/yr)	1.19E+06

Total NOx Emissions from Boiler #6 (lb/yr)	215,761
Total NOx Emissions from Boiler #6 (ton/yr)	**107.88**

NOx Emissions Associated with Coal Combustion (ton/yr)	**72.75**
NOx Emissions Associated with Fuel Oil No. 2 Combustion (ton/yr)	**0.0000**
NOx Emissions Associated with Natural Gas Combustion (ton/yr)	**35.13**
NOx Emissions Associated with Wood Pellet Combustion (ton/yr)	**0.000**

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
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2019 Annual Emissions Inventory

CO_2 Emissions from Boiler No.6
(ES-3)

The exhaust system on Boiler #6 is equipped with a continuous emissions monitor (CEMs) for CO_2 concentrations. The exhaust also includes a flow monitor. Mass CO_2 emissions are calculated by the DAHS for GHG reporting. For the 2019 calendar year, the monthly CO2 emissions measured by the CEM/DAHS System are as follows:

Month	Metric Tons	Tons
January 2019	16,124	17,773
February 2019	14,487	15,969
March 2019	14,698	16,202
April 2019	14,020	15,454
May 2019	12,978	14,305
June 2019	705	777
July 2019	3,598	3,966
August 2019	7,352	8,105
September 2019	8,578	9,455
October 2019	678	748
November 2019	11,617	12,806
December 2019	11,492	12,668
Annual Total	116,327.7	128,228.0

This total includes CO2 emissions from coal, fuel oil, wood pellets, and natural gas from Boiler #6 over the entire year, representing a composite average for all fuels combusted.

Fuel Inputs to Boiler #6 for 2019

Boiler #6			
Coal Tons/yr	**Gas 1,000cf/yr**	**No. 2 Oil Gallons/yr**	**Wood Pellets, Tons/yr**
32,717	**378,725**	**0**	**0.0**
Coal (12,296 btu/lb)	Nat. Gas (1,026 btu/cf)	Oil (140,635 btu/gal)	Wood (8,185 btu/lb)
MMBtu/yr			
8.05E+05	3.89E+05	0.00E+00	0

Total for Boiler #6 (MMBtu/yr)	1.19E+06

CO_2 Emission Rate Ratios

	kg/MMBtu	Ratio
coal	93.28	1
n.gas	53.06	0.56883
No.2 oil	73.96	0.79288
wood	93.80	1.00557

1.03E+06 Dist. Factor

CO_2 Emissions Associated with Coal Combustion (ton/yr)	**100,593.5**
CO_2 Emissions Associated with Fuel Oil No. 2 Combustion (ton/yr)	**0.00**
CO_2 Emissions Associated with Natural Gas Combustion (ton/yr)	**27,634.5**
CO_2 Emissions Associated with Wood Pellet Combustion (ton/yr)	**0.00**

128,228.0

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Boiler #7
(ES-002-Boiler #7)

Operating Scenarios
#1 - Coal Firing
#2 - Natural Gas Firing
#4 - No.2 Fuel Oil Firing
#5 - Wood Pellet Firing
(#3 - No.6 Fuel Oil Firing is no longer permitted)

Boilers #6 and #7 are equipped with Continuous Emission Monitoring (CEMs) devices to measure SO2, NOx, and CO2 emissions from each of the boilers. The monthly averages presented in the attached spreadsheets are for the total emissions from firing all types of fuel. The 2019 Annual Emission Inventory forms require that the emissions be divided among the four possible operating scenarios.

NOx and CO_2 emissions have been divided between the four operating scenarios based on the percentage of total heat input by each fuel. These calculations are detailed in the attached spreadsheets.

SO_2 emissions from natural gas and wood pellet combustion are insignificant, therefore, SO_2 emissions have been divided between the fuel oil and coal operating scenarios based on the percentage of total heat input by each fuel. These calculations are detailed in the attached spreadsheets.

Emissions Calculations

SO_2, NOx, and CO_2 Emissions are taken from CEMs data
Other emission factors are from stack test or DAQ spreadsheets

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Boiler #7
(ES-002-Boiler #7)
Emissions Calculations

SO_2, NOx, and CO_2 Emissions are Taken from CEMs Data
Other emission factors are from stack test or DAQ spreadsheets

Bituminous Coal Combustion

2019 Annual Emissions Inventory

Facility	**University of North Carolina at Chapel Hill**	APP #/Fac ID	**6800043**
City	**Chapel Hill**	Input By	**ClimeCo**
County	**Orange County**	Source ID	**Boiler #7**

Operating Scenario #1

(ES-002-Boiler #7)

Data Input

Maximum Heat Input	323.17	mmBtu/hr
Boiler Size/Type	Large Industrial	
Actual Fuel Usage	25,368	ton/yr
or	or	
Hours of Operation		hr/yr
and	and	
Heating Value	12,336	Btu/lb
		ton/yr
Sulfur Content	2.00	%
Ash Content :	10.65	%
(B)ituminous or (S)ubbituminous?	B	(B/S)
Calcium to Sulfur Ratio	2.22	

Boiler Type: 7

1) Pulverized/Dry Bottom
2) Pulverized/Wet Bottom
3) Cyclone Furnace
4) Spreader Stoker
5) Overfeed Stoker
6) Underfeed Stoker
7) Fluidized Bed Cir.
8) Fluidized Bed Bub.
9) Hand Fed

Control Device Efficiencies:

PM	99.80	%
PM-10	98.00	%
PM-2.5	97.90	%
SOx*	90.00	%
NOx*	0.00	%
HCL	75.40	%

SOx and NOx emission estimates were calculated using CEMS data. Please refer to the SOx and NOX emissions data presented in the following CEMs spreadsheets.

HCl, HF, and Hg emissions based on stack test data.

Bituminous Coal Combustion

2019 Annual Emissions Inventory

Facility	**University of North Carolina at Chapel Hill**	APP #/Fac ID	**6800043**
City	**Chapel Hill**	Input By	**ClimeCo**
County	**Orange County**	Source ID	**Boiler #7**

Operating Scenario #1 (ES-002-Boiler #7)

ACTUAL CRITERIA EMISSIONS

	Factor	Emission Rates		
Pollutant	(lb poll./ton coal)	(lb/hr)	(lb/yr)	(tpy)
*PM**	*0.21*	*2.73*	*5,275*	*2.64*
*PM-10**	*0.21*	*2.73*	*5,275*	*2.64*
*PM-2.5**	*0.12*	*1.58*	*3,041*	*1.52*
SO2	17.40	**	**	**
SO3	0.12	**	**	**
NOx	3.90	**	**	**
*VOC**	*0.01*	*0.15*	*288*	*0.14*
*CO**	*0.84*	*11.02*	*21,343*	*10.67*

ACTUAL TOXIC EMISSIONS

	Factor	Emission Rates		
Pollutant	(lb poll./ton coal)	(lb/hr)	(lb/yr)	(tpy)
Acetaldehyde	5.70E-04	7.47E-03	1.45E+01	7.23E-03
Acetophenone	1.50E-05	1.96E-04	3.81E-01	1.90E-04
Acrolein	2.90E-04	3.80E-03	7.36E+00	3.68E-03
*Antimony**	*7.97E-06*	*1.04E-04*	*2.02E-01*	*1.01E-04*
*Arsenic**	*7.43E-06*	*9.73E-05*	*1.88E-01*	*9.42E-05*
Benzene	1.30E-03	1.70E-02	3.30E+01	1.65E-02
Benzo(a)pyrene	3.80E-08	4.98E-07	9.64E-04	4.82E-07
Benzyl chloride	7.00E-04	9.17E-03	1.78E+01	8.88E-03
*Beryllium**	*1.30E-06*	*1.71E-05*	*3.30E-02*	*1.65E-05*
Biphenyl	1.70E-06	2.23E-05	4.31E-02	2.16E-05
Bis(2-ethylhexyl)phthalate (DEHP)	7.30E-05	9.56E-04	1.85E+00	9.26E-04
Bromine	1.01E-01	2.65E-03	5.13E+00	2.57E-03
Bromoform	3.90E-05	5.11E-04	9.89E-01	4.95E-04
*Cadmium**	*3.43E-06*	*4.49E-05*	*8.70E-02*	*4.35E-05*
Carbon disulfide	1.30E-04	1.70E-03	3.30E+00	1.65E-03
2-Chloroacetophenone	7.00E-06	9.17E-05	1.78E-01	8.88E-05
Chlorobenzene	2.20E-05	2.88E-04	5.58E-01	2.79E-04
*Chlorine**	*2.66E-03*	*3.49E-02*	*6.76E+01*	*3.38E-02*
Chloroform	5.90E-05	7.73E-04	1.50E+00	7.48E-04
*Chromium**	*1.18E-04*	*1.55E-03*	*3.00E+00*	*1.50E-03*
Chromium (VI)	1.18E-04	3.10E-06	6.01E-03	3.00E-06
*Cobalt**	*6.81E-06*	*8.92E-05*	*1.73E-01*	*8.64E-05*
Cumene	5.30E-06	6.94E-05	1.34E-01	6.72E-05
Cyanide	2.50E-03	3.27E-02	6.34E+01	3.17E-02
Dibenzofurans	2.01E-07	2.63E-06	5.10E-03	2.55E-06
Dimethyl sulfate	4.80E-05	6.29E-04	1.22E+00	6.09E-04
2,4-Dinitrotoluene	2.80E-07	3.67E-06	7.10E-03	3.55E-06
Ethyl benzene	9.40E-05	1.23E-03	2.38E+00	1.19E-03
Ethyl chloride	4.20E-05	5.50E-04	1.07E+00	5.33E-04
Ethylene dibromide	1.20E-06	1.57E-05	3.04E-02	1.52E-05
Ethylene dichloride	4.00E-05	5.24E-04	1.01E+00	5.07E-04
*Formaldehyde**	*1.62E-03*	*2.13E-02*	*4.12E+01*	*2.06E-02*
Hexane	6.70E-05	8.78E-04	1.70E+00	8.50E-04
*Hydrogen Chloride **	*4.98E-01*	*4.14E+00*	*1.26E+04*	*6.32E+00*
*Hydrogen Fluoride **	*5.67E-03*	*7.43E-02*	*1.44E+02*	*7.20E-02*
Isophorone	5.80E-04	7.60E-03	1.47E+01	7.36E-03
*Lead**	*4.34E-05*	*5.69E-04*	*1.10E+00*	*5.51E-04*

**SO_2 and NOx emissions were estimated using CEMS data, please refer to the attached data sheets entitled "Sulfur Dioxide Emissions from Boiler #7" and Nitrogen Dioxide Emissions from Boiler #7".

Bituminous Coal Combustion

2019 Annual Emissions Inventory

Facility **University of North Carolina at Chapel Hill** APP #/Fac ID **6800043**
City **Chapel Hill** Input By **ClimeCo**
County **Orange County** Source ID **Boiler #7**

Operating Scenario #1 (ES-002-Boiler #7)

ACTUAL TOXIC EMISSIONS (continued)

Pollutant	Factor (lb poll./ton coal)	Emission Rates (lb/hr)	(lb/yr)	(tpy)
*Manganese**	*2.96E-04*	*3.88E-03*	*7.51E+00*	*3.76E-03*
*Mercury**	*2.07E-05*	*2.70E-04*	*5.24E-01*	*2.62E-04*
Methyl bromide	1.60E-04	2.10E-03	4.06E+00	2.03E-03
Methyl chloride	5.30E-04	6.94E-03	1.34E+01	6.72E-03
Methyl ethyl ketone	3.90E-04	5.11E-03	9.89E+00	4.95E-03
Methyl hydrazine	1.70E-04	2.23E-03	4.31E+00	2.16E-03
Methyl methacrylate	2.00E-05	2.62E-04	5.07E-01	2.54E-04
Methyl tert butyl ether	3.50E-05	4.58E-04	8.88E-01	4.44E-04
Methylene chloride	2.90E-04	3.80E-03	7.36E+00	3.68E-03
Naphthalene	1.30E-05	1.70E-04	3.30E-01	1.65E-04
*Nickel**	*2.41E-04*	*3.16E-03*	*6.11E+00*	*3.06E-03*
Phenol	1.60E-05	2.10E-04	4.06E-01	2.03E-04
*Phosphorus**	*3.60E-05*	*4.72E-04*	*9.14E-01*	*4.57E-04*
POM	5.53E-05	7.24E-04	1.40E+00	7.01E-04
Propionaldehyde	3.80E-04	4.98E-03	9.64E+00	4.82E-03
*Selenium**	*5.30E-06*	*6.95E-05*	*1.35E-01*	*6.73E-05*
Styrene	2.50E-05	3.27E-04	6.34E-01	3.17E-04
2,3,7,8-TCDD	1.43E-11	1.87E-10	3.63E-07	1.81E-10
Tetrachloroethylene	4.30E-05	5.63E-04	1.09E+00	5.45E-04
Toluene	2.40E-04	3.14E-03	6.09E+00	3.04E-03
1,1,1-Trichloroethane	2.00E-05	2.62E-04	5.07E-01	2.54E-04
Vinyl acetate	7.60E-06	9.95E-05	1.93E-01	9.64E-05
Xylenes	3.70E-05	4.85E-04	9.39E-01	4.69E-04
Total HAPs		4.40	13,144.41	6.57

Greenhouse Gases

Pollutant	Factor (lb poll./ton coal)	Emission Rates (lb/hr)	(lb/yr)	(tpy)
Carbon dioxide		see attached CEMs-based calculations		
Methane	0.60	*0.12*	*15178.18*	*7.59*
Nitrous Oxide	0.09	1.14	2,208	1.10

Emission rates for pollutants in italics from August 2009 Section 114 test of Boiler #7.

****Emission rates for hydrogen chloride from September 2019 Boiler MACT compliance test of Boiler #7.***

Notes :

1) Emission factors are from Supplement B to the 5th edition of AP-42, unless otherwise noted
2) Emission calculations will be based on the hours of operation only when actual fuel usage is not supplied
3) Particulate controls affect PM, PM-10, PM-2.5, and all toxics that are regulated as particulates except Mercury
4) VOC = NMTOC = TOC * (1-%METHANE)
5) PM-2.5 and SO3 do not currently need to be reported
6) Dibenzofurans = Polychlorinated dibenzo-p-furans
7) The Br emission factor is based on a mass balance generated from a 3 year coal analysis for Duke Power (1990-1992 7 samples per year). The average concentration of bromine was 55.33 ppm (wet basis) and a heating value of 13,500 Btu/lb was assumed
8) For fluidized bed combustion the emission factor for underfeed stokers is utilized whenever the calcium-to-sulfur ratio is outside of the acceptable range of 1.5 to 7

Natural Gas Combustion Emissions Calculator NG2000 Revision C
2019 Annual Emissions Inventory
Boiler #7
(ES-002-Boiler #7)

Facility ID # 6800043
Permit # 03069T35

Operating Scenario #2

User Input	
Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**323.17**
Fuel Input Capacity (10^6 scf/hr):	0.31
Annual Fuel Throughput (10^6 scf):	**307.42**
Latest Construction/Modification Date:	**N/A**

Enter the boiler type below ⇲
2

Other NOx Control
4

Large Wall-Fired Boilers (=>100 mmBtu/hr)
1 = Uncontrolled (Pre-NSPS)
2 = Uncontrolled (Post-NSPS)
3 = Controlled - Low NOx burners
4 = Controlled - Flue gas recirculation (FGR)

Small Boilers (<100 mmBtu/hr)
5 = Uncontrolled
6 = Controlled - Low NOx burners
7 = Controlled - Low NOx burners/FGR

Tangential-Fired Boilers (All Sizes)
8 = Uncontrolled
9 = Controlled - FGR

Residential Furnaces (<0.3 mmBtu/hr)
10 = Uncontrolled

Emissions Output (for operation 19.22 hr/yr)

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmscf)
PM	2.4E+00	2.3E+03	1.2E+00	7.6E+00
PM-10	2.4E+00	2.3E+03	1.2E+00	7.6E+00
PM-2.5	2.4E+00	2.3E+03	1.2E+00	7.6E+00
NOx	see attached CEMs-based calculations			1.9E+02
VOC	1.7E+00	1.7E+03	8.5E-01	5.5E+00
CO	2.6E+01	2.6E+04	1.3E+01	8.4E+01
SO2	see attached CEMs-based calculations			6.0E-01
Total HAP	5.9E-01	5.8E+02	2.9E-01	1.9E+00
Largest HAP	5.7E-01	5.5E+02	2.8E-01	1.8E+00

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Arsenic	6.3E-05	NA	6.1E-02	2.0E-04
Benzene	6.6E-04	NA	6.5E-01	2.1E-03
Cadmium	3.5E-04	NA	3.4E-01	1.1E-03
Chromium	4.4E-04	NA	4.3E-01	1.4E-03
Chromium VI	4.4E-04	NA	4.3E-01	1.4E-03
Dichlorobenzene	3.8E-04	NA	3.7E-01	1.2E-03
Formaldehyde	2.4E-02	NA	2.3E+01	7.5E-02
Hexane	5.7E-01	1.4E+01	5.5E+02	1.8E+00
Lead	1.6E-04	NA	1.5E-01	5.0E-04
Manganese	1.2E-04	2.9E-03	1.2E-01	3.8E-04
Mercury	8.2E-05	2.0E-03	8.0E-02	2.6E-04
Naphthalene	1.9E-04	NA	1.9E-01	6.1E-04
Nickel	6.6E-04	1.6E-02	6.5E-01	2.1E-03
POM	2.1E-04	NA	2.0E-01	6.6E-04
Toluene	1.1E-03	2.6E-02	1.0E+00	3.4E-03

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	see attached CEMs-based calculations			116.98
Methane	0.71	695.36	3.48E-01	2.20E-03
Nitrous Oxide	0.071	69.54	3.48E-02	2.20E-04

Fuel Oil Combustion Emissions Calculator FO2000 Revision A
2019 Annual Emissions Inventory
Boiler #7
(ES-002-Boiler #7)
Facility ID # 6800043
Permit # 03069T35

Operating Scenario #4 - No.2 Fuel Oil

User Input	
Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**323.17**
Fuel Input Capacity (10^3 gal/hr):	2.30
Annual Fuel Throughput (1000 gal):	**0.000**
Maximum fuel sulfur content (%)	**0.043**
Latest Construction/Modification Date:	**N/A**

Enter the boiler type below ⇲	
15	

Boilers =>100 mmBtu/hr	**Boilers =>100 mmBtu/hr (cont'd)**
1 = No. 6 oil fired, normal firing (U)	16 = No. 2 oil fired (C)
2 = No. 6 oil fired, normal firing (I)	17 = No. 2 oil fired, LNB/FGR (U,I)
3 = No. 6 oil fired, normal firing (C)	18 = No. 2 oil fired, LNB/FGR (C)
4 = No. 6 oil fired, normal firing, low NOx burner (U)	
5 = No. 6 oil fired, normal firing, low NOx burner (I)	19 = Vertical fired utility boiler
6 = No. 6 oil fired, normal firing, low NOx burner (C)	
7 = No. 6 oil fired, tangential firing (U)	**Small Boilers (<100 mmBtu/hr)**
8 = No. 6 oil fired, tangential firing, low NOx burner (U)	20 = No. 6 oil fired (I)
9 = No. 5 oil fired, normal firing (U)	21 = No. 6 oil fired (C)
10 = No. 5 oil fired, normal firing (I)	22 = No. 5 oil fired (C)
11 = No. 5 oil fired, tangential firing (U)	23 = No. 4 oil fired (C)
12 = No. 4 oil fired, normal firing (U)	24 = No. 2 oil fired (I)
13 = No. 4 oil fired, normal firing (I)	25 = No. 2 oil fired (C)
14 = No. 4 oil fired, tangential firing (U)	
15 = No. 2 oil fired (U,I)	26 = Residential Furnace

Emission Controls

Particulate controls

Enter the control type below ⇲	Message Area	Or enter a PM control efficiency below to override built in values.
3		User Input PM Cont. Effic.
		Message Area

Control Device	Avg. Cont. Effic.
0 = None/other	
1 = ESP	
2 = Scrubber	

3 = Bagfilter	99.0
4 = Multiple cyclone	

Postcombustion SO_2 controls

Enter the control type below ↘	Message Area	Or enter an SO_2 control efficiency below to override built in values.
0		User Input SO_2 Cont. Effic.
		90.0

Control Technology/Process		
0 = None/other		
1 = Wet scrubber, Lime/limestone	Avg. Cont. Effic.	User entered control efficiency may be overestimated and should be documented.
2 = Wet scrubber, Sodium carbonate	0.0	
3 = Wet scrubber, Magnesium oxide/hydroxide		
4 = Wet scrubber, Dual alkali	Remarks	
5 = Spray drying, calcium hydroxide slurry, vap. in spray vessel	NA	
6 = Furnace injection, Dry calcium carbonate/hydrate inj. in upper furn. cavity		
7 = Duct injection, Dry sorbent injection into duct, sometimes combined with water spray		

NO_x controls

Enter the control type below ↘	Message Area	Or enter a NO_x control efficiency below to override built in values.
0		User Input NO_x Cont. Effic.
		0.0

Control Technology/Process		
0 = None/other		
1 = Low excess air (LEA)	Avg. Cont. Effic.	Message Area
2 = Staged combustion (SC)	0.0	
3 = Burners out of service (BOOS)		
4 = Flue gas recirculation (FGR)	Remarks	
5 = Flue gas recirculation plus staged combustion	NA	
6 = Low NOx burners (LNB)		
7 = Reduced air preheat (RAP)		
8 = Selective noncatalytic reduction (SNCR)		
9 = Conventional selective catalytic reduction (SCR)		

Emissions Output (for operation 6.79 hr/yr)

Criteria Pollutants

Pollutant	lb/hr[2]	tpy	lb/yr[3]	Emission Factor[1] (lb/10^3 gal)
Total PM (FPM + CPM)	3.0	0.0000	0	3.30E+00
Filterable PM (FPM) rates @ 99% control	0.0	0.0000	0	2.00E+00
Condensable PM (CPM)[4]	3.0	0.0000	0	1.30E+00
Filterable PM-10[5]	0.0	0.0000	0	1.00E+00
Filterable PM-2.5[5]	0.0	0.0000	0	2.50E-01
NOx rates uncontrolled	see attached CEMs-based calculations			2.40E+01
NMTOC	0	0.0000	0	2.00E-01
CO	11	0.0000	0	5.00E+00
SO2 rates @ 90% control	see attached CEMs-based calculations			2.98E+02
Total HAP[6]	4.15E-01	0.0000	0	1.81E-01
Largest HAP[6]	1.83E-01	0.0000	0	7.97E-02

Toxic/Hazardous Air Pollutants.

Pollutant	lb/hr[2]	lb/day[7]	lb/yr[3]	Emission Factor[1] (lb/10^3 gal)
Antimony rates @ 99% control	0.00E+00	NA	0.00E+00	0.00E+00
Arsenic rates @ 99% control	1.29E-05	NA	0.00E+00	5.60E-04
Benzene	6.32E-03	NA	0.00E+00	2.75E-03
Beryllium rates @ 99% control	9.65E-06	NA	0.00E+00	4.20E-04
Cadmium rates @ 99% control	9.65E-06	NA	0.00E+00	4.20E-04
Chromium rates @ 99% control	9.65E-06	NA	0.00E+00	4.20E-04
Chromium VI rates @ 99% control	2.83E-06	NA	0.00E+00	1.23E-04
Cobalt rates @ 99% control	0.00E+00	NA	0.00E+00	0.00E+00

Ethylbenzene	1.88E-03	NA	0.00E+00	8.17E-04
Fluoride	8.57E-02	2.06E+00	0.00E+00	3.73E-02
Formaldehyde	1.10E-01	2.65E+00	0.00E+00	4.80E-02
Lead rates @ 99% control	2.90E-05	NA	0.00E+00	1.26E-03
Manganese rates @ 99% control	1.93E-05	4.63E-04	0.00E+00	8.40E-04
Mercury	9.65E-04	2.32E-02	0.00E+00	4.20E-04
Methyl chloroform (1,1,1-Trichloroethane)	5.42E-04	1.30E-02	0.00E+00	2.36E-04
Napthalene	7.65E-04	NA	0.00E+00	3.33E-04
Nickel rates @ 99% control	9.65E-06	2.32E-04	0.00E+00	4.20E-04
POM rates @ 99% control	7.58E-05	NA	0.00E+00	3.30E-03
Selenium rates @ 99% control	4.83E-05	NA	0.00E+00	2.10E-03
Toluene	1.83E-01	4.39E+00	0.00E+00	7.97E-02
Xylene	3.22E-03	7.72E-02	0.00E+00	1.40E-03

Greenhouse Gases

Pollutant	lb/hr[2]	tpy	lb/yr[3]	Emission Factor (lb/10^3 gal)
Carbon dioxide	see attached CEMs-based calculations			22930.85
Methane	2.14E+00	0.00E+00	0.00E+00	0.930
Nitrous Oxide	4.27E-01	0.00E+00	0.00E+00	0.19

[1]Emission factors represent AP-42 uncontrolled values. Emission rates are reflective of controls where applicable.

[2]Hourly emission rates for all pollutants are based on hourly rated capacity.

[3]Annual emission rates for all pollutants are based on maximum annual fuel throughput.

[4]Wet scrubbers are assumed to control CPM whereas other PM control devices are assumed to only control FPM.

[5]AP-42 assumes PM-10 and PM-2.5 assumes these pollutants are controlled with the same efficiency as total PM.

[6]Total and largest HAP factors and emission rates do not reflect control of metals. Individual metal emission rates are reflective of particulate matter controls where applicable.

[7]Daily emission rates are based on operation 24 hours per day at rated capacity.

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043 ***Revise per Stk Test***
Permit # 03069T35
2019 Annual Emissions Inventory

Boiler # 7 Wood Pellet Combustion

0.0 ton/yr, wood pellets burned	0.00E+00 MMBtu/yr		
64.63 MMBtu/hr, HI from wood	99.8% PM control	99.6% Metals control	
8,125 Btu/lb, wood heating value	67.8% HCl efficiency*		
3.98 ton/hr, max. wood firing rate	92.3% Hg efficiency*		
8,760 hr/yr	*Calculated from August 2009 EPA Tests		

Pollutant	Emission Factor (lb/MMBtu)[1]	Emissions (lb/hr)	Emissions (lb/yr)	Emissions (ton/yr)
NOx	see attached CEMs-based calculations			
CO	0.17	10.99	0.0	0.00
SO_2	see attached CEMs-based calculations			
PM	0.417	0.054	0.00	0.00000
PM_{10}	0.377	0.049	0.00	0.00000
$PM_{2.5}$	0.327	0.042	0.00	0.00000
VOC	0.017	1.10	0.0	0.000
	lb/MMBtu			
Acetaldehyde	8.30E-04	5.36E-02	0.00E+00	0.00E+00
Acetophenone	3.20E-09	2.07E-07	0.00E+00	0.00E+00
Acrolein	4.00E-03	2.59E-01	0.00E+00	0.00E+00
Antimony	7.90E-06	2.04E-06	0.00E+00	0.00E+00
Arsenic	2.20E-05	5.69E-06	0.00E+00	0.00E+00
Benzene	4.20E-03	2.71E-01	0.00E+00	0.00E+00
Benzo(a)pyrene	2.60E-06	1.68E-04	0.00E+00	0.00E+00
Beryllium	1.10E-06	2.84E-07	0.00E+00	0.00E+00
Cadmium	4.10E-06	1.06E-06	0.00E+00	0.00E+00
Carbon tetrachloride	4.50E-05	2.91E-03	0.00E+00	0.00E+00
Chlorine	7.90E-04	5.11E-02	0.00E+00	0.00E+00
Chlorobenzene	3.30E-05	2.13E-03	0.00E+00	0.00E+00
Chloroform	2.80E-05	1.81E-03	0.00E+00	0.00E+00
Chromium	1.75E-05	4.52E-06	0.00E+00	0.00E+00
Cobalt	6.50E-06	1.68E-06	0.00E+00	0.00E+00
Di(2-ethylhexyl)phthalate	4.70E-08	3.04E-06	0.00E+00	0.00E+00
Dinitrophenol, 2,4-	1.80E-07	1.16E-05	0.00E+00	0.00E+00
Ethyl Benzene	3.10E-05	2.00E-03	0.00E+00	0.00E+00
Ethylene dichloride	2.90E-05	1.87E-03	0.00E+00	0.00E+00
Formaldehyde	4.40E-03	2.84E-01	0.00E+00	0.00E+00
Hexachlorodibenzo-p-dioxin	1.60E-06	1.03E-04	0.00E+00	0.00E+00
Hydrogen Chloride	1.90E-02	3.95E-01	0.00E+00	0.00E+00
Lead	4.80E-05	1.24E-05	0.00E+00	0.00E+00
Manganese	1.60E-03	4.14E-04	0.00E+00	0.00E+00
Mercury	3.50E-06	1.74E-05	0.00E+00	0.00E+00
Methyl bromide	1.50E-05	9.70E-04	0.00E+00	0.00E+00
Methyl chloride	2.30E-05	1.49E-03	0.00E+00	0.00E+00
Methyl chloroform	3.10E-05	2.00E-03	0.00E+00	0.00E+00
Methyl ethyl ketone	5.40E-06	3.49E-04	0.00E+00	0.00E+00
Methylene chloride	2.90E-04	1.87E-02	0.00E+00	0.00E+00
Naphthalene	9.70E-05	6.27E-03	0.00E+00	0.00E+00
Nickel	3.30E-05	8.53E-06	0.00E+00	0.00E+00
Nitrophenol, 4-	1.10E-07	7.11E-06	0.00E+00	0.00E+00
Pentachlorophenol	5.10E-08	3.30E-06	0.00E+00	0.00E+00
Perchloroethylene	3.80E-05	2.46E-03	0.00E+00	0.00E+00
Phenol	5.10E-05	3.30E-03	0.00E+00	0.00E+00
Phosphorus	2.70E-05	6.98E-06	0.00E+00	0.00E+00
Polychlorinated biphenyls	8.15E-09	5.27E-07	0.00E+00	0.00E+00
POM	1.25E-04	8.08E-03	0.00E+00	0.00E+00
Propionaldehyde	6.10E-05	3.94E-03	0.00E+00	0.00E+00
Propylene dichloride	3.30E-05	2.13E-03	0.00E+00	0.00E+00
Selenium	2.80E-06	7.24E-07	0.00E+00	0.00E+00
Styrene	1.90E-03	1.23E-01	0.00E+00	0.00E+00
2,3,7,8-TCDD	8.60E-12	5.56E-10	0.00E+00	0.00E+00
Toluene	9.20E-04	5.95E-02	0.00E+00	0.00E+00
Trichloroethylene	3.00E-05	1.94E-03	0.00E+00	0.00E+00
Trichlorofluoromethane	4.10E-05	2.65E-03	0.00E+00	0.00E+00
Trichlorophenol	2.20E-08	1.42E-06	0.00E+00	0.00E+00
Vinyl chloride	1.80E-05	1.16E-03	0.00E+00	0.00E+00
Xylenes	2.50E-05	1.62E-03	0.00E+00	0.00E+00
Carbon Dioxide	see attached CEMs-based calculations			
Methane	0.0159	1.026	0.0	0.0000
N_2O	0.00794	0.51	0.0	0.0000

1-Emission factors based on DAQ wood combustion spreadsheet

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Sulfur Dioxide Emissions from Boiler #7 (ES-002-Boiler #7)

The exhaust duct at Boiler #7 is equipped with a continuous emissions monitor (CEMs) for SO_2 emissions.
For the 2019 calendar year, 30 day facility averages for the SO2 emission rate measured by the CEM are as follows:

Month	30 day average CEM reading (lb/MMBtu)
January 2019	0.26
February 2019	0.27
March 2019	0.27
April 2019	0.27
May 2019	0.27
June 2019	0.27
July 2019	0.30
August 2019	0.20
September 2019	0.20
October 2019	0.30
November 2019	0.20
December 2019	0.20
Annual Average	***0.251***

This average includes SO_2 emissions from coal, fuel oil, wood, and natural gas from Boiler #7 over the entire year, representing a composite average for all fuels combusted.

Fuel Inputs to Boiler #7 for 2019

Boiler #7			
Coal Tons/yr	**Gas 1,000cf/yr**	**No. 2 Oil Gallons/yr**	**Wood Pellets, Tons/yr**
25,368	**307,420**	**0**	**0.0**
Coal (12,336 btu/lb)	Nat. Gas (1,026 btu/cf)	Oil (137,204 btu/gal)	Wood (8,185 btu/lb)
MMBtu/yr			
6.26E+05	3.15E+05	0.00E+00	0

Total for Boiler #7 (MMBtu/yr)	9.41E+05

Total SO_2 Emissions from Boiler #7 (lb/yr)	236,110
Total SO_2 Emissions from Boiler #7 (ton/yr)	**118.055**

SO_2 Emissions Associated with Coal Combustion (ton/yr)	**118.05**
SO_2 Emissions Associated with No. 2 Fuel Oil Combustion (ton/yr)	**0.000**
SO_2 Emissions Associated with Natural Gas Combustion (ton/yr)	**0***
SO_2 Emissions Associated with Wood Pellet Combustion (ton/yr)	**0***

**All SO_2 measured by CEMS allocated to coal and No.2 fuel oil.*

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Nitrogen Dioxide Emissions from Boiler #7 (ES-002-Boiler #7)

The exhaust duct at Boiler #7 is equipped with a continuous emissions monitor (CEMs) for NOx emissions.
For the 2019 calendar year, 30 day facility averages for the NOx emission rate measured by the CEM are as follows:

Month	30 day average CEM reading (lb/MMBtu)
January 2019	0.29
February 2019	0.26
March 2019	0.26
April 2019	0.25
May 2019	0.25
June 2019	0.25
July 2019	0.27
August 2019	0.18
September 2019	0.20
October 2019	0.22
November 2019	0.21
December 2019	0.24
Annual Average	***0.24***

This average includes NOx emissions from coal, fuel oil, wood, and natural gas within Boiler #7 over the entire year, representing a composite average for all fuels combusted.

Fuel Inputs to Boiler #7 for 2019

Boiler #7			
Coal Tons/yr	**Gas 1,000cf/yr**	**No. 2 Oil Gallons/yr**	**Wood Pellets, Tons/yr**
25,368	**307,420**	**0**	**0.0**
Coal (12,336 btu/lb)	Nat. Gas (1,026 btu/cf)	Oil (140,635 btu/gal)	Wood (8,185 btu/lb)
MMBtu/yr			
6.26E+05	3.15E+05	0.00E+00	0

Total for Boiler #7 (MMBtu/yr)	9.41E+05

NOx Emissions from Boiler #7 (lb/yr)	225,912
NOx Emissions from Boiler #7 (ton/yr)	**112.96**

NOx Emissions Associated with Coal Combustion (ton/yr)	**75.11**
NOx Emissions Associated with Fuel Oil No. 2 Combustion (ton/yr)	**0.00**
NOx Emissions Associated with Natural Gas Combustion (ton/yr)	**37.85**
NOx Emissions Associated with Wood Pellet Combustion (ton/yr)	**0.0**

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

CO_2 Emissions from Boiler No.7
(ES-3)

The exhaust system on Boiler #7 is equipped with a continuous emissions monitor (CEMs) for CO_2 concentrations. The exhaust also includes a flow monitor. Mass CO_2 emissions are calculated by the DAHS for GHG reporting. For the 2019 calendar year, the monthly CO2 emissions measured by the CEM/DAHS System are as follows:

Month	Metric Tons	Tons
January 2019	14,716	16,221
February 2019	12,837	14,150
March 2019	13,610	15,003
April 2019	6,212	6,847
May 2019	0	0
June 2019	0	0
July 2019	0	0
August 2019	1,542	1,699
September 2019	8,355	9,209
October 2019	13,545	14,930
November 2019	8,889	9,799
December 2019	12,102	13,340
Annual Total	91,806	101,198

This total includes CO_2 emissions from coal, fuel oil, wood pellets, and natural gas from Boiler #7 over the entire year, representing a composite average for all fuels combusted.

Fuel Inputs to Boiler #7 for 2019

Boiler #7			
Coal Tons/yr	**Gas 1,000cf/yr**	**No. 2 Oil Gallons/yr**	**Wood Pellets, Tons/yr**
25,368	**307,420**	**0**	**0.0**
Coal (12,336 btu/lb)	Nat. Gas (1,026 btu/cf)	Oil (140,635 btu/gal)	Wood (8,185 btu/lb)
MMBtu/yr			
6.26E+05	3.15E+05	0.00E+00	0

Total for Boiler #7 (MMBtu/yr)	9.41E+05

CO_2 Emission Rate Ratios

	kg/MMBtu	Ratio
coal	93.28	1
n.gas	53.06	0.56883
No.2 oil	73.96	0.79288
wood	93.80	1.00557

8.05E+05 Dist. Factor

CO_2 Emissions Associated with Coal Combustion (ton/yr)	**78,652.0**
CO_2 Emissions Associated with Fuel Oil No. 2 Combustion (ton/yr)	**0.00**
CO_2 Emissions Associated with Natural Gas Combustion (ton/yr)	**22,546.1**
CO_2 Emissions Associated with Wood Pellet Combustion (ton/yr)	**0.0**

101,198.1

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Boiler #8
(ES-003-Boiler #8)

Operating Scenario #1 - Natural Gas Firing
Operating Scenario #2 - No. 2 Fuel Oil Firing

Natural Gas Combustion Emissions Calculator NG2000 Revision C
2019 Annual Emissions Inventory
Boiler #8
(ES-003-Boiler #8)

Facility ID # 6800043
Permit # 03069T35

Operating Scenario #1

User Input

Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**338**
Fuel Input Capacity (10^6 scf/hr):	0.33
Annual Fuel Throughput (10^6 scf):	**58.69**
Latest Construction/Modification Date:	**N/A**

Enter the boiler type below ↘

3 + 4

Other NOx Control
Enter 1 below if SNCR is applied to the boiler.

0

Large Wall-Fired Boilers (=>100 mmBtu/hr)
1 = Uncontrolled (Pre-NSPS)
2 = Uncontrolled (Post-NSPS)
3 = Controlled - Low NOx burners
4 = Controlled - Flue gas recirculation (FGR)

Small Boilers (<100 mmBtu/hr)
5 = Uncontrolled
6 = Controlled - Low NOx burners
7 = Controlled - Low NOx burners/FGR

Tangential-Fired Boilers (All Sizes)
8 = Uncontrolled
9 = Controlled - FGR

Residential Furnaces (<0.3 mmBtu/hr)
10 = Uncontrolled

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmscf)
PM	2.5E+00	4.5E+02	2.2E-01	7.6E+00
PM-10	2.5E+00	4.5E+02	2.2E-01	7.6E+00
PM-2.5	2.5E+00	4.5E+02	2.2E-01	7.6E+00
NOx	see attached CEMs-based calculations			1.9E+02
VOC	1.8E+00	3.2E+02	1.6E-01	5.5E+00
CO	2.8E+01	4.9E+03	2.5E+00	8.4E+01
SO2	2.0E-01	3.5E+01	1.8E-02	6.0E-01
Total HAP	6.2E-01	1.1E+02	5.5E-02	1.9E+00
Largest HAP	5.9E-01	1.1E+02	5.3E-02	1.8E+00

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Arsenic	6.6E-05	NA	1.2E-02	2.0E-04
Benzene	6.9E-04	NA	1.2E-01	2.1E-03
Cadmium	3.6E-04	NA	6.5E-02	1.1E-03
Chromium	4.6E-04	NA	8.2E-02	1.4E-03
Chromium VI	4.6E-04	NA	8.2E-02	1.4E-03
Dichlorobenzene	4.0E-04	NA	7.0E-02	1.2E-03
Formaldehyde	2.5E-02	NA	4.4E+00	7.5E-02
Hexane	5.9E-01	1.4E+01	1.1E+02	1.8E+00
Lead	1.6E-04	NA	2.9E-02	5.0E-04
Manganese	1.3E-04	3.0E-03	2.2E-02	3.8E-04
Mercury	8.6E-05	2.1E-03	1.5E-02	2.6E-04
Naphthalene	2.0E-04	NA	3.6E-02	6.1E-04
Nickel	6.9E-04	1.7E-02	1.2E-01	2.1E-03
POM	2.2E-04	NA	3.9E-02	6.6E-04
Toluene	1.1E-03	2.7E-02	2.0E-01	3.4E-03

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	see attached CEMs-based calculations			116.98
Methane	0.75	132.75	6.64E-02	2.20E-03
Nitrous Oxide	0.075	13.27	6.64E-03	2.20E-04

Fuel Oil Combustion Emissions Calculator FO2000 Revision A
Boiler #8
2019 Annual Emissions Inventory
(ES-003-Boiler #8)
Facility ID # 6800043
Permit # 03069T35

Operating Scenario #2

User Input	
Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**338**
Fuel Input Capacity (10^3 gal/hr):	2.40
Annual Fuel Throughput (1000 gal):	**0.00**
Maximum fuel sulfur content (%)	**0.043**
Latest Construction/Modification Date:	**N/A**

Enter the boiler type below ↘	
17	

Boilers =>100 mmBtu/hr
1 = No. 6 oil fired, normal firing (U)
2 = No. 6 oil fired, normal firing (I)
3 = No. 6 oil fired, normal firing (C)
4 = No. 6 oil fired, normal firing, low NOx burner (U)
5 = No. 6 oil fired, normal firing, low NOx burner (I)
6 = No. 6 oil fired, normal firing, low NOx burner (C)
7 = No. 6 oil fired, tangential firing (U)
8 = No. 6 oil fired, tangential firing, low NOx burner (U)
9 = No. 5 oil fired, normal firing (U)
10 = No. 5 oil fired, normal firing (I)
11 = No. 5 oil fired, tangential firing (U)
12 = No. 4 oil fired, normal firing (U)
13 = No. 4 oil fired, normal firing (I)
14 = No. 4 oil fired, tangential firing (U)
15 = No. 2 oil fired (U,I)

Boilers =>100 mmBtu/hr (cont'd)
16 = No. 2 oil fired (C)
17 = No. 2 oil fired, LNB/FGR (U,I)
18 = No. 2 oil fired, LNB/FGR (C)

19 = Vertical fired utility boiler

Small Boilers (<100 mmBtu/hr)
20 = No. 6 oil fired (I)
21 = No. 6 oil fired (C)
22 = No. 5 oil fired (C)
23 = No. 4 oil fired (C)
24 = No. 2 oil fired (I)
25 = No. 2 oil fired (C)

26 = Residential Furnace

Fuel Oil Combustion Emissions Calculator FO2000 Revision A
Boiler #8
2019 Annual Emissions Inventory
(ES-003-Boiler #8)
Facility ID # 6800043
Permit # 03069T35

Operating Scenario #2

User Input	
Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**338**
Fuel Input Capacity (10^3 gal/hr):	2.40
Annual Fuel Throughput (1000 gal):	**0.00**
Maximum fuel sulfur content (%)	**0.043**
Latest Construction/Modification Date:	**N/A**

Emission Controls

Particulate controls

Enter the control type below ↘	Message Area	Or enter a PM control efficiency below to override built in values.
0		User Input PM Cont. Effic. **0.0**

Control Device	Avg. Cont. Effic.
0 = None/other	0.0
1 = ESP	
2 = Scrubber	
3 = Bagfilter	0.0
4 = Multiple cyclone	

Message Area

Postcombustion SO_2 controls

Enter the control type below ↘	Message Area	Or enter an SO_2 control efficiency below to override built in values.
0		User Input SO_2 Cont. Effic. **0.0**

Control Technology/Process	Avg. Cont. Effic.
0 = None/other	
1 = Wet scrubber, Lime/limestone	0.0
2 = Wet scrubber, Sodium carbonate	
3 = Wet scrubber, Magnesium oxide/hydroxide	
4 = Wet scrubber, Dual alkali	Remarks
5 = Spray drying, calcium hydroxide slurry, vap. in spray vessel	NA
6 = Furnace injection, Dry calcium carbonate/hydrate inj. in upper furn. cavity	
7 = Duct injection, Dry sorbent injection into duct, sometimes combined with water spray	

Message Area

NO_x controls

Enter the control type below ↘		Or enter a NO_x control efficiency below to override built in values.
5 + 6		User Input NO_x Cont. Effic. **0.0**

Control Technology/Process	Avg. Cont. Effic.
0 = None/other	
1 = Low excess air (LEA)	0.0
2 = Staged combustion (SC)	
3 = Burners out of service (BOOS)	
4 = Flue gas recirculation (FGR)	Remarks
5 = Flue gas recirculation plus staged combustion	NA
6 = Low NOx burners (LNB)	
7 = Reduced air preheat (RAP)	
8 = Selective noncatalytic reduction (SNCR)	

Message Area

Fuel Oil Combustion Emissions Calculator FO2000 Revision A
Boiler #8
2019 Annual Emissions Inventory
(ES-003-Boiler #8)
Facility ID # 6800043
Permit # 03069T35

Operating Scenario #2

User Input	
Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**338**
Fuel Input Capacity (10^3 gal/hr):	2.40
Annual Fuel Throughput (1000 gal):	**0.00**
Maximum fuel sulfur content (%)	**0.043**
Latest Construction/Modification Date:	**N/A**

9 = Conventional selective catalytic reduction (SCR)

Fuel Oil Combustion Emissions Calculator FO2000 Revision A
Boiler #8
2019 Annual Emissions Inventory
(ES-003-Boiler #8)
Facility ID # 6800043
Permit # 03069T35

Operating Scenario #2

User Input	
Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**338**
Fuel Input Capacity (10^3 gal/hr):	2.40
Annual Fuel Throughput (1000 gal):	**0.00**
Maximum fuel sulfur content (%)	**0.043**
Latest Construction/Modification Date:	**N/A**

Emissions Output

Criteria Pollutants

Pollutant	lb/hr[2]	tpy	lb/yr[3]	Emission Factor[1] (lb/10^3 gal)
Total PM (FPM + CPM)	7.9	0.0000	0	3.30E+00
Filterable PM (FPM) rates uncontrolled	4.8	0.0000	0	2.00E+00
Condensable PM (CPM)[4]	3.1	0.0000	0	1.30E+00
Filterable PM-10[5]	2.4	0.0000	0	1.00E+00
Filterable PM-2.5[5]	0.6	0.0000	0	2.50E-01
NOx rates uncontrolled	see attached CEMs-based calculations			2.40E+01
NMTOC	0	0.0000	0	2.00E-01
CO	12	0.0000	0	5.00E+00
SO2 rates uncontrolled	14.9	0.0000	0	6.19E+00
Total HAP[6]	4.34E-01	0.0000	0	1.81E-01
Largest HAP[6]	1.91E-01	0.0000	0	7.97E-02

***NOx emissions based on CEMs data.*

Toxic/Hazardous Air Pollutants.

Pollutant	lb/hr[2]	lb/day[7]	lb/yr[3]	Emission Factor[1] (lb/10^3 gal)
Antimony rates uncontrolled	0.00E+00	NA	0.00E+00	0.00E+00
Arsenic rates uncontrolled	1.35E-03	NA	0.00E+00	5.60E-04
Benzene	6.61E-03	NA	0.00E+00	2.75E-03
Beryllium rates uncontrolled	1.01E-03	NA	0.00E+00	4.20E-04
Cadmium rates uncontrolled	1.01E-03	NA	0.00E+00	4.20E-04
Chromium rates uncontrolled	1.01E-03	NA	0.00E+00	4.20E-04
Chromium VI rates uncontrolled	2.96E-04	NA	0.00E+00	1.23E-04
Cobalt rates uncontrolled	0.00E+00	NA	0.00E+00	0.00E+00
Ethylbenzene	1.96E-03	NA	0.00E+00	8.17E-04
Fluoride	8.96E-02	2.15E+00	0.00E+00	3.73E-02
Formaldehyde	1.15E-01	2.77E+00	0.00E+00	4.80E-02
Lead rates uncontrolled	3.03E-03	NA	0.00E+00	1.26E-03
Manganese rates uncontrolled	2.02E-03	4.85E-02	0.00E+00	8.40E-04
Mercury	1.01E-03	2.42E-02	0.00E+00	4.20E-04
Methyl chloroform (1,1,1-Trichloroethane)	5.67E-04	1.36E-02	0.00E+00	2.36E-04
Naphthalene	8.00E-04	NA	0.00E+00	3.33E-04
Nickel rates uncontrolled	1.01E-03	2.42E-02	0.00E+00	4.20E-04
POM rates uncontrolled	7.93E-03	NA	0.00E+00	3.30E-03
Selenium rates uncontrolled	5.05E-03	NA	0.00E+00	2.10E-03
Toluene	1.91E-01	4.60E+00	0.00E+00	7.97E-02

Fuel Oil Combustion Emissions Calculator FO2000 Revision A
Boiler #8
2019 Annual Emissions Inventory
(ES-003-Boiler #8)
Facility ID # 6800043
Permit # 03069T35

Operating Scenario #2

User Input	
Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**338**
Fuel Input Capacity (10^3 gal/hr):	2.40
Annual Fuel Throughput (1000 gal):	**0.00**
Maximum fuel sulfur content (%)	**0.043**
Latest Construction/Modification Date:	**N/A**

Xylene	3.37E-03	8.08E-02	0.00E+00	1.40E-03

Greenhouse Gases

Pollutant	lb/hr[2]	tpy	lb/yr[3]	Emission Factor (lb/10^3 gal)
Carbon dioxide	see attached CEMs-based calculations			22930.85
Methane	2.24E+00	0.00E+00	0.00E+00	0.930
Nitrous Oxide	4.47E-01	0.00E+00	0.00E+00	0.19

[1]Emission factors represent AP-42 uncontrolled values. Emission rates are reflective of controls where applicable.
[2]Hourly emission rates for all pollutants are based on hourly rated capacity.
[3]Annual emission rates for all pollutants are based on maximum annual fuel throughput.
[4]Wet scrubbers are assumed to control CPM whereas other PM control devices are assumed to only control FPM.
[5]AP-42 assumes PM-10 and PM-2.5 assumes these pollutants are controlled with the same efficiency as total PM.
[6]Total and largest HAP factors and emission rates do not reflect control of metals. Individual metal emission rates are reflective of particulate matter controls where applicable.
[7]Daily emission rates are based on operation 24 hours per day at rated capacity.

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Nitrogen Dioxide Emissions from Boiler #8 (ES-003-Boiler #8)

The exhaust duct at Boiler #8 is equipped with a continuous emissions monitor (CEMs) for NOx emissions.
For the 2019 calendar year, 30 day facility averages for the NOx emission rate measured by the CEM are as follows:

Month	30 day average CEM reading (lb/MMBtu)
January 2019	0.06
February 2019	0.06
March 2019	0.06
April 2019	0.06
May 2019	0.06
June 2019	0.05
July 2019	0.05
August 2019	0.05
September 2019	0.05
October 2019	0.05
November 2019	0.05
December 2019	0.05
Annual Total	***0.054***

This average includes NOx emissions from fuel oil and natural gas from Boiler #8 over the entire year, representing a composite average for all fuels combusted.

Fuel Inputs to Boiler #8 for 2019

Boiler #8	
Gas 1,000cf/yr	**Oil Gallons/yr**
58,688	**0**
Nat. Gas (1,026 btu/cf)	Oil (140,635 btu/gal)
MMBtu/yr	
6.02E+04	0.00E+00

Total for Boiler #8 (MMBtu/yr)	6.02E+04

NOx Emissions from Boiler #8 (lb/yr)	3,262
NOx Emissions from Boiler #8 (ton/yr)	**1.63**

NOx Emissions Associated with Fuel Oil Combustion (ton/yr)	**0.000**
NOx Emissions Associated with Natural Gas Combustion (ton/yr)	**1.631**

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

CO_2 Emissions from Boiler No.8
(ES-3)

The exhaust system on Boiler #8 is equipped with a continuous emissions monitor (CEMs) for CO_2 concentrations. The natural gas and oil flow rates to the boiler are monitored. Mass CO_2 emissions are calculated by the DAHS for GHG reporting. For the 2019 calendar year, the monthly CO2 emissions measured by the CEM/DAHS System are as follows:

Month	Metric Tons	Tons
January 2019	609	671
February 2019	92	101
March 2019	100	110
April 2019	39	42
May 2019	88	97
June 2019	119	131
July 2019	130	143
August 2019	106	117
September 2019	0	0
October 2019	44	48
November 2019	28	31
December 2019	12	13
Annual Total	1,365	1,505

This total includes CO_2 emissions from No.2 fuel oil and natural gas from Boiler #8 over the entire year, representing a composite average for all fuels combusted.

Fuel Inputs to Boiler #8 for 2019

Boiler #8	
Gas 1,000cf/yr	**No. 2 Oil Gallons/yr**
58,688	**0**
Nat. Gas (1,026 btu/cf)	Oil (140,635 btu/gal)
MMBtu/yr	
6.02E+04	0.00E+00

Total for Boiler #7 (MMBtu/yr)	6.02E+04

CO_2 Emission Rate Ratios

	kg/MMBtu	Ratio
n.gas	53.06	1
No.2 oil	73.96	1.3939

CO_2 Emissions Associated with Fuel Oil No. 2 Combustion (ton/yr)	**0.00**
CO_2 Emissions Associated with Natural Gas Combustion (ton/yr)	**1,505.18**

6.02E+04 *Dist. Factor*

1505.2

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Boiler #9
(ES-004)

Operating Scenarios
OS-1 Natural Gas Firing
OS-2 No. 2 Fuel Oil Firing

Fuel Oil Combustion Emissions Calculator FO2000 Revision A
Boiler #9
2019 Annual Emissions Inventory
(ES-004-Boiler #9)
Facility ID # 6800043
Permit # 03069T35

Operating Scenario #2

User Input	
Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**249**
Fuel Input Capacity (10^3 gal/hr):	1.79
Annual Fuel Throughput (1000 gal):	**0.000**
Maximum fuel sulfur content (%)	**0.0359**
Latest Construction/Modification Date:	**N/A**

Enter the boiler type below ↘	
17	

Boilers =>100 mmBtu/hr
1 = No. 6 oil fired, normal firing (U)
2 = No. 6 oil fired, normal firing (I)
3 = No. 6 oil fired, normal firing (C)
4 = No. 6 oil fired, normal firing, low NOx burner (U)
5 = No. 6 oil fired, normal firing, low NOx burner (I)
6 = No. 6 oil fired, normal firing, low NOx burner (C)
7 = No. 6 oil fired, tangential firing (U)
8 = No. 6 oil fired, tangential firing, low NOx burner (U)
9 = No. 5 oil fired, normal firing (U)
10 = No. 5 oil fired, normal firing (I)
11 = No. 5 oil fired, tangential firing (U)
12 = No. 4 oil fired, normal firing (U)
13 = No. 4 oil fired, normal firing (I)
14 = No. 4 oil fired, tangential firing (U)
15 = No. 2 oil fired (U,I)

Boilers =>100 mmBtu/hr (cont'd)
16 = No. 2 oil fired (C)
17 = No. 2 oil fired, LNB/FGR (U,I)
18 = No. 2 oil fired, LNB/FGR (C)
19 = Vertical fired utility boiler
Small Boilers (<100 mmBtu/hr)
20 = No. 6 oil fired (I)
21 = No. 6 oil fired (C)
22 = No. 5 oil fired (C)
23 = No. 4 oil fired (C)
24 = No. 2 oil fired (I)
25 = No. 2 oil fired (C)
26 = Residential Furnace

Fuel Oil Combustion Emissions Calculator FO2000 Revision A
Boiler #9
2019 Annual Emissions Inventory
(ES-004-Boiler #9)
Facility ID # 6800043
Permit # 03069T35

Operating Scenario #2

User Input	
Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**249**
Fuel Input Capacity (10^3 gal/hr):	1.79
Annual Fuel Throughput (1000 gal):	**0.000**
Maximum fuel sulfur content (%)	**0.0359**
Latest Construction/Modification Date:	**N/A**

Emission Controls

Particulate controls

Enter the control type below ↘	Message Area	Or enter a PM control efficiency below to override built in values.
0		User Input PM Cont. Effic. **0.0**

Control Device	Avg. Cont. Effic.
0 = None/other	0.0
1 = ESP	
2 = Scrubber	
3 = Bagfilter	0.0
4 = Multiple cyclone	

Message Area

Postcombustion SO_2 controls

Enter the control type below ↘	Message Area	Or enter an SO_2 control efficiency below to override built in values.
0		User Input SO_2 Cont. Effic. **0.0**

Control Technology/Process	Avg. Cont. Effic.
0 = None/other	
1 = Wet scrubber, Lime/limestone	0.0
2 = Wet scrubber, Sodium carbonate	
3 = Wet scrubber, Magnesium oxide/hydroxide	
4 = Wet scrubber, Dual alkali	Remarks
5 = Spray drying, calcium hydroxide slurry, vap. in spray vessel	NA
6 = Furnace injection, Dry calcium carbonate/hydrate inj. in upper furn. cavity	
7 = Duct injection, Dry sorbent injection into duct, sometimes combined with water spray	

Message Area

NO_x controls

Enter the control type below ↘		Or enter a NO_x control efficiency below to override built in values.
5 + 6		User Input NO_x Cont. Effic. **0.0**

Control Technology/Process	Avg. Cont. Effic.
0 = None/other	
1 = Low excess air (LEA)	0.0
2 = Staged combustion (SC)	
3 = Burners out of service (BOOS)	
4 = Flue gas recirculation (FGR)	Remarks
5 = Flue gas recirculation plus staged combustion	NA
6 = Low NOx burners (LNB)	
7 = Reduced air preheat (RAP)	
8 = Selective noncatalytic reduction (SNCR)	

Message Area

Fuel Oil Combustion Emissions Calculator FO2000 Revision A
Boiler #9
2019 Annual Emissions Inventory
(ES-004-Boiler #9)
Facility ID # 6800043
Permit # 03069T35

Operating Scenario #2

User Input	
Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**249**
Fuel Input Capacity (10^3 gal/hr):	1.79
Annual Fuel Throughput (1000 gal):	**0.000**
Maximum fuel sulfur content (%)	**0.0359**
Latest Construction/Modification Date:	**N/A**

9 = Conventional selective catalytic reduction (SCR)

Fuel Oil Combustion Emissions Calculator FO2000 Revision A
Boiler #9
2019 Annual Emissions Inventory
(ES-004-Boiler #9)
Facility ID # 6800043
Permit # 03069T35

Operating Scenario #2

User Input	
Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**249**
Fuel Input Capacity (10^3 gal/hr):	1.79
Annual Fuel Throughput (1000 gal):	**0.000**
Maximum fuel sulfur content (%)	**0.0359**
Latest Construction/Modification Date:	**N/A**

Emissions Output

Criteria Pollutants

Pollutant	lb/hr[2]	tpy	lb/yr[3]	Emission Factor[1] (lb/10^3 gal)
Total PM (FPM + CPM)	5.9	0.0000	0	3.30E+00
Filterable PM (FPM) rates uncontrolled	3.6	0.0000	0	2.00E+00
Condensable PM (CPM)[4]	2.3	0.0000	0	1.30E+00
Filterable PM-10[5]	1.8	0.0000	0	1.00E+00
Filterable PM-2.5[5]	0.4	0.0000	0	2.50E-01
NOx rates uncontrolled	see attached CEMs-based calculations			2.40E+01
NMTOC	0	0.0000	0	2.00E-01
CO	9	0.0000	0	5.00E+00
SO2 rates uncontrolled	9.2	0.0000	0	5.1696
Total HAP[6]	3.23E-01	0.0000	0	1.81E-01
Largest HAP[6]	1.42E-01	0.0000	0	7.97E-02

***NOx emissions based on CEMs data.*

Toxic/Hazardous Air Pollutants.

Pollutant	lb/hr[2]	lb/day[7]	lb/yr[3]	Emission Factor[1] (lb/10^3 gal)
Antimony rates uncontrolled	0.00E+00	NA	0.00E+00	0.00E+00
Arsenic rates uncontrolled	1.00E-03	NA	0.00E+00	5.60E-04
Benzene	4.91E-03	NA	0.00E+00	2.75E-03
Beryllium rates uncontrolled	7.50E-04	NA	0.00E+00	4.20E-04
Cadmium rates uncontrolled	7.50E-04	NA	0.00E+00	4.20E-04
Chromium rates uncontrolled	7.50E-04	NA	0.00E+00	4.20E-04
Chromium VI rates uncontrolled	2.20E-04	NA	0.00E+00	1.23E-04
Cobalt rates uncontrolled	0.00E+00	NA	0.00E+00	0.00E+00
Ethylbenzene	1.46E-03	NA	0.00E+00	8.17E-04
Fluoride	6.66E-02	1.60E+00	0.00E+00	3.73E-02
Formaldehyde	8.57E-02	2.06E+00	0.00E+00	4.80E-02
Lead rates uncontrolled	2.25E-03	NA	0.00E+00	1.26E-03
Manganese rates uncontrolled	1.50E-03	3.60E-02	0.00E+00	8.40E-04
Mercury	7.50E-04	1.80E-02	0.00E+00	4.20E-04
Methyl chloroform (1,1,1-Trichloroethane)	4.21E-04	1.01E-02	0.00E+00	2.36E-04
Naphthalene	5.95E-04	NA	0.00E+00	3.33E-04
Nickel rates uncontrolled	7.50E-04	1.80E-02	0.00E+00	4.20E-04
POM rates uncontrolled	5.89E-03	NA	0.00E+00	3.30E-03
Selenium rates uncontrolled	3.75E-03	NA	0.00E+00	2.10E-03
Toluene	1.42E-01	3.42E+00	0.00E+00	7.97E-02

Fuel Oil Combustion Emissions Calculator FO2000 Revision A
Boiler #9
2019 Annual Emissions Inventory
(ES-004-Boiler #9)
Facility ID # 6800043
Permit # 03069T35

Operating Scenario #2

User Input	
Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**249**
Fuel Input Capacity (10^3 gal/hr):	1.79
Annual Fuel Throughput (1000 gal):	**0.000**
Maximum fuel sulfur content (%)	**0.0359**
Latest Construction/Modification Date:	**N/A**

Xylene	2.50E-03	6.00E-02	0.00E+00	1.40E-03

Greenhouse Gases

Pollutant	lb/hr[2]	tpy	lb/yr[3]	Emission Factor (lb/10^3 gal)
Carbon dioxide	see attached CEMs-based calculations			22930.85
Methane	1.66E+00	0.00E+00	0.00E+00	0.930
Nitrous Oxide	3.32E-01	0.00E+00	0.00E+00	0.19

[1]Emission factors represent AP-42 uncontrolled values. Emission rates are reflective of controls where applicable.
[2]Hourly emission rates for all pollutants are based on hourly rated capacity.
[3]Annual emission rates for all pollutants are based on maximum annual fuel throughput.
[4]Wet scrubbers are assumed to control CPM whereas other PM control devices are assumed to only control FPM.
[5]AP-42 assumes PM-10 and PM-2.5 assumes these pollutants are controlled with the same efficiency as total PM.
[6]Total and largest HAP factors and emission rates do not reflect control of metals. Individual metal emission rates are reflective of particulate matter controls where applicable.
[7]Daily emission rates are based on operation 24 hours per day at rated capacity.

Natural Gas Combustion Emissions Calculator NG2000 Revision C
2019 Annual Emissions Inventory
Boiler #9
(ES-004-Boiler #9)

Facility ID # 6800043
Permit # 03069T35

Operating Scenario #1

User Input	
Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**249**
Fuel Input Capacity (10^6 scf/hr):	0.24
Annual Fuel Throughput (10^6 scf):	**144.47**
Latest Construction/Modification Date:	**N/A**

Enter the boiler type below ↘	
3 + 4	

Other NOx Control
Enter 1 below if SNCR is applied to the boiler.
0

Large Wall-Fired Boilers (=>100 mmBtu/hr)
1 = Uncontrolled (Pre-NSPS)
2 = Uncontrolled (Post-NSPS)
3 = Controlled - Low NOx burners
4 = Controlled - Flue gas recirculation (FGR)

Small Boilers (<100 mmBtu/hr)
5 = Uncontrolled
6 = Controlled - Low NOx burners
7 = Controlled - Low NOx burners/FGR

Tangential-Fired Boilers (All Sizes)
8 = Uncontrolled
9 = Controlled - FGR

Residential Furnaces (<0.3 mmBtu/hr)
10 = Uncontrolled

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmscf)
PM	1.8E+00	1.1E+03	5.5E-01	7.6E+00
PM-10	1.8E+00	1.1E+03	5.5E-01	7.6E+00
PM-2.5	1.8E+00	1.1E+03	5.5E-01	7.6E+00
NOx	see attached CEMs-based calculations			1.9E+02
VOC	1.3E+00	7.9E+02	4.0E-01	5.5E+00
CO	2.0E+01	1.2E+04	6.1E+00	8.4E+01
SO2	1.5E-01	8.7E+01	4.3E-02	6.0E-01
Total HAP	4.6E-01	2.7E+02	1.4E-01	1.9E+00
Largest HAP	4.4E-01	2.6E+02	1.3E-01	1.8E+00

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Arsenic	4.9E-05	NA	2.9E-02	2.0E-04
Benzene	5.1E-04	NA	3.0E-01	2.1E-03
Cadmium	2.7E-04	NA	1.6E-01	1.1E-03
Chromium	3.4E-04	NA	2.0E-01	1.4E-03
Chromium VI	3.4E-04	NA	2.0E-01	1.4E-03
Dichlorobenzene	2.9E-04	NA	1.7E-01	1.2E-03
Formaldehyde	1.8E-02	NA	1.1E+01	7.5E-02
Hexane	4.4E-01	1.0E+01	2.6E+02	1.8E+00
Lead	1.2E-04	NA	7.2E-02	5.0E-04
Manganese	9.2E-05	2.2E-03	5.5E-02	3.8E-04
Mercury	6.3E-05	1.5E-03	3.8E-02	2.6E-04
Naphthalene	1.5E-04	NA	8.8E-02	6.1E-04
Nickel	5.1E-04	1.2E-02	3.0E-01	2.1E-03
POM	1.6E-04	NA	9.6E-02	6.6E-04
Toluene	8.3E-04	2.0E-02	4.9E-01	3.4E-03

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	see attached CEMs-based calculations			116.98
Methane	0.55	326.78	1.63E-01	2.20E-03
Nitrous Oxide	0.055	32.68	1.63E-02	2.20E-04

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Nitrogen Dioxide Emissions from Boiler #9 (ES-004-Boiler #9)

The exhaust duct at Boiler #9 is equipped with a continuous emissions monitor (CEMs) for NOx emissions.
For the 2019 calendar year, 30 day facility averages for the NOx emission rate measured by the CEM are as follows:

Month	30 day average CEM reading (lb/MMBtu)
January 2019	0.04
February 2019	0.04
March 2019	0.04
April 2019	0.04
May 2019	0.04
June 2019	0.04
July 2019	0.04
August 2019	0.04
September 2019	0.04
October 2019	0.04
November 2019	0.04
December 2019	0.05
Annual Average	***0.041***

This average includes NOx emissions from fuel oil and natural gas from Boiler #9 over the entire year, representing a composite average for all fuels combusted.

Fuel Inputs to Boiler #9 for 2019

Boiler #9	
Gas 1,000cf/yr	**Oil Gallons/yr**
144,470	**0**
Nat. Gas (1,026 btu/cf)	Oil (139,417 btu/gal)
MMBtu/yr	
1.48E+05	0.00E+00

Total for Boiler #9 (MMBtu/yr)	1.48E+05

NOx Emissions from Boiler #9 (lb/yr)	6,053
NOx Emissions from Boiler #9 (ton/yr)	**3.03**

NOx Emissions Associated with Fuel Oil Combustion (ton/yr)	**0.000**
NOx Emissions Associated with Natural Gas Combustion (ton/yr)	**3.03**

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

CO_2 Emissions from Boiler No.9
(ES-3)

The exhaust system on Boiler #9 is equipped with a continuous emissions monitor (CEMs) for CO_2 concentrations. The natural gas and oil flow rates to the boiler are monitored. Mass CO_2 emissions are calculated by the DAHS for GHG reporting. For the 2019 calendar year, the monthly CO2 emissions measured by the CEM/DAHS System are as follows:

Month	Metric Tons	Tons
January 2019	354	390
February 2019	100	110
March 2019	104	115
April 2019	423	467
May 2019	620	684
June 2019	2,876	3,170
July 2019	1,950	2,150
August 2019	487	537
September 2019	39	43
October 2019	797	878
November 2019	1,561	1,721
December 2019	74	81
Annual Total	9,386.1	10,346.3

This total includes CO_2 emissions from No.2 fuel oil and natural gas from Boiler #9 over the entire year, representing a composite average for all fuels combusted.

Fuel Inputs to Boiler #9 for 2019

Boiler #9	
Gas 1,000cf/yr	**No. 2 Oil Gallons/yr**
144,470	**0**
Nat. Gas (1,026 btu/cf)	Oil (139,417 btu/gal)
MMBtu/yr	
1.48E+05	0.00E+00

Total for Boiler #9 (MMBtu/yr)	1.48E+05

CO_2 Emission Rate Ratios

	kg/MMBtu	Ratio
n.gas	53.06	1
No.2 oil	73.96	1.3939

CO_2 Emissions Associated with Fuel Oil No. 2 Combustion (ton/yr)	**0.00**
CO_2 Emissions Associated with Natural Gas Combustion (ton/yr)	**10,346.30**

1.48E+05 *Dist. Factor*

10,346.30

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019Annual Emissions Inventory

Boiler #10
(ES-005)

Operating Scenarios
OS-1 Natural Gas Firing
OS-2 No. 2 Fuel Oil Firing

Fuel Oil Combustion Emissions Calculator FO2000 Revision A
Boiler #10
2019 Annual Emissions Inventory
(ES-005-Boiler #10)
Facility ID # 6800043
Permit # 03069T35

Operating Scenario #2

User Input	
Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**249**
Fuel Input Capacity (10^3 gal/hr):	1.79
Annual Fuel Throughput (1000 gal):	**0.00**
Maximum fuel sulfur content (%)	**0.0359**
Latest Construction/Modification Date:	**N/A**

Enter the boiler type below ↘	
17	

Boilers =>100 mmBtu/hr
1 = No. 6 oil fired, normal firing (U)
2 = No. 6 oil fired, normal firing (I)
3 = No. 6 oil fired, normal firing (C)
4 = No. 6 oil fired, normal firing, low NOx burner (U)
5 = No. 6 oil fired, normal firing, low NOx burner (I)
6 = No. 6 oil fired, normal firing, low NOx burner (C)
7 = No. 6 oil fired, tangential firing (U)
8 = No. 6 oil fired, tangential firing, low NOx burner (U)
9 = No. 5 oil fired, normal firing (U)
10 = No. 5 oil fired, normal firing (I)
11 = No. 5 oil fired, tangential firing (U)
12 = No. 4 oil fired, normal firing (U)
13 = No. 4 oil fired, normal firing (I)
14 = No. 4 oil fired, tangential firing (U)
15 = No. 2 oil fired (U,I)

Boilers =>100 mmBtu/hr (cont'd)
16 = No. 2 oil fired (C)
17 = No. 2 oil fired, LNB/FGR (U,I)
18 = No. 2 oil fired, LNB/FGR (C)
19 = Vertical fired utility boiler
Small Boilers (<100 mmBtu/hr)
20 = No. 6 oil fired (I)
21 = No. 6 oil fired (C)
22 = No. 5 oil fired (C)
23 = No. 4 oil fired (C)
24 = No. 2 oil fired (I)
25 = No. 2 oil fired (C)
26 = Residential Furnace

Fuel Oil Combustion Emissions Calculator FO2000 Revision A
Boiler #10
2019 Annual Emissions Inventory
(ES-005-Boiler #10)
Facility ID # 6800043
Permit # 03069T35

Operating Scenario #2

User Input	
Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**249**
Fuel Input Capacity (10^3 gal/hr):	1.79
Annual Fuel Throughput (1000 gal):	**0.00**
Maximum fuel sulfur content (%)	**0.0359**
Latest Construction/Modification Date:	**N/A**

Emission Controls

Particulate controls

Enter the control type below ↘	Message Area	Or enter a PM control efficiency below to override built in values.
0		User Input PM Cont. Effic. **0.0**

Control Device	Avg. Cont. Effic.
0 = None/other	0.0
1 = ESP	
2 = Scrubber	
3 = Bagfilter	0.0
4 = Multiple cyclone	

Message Area

Postcombustion SO_2 controls

Enter the control type below ↘	Message Area	Or enter an SO_2 control efficiency below to override built in values.
0		User Input SO_2 Cont. Effic. **0.0**

Control Technology/Process	Avg. Cont. Effic.
0 = None/other	
1 = Wet scrubber, Lime/limestone	0.0
2 = Wet scrubber, Sodium carbonate	
3 = Wet scrubber, Magnesium oxide/hydroxide	
4 = Wet scrubber, Dual alkali	Remarks
5 = Spray drying, calcium hydroxide slurry, vap. in spray vessel	NA
6 = Furnace injection, Dry calcium carbonate/hydrate inj. in upper furn. cavity	
7 = Duct injection, Dry sorbent injection into duct, sometimes combined with water spray	

Message Area

NO_x controls

Enter the control type below ↘		Or enter a NO_x control efficiency below to override built in values.
5 + 6		User Input NO_x Cont. Effic. **0.0**

Control Technology/Process	Avg. Cont. Effic.
0 = None/other	
1 = Low excess air (LEA)	0.0
2 = Staged combustion (SC)	
3 = Burners out of service (BOOS)	
4 = Flue gas recirculation (FGR)	Remarks
5 = Flue gas recirculation plus staged combustion	NA
6 = Low NOx burners (LNB)	
7 = Reduced air preheat (RAP)	
8 = Selective noncatalytic reduction (SNCR)	

Message Area

Fuel Oil Combustion Emissions Calculator FO2000 Revision A
Boiler #10
2019 Annual Emissions Inventory
(ES-005-Boiler #10)
Facility ID # 6800043
Permit # 03069T35

Operating Scenario #2

User Input	
Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**249**
Fuel Input Capacity (10^3 gal/hr):	1.79
Annual Fuel Throughput (1000 gal):	**0.00**
Maximum fuel sulfur content (%)	**0.0359**
Latest Construction/Modification Date:	**N/A**

9 = Conventional selective catalytic reduction (SCR)

Fuel Oil Combustion Emissions Calculator FO2000 Revision A
Boiler #10
2019 Annual Emissions Inventory
(ES-005-Boiler #10)
Facility ID # 6800043
Permit # 03069T35

Operating Scenario #2

User Input	
Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**249**
Fuel Input Capacity (10^3 gal/hr):	1.79
Annual Fuel Throughput (1000 gal):	**0.00**
Maximum fuel sulfur content (%)	**0.0359**
Latest Construction/Modification Date:	**N/A**

Emissions Output

Criteria Pollutants

Pollutant	lb/hr[2]	tpy	lb/yr[3]	Emission Factor[1] (lb/10^3 gal)
Total PM (FPM + CPM)	5.9	0.0000	0	3.30E+00
Filterable PM (FPM) rates uncontrolled	3.6	0.0000	0	2.00E+00
Condensable PM (CPM)[4]	2.3	0.0000	0	1.30E+00
Filterable PM-10[5]	1.8	0.0000	0	1.00E+00
Filterable PM-2.5[5]	0.4	0.0000	0	2.50E-01
NOx rates uncontrolled	see attached CEMs-based calculations			2.40E+01
NMTOC	0	0.0000	0	2.00E-01
CO	9	0.0000	0	5.00E+00
SO2 rates uncontrolled	9.2	0.0000	0	5.1696
Total HAP[6]	3.23E-01	0.0000	0	1.81E-01
Largest HAP[6]	1.42E-01	0.0000	0	7.97E-02

***NOx emissions based on CEMs data.*

Toxic/Hazardous Air Pollutants.

Pollutant	lb/hr[2]	lb/day[7]	lb/yr[3]	Emission Factor[1] (lb/10^3 gal)
Antimony rates uncontrolled	0.00E+00	NA	0.00E+00	0.00E+00
Arsenic rates uncontrolled	1.00E-03	NA	0.00E+00	5.60E-04
Benzene	4.91E-03	NA	0.00E+00	2.75E-03
Beryllium rates uncontrolled	7.50E-04	NA	0.00E+00	4.20E-04
Cadmium rates uncontrolled	7.50E-04	NA	0.00E+00	4.20E-04
Chromium rates uncontrolled	7.50E-04	NA	0.00E+00	4.20E-04
Chromium VI rates uncontrolled	2.20E-04	NA	0.00E+00	1.23E-04
Cobalt rates uncontrolled	0.00E+00	NA	0.00E+00	0.00E+00
Ethylbenzene	1.46E-03	NA	0.00E+00	8.17E-04
Fluoride	6.66E-02	1.60E+00	0.00E+00	3.73E-02
Formaldehyde	8.57E-02	2.06E+00	0.00E+00	4.80E-02
Lead rates uncontrolled	2.25E-03	NA	0.00E+00	1.26E-03
Manganese rates uncontrolled	1.50E-03	3.60E-02	0.00E+00	8.40E-04
Mercury	7.50E-04	1.80E-02	0.00E+00	4.20E-04
Methyl chloroform (1,1,1-Trichloroethane)	4.21E-04	1.01E-02	0.00E+00	2.36E-04
Naphthalene	5.95E-04	NA	0.00E+00	3.33E-04
Nickel rates uncontrolled	7.50E-04	1.80E-02	0.00E+00	4.20E-04
POM rates uncontrolled	5.89E-03	NA	0.00E+00	3.30E-03
Selenium rates uncontrolled	3.75E-03	NA	0.00E+00	2.10E-03
Toluene	1.42E-01	3.42E+00	0.00E+00	7.97E-02

Fuel Oil Combustion Emissions Calculator FO2000 Revision A
Boiler #10
2019 Annual Emissions Inventory
(ES-005-Boiler #10)
Facility ID # 6800043
Permit # 03069T35

Operating Scenario #2

User Input	
Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**249**
Fuel Input Capacity (10^3 gal/hr):	1.79
Annual Fuel Throughput (1000 gal):	**0.00**
Maximum fuel sulfur content (%)	**0.0359**
Latest Construction/Modification Date:	**N/A**

Xylene	2.50E-03	6.00E-02	0.00E+00	1.40E-03

Greenhouse Gases

Pollutant	lb/hr[2]	tpy	lb/yr[3]	Emission Factor (lb/10^3 gal)
Carbon dioxide	see attached CEMs-based calculations			22930.85
Methane	1.66E+00	0.00E+00	0.00E+00	0.930
Nitrous Oxide	3.32E-01	0.00E+00	0.00E+00	0.19

[1]Emission factors represent AP-42 uncontrolled values. Emission rates are reflective of controls where applicable.
[2]Hourly emission rates for all pollutants are based on hourly rated capacity.
[3]Annual emission rates for all pollutants are based on maximum annual fuel throughput.
[4]Wet scrubbers are assumed to control CPM whereas other PM control devices are assumed to only control FPM.
[5]AP-42 assumes PM-10 and PM-2.5 assumes these pollutants are controlled with the same efficiency as total PM.
[6]Total and largest HAP factors and emission rates do not reflect control of metals. Individual metal emission rates are reflective of particulate matter controls where applicable.
[7]Daily emission rates are based on operation 24 hours per day at rated capacity.

Natural Gas Combustion Emissions Calculator NG2000 Revision C
2019 Annual Emissions Inventory
Boiler #10
(ES-005-Boiler 10)

Facility ID # 6800043
Permit # 03069T35

Operating Scenario #1

User Input	
Company Name:	**University of North Carolina at Chapel Hill**
Plant County:	**Orange County**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**ClimeCo**
Heat Input Capacity (mmBtu/hr):	**249**
Fuel Input Capacity (10^6 scf/hr):	0.24
Annual Fuel Throughput (10^6 scf):	**103.97**
Latest Construction/Modification Date:	**N/A**

Enter the boiler type below ↘	
3 + 4	

Other NOx Control
Enter 1 below if SNCR is applied to the boiler.
0

Large Wall-Fired Boilers (=>100 mmBtu/hr)
1 = Uncontrolled (Pre-NSPS)
2 = Uncontrolled (Post-NSPS)
3 = Controlled - Low NOx burners
4 = Controlled - Flue gas recirculation (FGR)

Small Boilers (<100 mmBtu/hr)
5 = Uncontrolled
6 = Controlled - Low NOx burners
7 = Controlled - Low NOx burners/FGR

Tangential-Fired Boilers (All Sizes)
8 = Uncontrolled
9 = Controlled - FGR

Residential Furnaces (<0.3 mmBtu/hr)
10 = Uncontrolled

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmscf)
PM	1.8E+00	7.9E+02	4.0E-01	7.6E+00
PM-10	1.8E+00	7.9E+02	4.0E-01	7.6E+00
PM-2.5	1.8E+00	7.9E+02	4.0E-01	7.6E+00
NOx	see attached CEMs-based calculations			1.9E+02
VOC	1.3E+00	5.7E+02	2.9E-01	5.5E+00
CO	2.0E+01	8.7E+03	4.4E+00	8.4E+01
SO2	1.5E-01	6.2E+01	3.1E-02	6.0E-01
Total HAP	4.6E-01	2.0E+02	9.8E-02	1.9E+00
Largest HAP	4.4E-01	1.9E+02	9.4E-02	1.8E+00

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Arsenic	4.9E-05	NA	2.1E-02	2.0E-04
Benzene	5.1E-04	NA	2.2E-01	2.1E-03
Cadmium	2.7E-04	NA	1.1E-01	1.1E-03
Chromium	3.4E-04	NA	1.5E-01	1.4E-03
Chromium VI	3.4E-04	NA	1.5E-01	1.4E-03
Dichlorobenzene	2.9E-04	NA	1.2E-01	1.2E-03
Formaldehyde	1.8E-02	NA	7.8E+00	7.5E-02
Hexane	4.4E-01	1.0E+01	1.9E+02	1.8E+00
Lead	1.2E-04	NA	5.2E-02	5.0E-04
Manganese	9.2E-05	2.2E-03	4.0E-02	3.8E-04
Mercury	6.3E-05	1.5E-03	2.7E-02	2.6E-04
Naphthalene	1.5E-04	NA	6.3E-02	6.1E-04
Nickel	5.1E-04	1.2E-02	2.2E-01	2.1E-03
POM	1.6E-04	NA	6.9E-02	6.6E-04
Toluene	8.3E-04	2.0E-02	3.5E-01	3.4E-03

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	see attached CEMs-based calculations			116.89
Methane	0.55	235.17	1.18E-01	2.20E-03
Nitrous Oxide	0.055	23.52	1.18E-02	2.20E-04

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Nitrogen Dioxide Emissions from Boiler #10 (ES-005-Boiler #10)

The exhaust duct at Boiler #10 is equipped with a continuous emissions monitor (CEMs) for NOx emissions.
For the 2019 calendar year, 30 day facility averages for the NOx emission rate measured by the CEM are as follows:

Month	30 day average CEM reading (lb/MMBtu)
January 2019	0.05
February 2019	0.05
March 2019	0.05
April 2019	0.05
May 2019	0.05
June 2019	0.05
July 2019	0.04
August 2019	0.04
September 2019	0.04
October 2019	0.05
November 2019	0.05
December 2019	0.05
Annual Average	***0.048***

This average includes NOx emissions from fuel oil and natural gas from Boiler #10 over the entire year, representing a composite average for all fuels combusted.

Fuel Inputs to Boiler #10 for 2019

Boiler #10	
Gas 1,000cf/yr	**Oil Gallons/yr**
103,970	**0**
Nat. Gas (1,026 btu/cf)	Oil (139,417 btu/gal)
MMBtu/yr	
1.07E+05	0.00E+00

Total for Boiler #10 (MMBtu/yr)	1.07E+05

NOx Emissions from Boiler #10 (lb/yr)	5,067
NOx Emissions from Boiler #10 (ton/yr)	**2.5**

NOx Emissions Associated with Fuel Oil Combustion (ton/yr)	**0.00**
NOx Emissions Associated with Natural Gas Combustion (ton/yr)	**2.53**

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

CO_2 Emissions from Boiler No.10
(ES-3)

The exhaust system on Boiler #10 is equipped with a continuous emissions monitor (CEMs) for CO_2 concentrations. The natural gas and oil flow rates to the boiler are monitored. Mass CO_2 emissions are calculated by the DAHS for GHG reporting. For the 2019 calendar year, the monthly CO2 emissions measured by the CEM/DAHS System are as follows:

Month	Metric Tons	Tons
January 2019	173	191
February 2019	134	148
March 2019	67	74
April 2019	116	128
May 2019	151	167
June 2019	2,483	2,737
July 2019	1,489	1,641
August 2019	1,439	1,587
September 2019	14	15
October 2019	697	769
November 2019	95	105
December 2019	10	11
Annual Total	6,869.9	7,572.7

This total includes CO_2 emissions from No.2 fuel oil and natural gas from Boiler #10 over the entire year, representing a composite average for all fuels combusted.

Fuel Inputs to Boiler #10 for 2019

Boiler #10	
Gas 1,000cf/yr	**No. 2 Oil Gallons/yr**
103,970	**0**
Nat. Gas (1,026 btu/cf)	Oil (139,417 btu/gal)
MMBtu/yr	
1.07E+05	0.00E+00

Total for Boiler #7 (MMBtu/yr)	1.07E+05

CO_2 Emission Rate Ratios

	kg/MMBtu	Ratio
n.gas	53.06	1
No.2 oil	73.96	1.3939

CO_2 Emissions Associated with Fuel Oil No. 2 Combustion (ton/yr)	**0.00**
CO_2 Emissions Associated with Natural Gas Combustion (ton/yr)	**7,572.72**

1.07E+05 *Dist. Factor*

7,572.72

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Coal Crusher/Conveyor Building
(ES-010A)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Emissions from the Conveyor/Crusher Building

(ES-010A)

Assume that the total amount of coal conveyed to the crusher is equal to the total amount of coal combusted in 2019.

Boiler #6	32,717	Tons/yr
Boiler #7	25,368	Tons/yr
Total	58,085	Tons/yr

The conveyor transfer points and crushers in the Coal Crusher Building are controlled by a vacuum dust pick-up system ducted to a baghouse. The air flow rate through the baghouse is 6,650 acfm. Emissions from the baghouse are conservatively estimated at 0.015 gr/acfm.

60 ton/hr, conveying rate
968.1 hrs/yr, conveying time

lb/yr = (6,650 acfm) (60 min/hr) (hr/yr) (0.015 gr/acfm) (1/7000 lb/gr)

Total Emissions from the Crusher	**5,794,027**	**gr/yr**
	828	**lb/yr**
	0.41	**ton/yr**

100% of these emissions are PM-10
95% of these emissions are PM-2.5

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Ash Silo with Loadout
(ES-030)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Ash Silo with Loadout
(ES-030)

Ash is conveyed to the silo and loaded into trucks for off-site transport. The ash is pneumatically conveyed to the silo with the conveying air filtered through a baghouse (CD-031) prior to discharge. The ash loadout to the transfer trucks is via a pipe within a pipe configuration. The annular space between the internal and external pipes is under a vacuum. This vacuum system collects the dust generated during truck loading and ducts it to the baghouse (CD-031). Ash is composed of coal flyash and $CaCO_3$ / $CaSO_3$ from desulfurization. Ash is similar to flyash used in concrete batching operations.

16,942 ton/yr, ash loaded in 2019

1. Uncaptured Truck Loading Fugitives

Truck loading operations are in an enclosure with discharge into an enclosed truck bed. The vacuum at the ash discharge point and enclosures should insure a minimum of 95% capture. Uncontrolled emissions are based on a conservatively high estimated 0.5 lb/ton emission factor (0.02 lb/ton AP-42 for batch truck loading at concrete plants).

16,942	ton/yr, Ash Generated
0.5	lb/ton, Emission Factor
95%	Capture Efficiency
423.6	lb/yr, Emissions
0.21	ton/yr, Emissions

Fugitives from the Enclosure:

0.011	ton/yr, Emissions

2. Baghouse Emissions

The air flow rate through the baghouse is 4,490 acfm. Emissions from the baghouse are conservatively estimated at 0.015 gr/acfm.

lb/yr = (4,490 acfm) (60 min/hr) (hr/yr) (0.015 gr/acfm) (1/7000 lb/gr)

4,490	acfm, Baghouse Flow Rate
3,166	hrs/yr, Operating Hours
0.015	gr/acfm, Emission Factor from Baghouse
1,828	lb/yr, Emissions
0.91	ton/yr, Emissions

3. Total Emissions

0.21	ton/yr, Emissions Truck Loading
0.011	ton/yr, Emissions, Truck Fugitives
0.91	ton/yr, Emissions, Baghouse
1.14	ton/yr, Total Emissions PM
1.14	ton/yr, Total Emissions PM-10
1.08	ton/yr, Total Emissions PM-2.5

100% as PM-10
95% as PM-2.5

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Wet Ash Loadout
(ES-030A)

(This unit was not in operation during CY 2019)

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
EPA Building

(ES-EG#1)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

EPA Building Emergency Generator
(ES-EG#1)

Fuel Input Rates	
Size Rating (kW)	**900**
Hourly Fuel Usage (gallons):	71
Annual Fuel Usage (gallons):	**182**
Fuel Sulfur Content (%)	**0.05**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	135,000
Hourly Fuel Usage (mmBtu):	9.63
Annual Fuel Usage (mmBtu):	24.57

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	9.6E-01	2.5E+00	1.23E-03	1.00E-01
PM-10	9.6E-01	2.5E+00	1.23E-03	1.00E-01
PM-2.5	9.6E-01	2.5E+00	1.23E-03	1.00E-01
NOx	1.8E+01	4.7E+01	2.33E-02	1.90E+00
NMTOC, Total	7.9E-01	2.0E+00	1.01E-03	8.19E-02
CO	8.2E+00	2.1E+01	1.04E-02	8.50E-01
SO_x	4.9E-01	1.2E+00	6.20E-04	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	2.4E-04	5.8E-03	6.19E-04	2.52E-05
Acrolein	7.6E-05	1.8E-03	1.94E-04	7.88E-06
Arsenic	3.9E-05	9.2E-04	9.83E-05	4.00E-06
Benzene	7.5E-03	1.8E-01	1.91E-02	7.76E-04
Benzo(a)pyrene	2.5E-06	5.9E-05	6.31E-06	2.57E-07
Beryllium	2.9E-05	6.9E-04	7.37E-05	3.00E-06
Cadmium	2.9E-05	6.9E-04	7.37E-05	3.00E-06
Chromium	2.9E-05	6.9E-04	7.37E-05	3.00E-06
Formaldehyde	7.6E-04	1.8E-02	1.94E-03	7.89E-05
Lead	8.7E-05	2.1E-03	2.21E-04	9.00E-06
Manganese	5.8E-05	1.4E-03	1.47E-04	6.00E-06
Mercury	2.9E-05	6.9E-04	7.37E-05	3.00E-06
Naphthalene	1.3E-03	3.0E-02	3.19E-03	1.30E-04
Nickel	2.9E-05	6.9E-04	7.37E-05	3.00E-06
PAH	2.0E-03	4.9E-02	5.21E-03	2.12E-04
Selenium	1.4E-04	3.5E-03	3.69E-04	1.50E-05
Toluene	2.7E-03	6.5E-02	6.90E-03	2.81E-04
Xylene	1.9E-03	4.5E-02	4.74E-03	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	1,570	4,006	2.00	163
Methane	6.4E-02	1.6E-01	8.13E-05	6.61E-03
Nitrous Oxide	1.3E-02	3.3E-02	1.63E-05	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Bondurant Hall
(Renamed building-was Medical Sciences Research Building)
(ES-EG#10)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Bondurant Hall Emergency Generator
(ES-EG#10)

Fuel Input Rates	
Size Rating (kW)	**800**
Hourly Fuel Usage (gallons):	63
Annual Fuel Usage (gallons):	**1,141**
Fuel Sulfur Content (%)	**0.05**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	135,000
Hourly Fuel Usage (mmBtu):	8.56
Annual Fuel Usage (mmBtu):	154.08

Emissions Output
Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	8.6E-01	1.5E+01	7.70E-03	1.00E-01
PM-10	8.6E-01	1.5E+01	7.70E-03	1.00E-01
PM-2.5	8.6E-01	1.5E+01	7.70E-03	1.00E-01
NOx	1.6E+01	2.9E+02	1.46E-01	1.90E+00
NMTOC, Total	7.0E-01	1.3E+01	6.31E-03	8.19E-02
CO	7.3E+00	1.3E+02	6.55E-02	8.50E-01
SO_x	4.3E-01	7.8E+00	3.89E-03	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	2.2E-04	5.2E-03	3.88E-03	2.52E-05
Acrolein	6.7E-05	1.6E-03	1.21E-03	7.88E-06
Arsenic	3.4E-05	8.2E-04	6.16E-04	4.00E-06
Benzene	6.6E-03	1.6E-01	1.20E-01	7.76E-04
Benzo(a)pyrene	2.2E-06	5.3E-05	3.96E-05	2.57E-07
Beryllium	2.6E-05	6.2E-04	4.62E-04	3.00E-06
Cadmium	2.6E-05	6.2E-04	4.62E-04	3.00E-06
Chromium	2.6E-05	6.2E-04	4.62E-04	3.00E-06
Formaldehyde	6.8E-04	1.6E-02	1.22E-02	7.89E-05
Lead	7.7E-05	1.8E-03	1.39E-03	9.00E-06
Manganese	5.1E-05	1.2E-03	9.24E-04	6.00E-06
Mercury	2.6E-05	6.2E-04	4.62E-04	3.00E-06
Naphthalene	1.1E-03	2.7E-02	2.00E-02	1.30E-04
Nickel	2.6E-05	6.2E-04	4.62E-04	3.00E-06
PAH	1.8E-03	4.4E-02	3.27E-02	2.12E-04
Selenium	1.3E-04	3.1E-03	2.31E-03	1.50E-05
Toluene	2.4E-03	5.8E-02	4.33E-02	2.81E-04
Xylene	1.7E-03	4.0E-02	2.97E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	1,396	25,123	12.56	163
Methane	5.7E-02	1.0E+00	5.10E-04	6.61E-03
Nitrous Oxide	1.1E-02	2.0E-01	1.02E-04	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Burnett-Womack Building

(ES-EG#11)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Burnett-Womack Emergency Generator
(ES-EG#11)

Fuel Input Rates	
Size Rating (kW)	**1750**
Hourly Fuel Usage (gallons):	139
Annual Fuel Usage (gallons):	**2,081**
Fuel Sulfur Content (%)	**0.05**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	135,000
Hourly Fuel Usage (mmBtu):	18.73
Annual Fuel Usage (mmBtu):	280.88

Emissions Output
Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	1.9E+00	2.8E+01	1.40E-02	1.00E-01
PM-10	1.9E+00	2.8E+01	1.40E-02	1.00E-01
PM-2.5	1.9E+00	2.8E+01	1.40E-02	1.00E-01
NOx	3.6E+01	5.3E+02	2.67E-01	1.90E+00
NMTOC, Total	1.5E+00	2.3E+01	1.15E-02	8.19E-02
CO	1.6E+01	2.4E+02	1.19E-01	8.50E-01
SO_x	9.5E-01	1.4E+01	7.09E-03	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	4.7E-04	1.1E-02	7.08E-03	2.52E-05
Acrolein	1.5E-04	3.5E-03	2.21E-03	7.88E-06
Arsenic	7.5E-05	1.8E-03	1.12E-03	4.00E-06
Benzene	1.5E-02	3.5E-01	2.18E-01	7.76E-04
Benzo(a)pyrene	4.8E-06	1.2E-04	7.22E-05	2.57E-07
Beryllium	5.6E-05	1.3E-03	8.43E-04	3.00E-06
Cadmium	5.6E-05	1.3E-03	8.43E-04	3.00E-06
Chromium	5.6E-05	1.3E-03	8.43E-04	3.00E-06
Formaldehyde	1.5E-03	3.5E-02	2.22E-02	7.89E-05
Lead	1.7E-04	4.0E-03	2.53E-03	9.00E-06
Manganese	1.1E-04	2.7E-03	1.69E-03	6.00E-06
Mercury	5.6E-05	1.3E-03	8.43E-04	3.00E-06
Naphthalene	2.4E-03	5.8E-02	3.65E-02	1.30E-04
Nickel	5.6E-05	1.3E-03	8.43E-04	3.00E-06
PAH	4.0E-03	9.5E-02	5.95E-02	2.12E-04
Selenium	2.8E-04	6.7E-03	4.21E-03	1.50E-05
Toluene	5.3E-03	1.3E-01	7.89E-02	2.81E-04
Xylene	3.6E-03	8.7E-02	5.42E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	3,053	45,798	22.90	163
Methane	1.2E-01	1.9E+00	9.29E-04	6.61E-03
Nitrous Oxide	2.5E-02	3.7E-01	1.86E-04	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Mary Ellen Jones Building

(ES-EG#12)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Mary Ellen Jones Emergency Generator
(ES-EG#12)

Fuel Input Rates	
Size Rating (kW)	**1250**
Hourly Fuel Usage (gallons):	99
Annual Fuel Usage (gallons):	**1,982**
Fuel Sulfur Content (%)	**0.05**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	135,000
Hourly Fuel Usage (mmBtu):	13.38
Annual Fuel Usage (mmBtu):	267.50

Emissions Output
Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	1.3E+00	2.7E+01	1.34E-02	1.00E-01
PM-10	1.3E+00	2.7E+01	1.34E-02	1.00E-01
PM-2.5	1.3E+00	2.7E+01	1.34E-02	1.00E-01
NOx	2.5E+01	5.1E+02	2.54E-01	1.90E+00
NMTOC, Total	1.1E+00	2.2E+01	1.10E-02	8.19E-02
CO	1.1E+01	2.3E+02	1.14E-01	8.50E-01
SO_x	6.8E-01	1.4E+01	6.75E-03	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	3.4E-04	8.1E-03	6.74E-03	2.52E-05
Acrolein	1.1E-04	2.5E-03	2.11E-03	7.88E-06
Arsenic	5.4E-05	1.3E-03	1.07E-03	4.00E-06
Benzene	1.0E-02	2.5E-01	2.08E-01	7.76E-04
Benzo(a)pyrene	3.4E-06	8.2E-05	6.87E-05	2.57E-07
Beryllium	4.0E-05	9.6E-04	8.03E-04	3.00E-06
Cadmium	4.0E-05	9.6E-04	8.03E-04	3.00E-06
Chromium	4.0E-05	9.6E-04	8.03E-04	3.00E-06
Formaldehyde	1.1E-03	2.5E-02	2.11E-02	7.89E-05
Lead	1.2E-04	2.9E-03	2.41E-03	9.00E-06
Manganese	8.0E-05	1.9E-03	1.61E-03	6.00E-06
Mercury	4.0E-05	9.6E-04	8.03E-04	3.00E-06
Naphthalene	1.7E-03	4.2E-02	3.48E-02	1.30E-04
Nickel	4.0E-05	9.6E-04	8.03E-04	3.00E-06
PAH	2.8E-03	6.8E-02	5.67E-02	2.12E-04
Selenium	2.0E-04	4.8E-03	4.01E-03	1.50E-05
Toluene	3.8E-03	9.0E-02	7.52E-02	2.81E-04
Xylene	2.6E-03	6.2E-02	5.16E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	2,181	43,617	21.81	163
Methane	8.8E-02	1.8E+00	8.85E-04	6.61E-03
Nitrous Oxide	1.8E-02	3.5E-01	1.77E-04	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Genetic Medicine Building

(ES-EG#13)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Genetic Medicine Building Emergency Generator

(ES-EG#13)

Fuel Input Rates	
Size Rating (kW)	**2000**
Hourly Fuel Usage (gallons):	159
Annual Fuel Usage (gallons):	**2,219**
Fuel Sulfur Content (%)	**0.0015**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	135,000
Hourly Fuel Usage (mmBtu):	21.40
Annual Fuel Usage (mmBtu):	299.60

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	2.1E+00	3.0E+01	1.50E-02	1.00E-01
PM-10	2.1E+00	3.0E+01	1.50E-02	1.00E-01
PM-2.5	2.1E+00	3.0E+01	1.50E-02	1.00E-01
NOx	4.1E+01	5.7E+02	2.85E-01	1.90E+00
NMTOC, Total	1.8E+00	2.5E+01	1.23E-02	8.19E-02
CO	1.8E+01	2.5E+02	1.27E-01	8.50E-01
SO_x	3.2E-02	4.5E-01	2.27E-04	1.52E-03

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	5.4E-04	1.3E-02	7.55E-03	2.52E-05
Acrolein	1.7E-04	4.0E-03	2.36E-03	7.88E-06
Arsenic	8.6E-05	2.1E-03	1.20E-03	4.00E-06
Benzene	1.7E-02	4.0E-01	2.32E-01	7.76E-04
Benzo(a)pyrene	5.5E-06	1.3E-04	7.70E-05	2.57E-07
Beryllium	6.4E-05	1.5E-03	8.99E-04	3.00E-06
Cadmium	6.4E-05	1.5E-03	8.99E-04	3.00E-06
Chromium	6.4E-05	1.5E-03	8.99E-04	3.00E-06
Formaldehyde	1.7E-03	4.1E-02	2.36E-02	7.89E-05
Lead	1.9E-04	4.6E-03	2.70E-03	9.00E-06
Manganese	1.3E-04	3.1E-03	1.80E-03	6.00E-06
Mercury	6.4E-05	1.5E-03	8.99E-04	3.00E-06
Naphthalene	2.8E-03	6.7E-02	3.89E-02	1.30E-04
Nickel	6.4E-05	1.5E-03	8.99E-04	3.00E-06
PAH	4.5E-03	1.1E-01	6.35E-02	2.12E-04
Selenium	3.2E-04	7.7E-03	4.49E-03	1.50E-05
Toluene	6.0E-03	1.4E-01	8.42E-02	2.81E-04
Xylene	4.1E-03	9.9E-02	5.78E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	3,489	48,851	24.43	163
Methane	1.4E-01	2.0E+00	9.91E-04	6.61E-03
Nitrous Oxide	2.8E-02	4.0E-01	1.98E-04	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.

Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
440 West Franklin Building

(ES-EG#14)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

440 W. Franklin Emergency Generator
(ES-EG#14)

Fuel Input Rates	
Size Rating (kW)	**900**
Hourly Fuel Usage (gallons):	71
Annual Fuel Usage (gallons):	**2,775**
Fuel Sulfur Content (%)	**0.05**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	135,000
Hourly Fuel Usage (mmBtu):	9.63
Annual Fuel Usage (mmBtu):	374.61

Emissions Output
Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	9.6E-01	3.7E+01	1.87E-02	1.00E-01
PM-10	9.6E-01	3.7E+01	1.87E-02	1.00E-01
PM-2.5	9.6E-01	3.7E+01	1.87E-02	1.00E-01
NOx	1.8E+01	7.1E+02	3.56E-01	1.90E+00
NMTOC, Total	7.9E-01	3.1E+01	1.53E-02	8.19E-02
CO	8.2E+00	3.2E+02	1.59E-01	8.50E-01
SO_x	4.9E-01	1.9E+01	9.46E-03	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	2.4E-04	5.8E-03	9.44E-03	2.52E-05
Acrolein	7.6E-05	1.8E-03	2.95E-03	7.88E-06
Arsenic	3.9E-05	9.2E-04	1.50E-03	4.00E-06
Benzene	7.5E-03	1.8E-01	2.91E-01	7.76E-04
Benzo(a)pyrene	2.5E-06	5.9E-05	9.63E-05	2.57E-07
Beryllium	2.9E-05	6.9E-04	1.12E-03	3.00E-06
Cadmium	2.9E-05	6.9E-04	1.12E-03	3.00E-06
Chromium	2.9E-05	6.9E-04	1.12E-03	3.00E-06
Formaldehyde	7.6E-04	1.8E-02	2.96E-02	7.89E-05
Lead	8.7E-05	2.1E-03	3.37E-03	9.00E-06
Manganese	5.8E-05	1.4E-03	2.25E-03	6.00E-06
Mercury	2.9E-05	6.9E-04	1.12E-03	3.00E-06
Naphthalene	1.3E-03	3.0E-02	4.87E-02	1.30E-04
Nickel	2.9E-05	6.9E-04	1.12E-03	3.00E-06
PAH	2.0E-03	4.9E-02	7.94E-02	2.12E-04
Selenium	1.4E-04	3.5E-03	5.62E-03	1.50E-05
Toluene	2.7E-03	6.5E-02	1.05E-01	2.81E-04
Xylene	1.9E-03	4.5E-02	7.23E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	1,570	61,081	30.54	163
Methane	6.4E-02	2.5E+00	1.24E-03	6.61E-03
Nitrous Oxide	1.3E-02	5.0E-01	2.48E-04	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Rams Head Center

(ES-EG#15)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Rams Head Center Emergency Generator

(ES-EG#15)

Fuel Input Rates	
Size Rating (kW)	**2000**
Hourly Fuel Usage (gallons):	159
Annual Fuel Usage (gallons):	**1,918**
Fuel Sulfur Content (%)	**0.05**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	135,000
Hourly Fuel Usage (mmBtu):	21.40
Annual Fuel Usage (mmBtu):	258.94

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	2.1E+00	2.6E+01	1.29E-02	1.00E-01
PM-10	2.1E+00	2.6E+01	1.29E-02	1.00E-01
PM-2.5	2.1E+00	2.6E+01	1.29E-02	1.00E-01
NOx	4.1E+01	4.9E+02	2.46E-01	1.90E+00
NMTOC, Total	1.8E+00	2.1E+01	1.06E-02	8.19E-02
CO	1.8E+01	2.2E+02	1.10E-01	8.50E-01
SO_x	1.1E+00	1.3E+01	6.54E-03	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	5.4E-04	1.3E-02	6.53E-03	2.52E-05
Acrolein	1.7E-04	4.0E-03	2.04E-03	7.88E-06
Arsenic	8.6E-05	2.1E-03	1.04E-03	4.00E-06
Benzene	1.7E-02	4.0E-01	2.01E-01	7.76E-04
Benzo(a)pyrene	5.5E-06	1.3E-04	6.65E-05	2.57E-07
Beryllium	6.4E-05	1.5E-03	7.77E-04	3.00E-06
Cadmium	6.4E-05	1.5E-03	7.77E-04	3.00E-06
Chromium	6.4E-05	1.5E-03	7.77E-04	3.00E-06
Formaldehyde	1.7E-03	4.1E-02	2.04E-02	7.89E-05
Lead	1.9E-04	4.6E-03	2.33E-03	9.00E-06
Manganese	1.3E-04	3.1E-03	1.55E-03	6.00E-06
Mercury	6.4E-05	1.5E-03	7.77E-04	3.00E-06
Naphthalene	2.8E-03	6.7E-02	3.37E-02	1.30E-04
Nickel	6.4E-05	1.5E-03	7.77E-04	3.00E-06
PAH	4.5E-03	1.1E-01	5.49E-02	2.12E-04
Selenium	3.2E-04	7.7E-03	3.88E-03	1.50E-05
Toluene	6.0E-03	1.4E-01	7.28E-02	2.81E-04
Xylene	4.1E-03	9.9E-02	5.00E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	3,489	42,221	21.11	163
Methane	1.4E-01	1.7E+00	8.56E-04	6.61E-03
Nitrous Oxide	2.8E-02	3.4E-01	1.71E-04	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
ITS Building

(ES-EG#16)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

ITS Building Emergency Generator

(ES-EG#16)

Fuel Input Rates	
Size Rating (kW)	**2000**
Hourly Fuel Usage (gallons):	159
Annual Fuel Usage (gallons):	**2,663**
Fuel Sulfur Content (%)	**0.05**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	135,000
Hourly Fuel Usage (mmBtu):	21.40
Annual Fuel Usage (mmBtu):	359.52

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	2.1E+00	3.6E+01	1.80E-02	1.00E-01
PM-10	2.1E+00	3.6E+01	1.80E-02	1.00E-01
PM-2.5	2.1E+00	3.6E+01	1.80E-02	1.00E-01
NOx	4.1E+01	6.8E+02	3.42E-01	1.90E+00
NMTOC, Total	1.8E+00	2.9E+01	1.47E-02	8.19E-02
CO	1.8E+01	3.1E+02	1.53E-01	8.50E-01
SO_x	1.1E+00	1.8E+01	9.08E-03	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	5.4E-04	1.3E-02	9.06E-03	2.52E-05
Acrolein	1.7E-04	4.0E-03	2.83E-03	7.88E-06
Arsenic	8.6E-05	2.1E-03	1.44E-03	4.00E-06
Benzene	1.7E-02	4.0E-01	2.79E-01	7.76E-04
Benzo(a)pyrene	5.5E-06	1.3E-04	9.24E-05	2.57E-07
Beryllium	6.4E-05	1.5E-03	1.08E-03	3.00E-06
Cadmium	6.4E-05	1.5E-03	1.08E-03	3.00E-06
Chromium	6.4E-05	1.5E-03	1.08E-03	3.00E-06
Formaldehyde	1.7E-03	4.1E-02	2.84E-02	7.89E-05
Lead	1.9E-04	4.6E-03	3.24E-03	9.00E-06
Manganese	1.3E-04	3.1E-03	2.16E-03	6.00E-06
Mercury	6.4E-05	1.5E-03	1.08E-03	3.00E-06
Naphthalene	2.8E-03	6.7E-02	4.67E-02	1.30E-04
Nickel	6.4E-05	1.5E-03	1.08E-03	3.00E-06
PAH	4.5E-03	1.1E-01	7.62E-02	2.12E-04
Selenium	3.2E-04	7.7E-03	5.39E-03	1.50E-05
Toluene	6.0E-03	1.4E-01	1.01E-01	2.81E-04
Xylene	4.1E-03	9.9E-02	6.94E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	3,489	58,621	29.31	163
Methane	1.4E-01	2.4E+00	1.19E-03	6.61E-03
Nitrous Oxide	2.8E-02	4.8E-01	2.38E-04	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.

Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Brinkhous-Bullitt Building

(ES-EG#17)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Brinkhous-Bullitt Emergency Generator
(ES-EG#17)

Fuel Input Rates	
Size Rating (kW)	**1000**
Hourly Fuel Usage (gallons):	79
Annual Fuel Usage (gallons):	**1,141**
Fuel Sulfur Content (%)	**0.0015**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	135,000
Hourly Fuel Usage (mmBtu):	10.70
Annual Fuel Usage (mmBtu):	154.08

Emissions Output
Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	1.1E+00	1.5E+01	7.70E-03	1.00E-01
PM-10	1.1E+00	1.5E+01	7.70E-03	1.00E-01
PM-2.5	1.1E+00	1.5E+01	7.70E-03	1.00E-01
NOx	2.0E+01	2.9E+02	1.46E-01	1.90E+00
NMTOC, Total	8.8E-01	1.3E+01	6.31E-03	8.19E-02
CO	9.1E+00	1.3E+02	6.55E-02	8.50E-01
SO_x	1.6E-02	2.3E-01	1.17E-04	1.52E-03

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	2.7E-04	6.5E-03	3.88E-03	2.52E-05
Acrolein	8.4E-05	2.0E-03	1.21E-03	7.88E-06
Arsenic	4.3E-05	1.0E-03	6.16E-04	4.00E-06
Benzene	8.3E-03	2.0E-01	1.20E-01	7.76E-04
Benzo(a)pyrene	2.7E-06	6.6E-05	3.96E-05	2.57E-07
Beryllium	3.2E-05	7.7E-04	4.62E-04	3.00E-06
Cadmium	3.2E-05	7.7E-04	4.62E-04	3.00E-06
Chromium	3.2E-05	7.7E-04	4.62E-04	3.00E-06
Formaldehyde	8.4E-04	2.0E-02	1.22E-02	7.89E-05
Lead	9.6E-05	2.3E-03	1.39E-03	9.00E-06
Manganese	6.4E-05	1.5E-03	9.24E-04	6.00E-06
Mercury	3.2E-05	7.7E-04	4.62E-04	3.00E-06
Naphthalene	1.4E-03	3.3E-02	2.00E-02	1.30E-04
Nickel	3.2E-05	7.7E-04	4.62E-04	3.00E-06
PAH	2.3E-03	5.4E-02	3.27E-02	2.12E-04
Selenium	1.6E-04	3.9E-03	2.31E-03	1.50E-05
Toluene	3.0E-03	7.2E-02	4.33E-02	2.81E-04
Xylene	2.1E-03	5.0E-02	2.97E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	1,745	25,123	12.56	163
Methane	7.1E-02	1.0E+00	5.10E-04	6.61E-03
Nitrous Oxide	1.4E-02	2.0E-01	1.02E-04	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Venable Hall

(ES-EG#18)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Venable Hall Emergency Generator
(ES-EG#18)

Fuel Input Rates	
Size Rating (kW)	**1000**
Hourly Fuel Usage (gallons):	79
Annual Fuel Usage (gallons):	**1,633**
Fuel Sulfur Content (%)	**0.0015**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	135,000
Hourly Fuel Usage (mmBtu):	10.70
Annual Fuel Usage (mmBtu):	220.42

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	1.1E+00	2.2E+01	1.10E-02	1.00E-01
PM-10	1.1E+00	2.2E+01	1.10E-02	1.00E-01
PM-2.5	1.1E+00	2.2E+01	1.10E-02	1.00E-01
NOx	2.0E+01	4.2E+02	2.09E-01	1.90E+00
NMTOC, Total	8.8E-01	1.8E+01	9.03E-03	8.19E-02
CO	9.1E+00	1.9E+02	9.37E-02	8.50E-01
SO_x	1.6E-02	3.3E-01	1.67E-04	1.52E-03

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	2.7E-04	6.5E-03	5.55E-03	2.52E-05
Acrolein	8.4E-05	2.0E-03	1.74E-03	7.88E-06
Arsenic	4.3E-05	1.0E-03	8.82E-04	4.00E-06
Benzene	8.3E-03	2.0E-01	1.71E-01	7.76E-04
Benzo(a)pyrene	2.7E-06	6.6E-05	5.66E-05	2.57E-07
Beryllium	3.2E-05	7.7E-04	6.61E-04	3.00E-06
Cadmium	3.2E-05	7.7E-04	6.61E-04	3.00E-06
Chromium	3.2E-05	7.7E-04	6.61E-04	3.00E-06
Formaldehyde	8.4E-04	2.0E-02	1.74E-02	7.89E-05
Lead	9.6E-05	2.3E-03	1.98E-03	9.00E-06
Manganese	6.4E-05	1.5E-03	1.32E-03	6.00E-06
Mercury	3.2E-05	7.7E-04	6.61E-04	3.00E-06
Naphthalene	1.4E-03	3.3E-02	2.87E-02	1.30E-04
Nickel	3.2E-05	7.7E-04	6.61E-04	3.00E-06
PAH	2.3E-03	5.4E-02	4.67E-02	2.12E-04
Selenium	1.6E-04	3.9E-03	3.31E-03	1.50E-05
Toluene	3.0E-03	7.2E-02	6.19E-02	2.81E-04
Xylene	2.1E-03	5.0E-02	4.25E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	1,745	35,940	17.97	163
Methane	7.1E-02	1.5E+00	7.29E-04	6.61E-03
Nitrous Oxide	1.4E-02	2.9E-01	1.46E-04	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Imaging Research Building
(Renamed Marsico Building)
(ES-EG#19)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Imaging Research Emergency Generator
(ES-EG#19)

Fuel Input Rates	
Size Rating (kW)	**2500**
Hourly Fuel Usage (gallons):	198
Annual Fuel Usage (gallons):	**2,814**
Fuel Sulfur Content (%)	**0.0015**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	135,000
Hourly Fuel Usage (mmBtu):	26.75
Annual Fuel Usage (mmBtu):	379.85

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	2.7E+00	3.8E+01	1.90E-02	1.00E-01
PM-10	2.7E+00	3.8E+01	1.90E-02	1.00E-01
PM-2.5	2.7E+00	3.8E+01	1.90E-02	1.00E-01
NOx	5.1E+01	7.2E+02	3.61E-01	1.90E+00
NMTOC, Total	2.2E+00	3.1E+01	1.56E-02	8.19E-02
CO	2.3E+01	3.2E+02	1.61E-01	8.50E-01
SO_x	4.1E-02	5.8E-01	2.88E-04	1.52E-03

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	6.7E-04	1.6E-02	9.57E-03	2.52E-05
Acrolein	2.1E-04	5.1E-03	2.99E-03	7.88E-06
Arsenic	1.1E-04	2.6E-03	1.52E-03	4.00E-06
Benzene	2.1E-02	5.0E-01	2.95E-01	7.76E-04
Benzo(a)pyrene	6.9E-06	1.6E-04	9.76E-05	2.57E-07
Beryllium	8.0E-05	1.9E-03	1.14E-03	3.00E-06
Cadmium	8.0E-05	1.9E-03	1.14E-03	3.00E-06
Chromium	8.0E-05	1.9E-03	1.14E-03	3.00E-06
Formaldehyde	2.1E-03	5.1E-02	3.00E-02	7.89E-05
Lead	2.4E-04	5.8E-03	3.42E-03	9.00E-06
Manganese	1.6E-04	3.9E-03	2.28E-03	6.00E-06
Mercury	8.0E-05	1.9E-03	1.14E-03	3.00E-06
Naphthalene	3.5E-03	8.3E-02	4.94E-02	1.30E-04
Nickel	8.0E-05	1.9E-03	1.14E-03	3.00E-06
PAH	5.7E-03	1.4E-01	8.05E-02	2.12E-04
Selenium	4.0E-04	9.6E-03	5.70E-03	1.50E-05
Toluene	7.5E-03	1.8E-01	1.07E-01	2.81E-04
Xylene	5.2E-03	1.2E-01	7.33E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	4,362	61,936	30.97	163
Methane	1.8E-01	2.5E+00	1.26E-03	6.61E-03
Nitrous Oxide	3.5E-02	5.0E-01	2.51E-04	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Thurston Bowles Building

(ES-EG#2)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Thurston Bowles Emergency Generator
(ES-EG#18)

Fuel Input Rates	
Size Rating (kW)	**1600**
Hourly Fuel Usage (gallons):	127
Annual Fuel Usage (gallons):	**1,649**
Fuel Sulfur Content (%)	**0.050**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	135,000
Hourly Fuel Usage (mmBtu):	17.12
Annual Fuel Usage (mmBtu):	222.56

Emissions Output
Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	1.7E+00	2.2E+01	1.11E-02	1.00E-01
PM-10	1.7E+00	2.2E+01	1.11E-02	1.00E-01
PM-2.5	1.7E+00	2.2E+01	1.11E-02	1.00E-01
NOx	3.3E+01	4.2E+02	2.11E-01	1.90E+00
NMTOC, Total	1.4E+00	1.8E+01	9.11E-03	8.19E-02
CO	1.5E+01	1.9E+02	9.46E-02	8.50E-01
SO_x	8.6E-01	1.1E+01	5.62E-03	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	4.3E-04	1.0E-02	5.61E-03	2.52E-05
Acrolein	1.3E-04	3.2E-03	1.75E-03	7.88E-06
Arsenic	6.8E-05	1.6E-03	8.90E-04	4.00E-06
Benzene	1.3E-02	3.2E-01	1.73E-01	7.76E-04
Benzo(a)pyrene	4.4E-06	1.1E-04	5.72E-05	2.57E-07
Beryllium	5.1E-05	1.2E-03	6.68E-04	3.00E-06
Cadmium	5.1E-05	1.2E-03	6.68E-04	3.00E-06
Chromium	5.1E-05	1.2E-03	6.68E-04	3.00E-06
Formaldehyde	1.4E-03	3.2E-02	1.76E-02	7.89E-05
Lead	1.5E-04	3.7E-03	2.00E-03	9.00E-06
Manganese	1.0E-04	2.5E-03	1.34E-03	6.00E-06
Mercury	5.1E-05	1.2E-03	6.68E-04	3.00E-06
Naphthalene	2.2E-03	5.3E-02	2.89E-02	1.30E-04
Nickel	5.1E-05	1.2E-03	6.68E-04	3.00E-06
PAH	3.6E-03	8.7E-02	4.72E-02	2.12E-04
Selenium	2.6E-04	6.2E-03	3.34E-03	1.50E-05
Toluene	4.8E-03	1.2E-01	6.25E-02	2.81E-04
Xylene	3.3E-03	7.9E-02	4.30E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	2,791	36,289	18.14	163
Methane	1.1E-01	1.5E+00	7.36E-04	6.61E-03
Nitrous Oxide	2.3E-02	2.9E-01	1.47E-04	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Genomic Science Building

(ES-EG#20)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Genomic Science Building Emergency Generator
(ES-EG#20)

Fuel Input Rates	
Size Rating (kW)	**2000**
Hourly Fuel Usage (gallons):	159
Annual Fuel Usage (gallons):	**2,219**
Fuel Sulfur Content (%)	**0.0015**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	135,000
Hourly Fuel Usage (mmBtu):	21.40
Annual Fuel Usage (mmBtu):	299.60

Emissions Output
Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	2.1E+00	3.0E+01	1.50E-02	1.00E-01
PM-10	2.1E+00	3.0E+01	1.50E-02	1.00E-01
PM-2.5	2.1E+00	3.0E+01	1.50E-02	1.00E-01
NOx	4.1E+01	5.7E+02	2.85E-01	1.90E+00
NMTOC, Total	1.8E+00	2.5E+01	1.23E-02	8.19E-02
CO	1.8E+01	2.5E+02	1.27E-01	8.50E-01
SO_x	3.2E-02	4.5E-01	2.27E-04	1.52E-03

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	5.4E-04	1.3E-02	7.55E-03	2.52E-05
Acrolein	1.7E-04	4.0E-03	2.36E-03	7.88E-06
Arsenic	8.6E-05	2.1E-03	1.20E-03	4.00E-06
Benzene	1.7E-02	4.0E-01	2.32E-01	7.76E-04
Benzo(a)pyrene	5.5E-06	1.3E-04	7.70E-05	2.57E-07
Beryllium	6.4E-05	1.5E-03	8.99E-04	3.00E-06
Cadmium	6.4E-05	1.5E-03	8.99E-04	3.00E-06
Chromium	6.4E-05	1.5E-03	8.99E-04	3.00E-06
Formaldehyde	1.7E-03	4.1E-02	2.36E-02	7.89E-05
Lead	1.9E-04	4.6E-03	2.70E-03	9.00E-06
Manganese	1.3E-04	3.1E-03	1.80E-03	6.00E-06
Mercury	6.4E-05	1.5E-03	8.99E-04	3.00E-06
Naphthalene	2.8E-03	6.7E-02	3.89E-02	1.30E-04
Nickel	6.4E-05	1.5E-03	8.99E-04	3.00E-06
PAH	4.5E-03	1.1E-01	6.35E-02	2.12E-04
Selenium	3.2E-04	7.7E-03	4.49E-03	1.50E-05
Toluene	6.0E-03	1.4E-01	8.42E-02	2.81E-04
Xylene	4.1E-03	9.9E-02	5.78E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	3,489	48,851	24.43	163
Methane	1.4E-01	2.0E+00	9.91E-04	6.61E-03
Nitrous Oxide	2.8E-02	4.0E-01	1.98E-04	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Dental Research Building

(ES-EG#21)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Dental Research Building Emergency Generator
(ES-EG#21)

Fuel Input Rates	
Size Rating (kW)	**1,350**
Hourly Fuel Usage (gallons):	**107.0**
Annual Fuel Usage (gallons):	**1,626**
Fuel Sulfur Content (%)	**0.0015**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	**135,000**
Hourly Fuel Usage (mmBtu):	**14.45**
Annual Fuel Usage (mmBtu):	219.57

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	1.4E+00	2.2E+01	1.10E-02	1.00E-01
PM-10	1.4E+00	2.2E+01	1.10E-02	1.00E-01
PM-2.5	1.4E+00	2.2E+01	1.10E-02	1.00E-01
NOx	2.7E+01	4.2E+02	2.09E-01	1.90E+00
NMTOC, Total	1.2E+00	1.8E+01	8.99E-03	8.19E-02
CO	1.2E+01	1.9E+02	9.33E-02	8.50E-01
SO_x	2.2E-02	3.3E-01	1.66E-04	1.52E-03

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	3.6E-04	8.7E-03	5.53E-03	2.52E-05
Acrolein	1.1E-04	2.7E-03	1.73E-03	7.88E-06
Arsenic	5.8E-05	1.4E-03	8.78E-04	4.00E-06
Benzene	1.1E-02	2.7E-01	1.70E-01	7.76E-04
Benzo(a)pyrene	3.7E-06	8.9E-05	5.64E-05	2.57E-07
Beryllium	4.3E-05	1.0E-03	6.59E-04	3.00E-06
Cadmium	4.3E-05	1.0E-03	6.59E-04	3.00E-06
Chromium	4.3E-05	1.0E-03	6.59E-04	3.00E-06
Formaldehyde	1.1E-03	2.7E-02	1.73E-02	7.89E-05
Lead	1.3E-04	3.1E-03	1.98E-03	9.00E-06
Manganese	8.7E-05	2.1E-03	1.32E-03	6.00E-06
Mercury	4.3E-05	1.0E-03	6.59E-04	3.00E-06
Naphthalene	1.9E-03	4.5E-02	2.85E-02	1.30E-04
Nickel	4.3E-05	1.0E-03	6.59E-04	3.00E-06
PAH	3.1E-03	7.3E-02	4.65E-02	2.12E-04
Selenium	2.2E-04	5.2E-03	3.29E-03	1.50E-05
Toluene	4.1E-03	9.7E-02	6.17E-02	2.81E-04
Xylene	2.8E-03	6.7E-02	4.24E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	2,355	35,801	17.90	163
Methane	9.6E-02	1.5E+00	7.26E-04	6.61E-03
Nitrous Oxide	1.9E-02	2.9E-01	1.45E-04	1.32E-03

Most emission factors are from DAQ spreadsheet for small diesel engines <600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Lineberger Cancer Research Building

(ES-EG#3)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Lineberger Cancer Research Emergency Generator
(ES-EG#3)

Fuel Input Rates	
Size Rating (kW)	**728**
Hourly Fuel Usage (gallons):	58
Annual Fuel Usage (gallons):	**1,016**
Fuel Sulfur Content (%)	**0.05**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	135,000
Hourly Fuel Usage (mmBtu):	7.79
Annual Fuel Usage (mmBtu):	137.10

Emissions Output
Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	7.8E-01	1.4E+01	6.85E-03	1.00E-01
PM-10	7.8E-01	1.4E+01	6.85E-03	1.00E-01
PM-2.5	7.8E-01	1.4E+01	6.85E-03	1.00E-01
NOx	1.5E+01	2.6E+02	1.30E-01	1.90E+00
NMTOC, Total	6.4E-01	1.1E+01	5.61E-03	8.19E-02
CO	6.6E+00	1.2E+02	5.83E-02	8.50E-01
SO_x	3.9E-01	6.9E+00	3.46E-03	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	2.0E-04	4.7E-03	3.45E-03	2.52E-05
Acrolein	6.1E-05	1.5E-03	1.08E-03	7.88E-06
Arsenic	3.1E-05	7.5E-04	5.48E-04	4.00E-06
Benzene	6.0E-03	1.5E-01	1.06E-01	7.76E-04
Benzo(a)pyrene	2.0E-06	4.8E-05	3.52E-05	2.57E-07
Beryllium	2.3E-05	5.6E-04	4.11E-04	3.00E-06
Cadmium	2.3E-05	5.6E-04	4.11E-04	3.00E-06
Chromium	2.3E-05	5.6E-04	4.11E-04	3.00E-06
Formaldehyde	6.1E-04	1.5E-02	1.08E-02	7.89E-05
Lead	7.0E-05	1.7E-03	1.23E-03	9.00E-06
Manganese	4.7E-05	1.1E-03	8.23E-04	6.00E-06
Mercury	2.3E-05	5.6E-04	4.11E-04	3.00E-06
Naphthalene	1.0E-03	2.4E-02	1.78E-02	1.30E-04
Nickel	2.3E-05	5.6E-04	4.11E-04	3.00E-06
PAH	1.7E-03	4.0E-02	2.91E-02	2.12E-04
Selenium	1.2E-04	2.8E-03	2.06E-03	1.50E-05
Toluene	2.2E-03	5.3E-02	3.85E-02	2.81E-04
Xylene	1.5E-03	3.6E-02	2.65E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	1,270	22,354	11.18	163
Methane	5.2E-02	9.1E-01	4.53E-04	6.61E-03
Nitrous Oxide	1.0E-02	1.8E-01	9.07E-05	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Taylor Hall

(ES-EG#4)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Taylor Hall Emergency Generator
(ES-EG#4)

Fuel Input Rates	
Size Rating (kW)	**1000**
Hourly Fuel Usage (gallons):	79
Annual Fuel Usage (gallons):	**1,030**
Fuel Sulfur Content (%)	**0.05**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	135,000
Hourly Fuel Usage (mmBtu):	10.70
Annual Fuel Usage (mmBtu):	139.10

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	1.1E+00	1.4E+01	6.96E-03	1.00E-01
PM-10	1.1E+00	1.4E+01	6.96E-03	1.00E-01
PM-2.5	1.1E+00	1.4E+01	6.96E-03	1.00E-01
NOx	2.0E+01	2.6E+02	1.32E-01	1.90E+00
NMTOC, Total	8.8E-01	1.1E+01	5.70E-03	8.19E-02
CO	9.1E+00	1.2E+02	5.91E-02	8.50E-01
SO_x	5.4E-01	7.0E+00	3.51E-03	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	2.7E-04	6.5E-03	3.51E-03	2.52E-05
Acrolein	8.4E-05	2.0E-03	1.10E-03	7.88E-06
Arsenic	4.3E-05	1.0E-03	5.56E-04	4.00E-06
Benzene	8.3E-03	2.0E-01	1.08E-01	7.76E-04
Benzo(a)pyrene	2.7E-06	6.6E-05	3.57E-05	2.57E-07
Beryllium	3.2E-05	7.7E-04	4.17E-04	3.00E-06
Cadmium	3.2E-05	7.7E-04	4.17E-04	3.00E-06
Chromium	3.2E-05	7.7E-04	4.17E-04	3.00E-06
Formaldehyde	8.4E-04	2.0E-02	1.10E-02	7.89E-05
Lead	9.6E-05	2.3E-03	1.25E-03	9.00E-06
Manganese	6.4E-05	1.5E-03	8.35E-04	6.00E-06
Mercury	3.2E-05	7.7E-04	4.17E-04	3.00E-06
Naphthalene	1.4E-03	3.3E-02	1.81E-02	1.30E-04
Nickel	3.2E-05	7.7E-04	4.17E-04	3.00E-06
PAH	2.3E-03	5.4E-02	2.95E-02	2.12E-04
Selenium	1.6E-04	3.9E-03	2.09E-03	1.50E-05
Toluene	3.0E-03	7.2E-02	3.91E-02	2.81E-04
Xylene	2.1E-03	5.0E-02	2.68E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	1,745	22,681	11.34	163
Methane	7.1E-02	9.2E-01	4.60E-04	6.61E-03
Nitrous Oxide	1.4E-02	1.8E-01	9.20E-05	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Neuroscience Research Building

(ES-EG#5)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Neuroscience Research Building Emergency Generator
(ES-EG#5)

Fuel Input Rates	
Size Rating (kW)	**910**
Hourly Fuel Usage (gallons):	72
Annual Fuel Usage (gallons):	**1,010**
Fuel Sulfur Content (%)	**0.05**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	135,000
Hourly Fuel Usage (mmBtu):	9.74
Annual Fuel Usage (mmBtu):	136.32

Emissions Output
Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	9.7E-01	1.4E+01	6.82E-03	1.00E-01
PM-10	9.7E-01	1.4E+01	6.82E-03	1.00E-01
PM-2.5	9.7E-01	1.4E+01	6.82E-03	1.00E-01
NOx	1.9E+01	2.6E+02	1.30E-01	1.90E+00
NMTOC, Total	8.0E-01	1.1E+01	5.58E-03	8.19E-02
CO	8.3E+00	1.2E+02	5.79E-02	8.50E-01
SO_x	4.9E-01	6.9E+00	3.44E-03	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	2.5E-04	5.9E-03	3.44E-03	2.52E-05
Acrolein	7.7E-05	1.8E-03	1.07E-03	7.88E-06
Arsenic	3.9E-05	9.3E-04	5.45E-04	4.00E-06
Benzene	7.6E-03	1.8E-01	1.06E-01	7.76E-04
Benzo(a)pyrene	2.5E-06	6.0E-05	3.50E-05	2.57E-07
Beryllium	2.9E-05	7.0E-04	4.09E-04	3.00E-06
Cadmium	2.9E-05	7.0E-04	4.09E-04	3.00E-06
Chromium	2.9E-05	7.0E-04	4.09E-04	3.00E-06
Formaldehyde	7.7E-04	1.8E-02	1.08E-02	7.89E-05
Lead	8.8E-05	2.1E-03	1.23E-03	9.00E-06
Manganese	5.8E-05	1.4E-03	8.18E-04	6.00E-06
Mercury	2.9E-05	7.0E-04	4.09E-04	3.00E-06
Naphthalene	1.3E-03	3.0E-02	1.77E-02	1.30E-04
Nickel	2.9E-05	7.0E-04	4.09E-04	3.00E-06
PAH	2.1E-03	5.0E-02	2.89E-02	2.12E-04
Selenium	1.5E-04	3.5E-03	2.04E-03	1.50E-05
Toluene	2.7E-03	6.6E-02	3.83E-02	2.81E-04
Xylene	1.9E-03	4.5E-02	2.63E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	1,588	22,227	11.11	163
Methane	6.4E-02	9.0E-01	4.51E-04	6.61E-03
Nitrous Oxide	1.3E-02	1.8E-01	9.02E-05	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Medical Biomolecular Research Building

(ES-EG#6)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Medical Biomolecular Research Building Emergency Generator
(ES-EG#6)

Fuel Input Rates	
Size Rating (kW)	**1500**
Hourly Fuel Usage (gallons):	119
Annual Fuel Usage (gallons):	**2,140**
Fuel Sulfur Content (%)	**0.05**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	135,000
Hourly Fuel Usage (mmBtu):	16.05
Annual Fuel Usage (mmBtu):	288.90

Emissions Output
Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	1.6E+00	2.9E+01	1.44E-02	1.00E-01
PM-10	1.6E+00	2.9E+01	1.44E-02	1.00E-01
PM-2.5	1.6E+00	2.9E+01	1.44E-02	1.00E-01
NOx	3.0E+01	5.5E+02	2.74E-01	1.90E+00
NMTOC, Total	1.3E+00	2.4E+01	1.18E-02	8.19E-02
CO	1.4E+01	2.5E+02	1.23E-01	8.50E-01
SO_x	8.1E-01	1.5E+01	7.29E-03	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	4.0E-04	9.7E-03	7.28E-03	2.52E-05
Acrolein	1.3E-04	3.0E-03	2.28E-03	7.88E-06
Arsenic	6.4E-05	1.5E-03	1.16E-03	4.00E-06
Benzene	1.2E-02	3.0E-01	2.24E-01	7.76E-04
Benzo(a)pyrene	4.1E-06	9.9E-05	7.42E-05	2.57E-07
Beryllium	4.8E-05	1.2E-03	8.67E-04	3.00E-06
Cadmium	4.8E-05	1.2E-03	8.67E-04	3.00E-06
Chromium	4.8E-05	1.2E-03	8.67E-04	3.00E-06
Formaldehyde	1.3E-03	3.0E-02	2.28E-02	7.89E-05
Lead	1.4E-04	3.5E-03	2.60E-03	9.00E-06
Manganese	9.6E-05	2.3E-03	1.73E-03	6.00E-06
Mercury	4.8E-05	1.2E-03	8.67E-04	3.00E-06
Naphthalene	2.1E-03	5.0E-02	3.76E-02	1.30E-04
Nickel	4.8E-05	1.2E-03	8.67E-04	3.00E-06
PAH	3.4E-03	8.2E-02	6.12E-02	2.12E-04
Selenium	2.4E-04	5.8E-03	4.33E-03	1.50E-05
Toluene	4.5E-03	1.1E-01	8.12E-02	2.81E-04
Xylene	3.1E-03	7.4E-02	5.58E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	2,617	47,106	23.55	163
Methane	1.1E-01	1.9E+00	9.55E-04	6.61E-03
Nitrous Oxide	2.1E-02	3.8E-01	1.91E-04	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Michael Hooker Research Center
(Renamed building-was School of Public Health)
(ES-EG#7)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Michael Hooker Research Center Emergency Generator
(ES-EG#7)

Fuel Input Rates	
Size Rating (kW)	**1250**
Hourly Fuel Usage (gallons):	99
Annual Fuel Usage (gallons):	**793**
Fuel Sulfur Content (%)	**0.05**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	135,000
Hourly Fuel Usage (mmBtu):	13.38
Annual Fuel Usage (mmBtu):	107.00

Emissions Output
Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	1.3E+00	1.1E+01	5.35E-03	1.00E-01
PM-10	1.3E+00	1.1E+01	5.35E-03	1.00E-01
PM-2.5	1.3E+00	1.1E+01	5.35E-03	1.00E-01
NOx	2.5E+01	2.0E+02	1.02E-01	1.90E+00
NMTOC, Total	1.1E+00	8.8E+00	4.38E-03	8.19E-02
CO	1.1E+01	9.1E+01	4.55E-02	8.50E-01
SO_x	6.8E-01	5.4E+00	2.70E-03	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	3.4E-04	8.1E-03	2.70E-03	2.52E-05
Acrolein	1.1E-04	2.5E-03	8.43E-04	7.88E-06
Arsenic	5.4E-05	1.3E-03	4.28E-04	4.00E-06
Benzene	1.0E-02	2.5E-01	8.30E-02	7.76E-04
Benzo(a)pyrene	3.4E-06	8.2E-05	2.75E-05	2.57E-07
Beryllium	4.0E-05	9.6E-04	3.21E-04	3.00E-06
Cadmium	4.0E-05	9.6E-04	3.21E-04	3.00E-06
Chromium	4.0E-05	9.6E-04	3.21E-04	3.00E-06
Formaldehyde	1.1E-03	2.5E-02	8.44E-03	7.89E-05
Lead	1.2E-04	2.9E-03	9.63E-04	9.00E-06
Manganese	8.0E-05	1.9E-03	6.42E-04	6.00E-06
Mercury	4.0E-05	9.6E-04	3.21E-04	3.00E-06
Naphthalene	1.7E-03	4.2E-02	1.39E-02	1.30E-04
Nickel	4.0E-05	9.6E-04	3.21E-04	3.00E-06
PAH	2.8E-03	6.8E-02	2.27E-02	2.12E-04
Selenium	2.0E-04	4.8E-03	1.61E-03	1.50E-05
Toluene	3.8E-03	9.0E-02	3.01E-02	2.81E-04
Xylene	2.6E-03	6.2E-02	2.07E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	2,181	17,447	8.72	163
Methane	8.8E-02	7.1E-01	3.54E-04	6.61E-03
Nitrous Oxide	1.8E-02	1.4E-01	7.08E-05	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Chapman Hall
(Renamed building-was Phillips Addition Building)
(ES-EG#8)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Chapman Hall Emergency Generator
(ES-EG#8)

Fuel Input Rates	
Size Rating (kW)	**800**
Hourly Fuel Usage (gallons):	63
Annual Fuel Usage (gallons):	**1,015**
Fuel Sulfur Content (%)	**0.05**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	135,000
Hourly Fuel Usage (mmBtu):	8.56
Annual Fuel Usage (mmBtu):	136.96

Emissions Output
Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	8.6E-01	1.4E+01	6.85E-03	1.00E-01
PM-10	8.6E-01	1.4E+01	6.85E-03	1.00E-01
PM-2.5	8.6E-01	1.4E+01	6.85E-03	1.00E-01
NOx	1.6E+01	2.6E+02	1.30E-01	1.90E+00
NMTOC, Total	7.0E-01	1.1E+01	5.61E-03	8.19E-02
CO	7.3E+00	1.2E+02	5.82E-02	8.50E-01
SO_x	4.3E-01	6.9E+00	3.46E-03	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	2.2E-04	5.2E-03	3.45E-03	2.52E-05
Acrolein	6.7E-05	1.6E-03	1.08E-03	7.88E-06
Arsenic	3.4E-05	8.2E-04	5.48E-04	4.00E-06
Benzene	6.6E-03	1.6E-01	1.06E-01	7.76E-04
Benzo(a)pyrene	2.2E-06	5.3E-05	3.52E-05	2.57E-07
Beryllium	2.6E-05	6.2E-04	4.11E-04	3.00E-06
Cadmium	2.6E-05	6.2E-04	4.11E-04	3.00E-06
Chromium	2.6E-05	6.2E-04	4.11E-04	3.00E-06
Formaldehyde	6.8E-04	1.6E-02	1.08E-02	7.89E-05
Lead	7.7E-05	1.8E-03	1.23E-03	9.00E-06
Manganese	5.1E-05	1.2E-03	8.22E-04	6.00E-06
Mercury	2.6E-05	6.2E-04	4.11E-04	3.00E-06
Naphthalene	1.1E-03	2.7E-02	1.78E-02	1.30E-04
Nickel	2.6E-05	6.2E-04	4.11E-04	3.00E-06
PAH	1.8E-03	4.4E-02	2.90E-02	2.12E-04
Selenium	1.3E-04	3.1E-03	2.05E-03	1.50E-05
Toluene	2.4E-03	5.8E-02	3.85E-02	2.81E-04
Xylene	1.7E-03	4.0E-02	2.64E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	1,396	22,332	11.17	163
Methane	5.7E-02	9.1E-01	4.53E-04	6.61E-03
Nitrous Oxide	1.1E-02	1.8E-01	9.06E-05	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Caudill Labs
(Renamed building-was Wilson-Dey Building)
(ES-EG#9)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Caudill Labs Emergency Generator
(ES-EG#9)

Fuel Input Rates	
Size Rating (kW)	**1000**
Hourly Fuel Usage (gallons):	79
Annual Fuel Usage (gallons):	**1,347**
Fuel Sulfur Content (%)	**0.05**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	135,000
Hourly Fuel Usage (mmBtu):	10.70
Annual Fuel Usage (mmBtu):	181.90

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	1.1E+00	1.8E+01	9.10E-03	1.00E-01
PM-10	1.1E+00	1.8E+01	9.10E-03	1.00E-01
PM-2.5	1.1E+00	1.8E+01	9.10E-03	1.00E-01
NOx	2.0E+01	3.5E+02	1.73E-01	1.90E+00
NMTOC, Total	8.8E-01	1.5E+01	7.45E-03	8.19E-02
CO	9.1E+00	1.5E+02	7.73E-02	8.50E-01
SO_x	5.4E-01	9.2E+00	4.59E-03	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	2.7E-04	6.5E-03	4.58E-03	2.52E-05
Acrolein	8.4E-05	2.0E-03	1.43E-03	7.88E-06
Arsenic	4.3E-05	1.0E-03	7.28E-04	4.00E-06
Benzene	8.3E-03	2.0E-01	1.41E-01	7.76E-04
Benzo(a)pyrene	2.7E-06	6.6E-05	4.67E-05	2.57E-07
Beryllium	3.2E-05	7.7E-04	5.46E-04	3.00E-06
Cadmium	3.2E-05	7.7E-04	5.46E-04	3.00E-06
Chromium	3.2E-05	7.7E-04	5.46E-04	3.00E-06
Formaldehyde	8.4E-04	2.0E-02	1.44E-02	7.89E-05
Lead	9.6E-05	2.3E-03	1.64E-03	9.00E-06
Manganese	6.4E-05	1.5E-03	1.09E-03	6.00E-06
Mercury	3.2E-05	7.7E-04	5.46E-04	3.00E-06
Naphthalene	1.4E-03	3.3E-02	2.36E-02	1.30E-04
Nickel	3.2E-05	7.7E-04	5.46E-04	3.00E-06
PAH	2.3E-03	5.4E-02	3.86E-02	2.12E-04
Selenium	1.6E-04	3.9E-03	2.73E-03	1.50E-05
Toluene	3.0E-03	7.2E-02	5.11E-02	2.81E-04
Xylene	2.1E-03	5.0E-02	3.51E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	1,745	29,660	14.83	163
Methane	7.1E-02	1.2E+00	6.02E-04	6.61E-03
Nitrous Oxide	1.4E-02	2.4E-01	1.20E-04	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

77 Hp Fire Pump
Kenan Stadium

(ES-FP-1)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Kenan Stadium Fire Pump

(ES-FP-1)

Fuel Input Rates	
Hourly Fuel Usage (gallons):	**7.6**
Annual Fuel Usage (gallons):	**91**
Fuel Sulfur Content (%)	**0.0015**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	**135,000**
Hourly Fuel Usage (mmBtu):	**1.024**
Annual Fuel Usage (mmBtu):	12.29

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	3.2E-01	3.8E+00	1.90E-03	3.10E-01
PM-10	3.2E-01	3.8E+00	1.90E-03	3.10E-01
PM-2.5	3.2E-01	3.8E+00	1.90E-03	3.10E-01
NOx	4.5E+00	5.4E+01	2.71E-02	4.41E+00
NMTOC, Total	3.7E-01	4.4E+00	2.21E-03	3.60E-01
CO	9.7E-01	1.2E+01	5.84E-03	9.50E-01
SO_x	1.6E-03	1.9E-02	9.31E-06	1.52E-03

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	7.9E-04	1.9E-02	9.42E-03	7.67E-04
Acrolein	9.5E-05	2.3E-03	1.14E-03	9.25E-05
Arsenic	4.1E-06	9.8E-05	4.92E-05	4.00E-06
Benzene	9.6E-04	2.3E-02	1.15E-02	9.33E-04
Benzo(a)pyrene	1.9E-07	4.6E-06	2.31E-06	1.88E-07
Beryllium	3.1E-06	7.4E-05	3.69E-05	3.00E-06
1,3-Butadiene	4.0E-05	9.6E-04	4.80E-04	3.91E-05
Cadmium	3.1E-06	7.4E-05	3.69E-05	3.00E-06
Chromium	3.1E-06	7.4E-05	3.69E-05	3.00E-06
Formaldehyde	1.2E-03	2.9E-02	1.45E-02	1.18E-03
Lead	9.2E-06	2.2E-04	1.11E-04	9.00E-06
Manganese	6.1E-06	1.5E-04	7.37E-05	6.00E-06
Mercury	3.1E-06	7.4E-05	3.69E-05	3.00E-06
Naphthalene	8.7E-05	2.1E-03	1.04E-03	8.48E-05
Nickel	3.1E-06	7.4E-05	3.69E-05	3.00E-06
PAH	1.7E-04	4.1E-03	2.06E-03	1.68E-04
Selenium	1.5E-05	3.7E-04	1.84E-04	1.50E-05
Toluene	4.2E-04	1.0E-02	5.03E-03	4.09E-04
Xylene	2.9E-04	7.0E-03	3.50E-03	2.85E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	167	2,004	1.00	163
Methane	6.8E-03	8.1E-02	4.06E-05	6.61E-03
Nitrous Oxide	1.4E-03	1.6E-02	8.13E-06	1.32E-03

Most emission factors are from DAQ spreadsheet for small diesel engines <600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

110 Hp Fire Pump
McColl Building

(ES-FP-2)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

McColl Building Fire Pump

(ES-FP-2)

Fuel Input Rates	
Hourly Fuel Usage (gallons):	**6.0**
Annual Fuel Usage (gallons):	**48**
Fuel Sulfur Content (%)	**0.05**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	**135,000**
Hourly Fuel Usage (mmBtu):	**0.812**
Annual Fuel Usage (mmBtu):	6.49

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	2.5E-01	2.0E+00	1.01E-03	3.10E-01
PM-10	2.5E-01	2.0E+00	1.01E-03	3.10E-01
PM-2.5	2.5E-01	2.0E+00	1.01E-03	3.10E-01
NOx	3.6E+00	2.9E+01	1.43E-02	4.41E+00
NMTOC, Total	2.9E-01	2.3E+00	1.17E-03	3.60E-01
CO	7.7E-01	6.2E+00	3.09E-03	9.50E-01
SO_x	4.1E-02	3.3E-01	1.64E-04	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	6.2E-04	1.5E-02	4.98E-03	7.67E-04
Acrolein	7.5E-05	1.8E-03	6.01E-04	9.25E-05
Arsenic	3.2E-06	7.8E-05	2.60E-05	4.00E-06
Benzene	7.6E-04	1.8E-02	6.06E-03	9.33E-04
Benzo(a)pyrene	1.5E-07	3.7E-06	1.22E-06	1.88E-07
Beryllium	2.4E-06	5.8E-05	1.95E-05	3.00E-06
1,3-Butadiene	3.2E-05	7.6E-04	2.54E-04	3.91E-05
Cadmium	2.4E-06	5.8E-05	1.95E-05	3.00E-06
Chromium	2.4E-06	5.8E-05	1.95E-05	3.00E-06
Formaldehyde	9.6E-04	2.3E-02	7.66E-03	1.18E-03
Lead	7.3E-06	1.8E-04	5.85E-05	9.00E-06
Manganese	4.9E-06	1.2E-04	3.90E-05	6.00E-06
Mercury	2.4E-06	5.8E-05	1.95E-05	3.00E-06
Naphthalene	6.9E-05	1.7E-03	5.51E-04	8.48E-05
Nickel	2.4E-06	5.8E-05	1.95E-05	3.00E-06
PAH	1.4E-04	3.3E-03	1.09E-03	1.68E-04
Selenium	1.2E-05	2.9E-04	9.74E-05	1.50E-05
Toluene	3.3E-04	8.0E-03	2.66E-03	4.09E-04
Xylene	2.3E-04	5.6E-03	1.85E-03	2.85E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	132	1,059	0.53	163
Methane	5.4E-03	4.3E-02	2.15E-05	6.61E-03
Nitrous Oxide	1.1E-03	8.6E-03	4.30E-06	1.32E-03

Most emission factors are from DAQ spreadsheet for small diesel engines <600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

110 Hp Fire Pump
Davis Library

(ES-FP-3)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Davis Library Fire Pump

(ES-FP-3)

Fuel Input Rates	
Hourly Fuel Usage (gallons):	**6.5**
Annual Fuel Usage (gallons):	**36**
Fuel Sulfur Content (%)	**0.05**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	**135,000**
Hourly Fuel Usage (mmBtu):	**0.875**
Annual Fuel Usage (mmBtu):	4.83

Emissions Output
Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	2.7E-01	1.5E+00	7.48E-04	3.10E-01
PM-10	2.7E-01	1.5E+00	7.48E-04	3.10E-01
PM-2.5	2.7E-01	1.5E+00	7.48E-04	3.10E-01
NOx	3.9E+00	2.1E+01	1.06E-02	4.41E+00
NMTOC, Total	3.1E-01	1.7E+00	8.69E-04	3.60E-01
CO	8.3E-01	4.6E+00	2.29E-03	9.50E-01
SO_x	4.4E-02	2.4E-01	1.22E-04	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	6.7E-04	1.6E-02	3.70E-03	7.67E-04
Acrolein	8.1E-05	1.9E-03	4.47E-04	9.25E-05
Arsenic	3.5E-06	8.4E-05	1.93E-05	4.00E-06
Benzene	8.2E-04	2.0E-02	4.50E-03	9.33E-04
Benzo(a)pyrene	1.6E-07	3.9E-06	9.08E-07	1.88E-07
Beryllium	2.6E-06	6.3E-05	1.45E-05	3.00E-06
1,3-Butadiene	3.4E-05	8.2E-04	1.89E-04	3.91E-05
Cadmium	2.6E-06	6.3E-05	1.45E-05	3.00E-06
Chromium	2.6E-06	6.3E-05	1.45E-05	3.00E-06
Formaldehyde	1.0E-03	2.5E-02	5.70E-03	1.18E-03
Lead	7.9E-06	1.9E-04	4.34E-05	9.00E-06
Manganese	5.2E-06	1.3E-04	2.90E-05	6.00E-06
Mercury	2.6E-06	6.3E-05	1.45E-05	3.00E-06
Naphthalene	7.4E-05	1.8E-03	4.09E-04	8.48E-05
Nickel	2.6E-06	6.3E-05	1.45E-05	3.00E-06
PAH	1.5E-04	3.5E-03	8.11E-04	1.68E-04
Selenium	1.3E-05	3.1E-04	7.24E-05	1.50E-05
Toluene	3.6E-04	8.6E-03	1.97E-03	4.09E-04
Xylene	2.5E-04	6.0E-03	1.38E-03	2.85E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	143	787	0.39	163
Methane	5.8E-03	3.2E-02	1.60E-05	6.61E-03
Nitrous Oxide	1.2E-03	6.4E-03	3.19E-06	1.32E-03

Most emission factors are from DAQ spreadsheet for small diesel engines <600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Davie Hall

ES-Gen-13

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Davie Hall Emergency Generator
(ES-Gen-13)

Fuel Input Rates	
Size Rating (kW)	**300**
Hourly Fuel Usage (gallons):	24
Annual Fuel Usage (gallons):	**359**
Fuel Sulfur Content (%)	**0.05**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	135,000
Hourly Fuel Usage (mmBtu):	3.21
Annual Fuel Usage (mmBtu):	48.47

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	3.2E-01	4.8E+00	2.42E-03	1.00E-01
PM-10	3.2E-01	4.8E+00	2.42E-03	1.00E-01
PM-2.5	3.2E-01	4.8E+00	2.42E-03	1.00E-01
NOx	6.1E+00	9.2E+01	4.60E-02	1.90E+00
NMTOC, Total	2.6E-01	4.0E+00	1.98E-03	8.19E-02
CO	2.7E+00	4.1E+01	2.06E-02	8.50E-01
SO_x	1.6E-01	2.4E+00	1.22E-03	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	8.1E-05	1.9E-03	1.22E-03	2.52E-05
Acrolein	2.5E-05	6.1E-04	3.82E-04	7.88E-06
Arsenic	1.3E-05	3.1E-04	1.94E-04	4.00E-06
Benzene	2.5E-03	6.0E-02	3.76E-02	7.76E-04
Benzo(a)pyrene	8.2E-07	2.0E-05	1.25E-05	2.57E-07
Beryllium	9.6E-06	2.3E-04	1.45E-04	3.00E-06
Cadmium	9.6E-06	2.3E-04	1.45E-04	3.00E-06
Chromium	9.6E-06	2.3E-04	1.45E-04	3.00E-06
Formaldehyde	2.5E-04	6.1E-03	3.82E-03	7.89E-05
Lead	2.9E-05	6.9E-04	4.36E-04	9.00E-06
Manganese	1.9E-05	4.6E-04	2.91E-04	6.00E-06
Mercury	9.6E-06	2.3E-04	1.45E-04	3.00E-06
Naphthalene	4.2E-04	1.0E-02	6.30E-03	1.30E-04
Nickel	9.6E-06	2.3E-04	1.45E-04	3.00E-06
PAH	6.8E-04	1.6E-02	1.03E-02	2.12E-04
Selenium	4.8E-05	1.2E-03	7.27E-04	1.50E-05
Toluene	9.0E-04	2.2E-02	1.36E-02	2.81E-04
Xylene	6.2E-04	1.5E-02	9.36E-03	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	523	7,903	3.95	163
Methane	2.1E-02	3.2E-01	1.60E-04	6.61E-03
Nitrous Oxide	4.2E-03	6.4E-02	3.21E-05	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Ambulatory Care Center

(ES-Gen-2)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Ambulatory Care Center Emergency Generator
(ES-Gen-2)

Fuel Input Rates	
Size Rating (kW)	**450**
Hourly Fuel Usage (gallons):	**35.7**
Annual Fuel Usage (gallons):	**927**
Fuel Sulfur Content (%)	**0.0015**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	**135,000**
Hourly Fuel Usage (mmBtu):	**4.82**
Annual Fuel Usage (mmBtu):	125.19

Emissions Output
Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	4.8E-01	1.3E+01	6.26E-03	1.00E-01
PM-10	4.8E-01	1.3E+01	6.26E-03	1.00E-01
PM-2.5	4.8E-01	1.3E+01	6.26E-03	1.00E-01
NOx	9.1E+00	2.4E+02	1.19E-01	1.90E+00
NMTOC, Total	3.9E-01	1.0E+01	5.13E-03	8.19E-02
CO	4.1E+00	1.1E+02	5.32E-02	8.50E-01
SO_x	7.3E-03	1.9E-01	9.48E-05	1.52E-03

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	1.2E-04	2.9E-03	3.15E-03	2.52E-05
Acrolein	3.8E-05	9.1E-04	9.87E-04	7.88E-06
Arsenic	1.9E-05	4.6E-04	5.01E-04	4.00E-06
Benzene	3.7E-03	9.0E-02	9.71E-02	7.76E-04
Benzo(a)pyrene	1.2E-06	3.0E-05	3.22E-05	2.57E-07
Beryllium	1.4E-05	3.5E-04	3.76E-04	3.00E-06
Cadmium	1.4E-05	3.5E-04	3.76E-04	3.00E-06
Chromium	1.4E-05	3.5E-04	3.76E-04	3.00E-06
Formaldehyde	3.8E-04	9.1E-03	9.88E-03	7.89E-05
Lead	4.3E-05	1.0E-03	1.13E-03	9.00E-06
Manganese	2.9E-05	6.9E-04	7.51E-04	6.00E-06
Mercury	1.4E-05	3.5E-04	3.76E-04	3.00E-06
Naphthalene	6.3E-04	1.5E-02	1.63E-02	1.30E-04
Nickel	1.4E-05	3.5E-04	3.76E-04	3.00E-06
PAH	1.0E-03	2.4E-02	2.65E-02	2.12E-04
Selenium	7.2E-05	1.7E-03	1.88E-03	1.50E-05
Toluene	1.4E-03	3.2E-02	3.52E-02	2.81E-04
Xylene	9.3E-04	2.2E-02	2.42E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	785	20,413	10.21	163
Methane	3.2E-02	8.3E-01	4.14E-04	6.61E-03
Nitrous Oxide	6.4E-03	1.7E-01	8.28E-05	1.32E-03

Most emission factors are from DAQ spreadsheet for small diesel engines <600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Old Dental School

ES-Gen-21

Large Diesel and All Dual-Fuel Engines Emissions Calculator LGD2000 Revision C
Old Dental Emergency Generator
(ES-Gen-21)

Instructions: Please provide the information shown in **blue** below. The applicability of this spreadsheet is limited to diesel engines larger than 600 hp and all dual-fuel (diesel/natural gas) engines. Please note that, when used in conjunction with permit applications, any value entered for annual operations of these engines may become a permit limit.

For annual emissions enter either: (1) **Annual Electrical Output**, (2) **Engine Output** and **Annual Operation** (leave the formula for calculating **Annual Electrical Output** unchanged) or (3) **Generator Output (kW)** and **Annual Operation** (remember to copy the resulting Annual Electrical Output to the appropriate cell to the left).

User Input	
Company Name:	**UNC-CH-Old Dental EG**
Plant County:	**Orange**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**G. Yoder**
Diesel Fuel Sulfur Content (%):	
NG Fuel Sulfur Content (gr/mm cu ft):	**2,000**
Engine Output (hp):	**107**
Annual Electrical Output (kW-hr):	**772**
Annual Output (hp-hr):	1,176

This section can be used to calculate kW-hr output from hours of operation and engine hp output. This can be useful for operators with hour meters but no Watt-hour meters. It assumes full load operation resulting in conservative emission estimates.

Annual Operation (hours):	**19.3**
Generator Output (kW):	**40**
Annual Output (kW-hr):	**772**

<----- Copy results to "Annual Output (kW-hr)" at left if desired.

Emissions Output for Diesel Engines
Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/hp-hr)	Factor Quality Rating
PM	7.5E-02	8.2E-01	4.1E-04	7.00E-04	B
PM-10	7.5E-02	8.2E-01	4.1E-04	7.00E-04	B
PM-2.5	7.5E-02	8.2E-01	4.1E-04	7.00E-04	B
NO_x, uncont.	2.6E+00	2.8E+01	1.4E-02	2.40E-02	B
NO_x, cont.	1.4E+00	1.5E+01	7.6E-03	1.30E-02	B
TOC (as CH_4)	7.5E-02	8.3E-01	4.1E-04	7.05E-04	C
NMTOC	6.9E-02	7.5E-01	3.8E-04	6.42E-04	E
CO	5.9E-01	6.5E+00	3.2E-03	5.50E-03	C
SO_x	0.0E+00	0.0E+00	0.0E+00	0.00E+00	B
Total HAP	2.5E-05	2.7E-04	1.4E-07	2.32E-07	
Largest HAP	5.8E-04	6.4E-03	3.2E-06	5.43E-06	

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	Emission Factor (lb/hp-hr)	Factor Quality Rating
Acetaldehyde	1.9E-05	NA	2.1E-04	1.76E-07	E
Acrolein	5.9E-06	NA	6.5E-05	5.52E-08	E
Benzene	5.8E-04	NA	6.4E-03	5.43E-06	E
Benzo (a) pyrene	1.9E-07	NA	2.1E-06	1.80E-09	E, <
Formaldehyde	5.9E-05	NA	6.5E-04	5.52E-07	E
Napthalene	9.7E-05	NA	1.1E-03	9.10E-07	E
PAH	1.6E-04	NA	1.7E-03	1.48E-06	E, <
Toluene	2.1E-04	5.1E-03	2.3E-03	1.97E-06	E
Xylenes	1.4E-04	3.5E-03	1.6E-03	1.35E-06	E

NO_x control is via ignition timing retard.

Emissions Output for Dual-fuel Engines
Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/hp-hr)	Factor Quality Rating
PM	NA	NA	NA	ND	NA
PM-10	NA	NA	NA	ND	NA
PM-2.5	NA	NA	NA	ND	NA
NO_x, uncont.	1.9E+00	2.1E+01	1.1E-02	1.80E-02	D
NO_x, cont.	NA	NA	NA	ND	NA
TOC (as CH_4)	5.7E-01	6.2E+00	3.1E-03	5.29E-03	D
NMTOC	1.4E-01	1.6E+00	7.8E-04	1.32E-03	E
CO	8.0E-01	8.8E+00	4.4E-03	7.50E-03	D
SO_x	6.4E-05	7.0E-04	3.5E-07	5.97E-07	B

There are no Toxic/Hazardous Air Pollutant emission factors for dual-fuel engines.

Greenhouse Gas	lb/hr	lb/yr	tpy	(lb/hp-hr)
CO_2	8.8E+01	9.6E+02	4.82E-01	8.19E-01
Methane	1.7E-03	1.8E-02	9.08E-06	1.54E-05
Nitrous Oxide	1.7E-04	1.8E-03	9.08E-07	1.54E-06

GHG emission factor based on 7,000 Btu/hp-hr

LGD2000 Revision C dated March 27, 2000

Pollutants in red are federally regulated hazardous air pollutants (HAPs) only. Pollutants in purple are NC regulated toxic air pollutants (TAPs) only
All other pollutants are regulated as both HAPs and TAPs.
Factor quality ratings containing "<" indicate an AP-42 emission factor based on test results being below detection.
Emission factors are from AP-42 Chapter 3, Section 4, Large Stationary Diesel and All Stationary Dual-fuel Engines, dated October 1996.
Hourly emission rates for all pollutants are based on the hourly engine output. Annual emissions are based on the annual engine output.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Lineberger Building Addition

ES-Gen-30

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Lineberger Building Addition Emergency Generator

(ES-Gen-30)

Fuel Input Rates	
Size Rating (kW)	**535**
Hourly Fuel Usage (gallons):	**42.4**
Annual Fuel Usage (gallons):	**755**
Fuel Sulfur Content (%)	**0.05**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	**135,000**
Hourly Fuel Usage (mmBtu):	**5.72**
Annual Fuel Usage (mmBtu):	101.90

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	5.7E-01	1.0E+01	5.09E-03	1.00E-01
PM-10	5.7E-01	1.0E+01	5.09E-03	1.00E-01
PM-2.5	5.7E-01	1.0E+01	5.09E-03	1.00E-01
NOx	1.1E+01	1.9E+02	9.68E-02	1.90E+00
NMTOC, Total	4.7E-01	8.3E+00	4.17E-03	8.19E-02
CO	4.9E+00	8.7E+01	4.33E-02	8.50E-01
SO_x	2.9E-01	5.1E+00	2.57E-03	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	1.4E-04	3.5E-03	2.57E-03	2.52E-05
Acrolein	4.5E-05	1.1E-03	8.03E-04	7.88E-06
Arsenic	2.3E-05	5.5E-04	4.08E-04	4.00E-06
Benzene	4.4E-03	1.1E-01	7.91E-02	7.76E-04
Benzo(a)pyrene	1.5E-06	3.5E-05	2.62E-05	2.57E-07
Beryllium	1.7E-05	4.1E-04	3.06E-04	3.00E-06
Cadmium	1.7E-05	4.1E-04	3.06E-04	3.00E-06
Chromium	1.7E-05	4.1E-04	3.06E-04	3.00E-06
Formaldehyde	4.5E-04	1.1E-02	8.04E-03	7.89E-05
Lead	5.2E-05	1.2E-03	9.17E-04	9.00E-06
Manganese	3.4E-05	8.2E-04	6.11E-04	6.00E-06
Mercury	1.7E-05	4.1E-04	3.06E-04	3.00E-06
Naphthalene	7.4E-04	1.8E-02	1.32E-02	1.30E-04
Nickel	1.7E-05	4.1E-04	3.06E-04	3.00E-06
PAH	1.2E-03	2.9E-02	2.16E-02	2.12E-04
Selenium	8.6E-05	2.1E-03	1.53E-03	1.50E-05
Toluene	1.6E-03	3.9E-02	2.86E-02	2.81E-04
Xylene	1.1E-03	2.7E-02	1.97E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	933	16,615	8.31	163
Methane	3.8E-02	6.7E-01	3.37E-04	6.61E-03
Nitrous Oxide	7.6E-03	1.3E-01	6.74E-05	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.

Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Morehead Planetarium

ES-Gen-36

Large Diesel and All Dual-Fuel Engines Emissions Calculator LGD2000 Revision C
Morehead Planetarium Emergency Generator
(ES-Gen-36)

Instructions: Please provide the information shown in **blue** below. The applicability of this spreadsheet is limited to diesel engines larger than 600 hp and all dual-fuel (diesel/natural gas) engines. Please note that, when used in conjunction with permit applications, any value entered for annual operations of these engines may become a permit limit.

For annual emissions enter either: (1) **Annual Electrical Output**, (2) **Engine Output** and **Annual Operation** (leave the formula for calculating **Annual Electrical Output** unchanged) or (3) **Generator Output (kW)** and **Annual Operation** (remember to copy the resulting Annual Electrical Output to the appropriate cell to the left).

User Input	
Company Name:	**UNC-CH-Morehead Plt. EG**
Plant County:	**Orange**
Plant City:	**Chapel Hill**
Permit Number:	**03069T35**
User:	**Butch Smith**
Diesel Fuel Sulfur Content (%):	
NG Fuel Sulfur Content (gr/mm cu ft):	**2,000**
Engine Output (hp):	
Annual Electrical Output (kW-hr):	**915**
Annual Output (hp-hr):	1,394

This section can be used to calculate kW-hr output from hours of operation and engine hp output. This can be useful for operators with hour meters but no Watt-hour meters. It assumes full load operation resulting in conservative emission estimates.

Annual Operation (hours):	**31**
Generator Output (kW):	**30**
Annual Output (kW-hr):	**915**

<----- Copy results to "Annual Output (kW-hr)" at left if desired.

Emissions Output for Diesel Engines
Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/hp-hr)	Factor Quality Rating
PM	0.0E+00	9.8E-01	4.9E-04	7.00E-04	B
PM-10	0.0E+00	9.8E-01	4.9E-04	7.00E-04	B
PM-2.5	0.0E+00	9.8E-01	4.9E-04	7.00E-04	B
NO_x, uncont.	0.0E+00	3.3E+01	1.7E-02	2.40E-02	B
NO_x, cont.	0.0E+00	1.8E+01	9.1E-03	1.30E-02	B
TOC (as CH_4)	0.0E+00	9.8E-01	4.9E-04	7.05E-04	C
NMTOC	0.0E+00	8.9E-01	4.5E-04	6.42E-04	E
CO	0.0E+00	7.7E+00	3.8E-03	5.50E-03	C
SO_x	0.0E+00	0.0E+00	0.0E+00	0.00E+00	B
Total HAP	0.0E+00	3.2E-04	1.6E-07	2.32E-07	
Largest HAP	0.0E+00	7.6E-03	3.8E-06	5.43E-06	

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	Emission Factor (lb/hp-hr)	Factor Quality Rating
Acetaldehyde	0.0E+00	NA	2.5E-04	1.76E-07	E
Acrolein	0.0E+00	NA	7.7E-05	5.52E-08	E
Benzene	0.0E+00	NA	7.6E-03	5.43E-06	E
Benzo (a) pyrene	0.0E+00	NA	2.5E-06	1.80E-09	E, <
Formaldehyde	0.0E+00	NA	7.7E-04	5.52E-07	E
Napthalene	0.0E+00	NA	1.3E-03	9.10E-07	E
PAH	0.0E+00	NA	2.1E-03	1.48E-06	E, <
Toluene	0.0E+00	0.0E+00	2.7E-03	1.97E-06	E
Xylenes	0.0E+00	0.0E+00	1.9E-03	1.35E-06	E

NO_x control is via ignition timing retard.

Emissions Output for Dual-fuel Engines
Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/hp-hr)	Factor Quality Rating
PM	NA	NA	NA	ND	NA
PM-10	NA	NA	NA	ND	NA
PM-2.5	NA	NA	NA	ND	NA
NO_x, uncont.	0.0E+00	2.5E+01	1.3E-02	1.80E-02	D
NO_x, cont.	NA	NA	NA	ND	NA
TOC (as CH_4)	0.0E+00	7.4E+00	3.7E-03	5.29E-03	D
NMTOC	0.0E+00	1.8E+00	9.2E-04	1.32E-03	E
CO	0.0E+00	1.0E+01	5.2E-03	7.50E-03	D
SO_x	0.0E+00	8.3E-04	4.2E-07	5.97E-07	B

There are no Toxic/Hazardous Air Pollutant emission factors for dual-fuel engines.

Greenhouse Gas	lb/hr	lb/yr	tpy	(lb/hp-hr)
CO_2	0.0E+00	1.1E+03	5.71E-01	8.19E-01
Methane	0.0E+00	2.2E-02	1.08E-05	1.54E-05
Nitrous Oxide	0.0E+00	2.2E-03	1.08E-06	1.54E-06

GHG emission factor based on 7,000 Btu/hp-hr

LGD2000 Revision C dated March 27, 2000

Pollutants in red are federally regulated hazardous air pollutants (HAPs) only. Pollutants in purple are NC regulated toxic air pollutants (TAPs) only
All other pollutants are regulated as both HAPs and TAPs.
Factor quality ratings containing "<" indicate an AP-42 emission factor based on test results being below detection.
Emission factors are from AP-42 Chapter 3, Section 4, Large Stationary Diesel and All Stationary Dual-fuel Engines, dated October 1996.
Hourly emission rates for all pollutants are based on the hourly engine output. Annual emissions are based on the annual engine output.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Phillips Hall

ES-Gen-40

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Phillips Hall Emergency Generator

(ES-Gen-40)

Fuel Input Rates	
Size Rating (kW)	**500**
Hourly Fuel Usage (gallons):	**39.6**
Annual Fuel Usage (gallons):	**793**
Fuel Sulfur Content (%)	**0.05**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	**135,000**
Hourly Fuel Usage (mmBtu):	**5.35**
Annual Fuel Usage (mmBtu):	107.00

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	5.4E-01	1.1E+01	5.35E-03	1.00E-01
PM-10	5.4E-01	1.1E+01	5.35E-03	1.00E-01
PM-2.5	5.4E-01	1.1E+01	5.35E-03	1.00E-01
NOx	1.0E+01	2.0E+02	1.02E-01	1.90E+00
NMTOC, Total	4.4E-01	8.8E+00	4.38E-03	8.19E-02
CO	4.5E+00	9.1E+01	4.55E-02	8.50E-01
SO_x	2.7E-01	5.4E+00	2.70E-03	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	1.3E-04	3.2E-03	2.70E-03	2.52E-05
Acrolein	4.2E-05	1.0E-03	8.43E-04	7.88E-06
Arsenic	2.1E-05	5.1E-04	4.28E-04	4.00E-06
Benzene	4.2E-03	1.0E-01	8.30E-02	7.76E-04
Benzo(a)pyrene	1.4E-06	3.3E-05	2.75E-05	2.57E-07
Beryllium	1.6E-05	3.9E-04	3.21E-04	3.00E-06
Cadmium	1.6E-05	3.9E-04	3.21E-04	3.00E-06
Chromium	1.6E-05	3.9E-04	3.21E-04	3.00E-06
Formaldehyde	4.2E-04	1.0E-02	8.44E-03	7.89E-05
Lead	4.8E-05	1.2E-03	9.63E-04	9.00E-06
Manganese	3.2E-05	7.7E-04	6.42E-04	6.00E-06
Mercury	1.6E-05	3.9E-04	3.21E-04	3.00E-06
Naphthalene	7.0E-04	1.7E-02	1.39E-02	1.30E-04
Nickel	1.6E-05	3.9E-04	3.21E-04	3.00E-06
PAH	1.1E-03	2.7E-02	2.27E-02	2.12E-04
Selenium	8.0E-05	1.9E-03	1.61E-03	1.50E-05
Toluene	1.5E-03	3.6E-02	3.01E-02	2.81E-04
Xylene	1.0E-03	2.5E-02	2.07E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	872	17,447	8.72	163
Methane	3.5E-02	7.1E-01	3.54E-04	6.61E-03
Nitrous Oxide	7.1E-03	1.4E-01	7.08E-05	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Medical Research Building B

(ES-Gen-43)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Medical Research Building B Emergency Generator
(ES-Gen-43)

Fuel Input Rates	
Size Rating (kW)	**125**
Hourly Fuel Usage (gallons):	**9.9**
Annual Fuel Usage (gallons):	**107**
Fuel Sulfur Content (%)	**0.0015**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	**135,000**
Hourly Fuel Usage (mmBtu):	**1.338**
Annual Fuel Usage (mmBtu):	14.45

Emissions Output
Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	4.1E-01	4.5E+00	2.24E-03	3.10E-01
PM-10	4.1E-01	4.5E+00	2.24E-03	3.10E-01
PM-2.5	4.1E-01	4.5E+00	2.24E-03	3.10E-01
NOx	5.9E+00	6.4E+01	3.19E-02	4.41E+00
NMTOC, Total	4.8E-01	5.2E+00	2.60E-03	3.60E-01
CO	1.3E+00	1.4E+01	6.86E-03	9.50E-01
SO_x	2.0E-03	2.2E-02	1.09E-05	1.52E-03

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	1.0E-03	2.5E-02	1.11E-02	7.67E-04
Acrolein	1.2E-04	3.0E-03	1.34E-03	9.25E-05
Arsenic	5.4E-06	1.3E-04	5.78E-05	4.00E-06
Benzene	1.2E-03	3.0E-02	1.35E-02	9.33E-04
Benzo(a)pyrene	2.5E-07	6.0E-06	2.72E-06	1.88E-07
Beryllium	4.0E-06	9.6E-05	4.33E-05	3.00E-06
1,3-Butadiene	5.2E-05	1.3E-03	5.65E-04	3.91E-05
Cadmium	4.0E-06	9.6E-05	4.33E-05	3.00E-06
Chromium	4.0E-06	9.6E-05	4.33E-05	3.00E-06
Formaldehyde	1.6E-03	3.8E-02	1.70E-02	1.18E-03
Lead	1.2E-05	2.9E-04	1.30E-04	9.00E-06
Manganese	8.0E-06	1.9E-04	8.67E-05	6.00E-06
Mercury	4.0E-06	9.6E-05	4.33E-05	3.00E-06
Naphthalene	1.1E-04	2.7E-03	1.22E-03	8.48E-05
Nickel	4.0E-06	9.6E-05	4.33E-05	3.00E-06
PAH	2.2E-04	5.4E-03	2.43E-03	1.68E-04
Selenium	2.0E-05	4.8E-04	2.17E-04	1.50E-05
Toluene	5.5E-04	1.3E-02	5.91E-03	4.09E-04
Xylene	3.8E-04	9.1E-03	4.12E-03	2.85E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	218	2,355	1.18	163
Methane	8.8E-03	9.6E-02	4.78E-05	6.61E-03
Nitrous Oxide	1.8E-03	1.9E-02	9.55E-06	1.32E-03

Most emission factors are from DAQ spreadsheet for small diesel engines <600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Kenan Stadium Electric Fire Pump

(ES-Gen-48)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Kenan Stadium EFP Emergency Generator
(ES-Gen-48)

Fuel Input Rates	
Size Rating (kW)	**500**
Hourly Fuel Usage (gallons):	**39.6**
Annual Fuel Usage (gallons):	**519**
Fuel Sulfur Content (%)	**0.0015**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	**135,000**
Hourly Fuel Usage (mmBtu):	**5.35**
Annual Fuel Usage (mmBtu):	70.09

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	5.4E-01	7.0E+00	3.50E-03	1.00E-01
PM-10	5.4E-01	7.0E+00	3.50E-03	1.00E-01
PM-2.5	5.4E-01	7.0E+00	3.50E-03	1.00E-01
NOx	1.0E+01	1.3E+02	6.66E-02	1.90E+00
NMTOC, Total	4.4E-01	5.7E+00	2.87E-03	8.19E-02
CO	4.5E+00	6.0E+01	2.98E-02	8.50E-01
SO_x	8.1E-03	1.1E-01	5.31E-05	1.52E-03

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	1.3E-04	3.2E-03	1.77E-03	2.52E-05
Acrolein	4.2E-05	1.0E-03	5.52E-04	7.88E-06
Arsenic	2.1E-05	5.1E-04	2.80E-04	4.00E-06
Benzene	4.2E-03	1.0E-01	5.44E-02	7.76E-04
Benzo(a)pyrene	1.4E-06	3.3E-05	1.80E-05	2.57E-07
Beryllium	1.6E-05	3.9E-04	2.10E-04	3.00E-06
Cadmium	1.6E-05	3.9E-04	2.10E-04	3.00E-06
Chromium	1.6E-05	3.9E-04	2.10E-04	3.00E-06
Formaldehyde	4.2E-04	1.0E-02	5.53E-03	7.89E-05
Lead	4.8E-05	1.2E-03	6.31E-04	9.00E-06
Manganese	3.2E-05	7.7E-04	4.21E-04	6.00E-06
Mercury	1.6E-05	3.9E-04	2.10E-04	3.00E-06
Naphthalene	7.0E-04	1.7E-02	9.11E-03	1.30E-04
Nickel	1.6E-05	3.9E-04	2.10E-04	3.00E-06
PAH	1.1E-03	2.7E-02	1.49E-02	2.12E-04
Selenium	8.0E-05	1.9E-03	1.05E-03	1.50E-05
Toluene	1.5E-03	3.6E-02	1.97E-02	2.81E-04
Xylene	1.0E-03	2.5E-02	1.35E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	872	11,428	5.71	163
Methane	3.5E-02	4.6E-01	2.32E-04	6.61E-03
Nitrous Oxide	7.1E-03	9.3E-02	4.64E-05	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Beard Hall

ES-Gen-50

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Beard Hall Emergency Generator
(ES-Gen-50)

Fuel Input Rates	
Size Rating (kW)	**600**
Hourly Fuel Usage (gallons):	**47.6**
Annual Fuel Usage (gallons):	**761**
Fuel Sulfur Content (%)	**0.05**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	**135,000**
Hourly Fuel Usage (mmBtu):	**6.42**
Annual Fuel Usage (mmBtu):	102.72

Emissions Output
Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	6.4E-01	1.0E+01	5.14E-03	1.00E-01
PM-10	6.4E-01	1.0E+01	5.14E-03	1.00E-01
PM-2.5	6.4E-01	1.0E+01	5.14E-03	1.00E-01
NOx	1.2E+01	2.0E+02	9.76E-02	1.90E+00
NMTOC, Total	5.3E-01	8.4E+00	4.21E-03	8.19E-02
CO	5.5E+00	8.7E+01	4.37E-02	8.50E-01
SO_x	3.2E-01	5.2E+00	2.59E-03	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	1.6E-04	3.9E-03	2.59E-03	2.52E-05
Acrolein	5.1E-05	1.2E-03	8.09E-04	7.88E-06
Arsenic	2.6E-05	6.2E-04	4.11E-04	4.00E-06
Benzene	5.0E-03	1.2E-01	7.97E-02	7.76E-04
Benzo(a)pyrene	1.6E-06	4.0E-05	2.64E-05	2.57E-07
Beryllium	1.9E-05	4.6E-04	3.08E-04	3.00E-06
Cadmium	1.9E-05	4.6E-04	3.08E-04	3.00E-06
Chromium	1.9E-05	4.6E-04	3.08E-04	3.00E-06
Formaldehyde	5.1E-04	1.2E-02	8.10E-03	7.89E-05
Lead	5.8E-05	1.4E-03	9.24E-04	9.00E-06
Manganese	3.9E-05	9.2E-04	6.16E-04	6.00E-06
Mercury	1.9E-05	4.6E-04	3.08E-04	3.00E-06
Naphthalene	8.3E-04	2.0E-02	1.34E-02	1.30E-04
Nickel	1.9E-05	4.6E-04	3.08E-04	3.00E-06
PAH	1.4E-03	3.3E-02	2.18E-02	2.12E-04
Selenium	9.6E-05	2.3E-03	1.54E-03	1.50E-05
Toluene	1.8E-03	4.3E-02	2.89E-02	2.81E-04
Xylene	1.2E-03	3.0E-02	1.98E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	1,047	16,749	8.37	163
Methane	4.2E-02	6.8E-01	3.40E-04	6.61E-03
Nitrous Oxide	8.5E-03	1.4E-01	6.79E-05	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Bioinformatics Building

ES-Gen-57

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Bioinformatics Building Emergency Generator
(ES-Gen-57)

Fuel Input Rates	
Size Rating (kW)	**600**
Hourly Fuel Usage (gallons):	**47.6**
Annual Fuel Usage (gallons):	**571**
Fuel Sulfur Content (%)	**0.05**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	**135,000**
Hourly Fuel Usage (mmBtu):	**6.42**
Annual Fuel Usage (mmBtu):	77.04

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	6.4E-01	7.7E+00	3.85E-03	1.00E-01
PM-10	6.4E-01	7.7E+00	3.85E-03	1.00E-01
PM-2.5	6.4E-01	7.7E+00	3.85E-03	1.00E-01
NOx	1.2E+01	1.5E+02	7.32E-02	1.90E+00
NMTOC, Total	5.3E-01	6.3E+00	3.15E-03	8.19E-02
CO	5.5E+00	6.5E+01	3.27E-02	8.50E-01
SO_x	3.2E-01	3.9E+00	1.95E-03	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	1.6E-04	3.9E-03	1.94E-03	2.52E-05
Acrolein	5.1E-05	1.2E-03	6.07E-04	7.88E-06
Arsenic	2.6E-05	6.2E-04	3.08E-04	4.00E-06
Benzene	5.0E-03	1.2E-01	5.98E-02	7.76E-04
Benzo(a)pyrene	1.6E-06	4.0E-05	1.98E-05	2.57E-07
Beryllium	1.9E-05	4.6E-04	2.31E-04	3.00E-06
Cadmium	1.9E-05	4.6E-04	2.31E-04	3.00E-06
Chromium	1.9E-05	4.6E-04	2.31E-04	3.00E-06
Formaldehyde	5.1E-04	1.2E-02	6.08E-03	7.89E-05
Lead	5.8E-05	1.4E-03	6.93E-04	9.00E-06
Manganese	3.9E-05	9.2E-04	4.62E-04	6.00E-06
Mercury	1.9E-05	4.6E-04	2.31E-04	3.00E-06
Naphthalene	8.3E-04	2.0E-02	1.00E-02	1.30E-04
Nickel	1.9E-05	4.6E-04	2.31E-04	3.00E-06
PAH	1.4E-03	3.3E-02	1.63E-02	2.12E-04
Selenium	9.6E-05	2.3E-03	1.16E-03	1.50E-05
Toluene	1.8E-03	4.3E-02	2.16E-02	2.81E-04
Xylene	1.2E-03	3.0E-02	1.49E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	1,047	12,562	6.28	163
Methane	4.2E-02	5.1E-01	2.55E-04	6.61E-03
Nitrous Oxide	8.5E-03	1.0E-01	5.10E-05	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Glaxo Building

ES-Gen-59

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Glaxo Building Emergency Generator
(ES-Gen-59)

Fuel Input Rates	
Size Rating (kW)	**500**
Hourly Fuel Usage (gallons):	**39.6**
Annual Fuel Usage (gallons):	**515**
Fuel Sulfur Content (%)	**0.05**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	**135,000**
Hourly Fuel Usage (mmBtu):	**5.35**
Annual Fuel Usage (mmBtu):	69.55

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	5.4E-01	7.0E+00	3.48E-03	1.00E-01
PM-10	5.4E-01	7.0E+00	3.48E-03	1.00E-01
PM-2.5	5.4E-01	7.0E+00	3.48E-03	1.00E-01
NOx	1.0E+01	1.3E+02	6.61E-02	1.90E+00
NMTOC, Total	4.4E-01	5.7E+00	2.85E-03	8.19E-02
CO	4.5E+00	5.9E+01	2.96E-02	8.50E-01
SO_x	2.7E-01	3.5E+00	1.76E-03	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	1.3E-04	3.2E-03	1.75E-03	2.52E-05
Acrolein	4.2E-05	1.0E-03	5.48E-04	7.88E-06
Arsenic	2.1E-05	5.1E-04	2.78E-04	4.00E-06
Benzene	4.2E-03	1.0E-01	5.40E-02	7.76E-04
Benzo(a)pyrene	1.4E-06	3.3E-05	1.79E-05	2.57E-07
Beryllium	1.6E-05	3.9E-04	2.09E-04	3.00E-06
Cadmium	1.6E-05	3.9E-04	2.09E-04	3.00E-06
Chromium	1.6E-05	3.9E-04	2.09E-04	3.00E-06
Formaldehyde	4.2E-04	1.0E-02	5.49E-03	7.89E-05
Lead	4.8E-05	1.2E-03	6.26E-04	9.00E-06
Manganese	3.2E-05	7.7E-04	4.17E-04	6.00E-06
Mercury	1.6E-05	3.9E-04	2.09E-04	3.00E-06
Naphthalene	7.0E-04	1.7E-02	9.04E-03	1.30E-04
Nickel	1.6E-05	3.9E-04	2.09E-04	3.00E-06
PAH	1.1E-03	2.7E-02	1.47E-02	2.12E-04
Selenium	8.0E-05	1.9E-03	1.04E-03	1.50E-05
Toluene	1.5E-03	3.6E-02	1.95E-02	2.81E-04
Xylene	1.0E-03	2.5E-02	1.34E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	872	11,340	5.67	163
Methane	3.5E-02	4.6E-01	2.30E-04	6.61E-03
Nitrous Oxide	7.1E-03	9.2E-02	4.60E-05	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Northeast Chiller

ES-Gen-76

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Notheast Chiller Emergency Generator

(ES-Gen-76)

Fuel Input Rates	
Size Rating (kW)	**500**
Hourly Fuel Usage (gallons):	**39.6**
Annual Fuel Usage (gallons):	**555**
Fuel Sulfur Content (%)	**0.05**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	**135,000**
Hourly Fuel Usage (mmBtu):	**5.35**
Annual Fuel Usage (mmBtu):	74.90

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	5.4E-01	7.5E+00	3.75E-03	1.00E-01
PM-10	5.4E-01	7.5E+00	3.75E-03	1.00E-01
PM-2.5	5.4E-01	7.5E+00	3.75E-03	1.00E-01
NOx	1.0E+01	1.4E+02	7.12E-02	1.90E+00
NMTOC, Total	4.4E-01	6.1E+00	3.07E-03	8.19E-02
CO	4.5E+00	6.4E+01	3.18E-02	8.50E-01
SO_x	2.7E-01	3.8E+00	1.89E-03	5.05E-02

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	1.3E-04	3.2E-03	1.89E-03	2.52E-05
Acrolein	4.2E-05	1.0E-03	5.90E-04	7.88E-06
Arsenic	2.1E-05	5.1E-04	3.00E-04	4.00E-06
Benzene	4.2E-03	1.0E-01	5.81E-02	7.76E-04
Benzo(a)pyrene	1.4E-06	3.3E-05	1.92E-05	2.57E-07
Beryllium	1.6E-05	3.9E-04	2.25E-04	3.00E-06
Cadmium	1.6E-05	3.9E-04	2.25E-04	3.00E-06
Chromium	1.6E-05	3.9E-04	2.25E-04	3.00E-06
Formaldehyde	4.2E-04	1.0E-02	5.91E-03	7.89E-05
Lead	4.8E-05	1.2E-03	6.74E-04	9.00E-06
Manganese	3.2E-05	7.7E-04	4.49E-04	6.00E-06
Mercury	1.6E-05	3.9E-04	2.25E-04	3.00E-06
Naphthalene	7.0E-04	1.7E-02	9.74E-03	1.30E-04
Nickel	1.6E-05	3.9E-04	2.25E-04	3.00E-06
PAH	1.1E-03	2.7E-02	1.59E-02	2.12E-04
Selenium	8.0E-05	1.9E-03	1.12E-03	1.50E-05
Toluene	1.5E-03	3.6E-02	2.10E-02	2.81E-04
Xylene	1.0E-03	2.5E-02	1.45E-02	1.93E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	872	12,213	6.11	163
Methane	3.5E-02	5.0E-01	2.48E-04	6.61E-03
Nitrous Oxide	7.1E-03	9.9E-02	4.95E-05	1.32E-03

Most emission factors are from DAQ spreadsheet for diesel engines >600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Carmichael Auditorium

ES-Gen-79

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Carmichael Auditorium Emergency Generator
(ES-Gen-79)

Fuel Input Rates	
Size Rating (kW)	**400**
Hourly Fuel Usage (gallons):	**31.7**
Annual Fuel Usage (gallons):	**399**
Fuel Sulfur Content (%)	**0.0015**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	**135,000**
Hourly Fuel Usage (mmBtu):	**4.280**
Annual Fuel Usage (mmBtu):	53.93

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	1.3E+00	1.7E+01	8.36E-03	3.10E-01
PM-10	1.3E+00	1.7E+01	8.36E-03	3.10E-01
PM-2.5	1.3E+00	1.7E+01	8.36E-03	3.10E-01
NOx	1.9E+01	2.4E+02	1.19E-01	4.41E+00
NMTOC, Total	1.5E+00	1.9E+01	9.71E-03	3.60E-01
CO	4.1E+00	5.1E+01	2.56E-02	9.50E-01
SO_x	6.5E-03	8.2E-02	4.09E-05	1.52E-03

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	3.3E-03	7.9E-02	4.14E-02	7.67E-04
Acrolein	4.0E-04	9.5E-03	4.99E-03	9.25E-05
Arsenic	1.7E-05	4.1E-04	2.16E-04	4.00E-06
Benzene	4.0E-03	9.6E-02	5.03E-02	9.33E-04
Benzo(a)pyrene	8.0E-07	1.9E-05	1.01E-05	1.88E-07
Beryllium	1.3E-05	3.1E-04	1.62E-04	3.00E-06
1,3-Butadiene	1.7E-04	4.0E-03	2.11E-03	3.91E-05
Cadmium	1.3E-05	3.1E-04	1.62E-04	3.00E-06
Chromium	1.3E-05	3.1E-04	1.62E-04	3.00E-06
Formaldehyde	5.1E-03	1.2E-01	6.36E-02	1.18E-03
Lead	3.9E-05	9.2E-04	4.85E-04	9.00E-06
Manganese	2.6E-05	6.2E-04	3.24E-04	6.00E-06
Mercury	1.3E-05	3.1E-04	1.62E-04	3.00E-06
Naphthalene	3.6E-04	8.7E-03	4.57E-03	8.48E-05
Nickel	1.3E-05	3.1E-04	1.62E-04	3.00E-06
PAH	7.2E-04	1.7E-02	9.06E-03	1.68E-04
Selenium	6.4E-05	1.5E-03	8.09E-04	1.50E-05
Toluene	1.8E-03	4.2E-02	2.21E-02	4.09E-04
Xylene	1.2E-03	2.9E-02	1.54E-02	2.85E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	698	8,793	4.40	163
Methane	2.8E-02	3.6E-01	1.78E-04	6.61E-03
Nitrous Oxide	5.7E-03	7.1E-02	3.57E-05	1.32E-03

Most emission factors are from DAQ spreadsheet for small diesel engines <600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator #2
Hinton James Dorm

ES-Gen-80

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Hinton James Emergency Generator #2

(ES-Gen-80)

Fuel Input Rates	
Size Rating (kW)	**350**
Hourly Fuel Usage (gallons):	**27.7**
Annual Fuel Usage (gallons):	**333**
Fuel Sulfur Content (%)	**0.0015**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	**135,000**
Hourly Fuel Usage (mmBtu):	**3.745**
Annual Fuel Usage (mmBtu):	44.94

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	1.2E+00	1.4E+01	6.97E-03	3.10E-01
PM-10	1.2E+00	1.4E+01	6.97E-03	3.10E-01
PM-2.5	1.2E+00	1.4E+01	6.97E-03	3.10E-01
NOx	1.7E+01	2.0E+02	9.91E-02	4.41E+00
NMTOC, Total	1.3E+00	1.6E+01	8.09E-03	3.60E-01
CO	3.6E+00	4.3E+01	2.13E-02	9.50E-01
SO_x	5.7E-03	6.8E-02	3.40E-05	1.52E-03

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	2.9E-03	6.9E-02	3.45E-02	7.67E-04
Acrolein	3.5E-04	8.3E-03	4.16E-03	9.25E-05
Arsenic	1.5E-05	3.6E-04	1.80E-04	4.00E-06
Benzene	3.5E-03	8.4E-02	4.19E-02	9.33E-04
Benzo(a)pyrene	7.0E-07	1.7E-05	8.45E-06	1.88E-07
Beryllium	1.1E-05	2.7E-04	1.35E-04	3.00E-06
1,3-Butadiene	1.5E-04	3.5E-03	1.76E-03	3.91E-05
Cadmium	1.1E-05	2.7E-04	1.35E-04	3.00E-06
Chromium	1.1E-05	2.7E-04	1.35E-04	3.00E-06
Formaldehyde	4.4E-03	1.1E-01	5.30E-02	1.18E-03
Lead	3.4E-05	8.1E-04	4.04E-04	9.00E-06
Manganese	2.2E-05	5.4E-04	2.70E-04	6.00E-06
Mercury	1.1E-05	2.7E-04	1.35E-04	3.00E-06
Naphthalene	3.2E-04	7.6E-03	3.81E-03	8.48E-05
Nickel	1.1E-05	2.7E-04	1.35E-04	3.00E-06
PAH	6.3E-04	1.5E-02	7.55E-03	1.68E-04
Selenium	5.6E-05	1.3E-03	6.74E-04	1.50E-05
Toluene	1.5E-03	3.7E-02	1.84E-02	4.09E-04
Xylene	1.1E-03	2.6E-02	1.28E-02	2.85E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	611	7,328	3.66	163
Methane	2.5E-02	3.0E-01	1.49E-04	6.61E-03
Nitrous Oxide	5.0E-03	5.9E-02	2.97E-05	1.32E-03

Most emission factors are from DAQ spreadsheet for small diesel engines <600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T35

2019 Annual Emissions Inventory

Emergency Generator
Physicians Office Building

ES-Gen-81

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Physicians Office Building Emergency Generator

(ES-Gen-81)

Fuel Input Rates	
Size Rating (kW)	**250**
Hourly Fuel Usage (gallons):	**19.8**
Annual Fuel Usage (gallons):	**250**
Fuel Sulfur Content (%)	**0.0015**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	**135,000**
Hourly Fuel Usage (mmBtu):	**2.675**
Annual Fuel Usage (mmBtu):	33.71

Emissions Output

Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	8.3E-01	1.0E+01	5.22E-03	3.10E-01
PM-10	8.3E-01	1.0E+01	5.22E-03	3.10E-01
PM-2.5	8.3E-01	1.0E+01	5.22E-03	3.10E-01
NOx	1.2E+01	1.5E+02	7.43E-02	4.41E+00
NMTOC, Total	9.6E-01	1.2E+01	6.07E-03	3.60E-01
CO	2.5E+00	3.2E+01	1.60E-02	9.50E-01
SO_x	4.1E-03	5.1E-02	2.55E-05	1.52E-03

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	2.1E-03	4.9E-02	2.59E-02	7.67E-04
Acrolein	2.5E-04	5.9E-03	3.12E-03	9.25E-05
Arsenic	1.1E-05	2.6E-04	1.35E-04	4.00E-06
Benzene	2.5E-03	6.0E-02	3.14E-02	9.33E-04
Benzo(a)pyrene	5.0E-07	1.2E-05	6.34E-06	1.88E-07
Beryllium	8.0E-06	1.9E-04	1.01E-04	3.00E-06
1,3-Butadiene	1.0E-04	2.5E-03	1.32E-03	3.91E-05
Cadmium	8.0E-06	1.9E-04	1.01E-04	3.00E-06
Chromium	8.0E-06	1.9E-04	1.01E-04	3.00E-06
Formaldehyde	3.2E-03	7.6E-02	3.98E-02	1.18E-03
Lead	2.4E-05	5.8E-04	3.03E-04	9.00E-06
Manganese	1.6E-05	3.9E-04	2.02E-04	6.00E-06
Mercury	8.0E-06	1.9E-04	1.01E-04	3.00E-06
Naphthalene	2.3E-04	5.4E-03	2.86E-03	8.48E-05
Nickel	8.0E-06	1.9E-04	1.01E-04	3.00E-06
PAH	4.5E-04	1.1E-02	5.66E-03	1.68E-04
Selenium	4.0E-05	9.6E-04	5.06E-04	1.50E-05
Toluene	1.1E-03	2.6E-02	1.38E-02	4.09E-04
Xylene	7.6E-04	1.8E-02	9.61E-03	2.85E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	436	5,496	2.75	163
Methane	1.8E-02	2.2E-01	1.11E-04	6.61E-03
Nitrous Oxide	3.5E-03	4.5E-02	2.23E-05	1.32E-03

Most emission factors are from DAQ spreadsheet for small diesel engines <600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

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2019 Annual Emissions Inventory

Emergency Generator
Bell Tower Parking Deck

(ES-Gen-84)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Bell Tower Parking Deck Emergency Generator
(ES-Gen-84)

Fuel Input Rates	
Size Rating (kW)	**250**
Hourly Fuel Usage (gallons):	**19.8**
Annual Fuel Usage (gallons):	**250**
Fuel Sulfur Content (%)	**0.0015**
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	**135,000**
Hourly Fuel Usage (mmBtu):	**2.675**
Annual Fuel Usage (mmBtu):	33.71

Emissions Output
Criteria Pollutants

Pollutant	lb/hr	lb/yr	tpy	Emission Factor (lb/mmBtu)
PM	8.3E-01	1.0E+01	5.22E-03	3.10E-01
PM-10	8.3E-01	1.0E+01	5.22E-03	3.10E-01
PM-2.5	8.3E-01	1.0E+01	5.22E-03	3.10E-01
NOx	1.2E+01	1.5E+02	7.43E-02	4.41E+00
NMTOC, Total	9.6E-01	1.2E+01	6.07E-03	3.60E-01
CO	2.5E+00	3.2E+01	1.60E-02	9.50E-01
SO_x	4.1E-03	5.1E-02	2.55E-05	1.52E-03

Toxic/Hazardous Air Pollutants

Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	2.1E-03	4.9E-02	2.59E-02	7.67E-04
Acrolein	2.5E-04	5.9E-03	3.12E-03	9.25E-05
Arsenic	1.1E-05	2.6E-04	1.35E-04	4.00E-06
Benzene	2.5E-03	6.0E-02	3.14E-02	9.33E-04
Benzo(a)pyrene	5.0E-07	1.2E-05	6.34E-06	1.88E-07
Beryllium	8.0E-06	1.9E-04	1.01E-04	3.00E-06
1,3-Butadiene	1.0E-04	2.5E-03	1.32E-03	3.91E-05
Cadmium	8.0E-06	1.9E-04	1.01E-04	3.00E-06
Chromium	8.0E-06	1.9E-04	1.01E-04	3.00E-06
Formaldehyde	3.2E-03	7.6E-02	3.98E-02	1.18E-03
Lead	2.4E-05	5.8E-04	3.03E-04	9.00E-06
Manganese	1.6E-05	3.9E-04	2.02E-04	6.00E-06
Mercury	8.0E-06	1.9E-04	1.01E-04	3.00E-06
Naphthalene	2.3E-04	5.4E-03	2.86E-03	8.48E-05
Nickel	8.0E-06	1.9E-04	1.01E-04	3.00E-06
PAH	4.5E-04	1.1E-02	5.66E-03	1.68E-04
Selenium	4.0E-05	9.6E-04	5.06E-04	1.50E-05
Toluene	1.1E-03	2.6E-02	1.38E-02	4.09E-04
Xylene	7.6E-04	1.8E-02	9.61E-03	2.85E-04

Greenhouse Gas Pollutants

Pollutant	lb/hr	lb/yr	tpy	Em. Factor (lb/mmBtu)
Carbon dioxide	436	5,496	2.75	163
Methane	1.8E-02	2.2E-01	1.11E-04	6.61E-03
Nitrous Oxide	3.5E-03	4.5E-02	2.23E-05	1.32E-03

Most emission factors are from DAQ spreadsheet for small diesel engines <600 Hp.
Greenhouse gas emission factors are from the Greenhouse Gas Reporting regulations.

The University of North Carolina at Chapel Hill

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2019 Annual Emissions Inventory

Davie Hall Small Boiler SB-6
(ES-SB-6)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
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2019 Annual Emissions Inventory

Small Boiler SB-6 Davie Hall

2019 Total Natural Gas Use	9,650	CCF
	0.97	10^6scf
	992	MMBtu

	Em. Factor	Emissions	
POLLUTANT	**lb/10^6scf**	**lb/yr**	**ton/yr**
NOX	100	96.5	0.048
CO	84	81.06	0.041
Lead	0.0005	0.000	2.41E-07
PM (Total)	7.6	7.33	0.0037
PM (Condensable)	5.7	5.50	0.0028
PM (Filterable)	1.9	1.83	0.0009
SO2	0.6	0.58	0.0003
TOC	11	10.62	0.0053
VOC	5.5	5.31	0.0027
Haps/Taps			
Benzene	2.10E-03	2.03E-03	1.01E-06
Benzopyrene	1.20E-06	1.16E-06	5.79E-10
Cobalt	8.40E-05	8.11E-05	4.05E-08
Formaldehyde	7.50E-02	7.24E-02	3.62E-05
Hexane	1.80E+00	1.74E+00	8.69E-04
Napthalene	6.10E-04	5.89E-04	2.94E-07
Selenium	2.40E-05	2.32E-05	1.16E-08
Toluene	3.40E-03	3.28E-03	1.64E-06
GHGs	**lb/mmBtu**		
Carbon dioxide	116.98	116,043	58.02
Methane	2.20E-03	2.19E+00	1.09E-03
Nitrous Oxide	2.20E-04	2.19E-01	1.09E-04

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

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2019 Annual Emissions Inventory

Sterilizers
(IES-51)

Dental School

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
Orange County
Facility ID # 6800043
Permit # 03069T35

2019 Annual Emissions Inventory

Sterilizer Unit
(IES-51)

There were previously two ethylene oxide sterilizers located at the Dental School and the Ambulatory Care Center. The sterilizer at the Ambulatory Care Center has been converted to steam. Ethylene Oxide is still used in the Dental School unit. As a conservative estimate 100% of the Ethylene Oxide is assumed to be vented to the atmosphere.

Ethylene Oxide (CAS# 75-21-8)

	Usage		Emission Rate			
Dental School	9.09	lb/yr	9.09	lb/yr	0.005	ton/yr
Ambulatory Care Center	0	lb/yr	0	lb/yr	0	ton/yr

The University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

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2019 Annual Emissions Inventory

Enclosed Sorbent Railcar Dump Pit
(Insignificant Source)
IS-53

11,806.8 tons of sorbent by rail in 2019.

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina
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2019 Annual Emissions Inventory

Enclosed Sorbent (Lime) Railcar Dump Pit

(Insignificant Source - ID No. 020)

Sorbent is transported from the railcar dump pit in enclosed conveyors to the storage area. Emissions can be best estimated using the drop equation.

From section 13.2.4 of the AP-42: The following equation represents the particulate emissions generated by the dropping of sorbent into the dump pit.

$$E = k\,(0.0032)\,\frac{(u/5)^{1.3}}{(m/2)^{1.4}}$$

E = Emission Factor (lb/ton)

k = Particle Size Multiplier
u = Mean Wind Speed (mph)
m = Material Moisture Content (%)

k Value	Particulate Size	Emission Factor (lb/ton)
0.74	PM	1.787E-03
0.35	PM-10	8.45E-04
0.11	PM-2.5	2.66E-04

Average moisture content of sorbent is 0.7%
The dump area is fully enclosed, therefore the minumum wind speed of 1.3 mph was used.

Total Sorbent 11,806.80 tons/yr

Emissions from the unloading of sorbent into the dump pit:

	Emission Factor (lb/ton)	Emissions (lb/yr)	Emissions (ton/yr)
PM	1.79E-03	21.10	1.06E-02
PM-10	8.45E-04	9.98	4.99E-03
PM-2.5	2.66E-04	3.14	1.57E-03