

2008 Cogeneration Facility Annual Air Emissions Inventory

**Cogeneration Facility
University of North Carolina at Chapel Hill
Chapel Hill, North Carolina**

**Facility ID # 6800043
Permit # 03069T22**

Prepared for:

University of North Carolina at Chapel Hill
Cogeneration Systems
501 Cameron Avenue, CB# 1855
Chapel Hill, North Carolina 27599-1855

Prepared by:

RST Engineering
5416 Orchard Oriole Trail
Wake Forest, North Carolina 27587-6770

March 2009

2008 Cogeneration Facility Annual Air Emissions Inventory

Cogeneration Facility University of North Carolina at Chapel Hill Chapel Hill, North Carolina

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University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

Supporting Documentation

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Facility Total CY 2008 Emissions Summary

Facility ID #: 6800043

Permit #(s): 03069T22

Facility Name: University of North Carolina at Chapel Hill

North Carolina Department of Environment and Natural Resources
 Division of Air Quality
 Air Pollutant Point Source Emissions Inventory - Calendar Year 2008

Record Facility-Wide Totals Below From all Permitted and Non-Permitted Air Pollutant Emission Sources

<i>Criteria Pollutants</i>	ID #'s of Contributing Sources	Actual Emissions (Tons/Year)*	
			CY 2008
Carbon Monoxide (CO) (Reporting required, but no fees based on CO)	Boiler 6,7,8, 2-Generators		1,184.5
Oxides of Nitrogen (NOx) (Report as tons of NO ₂ equivalent)	Boiler 6,7,8, 2-Generators		437.7
PM/TSP - Particulate Matter (Total - not used for emission fees)	Boiler 6,7,8 & Coal and Ash Handling & 2-Generators		7.4
PM-10 Particulate Matter with mean aerodynamic particle size less than 10 micrometers. Include all condensibles, including Sulfur Trioxide and Sulfuric Acid as PM-10	Boiler 6,7,8 & Coal and Ash Handling & 2-Generators		7.4
PM-2.5 Particulate Matter with mean aerodynamic particle size less than 2.5 micrometers. This pollutant includes all condensibles using best information available.	Boiler 6,7,8 & Coal and Ash Handling & 2-Generators		5.9
Sulfur Dioxide (SO₂) Do not include Sulfur Trioxide and Sulfuric Acid	Boiler 6,7,8, 2-Generators		245.0
VOC Volatile Organic Compounds - See instructions for Federal definition excluding some non-photochemically reactive organics	Boiler 6,7,8, 2-Generators		3.7

<i>Greenhouse Gases</i>	ID #'s of Contributing Sources	Actual Emissions (Tons/Year)*	
			CY 2008
Carbon Dioxide (CO₂) (Reporting required, but no fees based on CO ₂)	Boiler 6,7,8, 2-Generators		374,863.2
Methane (MeOH) (Reporting required, but no fees based on MeOH)	Boiler 6,7,8, 2-Generators		4.0
Nitrous Oxide (N₂O) (Reporting required, but no fees based on CO ₂)	Boiler 6,7,8, 2-Generators		229.7

On Next Page: Enter, in Alphabetical Order, All HAPs/TAPs Required by Instructions

(Sum Source Emissions From Emission Source / Operating Scenario Forms)

Information on this form cannot be held confidential.

Facility Name: University of North Carolina at Chapel Hill

North Carolina Department of Environment and Natural Resources

Division of Air Quality

Air Pollutant Point Source Emissions Inventory - Calendar Year 2008

Hazardous Air Pollutants (HAPs) and/or Toxic Air Pollutants (TAPs)	CAS Number or Symbol (see instructions)	ID Numbers of Contributing Sources	Actual Emissions (Pounds/Year)*	
				CY 2008
2,3,7,8-TCDD		Boilers 6,7,8		0.000002
2,4-Dinitrotoluene	121-14-2	Boilers 6,7,8		0.04
2-Chloroacetophenone	532-27-4	Boilers 6,7,8		0.92
Acetaldehyde	75-07-0	Boilers 6,7,8		74.80
Acetophenone	98-86-2	Boilers 6,7,8		1.97
Acrolein	107-02-8	Boilers 6,7,8		38.06
Arsenic	ARSENICCPDS	Boilers 6,7,8		1.29
Benzene	71-43-2	Boilers 6,7,8		171.24
Benzo(a)pyrene	50-32-8	Boilers 6,7,8		0.005
Benzyl Chloride	100-44-7	Boilers 6,7,8		91.85
Beryllium	BERYLCPDS	Boilers 6,7,8		0.12
Biphenyl	92-52-4	Boilers 6,7,8		0.22
Bis(2-ethylhexyl)phthalate (DEHP)		Boilers 6,7,8		9.58
Bromine	7726-95-6	Boilers 6,7,8		25.89
Bromoform	75-25-2	Boilers 6,7,8		5.12
Cadmium	CADMIUMCPDS	Boilers 6,7,8		0.14
Carbon Disulfide	75-15-0	Boilers 6,7,8		17.06
Chlorobenzene	108-90-7	Boilers 6,7,8		2.89
Chloroform	67-66-3	Boilers 6,7,8		7.74
Chromium	CROMCPDS	Boilers 6,7,8		2.16
Chromium VI	CHROM6CPDS	Boilers 6,7,8		2.16
Cobalt	COBALTCPDS	Boilers 6,7,8		0.00
Cumene	98-82-8	Boilers 6,7,8		0.70
Cyanide	CNC	Boilers 6,7,8		328
Dibenzofurans	132-64-9	Boilers 6,7,8		0.03
Dichlorobenzene	106-46-7	Boilers 6,7,8		0.10
Dimethyl Sulfate	77-78-1	Boilers 6,7,8		6.30
Ethyl Benzene	100-41-4	Boilers 6,7,8		12.33
Ethyl Chloride	75-00-3	Boilers 6,7,8		5.51
Ethylene Dibromide	106-93-4	Boilers 6,7,8		0.16
Ethylene Dichloride	107-06-2	Boilers 6,7,8		5.25

Inventory Report Prepared by RST Engineering, PLLC - S.G. "Butch" Smith, P.E.
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Facility Total CY 2008 Emissions Summary

Facility ID #: 6800043

Permit #(s): 03069T22

Facility Name: University of North Carolina at Chapel Hill

North Carolina Department of Environment and Natural Resources

Division of Air Quality

Air Pollutant Point Source Emissions Inventory - Calendar Year 2008

Hazardous Air Pollutants (HAPs) and/or Toxic Air Pollutants (TAPs)	CAS Number or Symbol (see instructions)	ID Numbers of Contributing Sources	Actual Emissions (Pounds/Year)*	
				CY 2008
Fluoride	16984-48-8	Boilers 6,7,8		0.00
Formaldehyde	50-00-0	Boilers 6,7,8		37.57
Hexane	110-54-3	Boilers 6,7,8		153.41
Hydrogen Chloride	7647-01-0	Boilers 6,7,8		114,227.6
Hydrogen Fluoride	7664-39-3	Boilers 6,7,8		5,773.1
Isophorone	78-59-1	Boilers 6,7,8		76.10
Lead	LEADCPDS	Boilers 6,7,8		0.86
Manganese	MANGCPDS	Boilers 6,7,8		3.56
Mercury	MERCCPDS	Boilers 6,7,8		4.91
Methyl Chloride	74-87-3	Boilers 6,7,8		69.54
Methyl Ethyl Ketone	78-93-3	Boilers 6,7,8		51.17
Methyl Bromide	74-83-9	Boilers 6,7,8		20.99
Methyl Chloroform	71-55-6	Boilers 6,7,8		0.00
Methyl Hydrazine	60-34-4	Boilers 6,7,8		22.31
Methyl Methacrylate	80-62-6	Boilers 6,7,8		2.62
Methyl Tert Butyl Ether	1634-04-4	Boilers 6,7,8		4.59
Methylene Chloride	75-09-2	Boilers 6,7,8		38.05
Napthalene	91-20-3	Boilers 6,7,8		1.84
Nickel	NICKCPDS	Boilers 6,7,8		1.85
Phenol	108-95-2	Boilers 6,7,8		2.10
POM	POM	Boilers 6,7,8		7.13
Propionaldehyde	123-38-6	Boilers 6,7,8		49.86
Selenium	SEC	Boilers 6,7,8		0.00E+00
Styrene	100-42-5	Boilers 6,7,8		3.28
Tetrachloroethane	79-34-5	Boilers 6,7,8		5.64
Toluene	108-88-3	Boilers 6,7,8		31.94
Vinyl Acetate	108-05-4	Boilers 6,7,8		1.00
Xylenes	1330-20-7	Boilers 6,7,8		4.98

Inventory Report Prepared by RST Engineering, PLLC - S.G. "Butch" Smith, P.E.

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University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

Facility Summary of Sources

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID# 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

Insignificant Activities

Enclosed Sorbent Railcar Dump Pit

Emission Sources

Source	Source ID #	Control Device #	Control Device
Boiler #6	ES-001-Boiler #6	CD-004	Bagfilter w/ CaCO ₃ Injection
Boiler #7	ES-002-Boiler #7	CD-005	Bagfilter w/ CaCO ₃ Injection
Boiler #8	ES-003-Boiler #8		
2,000 kW Generator	ES-007		
2,000 kW Generator	ES-008		
2,000 kW Generator*	ES-009		
Three Enclosed Railcar Dump Pits	ES-010	CD-018	Wet Spray
One Coal Silo	ES-1	CD-011	Bagfilter
One Coal Silo	ES-2	CD-012	Bagfilter
Five Silo Feed Conveyors	ES-3	CD-019	Bagfilter
Coal Crusher Building	ES-010A	CD-013	Bagfilter
Ash Silo w/ Loadout	ES-030	CD-031	Bagfilter
Wet Ash Loadout	ES-030A	CD-032	Water Injection
Fuel Oil Storage Tanks	T-001, 002		

**Not installed.*

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

Fuel Use Summary

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

Seasonal Fuel Usage Breakdown

Month	Boiler #6			Boiler #7			Boiler #8	
	Coal (tons)	Gas (1,000cf)	Oil (gallons)	Coal (tons)	Gas (1,000cf)	Oil (gallons)	Gas (1,000cf)	Oil (gallons)
December 2008	6,344	200	0	6,627	0	0	430	0
January 2008	7,677	4,643	0	7,052	4,365	0	12,603	0
February 2008	5,420	631	0	6,015	484	0	19,726	0
<i>1st Quarter Total</i>	<i>19,442</i>	<i>5,473</i>	<i>0</i>	<i>19,694</i>	<i>4,849</i>	<i>0</i>	<i>32,759</i>	<i>0</i>
March 2008	5,908	0	0	5,223	190	0	3,110	0
April 2008	5,740	297	0	3,472	823	0	4,265	0
May 2008	4,718	2,003	0	4,605	397	0	0	0
<i>2nd Quarter Total</i>	<i>16,366</i>	<i>2,300</i>	<i>0</i>	<i>13,300</i>	<i>1,410</i>	<i>0</i>	<i>7,375</i>	<i>0</i>
June 2008	5,243	967	0	6,776	793	0	0	0
July 2008	4,951	80	0	4,899	188	0	17,882	0
August 2008	4,816	280	0	4,441	770	0	0	0
<i>3rd Quarter Total</i>	<i>15,010</i>	<i>1,327</i>	<i>0</i>	<i>16,117</i>	<i>1,751</i>	<i>0</i>	<i>17,882</i>	<i>0</i>
September 2008	2,762	320	0	5,876	100	0	0	0
October 2008	5,324	1,630	0	4,954	640	0	1,110	0
November 2008	6,119	0	0	6,245	0	0	1,420	0
<i>4th Quarter Total</i>	<i>14,204</i>	<i>1,950</i>	<i>0</i>	<i>17,075</i>	<i>740</i>	<i>0</i>	<i>2,530</i>	<i>0</i>
2008 TOTAL	65,022	11,050	0	66,185	8,750	0	60,546	0

Seasonal Btu Breakdown

Coal (btu/lb)	12,031	Natural Gas (btu/ft ³)	1,030	Fuel Oil (btu/gal)	137,006
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Month	Boiler #6			Boiler #7			Boiler #8	
	Coal	Gas	Oil	Coal	Gas	Oil	Gas	Oil
December 2008	1.53E+11	2.06E+08	0	1.59E+11	0.00E+00	0	4.43E+08	0
January 2008	1.85E+11	4781775000	0	1.70E+11	4.50E+09	0	1.30E+10	0
February 2008	1.30E+11	6.50E+08	0	1.45E+11	4.99E+08	0	2.03E+10	0
<i>1st Quarter Total</i>	<i>4.68E+11</i>	<i>5.64E+09</i>	<i>0</i>	<i>4.74E+11</i>	<i>4.99E+09</i>	<i>0</i>	<i>3.37E+10</i>	<i>0</i>
March 2008	1.42E+11	0.00E+00	0	1.26E+11	1.96E+08	0	3203300000	0
April 2008	1.38E+11	3.06E+08	0	8.35E+10	8.48E+08	0	4.39E+09	0
May 2008	1.14E+11	2.06E+09	0	1.11E+11	4.09E+08	0	0	0
<i>2nd Quarter Total</i>	<i>3.94E+11</i>	<i>2.37E+09</i>	<i>0</i>	<i>3.20E+11</i>	<i>1.45E+09</i>	<i>0</i>	<i>7.60E+09</i>	<i>0</i>
June 2008	1.26E+11	9.96E+08	0	1.63E+11	8.17E+08	0	0.00E+00	0
July 2008	1.19E+11	8.24E+07	0	1.18E+11	1.94E+08	0	1.84E+10	0
August 2008	1.16E+11	2.88E+08	0	1.07E+11	793100000	0	0.00E+00	0
<i>3rd Quarter Total</i>	<i>3.61E+11</i>	<i>1.37E+09</i>	<i>0</i>	<i>3.88E+11</i>	<i>1.80E+09</i>	<i>0</i>	<i>1.84E+10</i>	<i>0</i>
September 2008	6.65E+10	3.30E+08	0.00E+00	1.41E+11	103000000	0.00E+00	0	0
October 2008	1.28E+11	1.68E+09	0	1.19E+11	6.59E+08	0	1.14E+09	0
November 2008	1.47E+11	0.00E+00	0	1.50E+11	0.00E+00	0	1.46E+09	0.00E+00
<i>4th Quarter Total</i>	<i>3.42E+11</i>	<i>2.01E+09</i>	<i>0.00E+00</i>	<i>4.11E+11</i>	<i>7.62E+08</i>	<i>0.00E+00</i>	<i>2.61E+09</i>	<i>0.00E+00</i>
2008 TOTAL	1.56E+12	1.14E+10	0.00E+00	1.59E+12	9.01E+09	0.00E+00	6.24E+10	0.00E+00

Seasonal Total Fuel Usage (%)

	Boiler #6	Boiler #7	Boiler #8
Dec., Jan., Feb.	30.04	29.90	54.11
Mar., Apr., May	25.14	20.07	12
June, July, Aug.	23.00	24.33	29.53
Sept., Oct., Nov.	21.81	25.70	4.18
	100	100	100

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

Coal Usage Breakdown

Month	Boiler #6 Coal (tons)	Boiler #7 Coal (tons)
December 2008	6,344	6,627
January 2008	7,677	7,052
February 2008	5,420	6,015
<i>1st Quarter Total</i>	<i>19,442</i>	<i>19,694</i>
March 2008	5,908	5,223
April 2008	5,740	3,472
May 2008	4,718	4,605
<i>2nd Quarter Total</i>	<i>16,366</i>	<i>13,300</i>
June 2008	5,243	6,776
July 2008	4,951	4,899
August 2008	4,816	4,441
<i>3rd Quarter Total</i>	<i>15,010</i>	<i>16,117</i>
September 2008	2,762	5,876
October 2008	5,324	4,954
November 2008	6,119	6,245
<i>4th Quarter Total</i>	<i>14,204</i>	<i>17,075</i>
2008 TOTAL	65,022	66,185

Facility-Wide Coal Usage 131,208 Tons/year

Seasonal Coal Usage (%)

	Boiler #6	Boiler #7	Average (%)
Dec., Jan., Feb.	29.90%	29.76%	29.83%
Mar., Apr., May	25.17%	20.09%	22.63%
June, July, Aug.	23.08%	24.35%	23.72%
Sept., Oct., Nov.	21.85%	25.80%	23.82%
	100%	100%	100%

University of North Carolina at Chapel Hill

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2008 Annual Emissions Inventory

Blackstart Generator Fuel Usage Breakdown

Month	DG1 & DG2 #2 Oil (gallons)
December 2008	81
January 2008	49.4
February 2008	1,402
<i>1st Quarter Total</i>	1,533
March 2008	1,840
April 2008	68
May 2008	78
<i>2nd Quarter Total</i>	1,986
June 2008	78
July 2008	134
August 2008	874
<i>3rd Quarter Total</i>	1,086
September 2008	51
October 2008	16
November 2008	2
<i>4th Quarter Total</i>	69
2008 TOTAL	4,673

Seasonal Oil Usage (%)

	DG1 & DG2
Dec., Jan., Feb.	32.80%
Mar., Apr., May	42.49%
June, July, Aug.	23.24%
Sept., Oct., Nov.	1.47%
	100%

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

Supporting Documentation

Facility Summary Forms

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

**Three Enclosed Railcar Dump Pits
(ES-010)**

Emission Source/Operating Scenario Data Page 1 of 2		Facility ID #: 6800043					
Railcar Dump Pits		Permit #: 03069T22					
If Emission Source has multiple Operating Scenarios, complete one form for each. (All permitted, Insignificant and/or Non-permitted Sources)		County: Orange					
Facility Name: <u>University of North Carolina at Chapel Hill</u>		DAQ Region: Raleigh					
North Carolina Department of Environment and Natural Resources Division of Air Quality Air Pollutant Point Source Emissions Inventory - Calendar Year 2008							
1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-010					
2. Emission Source Description		Three Enclosed Railcar Dump Pits					
3. Operating Scenario Description		N/A					
4. Maximum Permitted Operating Rate With Units (Ex. gal/hr, mmBtu/hr)		350 tons/hr					
5. Throughput in CY (e.g. production or fuel use) With Units (Ex. lbs/yr, gal/yr)		131,208 tons/yr					
6. Fuel Information (if fuel used)		% Sulfur	N/A				
		% Ash	N/A				
		Heat Content (Btu/lb or mmCF)	N/A				
If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.							
7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)		N/A					
8. Control Device Information, if none, write "none"							
	Control Device ID # (as listed in permit)	Control Device Description					
i. (nearest stack)	N/A	Enclosed Dump Pits					
ii.	CD-018	Wet Spray Dust Suppression System					
iii.	N/A	N/A					
iv.	N/A	N/A					
9. Stack Information (sources vented to more than one stack use additional entry lines)							
Stack ID #	Height (in whole feet)	Diameter (feet) Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)	Temperature (F)	Velocity (feet/sec)	Volume Flow Rate (acfm)	Release Point Description (Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)	
Fugitive							
--	--	--	--	--	--	--	
--	--	--	--	--	--	--	
10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)							
Hours/Day	1.5	Days/Week	5	Weeks/Year	52	Hours/Year	390
Typical Start & End Times in CY:				Start:	N/A	End:	N/A
11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)							
Jan-Feb, 2002 + Dec, 2002	29.83%	Mar-May	22.63%	June-Aug	23.72%	Sept-Nov	23.82%

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

Fugitive Losses from the unloading of coal from railcars into a dump pit.

(ES-010)

Assume that the total amount of coal unloaded is equal to the total amount of coal combusted in 2008.

Boiler #6	65,022	Tons/yr
Boiler #7	66,185	Tons/yr
Total	131,208	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 131,208 tons/yr

Emissions from the unloading of coal:

	Emission Factor (lb/ton)	Emissions (lb/yr)	Emissions (ton/yr)
PM	1.32E-04	17.33	8.66E-03
PM-10	6.25E-05	8.20	4.10E-03
PM-2.5	1.96E-05	2.58	1.29E-03

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

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2008 Annual Emissions Inventory

**Coal Silos
(ES-1, ES-2)**

Emission Source/Operating Scenario Data Page 1 of 2		Facility ID #: 6800043					
<i>Coal Silos</i> <small>If Emission Source has multiple Operating Scenarios, complete one form for each. (All permitted, Insignificant and/or Non-permitted Sources)</small>		Permit #: 03069T22					
Facility Name: <u>University of North Carolina at Chapel Hill</u>		County: Orange					
		DAQ Region: Raleigh					
North Carolina Department of Environment and Natural Resources Division of Air Quality Air Pollutant Point Source Emissions Inventory - Calendar Year 2008							
1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-1 and ES-2					
2. Emission Source Description		Two Coal Storage Silos					
3. Operating Scenario Description		N/A					
4. Maximum Permitted Operating Rate <small>With Units (Ex. gal/hr, mmBtu/hr)</small>		350 tons/hr					
5. Throughput in CY (e.g. production or fuel use) <small>With Units (Ex. lbs/yr, gal/yr)</small>		131,208 tons/yr					
6. Fuel Information (if fuel used)		% Sulfur	N/A				
		% Ash	N/A				
		Heat Content (Btu/lb or mmCF)	N/A				
<small>If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.</small>							
7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)		100%					
8. Control Device Information, if none, write "none"							
	Control Device ID # <small>(as listed in permit)</small>	Control Device Description					
i. (nearest stack)	CD-011	Bagfilter Installed on Silo ES-1					
ii.	CD-012	Bagfilter Installed on Silo ES-2					
iii.	N/A	N/A					
iv.	N/A	N/A					
9. Stack Information (sources vented to more than one stack use additional entry lines)							
Stack ID #	Height <small>(in whole feet)</small>	Diameter (feet) <small>Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)</small>	Temperature (F)	Velocity (feet/sec)	Volume Flow Rate (acfm)	Release Point Description <small>(Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)</small>	
EP-12-028	140	0.9	Ambient	61	2,500	Horizontal	
EP-12-036	140	0.9	Ambient	61	2,500	Horizontal	
--	--	--	--	--	--	--	
10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)							
Hours/Day	1.5	Days/Week	5	Weeks/Year	52	Hours/Year	390
Typical Start & End Times in CY:				Start:	N/A	End:	N/A
11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)							
Jan-Feb, 2002 + Dec, 2002	29.83%	Mar-May	22.63%	June-Aug	23.72%	Sept-Nov	23.82%

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

Emissions from the loading of 2 coal storage silos.

(ES-1, ES-2)

Assume that the total amount of coal fed to the silos is equal to the total amount of coal combusted in 2007.

Boiler #6	65,022	Tons/yr
Boiler #7	66,185	Tons/yr
Total	131,208	Tons/yr

The bulk density of coal is 47 lb/ft³

Total volume of coal combusted is = 5,583,306 ft³/yr
(Volume of coal combusted = 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).

$$\text{lb/yr} = (\text{volume of coal, ft}^3/\text{yr}) (0.015 \text{ gr/acf}) (1/7000 \text{ lb/gr})$$

Total Emissions from the silos	83,750	gr/yr
	11,964	lb/yr
	0.006	ton/yr

100% of these emissions are PM-10

95% of these emissions are PM-2.5

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

**Silo Feed Conveyors
(ES-3)**

Emission Source/Operating Scenario Data Page 1 of 2		Facility ID #: 6800043					
<i>Silo Feed Conveyors</i> <small>If Emission Source has multiple Operating Scenarios, complete one form for each. (All permitted, Insignificant and/or Non-permitted Sources)</small>		Permit #: 03069T22					
Facility Name: University of North Carolina at Chapel Hill		County: Orange					
		DAQ Region: Raleigh					
North Carolina Department of Environment and Natural Resources Division of Air Quality Air Pollutant Point Source Emissions Inventory - Calendar Year 2008							
1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-3					
2. Emission Source Description		Silo Feed Conveyors					
3. Operating Scenario Description		N/A					
4. Maximum Permitted Operating Rate <small>With Units (Ex. gal/hr, mmBtu/hr)</small>		700 tons/hr					
5. Throughput in CY (e.g. production or fuel use) <small>With Units (Ex. lbs/yr, gal/yr)</small>		131,208 tons/yr					
6. Fuel Information (if fuel used)		% Sulfur	N/A				
		% Ash	N/A				
		Heat Content (Btu/lb or mmCF)	N/A				
<small>If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.</small>							
7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)		100%					
8. Control Device Information , if none, write "none"							
	Control Device ID # <small>(as listed in permit)</small>	Control Device Description					
i. (nearest stack)	CD-019	Bagfilter					
ii.	N/A	N/A					
iii.	N/A	N/A					
iv.	N/A	N/A					
9. Stack Information (sources vented to more than one stack use additional entry lines)							
Stack ID #	Height <small>(in whole feet)</small>	Diameter (feet) <small>Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)</small>	Temperature <small>(F)</small>	Velocity <small>(feet/sec)</small>	Volume Flow Rate <small>(acfm)</small>	Release Point Description <small>(Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)</small>	
EP-12-6901	200	2	Ambient	45	8,500	Vertical	
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--	--	--	--	--	--	--	
10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)							
Hours/Day	N/A	Days/Week	N/A	Weeks/Year	N/A	Hours/Year	N/A
Typical Start & End Times in CY:				Start:	N/A	End:	N/A
11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)							
Jan-Feb, 2002 + Dec, 2002	25.00%	Mar-May	25.00%	June-Aug	25.00%	Sept-Nov	25.00%

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

Emissions from silo feed conveyors.

(ES-3)

Assume that the total amount of coal fed to the silos is equal to the total amount of coal combusted in 2008.

Boiler #6	65,022	Tons/yr
Boiler #7	66,185	Tons/yr
Total	131,208	Tons/yr

The bulk density of coal is 47 lb/ft³

Total volume of coal combusted is = 5,583,306 ft³/yr
(Volume of coal combusted = 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).

$$\text{lb/yr} = (\text{volume of coal, ft}^3/\text{yr}) (0.015 \text{ gr/acf}) (1/7000 \text{ lb/gr})$$

Total Emissions from the conveyors	83,750	gr/yr
	11.964	lb/yr
	0.006	ton/yr

100% of these emissions are PM-10

95% of these emissions are PM-2.5

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

Fuel Oil Storage Tanks

(T-001 and T-002)

Emission Source/Operating Scenario Data Page 1 of 2		Facility ID #: 6800043					
<i>Silo Feed Conveyors</i> <small>If Emission Source has multiple Operat</small>		Permit #: 03069T22					
Facility Name: University of North Carolina at Chapel Hill		County: Orange					
		DAQ Region: Raleigh					
North Carolina Department of Environment and Natural Resources Division of Air Quality Air Pollutant Point Source Emissions Inventory - Calendar Year 2008							
1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		T-001, T-002					
2. Emission Source Description		2 - 500,000 gallon No.2 Fuel Oil Tanks					
3. Operating Scenario Description		No.2 Fuel Oil Storage					
4. Maximum Permitted Operating Rate <small>With Units (Ex. gal/hr, mmBtu/hr)</small>		500,000 gallons capacity - each tank					
5. Throughput in CY (e.g. production or fuel use) <small>With Units (Ex. lbs/yr, gal/yr)</small>		4,673 gal/yr					
6. Fuel Information (if fuel used)		% Sulfur	N/A				
		% Ash	N/A				
		Heat Content (Btu/lb or mmCF)	N/A				
<small>If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.</small>							
7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)		NA					
8. Control Device Information , if none, write "none"							
	Control Device ID # <small>(as listed in permit)</small>	Control Device Description					
<i>i. (nearest stack)</i>	N/A	N/A					
<i>ii.</i>	N/A	N/A					
<i>iii.</i>	N/A	N/A					
<i>iv.</i>	N/A	N/A					
9. Stack Information (sources vented to more than one stack use additional entry lines)							
Stack ID #	Height <small>(in whole feet)</small>	Diameter (feet) <small>Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)</small>	Temperature <small>(F)</small>	Velocity <small>(feet/sec)</small>	Volume Flow Rate <small>(acfm)</small>	Release Point Description <small>(Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)</small>	
--	--	--	--	--	--	--	
--	--	--	--	--	--	--	
--	--	--	--	--	--	--	
10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)							
Hours/Day	24	Days/Week	7	Weeks/Year	52	Hours/Year	8760
Typical Start & End Times in CY:				Start:	N/A	End:	N/A
11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)							
Jan-Feb, 2002 + Dec, 2002	25.00%	Mar-May	25.00%	June-Aug	25.00%	Sept-Nov	25.00%

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 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	212.36	lb/yr	0.106	Tons/yr
T-002	212.36	lb/yr	0.106	Tons/yr
Total	424.72	lb/yr	0.212	Tons/yr

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

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

Operating Scenarios

#1 - Coal Firing

#2 - Natural Gas Firing

#4 - No.2 Fuel Oil 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 and NO_x 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 2008 Annual Emission Inventory forms require that the emissions be divided among the three possible operating scenarios.

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

SO₂ emissions from natural gas combustion are insignificant, therefore, SO₂ 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

SO₂ and NO_x Emissions are taken from CEMs data

HCl emissions are based on stack testing for Boiler MACT HCl eligibility demonstration completed in year 2006

Hf and Hg emissions are based on stack testing for Boiler MACT compliance planning completed in year 2004

All other estimates are from DAQ and EPA Emission Factors

Boiler #6 - Operating Scenario #4 - No. 2 Fuel Oil
 If Emission Source has multiple Operating Scenarios, complete one form for each.
 (All permitted, Insignificant and/or Non-permitted Sources)

Facility ID #: **6800043**
 Permit #: **03069T22**
 County: **Orange**
 DAQ Region: **Raleigh**

Facility Name: University of North Carolina at Chapel Hill

**North Carolina Department of Environment and Natural Resources
 Division of Air Quality
 Air Pollutant Point Source Emissions Inventory - Calendar Year 2008**

1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-001-Boiler #6					
2. Emission Source Description		Coal / Natural Gas / No. 6 Fuel Oil / No. 2 Fuel Oil Fired Circulating Fluidized Bed Combustion - Steam Generating Unit					
3. Operating Scenario Description		Operating Scenario #4 - No. 2 Fuel Oil					
4. Maximum Permitted Operating Rate With Units (Ex. gal/hr, mmBtu/hr)		323.17 MMBtu/hr					
5. Throughput in CY (e.g. production or fuel use) With Units (Ex. lbs/yr, gal/yr)		0 gallons/yr					
6. Fuel Information (if fuel used)		% Sulfur	0.05%	% Ash		Heat Content (Btu/lb or mmCF)	137,006 Btu/gal

If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.

7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)	100%
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8. Control Device Information, if none, write "none"

	Control Device ID # (as listed in permit)	Control Device Description
i. (nearest stack)	CD-004	Bagfilter with Calcium Carbonate (CaCO₃) Sorbent Injection
ii.	N/A	N/A
iii.	N/A	N/A
iv.	N/A	N/A

9. Stack Information (sources vented to more than one stack use additional entry lines)

Stack ID #	Height (in whole feet)	Diameter (feet) Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)	Temperature (F)	Velocity (feet/sec)	Volume Flow Rate (acfm)	Release Point Description (Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)
EP-14-136	220	9	305	56.1	214,000	Vertical
--	--	--	--	--	--	--
--	--	--	--	--	--	--

10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)

Hours/Day	24	Days/Week	7	Weeks/Year	50	Hours/Year	8,057 Total
Typical Start & End Times in CY:				Start:	N/A	End:	N/A

11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)

Jan-Feb, 2002 + Dec, 2002	#DIV/0!	Mar-May	#DIV/0!	June-Aug	#DIV/0!	Sept-Nov	#DIV/0!
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Facility ID #: **6800043**
 Permit #: **03069T22**
 County: **Orange**
 DAQ Region: **Raleigh**

Facility Name: University of North Carolina at Chapel Hill

**North Carolina Department of Environment and Natural Resources
 Division of Air Quality
 Air Pollutant Point Source Emissions Inventory - Calendar Year 2008**

Emissions: Attach calculations and documentation of emission factors or other estimation methods used.

Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant) ES-001-Boiler #6

Criteria (NAAQS) Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Monoxide	CO	0.00	8	N/A
NOx	NOx	0.00	1	N/A
PM Total	PM	0.000	8	99.0%
PM-2.5	PM-2.5	0.0000	8	99.0%
PM-10	PM-10	0.000	8	99.0%
SO2	SO2	0.00	1	90.0%
VOC	VOC	0.000	8	N/A
HAP/TAP Pollutants (In Alphabetical Order)	CAS # (or other code - see instructions)	Emissions HAP/TAP (Pounds/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Antimony	ANTIMONYPDS	0.00E+00	8	99.0%
Arsenic	ARSENICPDS	0.00E+00	8	99.0%
Benzene	71-43-2	0.00E+00	8	N/A
Beryllium	BERYLCPDS	0.00E+00	8	99.0%
Cadmium	CADMIUMCPDS	0.00E+00	8	99.0%
Chromium	CROMCPDS	0.00E+00	8	99.0%
Chromium VI	CHROM6CPDS	0.00E+00	8	99.0%
Cobalt	COBALTCPDS	0.00E+00	8	99.0%
Ethylbenzene	100-41-4	0.00E+00	8	N/A
Fluoride	16984-48-8	0.00	8	N/A
Formaldehyde	50-00-0	0.00	8	N/A
Lead	LEADCPDS	0.00E+00	8	99.0%
Manganese	MANGCPDS	0.00E+00	8	99.0%
Mercury	MERCPDS	0.00E+00	8	99.0%
Methyl chloroform	71-55-6	0.00E+00	8	N/A
Napthalene	91-20-3	0.00E+00	8	N/A
Nickel	NICKCPDS	0.00E+00	8	99.0%
POM	POM	0.00E+00	8	99.0%
Selenium	SEC	0.00E+00	8	99.0%
Toluene	108-88-3	0.00	8	N/A
Xylene	1330-20-7	0.00E+00	8	N/A
Greenhouse Gas Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Dioxide	CO ₂	0.00	8	N/A
Methane	CH ₄	0.00	8	N/A
Nitrous oxide	N ₂ O	0.00	8	N/A

Emissions and data on this form required to report or verify emissions cannot be held confidential.

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed.

Boiler #6 - Operating Scenario #1 - Coal
 If Emission Source has multiple Operating Scenarios, complete one form for each.
 (All permitted, Insignificant and/or Non-permitted Sources)

Facility ID #: **6800043**
 Permit #: **03069T22**
 County: **Orange**
 DAQ Region: **Raleigh**

Facility Name: University of North Carolina at Chapel Hill

**North Carolina Department of Environment and Natural Resources
 Division of Air Quality
 Air Pollutant Point Source Emissions Inventory - Calendar Year 2008**

1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-001-Boiler #6					
2. Emission Source Description		Coal / Natural Gas / No. 2 Fuel Oil Fired Circulating Fluidized Bed Combustion - Steam Generating Unit					
3. Operating Scenario Description		Operating Scenario #1 - Coal					
4. Maximum Permitted Operating Rate With Units (Ex. gal/hr, mmBtu/hr)		323.17 MMBtu/hr					
5. Throughput in CY (e.g. production or fuel use) With Units (Ex. lbs/yr, gal/yr)		65,022			tons/yr		
6. Fuel Information (if fuel used)		% Sulfur	1.46%	% Ash	12.52%	Heat Content (Btu/lb or mmCF)	12,669 Btu/lb

If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.

7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)	100%
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8. Control Device Information, if none, write "none"

	Control Device ID # (as listed in permit)	Control Device Description
i. (nearest stack)	CD-004	Bagfilter with Calcium Carbonate (CaCO₃) Sorbent Injection
ii.	N/A	N/A
iii.	N/A	N/A
iv.	N/A	N/A

9. Stack Information (sources vented to more than one stack use additional entry lines)

Stack ID #	Height (in whole feet)	Diameter (feet) Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)	Temperature (F)	Velocity (feet/sec)	Volume Flow Rate (acfm)	Release Point Description (Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)
EP-14-136	220	9	305	56.1	214,000	Vertical
--	--	--	--	--	--	--
--	--	--	--	--	--	--

10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)

Hours/Day	24	Days/Week	7	Weeks/Year	50	Hours/Year	8057 Total
Typical Start & End Times in CY:				Start:	N/A	End:	N/A

11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)

Jan-Feb, 2002 + Dec, 2002	29.90%	Mar-May	25.17%	June-Aug	23.08%	Sept-Nov	21.85%
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Boiler #6 - Operating Scenario #1 - Coal

If Emission Source has multiple Operating Scenarios, complete one form for each.
(All permitted, Insignificant and/or Non-permitted Sources)

Facility ID #: **6800043**

Permit #: **03069T22**

County: **Orange**

DAQ Region: **Raleigh**

Facility Name: University of North Carolina at Chapel Hill

**North Carolina Department of Environment and Natural Resources
Division of Air Quality
Air Pollutant Point Source Emissions Inventory - Calendar Year 2008**

Emissions: Attach calculations and documentation of emission factors or other estimation methods used.

Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)

ES-001-Boiler #6

Criteria (NAAQS) Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Monoxide	CO	585.20	8	N/A
NOx	NOx	178.62	1	N/A
PM Total	PM	1.61	8	99.80%
PM-2.5	PM-2.5	0.96	8	97.90%
PM-10	PM-10	1.61	8	99.60%
SO2	SO2	119.51	1	90.00%
VOC	VOC	1.63	8	N/A
HAP/TAP Pollutants (In Alphabetical Order)	CAS # (or other code - see instructions)	Emissions HAP/TAP (Pounds/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Acetaldehyde	750-07-0	37.06	8	N/A
Acetophenone	98-86-2	0.98	8	N/A
Acrolein	107-02-8	18.86	8	N/A
Arsenic	ARSENICPDS	0.63	8	99.60%
Benzene	71-43-2	84.53	8	N/A
Benzo(a)pyrene	50-32-8	2.47E-03	8	N/A
Benzyl chloride	100-44-7	45.52	8	N/A
Beryllium	BERYLCPDS	0.06	8	N/A
Biphenyl	92-52-4	1.11E-01	8	N/A
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	4.75	8	N/A
Bromine	7726-95-6	12.83	8	99.60%
Bromoform	75-25-2	2.54	8	N/A
Cadmium	CADMIUMCPDS	2.58E-02	8	99.60%
Carbon disulfide	75-10-0	8.45	8	N/A
2-Chloroacetophenone	532-27-4	0.46	8	N/A
Chlorobenzene	108-90-7	1.43	8	N/A
Chloroform	67-66-3	3.84	8	N/A
Chromium	CROMCPDS	1.01	8	99.60%
Chromium (VI)	CHROM6CPDS	1.01	8	99.60%
Cumene	98-82-8	0.34	8	N/A
Cyanide	CNC	162.56	8	N/A
Dibenzofurans	132-64-9	1.31E-02	8	N/A
Dimethyl sulfate	77-78-1	3.12	8	N/A
2,4-Dinitrotoluene	121-14-2	1.82E-02	8	N/A
Ethyl benzene	100-41-4	6.11	8	N/A
Ethyl chloride	75-00-3	2.73	8	N/A
Ethylene dibromide	106-93-4	7.80E-02	8	N/A
Ethylene dichloride	107-06-2	2.60	8	N/A

Emissions and data on this form required to report or verify emissions cannot be held confidential.

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed.

Boiler #6 - Operating Scenario #1 - CoalIf Emission Source has multiple Operating Scenarios, complete one form for each.
(All permitted, Insignificant and/or Non-permitted Sources)Facility ID #: 6800043Permit #: 03069T22County: OrangeDAQ Region: RaleighFacility Name: University of North Carolina at Chapel Hill

North Carolina Department of Environment and Natural Resources

Division of Air Quality

Air Pollutant Point Source Emissions Inventory - Calendar Year 2008

Emissions: Attach calculations and documentation of emission factors or other estimation methods used.

Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)

ES-001-Boiler #6

Criteria (NAAQS) Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Monoxide	CO	N/A	N/A	N/A
NOx	NOx	N/A	N/A	N/A
PM Total	PM	N/A	N/A	N/A
PM-2.5	PM-2.5	N/A	N/A	N/A
PM-10	PM-10	N/A	N/A	N/A
SO2	SO2	N/A	N/A	N/A
VOC	VOC	N/A	N/A	N/A
HAP/TAP Pollutants (In Alphabetical Order)	CAS # (or other code - see instructions)	Emissions HAP/TAP (Pounds/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Formaldehyde	50-00-00	15.61	8	N/A
Hexane	HEXANEISO	4.36	8	N/A
Hydrogen Chloride ***	7647-01-0	48571.62	8	N/A
Hydrogen Fluoride ***	7664-39-3	2860.98	8	90% Control with CaCO ₃
Isophorone	78-59-1	37.71	8	N/A
Lead	LEADCPDS	0.41	8	99.60%
Manganese	MANGCPDS	1.75	8	99.60%
Mercury***	MERCCPDS	2.42	8	N/A
Methyl bromide	74-83-9	10.40	8	N/A
Methyl chloride	74-87-3	34.46	8	N/A
Methyl ethyl ketone	78-93-3	25.36	8	N/A
Methyl hydrazine	60-34-4	11.05	8	N/A
Methyl methacrylate	80-62-6	1.30	8	N/A
Methyl tert butyl ether	1634-04-4	2.28	8	N/A
Methylene chloride	75-09-2	18.86	8	N/A
Naphthalene	91-20-3	0.85	8	N/A
Nickel	NICKCPDS	0.83	8	99.60%
Phenol	108-95-2	1.04	8	N/A
POM	POM	3.50	8	N/A
Propionaldehyde	123-38-6	24.71	8	N/A
Styrene	100-42-5	1.63	8	N/A
2,3,7,8-TCDD	1746-01-6	9.30E-07	8	N/A
Tetrachloroethylene	79-34-5	2.80	8	N/A
Toluene	108-88-3	15.61	8	N/A
1,1,1-Trichloroethane	79-00-5	1.30	8	N/A
Vinyl acetate	108-05-4	0.49	8	N/A
Xylenes	1330-20-7	2.41	8	N/A
Greenhouse Gas Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Dioxide	CO ₂	183,347.63	8	N/A
Methane	CH ₄	1.95	8	N/A
Nitrous oxide	N ₂ O	113.79	8	N/A

Boiler #6 - Operating Scenario #3 - Natural Gas
 If Emission Source has multiple Operating Scenarios, complete one form for each.
 (All permitted, Insignificant and/or Non-permitted Sources)

Facility ID #: **6800043**
 Permit #: **03069T22**
 County: **Orange**
 DAQ Region: **Raleigh**

Facility Name: University of North Carolina at Chapel Hill

North Carolina Department of Environment and Natural Resources
Division of Air Quality
Air Pollutant Point Source Emissions Inventory - Calendar Year 2008

1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-001-Boiler #6					
2. Emission Source Description		Coal / Natural Gas / No. 2 Fuel Oil Fired Circulating Fluidized Bed Combustion - Steam Generating Unit					
3. Operating Scenario Description		Operating Scenario #2 - Natural Gas					
4. Maximum Permitted Operating Rate With Units (Ex. gal/hr, mmBtu/hr)		323.17 MMBtu/hr					
5. Throughput in CY (e.g. production or fuel use) With Units (Ex. lbs/yr, gal/yr)		11,050			1,000 ft ³ /yr		
6. Fuel Information (if fuel used)		% Sulfur	N/A	% Ash	N/A	Heat Content (Btu/lb or mmCF)	1,030 Btu/ft ³

If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.

7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)	100%
--	------

8. Control Device Information, if none, write "none"

	Control Device ID # (as listed in permit)	Control Device Description
i. (nearest stack)	CD-004	Bagfilter with Calcium Carbonate (CaCO ₃) Sorbent Injection
ii.	N/A	N/A
iii.	N/A	N/A
iv.	N/A	N/A

9. Stack Information (sources vented to more than one stack use additional entry lines)

Stack ID #	Height (in whole feet)	Diameter (feet) Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)	Temperature (F)	Velocity (feet/sec)	Volume Flow Rate (acfm)	Release Point Description (Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)
EP-14-136	220	9	305	56.1	214,000	Vertical
--	--	--	--	--	--	--
--	--	--	--	--	--	--

10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)

Hours/Day	24	Days/Week	7	Weeks/Year	50	Hours/Year	8059 Total
Typical Start & End Times in CY:				Start:	N/A	End:	N/A

11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)

Jan-Feb, 2002 + Dec, 2002	49.53%	Mar-May	20.81%	June-Aug	12.01%	Sept-Nov	17.65%
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Facility ID #: **6800043**
 Permit #: **03069T22**
 County: **Orange**
 DAQ Region: **Raleigh**

Facility Name: University of North Carolina at Chapel Hill

**North Carolina Department of Environment and Natural Resources
 Division of Air Quality
 Air Pollutant Point Source Emissions Inventory - Calendar Year 2008**

Emissions: Attach calculations and documentation of emission factors or other estimation methods used.

Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant) ES-001-Boiler #6

Criteria (NAAQS) Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Monoxide	CO	0.46	8	N/A
NOx	NOx	1.30	1	N/A
PM Total	PM	0.04	8	N/A
PM-2.5	PM-2.5	0.04	8	N/A
PM-10	PM-10	0.04	8	N/A
SO2	SO2	0.00	1	N/A
VOC	VOC	0.03	8	N/A
HAP/TAP Pollutants (In Alphabetical Order)	CAS # (or other code - see instructions)	Emissions HAP/TAP (Pounds/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Arsenic	ARSENICPDS	2.21E-03	8	N/A
Benzene	71-43-2	0.02	8	N/A
Cadmium	CADMIUMCPDS	1.22E-02	8	N/A
Chromium	CROMCPDS	1.55E-02	8	N/A
Chromium VI	CHROM6CPDS	1.55E-02	8	N/A
Dichlorobenzene	106-46-7	1.33E-02	8	N/A
Formaldehyde	50-00-0	0.83	8	N/A
Hexane	HEXANEISO	19.89	8	N/A
Lead	LEADCPDS	5.53E-03	8	N/A
Manganese	MANGCPDS	4.20E-03	8	N/A
Mercury	MERCPDS	2.87E-03	8	N/A
Napthalene	91-20-3	6.74E-03	8	N/A
Nickel	NICKCPDS	0.02	8	N/A
POM	POM	7.31E-03	8	N/A
Toluene	108-88-3	0.04	8	N/A
Greenhouse Gas Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Dioxide	CO ₂	664.99	8	N/A
Methane	CH ₄	0.013	8	N/A
Nitrous oxide	N ₂ O	0.012	8	N/A

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

Boiler #6

(ES-001-Boiler #6)

Emissions Calculations

SO₂ and NO_x Emissions are Taken from CEMs Data
HCl, HF, Hg emissions are based on stack test data
All other estimates are from DAQ Spreadsheets

**Fuel Oil Combustion Emissions Calculator FO2000 Revision A
2008 Annual Emissions Inventory**

**Boiler #6
(ES-001-Boiler #6)
Facility ID # 6800043
Permit # 03069T22**

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:	03069T22
User:	RST Engineering
Heat Input Capacity (mmBtu/hr):	323.17
Fuel Input Capacity (10 ³ gal/hr):	2.31
Annual Fuel Throughput (1000 gal):	0.00
Maximum fuel sulfur content (%):	0.5
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

2008 Annual Emissions Inventory

Boiler #6

(ES-001-Boiler #6)

Facility ID # 6800043

Permit # 03069T22

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:	03069T22
User:	RST Engineering
Heat Input Capacity (mmBtu/hr):	323.17
Fuel Input Capacity (10 ³ gal/hr):	2.31
Annual Fuel Throughput (1000 gal):	0.00
Maximum fuel sulfur content (%):	0.5
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		
Control Device	Avg. Cont. Effic.	User Input PM Cont. Effic.
0 = None/other		
1 = ESP		
2 = Scrubber		
3 = Bagfilter	99.0	
4 = Multiple cyclone		
		Message Area

Postcombustion SO₂ controls

Enter the control type below ▾	Message Area	Or enter an SO ₂ control efficiency below to override built in values.
0		
Control Technology/Process	Avg. Cont. Effic.	User Input SO ₂ Cont. Effic.
0 = None/other		90.0
1 = Wet scrubber, Lime/limestone		
2 = Wet scrubber, Sodium carbonate	0.0	
3 = Wet scrubber, Magnesium oxide/hydroxide		
4 = Wet scrubber, Dual alkali		
5 = Spray drying, calcium hydroxide slurry, vap. in spray vessel		
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	Remarks	
	NA	

NO_x controls

Enter the control type below ▾	Message Area	Or enter a NO _x control efficiency below to override built in values.
5		
Control Technology/Process	Avg. Cont. Effic.	User Input NO _x Cont. Effic.
0 = None/other		0.0
1 = Low excess air (LEA)		
2 = Staged combustion (SC)		
3 = Burners out of service (BOOS)	39.0	
4 = Flue gas recirculation (FGR)		
5 = Flue gas recirculation plus staged combustion		
6 = Low NO _x burners (LNB)		
7 = Reduced air preheat (RAP)		
8 = Selective noncatalytic reduction (SNCR)		
9 = Conventional selective catalytic reduction (SCR)	Remarks	
	Available for boilers with sufficient operational flexibility	

Fuel Oil Combustion Emissions Calculator FO2000 Revision A
2008 Annual Emissions Inventory

Boiler #6
(ES-001-Boiler #6)
Facility ID # 6800043
Permit # 03069T22

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:	03069T22
User:	RST Engineering
Heat Input Capacity (mmBtu/hr):	323.17
Fuel Input Capacity (10 ³ gal/hr):	2.31
Annual Fuel Throughput (1000 gal):	0.00
Maximum fuel sulfur content (%):	0.5
Latest Construction/Modification Date:	N/A

Emissions Output (for operation 3.42 hr/yr)

Criteria Pollutants				Emission Factor ¹
Pollutant	lb/hr ²	tpy	lb/yr ³	(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	**	**	**	2.40E+01
NMTOC	0	0.000	0	2.00E-01
CO	12	0.000	0	5.00E+00
SO2 rates @ 90% control	**	**	**	2.98E+02
Total HAP ⁶	4.17E-01	0.000	0	1.81E-01
Largest HAP ⁶	1.84E-01	0.000	0	7.97E-02

Toxic/Hazardous Air Pollutants

Toxic/Hazardous Air Pollutants				Emission Factor ¹
Pollutant	lb/hr ²	lb/day ⁷	lb/yr ³	(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	6.35E-03	NA	0.00E+00	2.75E-03
Beryllium rates @ 99% control	9.70E-06	NA	0.00E+00	4.20E-04
Cadmium rates @ 99% control	9.70E-06	NA	0.00E+00	4.20E-04
Chromium rates @ 99% control	9.70E-06	NA	0.00E+00	4.20E-04
Chromium VI rates @ 99% control	2.85E-06	NA	0.00E+00	1.23E-04
Cobalt rates @ 99% control	0.00E+00	NA	0.00E+00	0.00E+00
Ethylbenzene	1.89E-03	NA	0.00E+00	8.17E-04
Fluoride	8.61E-02	2.07E+00	0.00E+00	3.73E-02
Formaldehyde	1.11E-01	2.66E+00	0.00E+00	4.80E-02
Lead rates @ 99% control	2.91E-05	NA	0.00E+00	1.26E-03
Manganese rates @ 99% control	1.94E-05	4.65E-04	0.00E+00	8.40E-04
Mercury	9.70E-04	2.33E-02	0.00E+00	4.20E-04
Methyl chloroform (1,1,1-Trichloroethane)	5.45E-04	1.31E-02	0.00E+00	2.36E-04
Naphthalene	7.69E-04	NA	0.00E+00	3.33E-04
Nickel rates @ 99% control	9.70E-06	2.33E-04	0.00E+00	4.20E-04
POM rates @ 99% control	7.62E-05	NA	0.00E+00	3.30E-03
Selenium rates @ 99% control	4.85E-05	NA	0.00E+00	2.10E-03
Toluene	1.84E-01	4.41E+00	0.00E+00	7.97E-02
Xylene	3.23E-03	7.76E-02	0.00E+00	1.40E-03

Greenhouse Gases

Greenhouse Gases				Emission Factor
Pollutant	lb/hr ²	tpy	lb/yr ³	(lb/10 ³ gal)
Carbon dioxide	50,491	0.0	0	21873.00
Methane	4.99E-01	0.00E+00	0.00E+00	0.216
Nitrous Oxide	2.54E-01	0.00E+00	0.00E+00	0.11

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

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

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

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

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

⁶Total 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.

Fuel Oil Combustion Emissions Calculator **FO2000 Revision A**
2008 Annual Emissions Inventory

Boiler #6
(ES-001-Boiler #6)
Facility ID # 6800043
Permit # 03069T22

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:	03069T22
User:	RST Engineering
Heat Input Capacity (mmBtu/hr):	323.17
Fuel Input Capacity (10 ³ gal/hr):	2.31
Annual Fuel Throughput (1000 gal):	0.00
Maximum fuel sulfur content (%):	0.5
Latest Construction/Modification Date:	N/A

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

**SOx and NOx emissions were estimated using CEMS data, please refer to the attached spreadsheets.

FO2000 Revision A dated March 9, 2000

Bituminous Coal Combustion

2008 Annual Emissions Inventory

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

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

Operating Scenario #1

Data Input

Maximum Heat Input	<input type="text" value="323.17"/>	mmBtu/hr	Boiler Type:	<input type="text" value="7"/>
Boiler Size/Type	Large Industrial		1) Pulverized/Dry Bottom	6) Underfeed Stoker
Actual Fuel Usage	<input type="text" value="65,022"/>	ton/yr	2) Pulverized/Wet Bottom	7) Fluidized Bed Cir.
or	or		3) Cyclone Furnace	8) Fluidized Bed Bub.
Hours of Operation	<input type="text"/>	hr/yr	4) Spreader Stoker	9) Hand Fed
and	and		5) Overfeed Stoker	
Heating Value	<input type="text" value="12,031"/>	Btu/lb	Control Device Efficiencies:	
		ton/yr	PM	<input type="text" value="99.80"/> %
Sulfur Content	<input type="text" value="1.46"/>	%	PM-10	<input type="text" value="99.60"/> %
Ash Content :	<input type="text" value="12.5"/>	%	PM-2.5	<input type="text" value="97.90"/> %
(B)ituminous or (S)ubbituminous?	<input type="text" value="B"/>	(B/S)	SOx*	<input type="text" value="90.00"/> %
Calcium to Sulfur Ratio	<input type="text" value="2.22"/>		NOx*	<input type="text" value="0.00"/> %

**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

2008 Annual Emissions Inventory

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

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

Operating Scenario #1

ACTUAL CRITERIA EMISSIONS

Pollutant	Factor		Emission Rates	
	(lb poll./ton coal)	(lb/hr)	(lb/yr)	(tpy)
PM	17	0.67	3,225	1.61
PM-10	12.4	0.67	3,225	1.61
PM-2.5*	1.4	0.39	1,912	0.96
SO2	12.71	**	**	**
SO3*	0.09	**	**	**
NOx	3.90	**	**	**
VOC	0.05	0.67	3,251	1.63
CO	18	241.75	1,170,401	585.20

ACTUAL TOXIC EMISSIONS

Pollutant	Factor		Emission Rates	
	(lb poll./ton coal)	(lb/hr)	(lb/yr)	(tpy)
Acetaldehyde	5.70E-04	7.66E-03	3.71E+01	1.85E-02
Acetophenone	1.50E-05	2.01E-04	9.75E-01	4.88E-04
Acrolein	2.90E-04	3.89E-03	1.89E+01	9.43E-03
Arsenic	4.87E-03	1.31E-04	6.34E-01	3.17E-04
Benzene	1.30E-03	1.75E-02	8.45E+01	4.23E-02
Benzo(a)pyrene	3.80E-08	5.10E-07	2.47E-03	1.24E-06
Benzyl chloride	7.00E-04	9.40E-03	4.55E+01	2.28E-02
Beryllium	4.52E-04	1.22E-05	5.88E-02	2.94E-05
Biphenyl	1.70E-06	2.28E-05	1.11E-01	5.53E-05
Bis(2-ethylhexyl)phthalate (DEHP)	7.30E-05	9.80E-04	4.75E+00	2.37E-03
Bromine	9.87E-02	2.65E-03	1.28E+01	6.41E-03
Bromoform	3.90E-05	5.24E-04	2.54E+00	1.27E-03
Cadmium	1.98E-04	5.33E-06	2.58E-02	1.29E-05
Carbon disulfide	1.30E-04	1.75E-03	8.45E+00	4.23E-03
2-Chloroacetophenone	7.00E-06	9.40E-05	4.55E-01	2.28E-04
Chlorobenzene	2.20E-05	2.95E-04	1.43E+00	7.15E-04
Chloroform	5.90E-05	7.92E-04	3.84E+00	1.92E-03
Chromium	7.78E-03	2.09E-04	1.01E+00	5.06E-04
Chromium (VI)	7.78E-03	2.09E-04	1.01E+00	5.06E-04
Cumene	5.30E-06	7.12E-05	3.45E-01	1.72E-04
Cyanide	2.50E-03	3.36E-02	1.63E+02	8.13E-02
Dibenzofurans	2.01E-07	2.70E-06	1.31E-02	6.53E-06
Dimethyl sulfate	4.80E-05	6.45E-04	3.12E+00	1.56E-03
2,4-Dinitrotoluene	2.80E-07	3.76E-06	1.82E-02	9.10E-06
Ethyl benzene	9.40E-05	1.26E-03	6.11E+00	3.06E-03
Ethyl chloride	4.20E-05	5.64E-04	2.73E+00	1.37E-03
Ethylene dibromide	1.20E-06	1.61E-05	7.80E-02	3.90E-05
Ethylene dichloride	4.00E-05	5.37E-04	2.60E+00	1.30E-03
Formaldehyde	2.40E-04	3.22E-03	1.56E+01	7.80E-03
Hexane	6.70E-05	9.00E-04	4.36E+00	2.18E-03
Hydrogen Chloride ***	7.47E-01	1.00E+01	4.86E+04	2.43E+01
Hydrogen Fluoride ***	4.40E-02	5.91E-01	2.86E+03	1.43E+00
Isophorone	5.80E-04	7.79E-03	3.77E+01	1.89E-02
Lead	3.14E-03	8.44E-05	4.09E-01	2.04E-04

**SO₂ and NO_x 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".

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

Bituminous Coal Combustion

2008 Annual Emissions Inventory

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

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

Operating Scenario #1

ACTUAL TOXIC EMISSIONS (continued)

Pollutant	Factor		Emission Rates	
	(lb poll./ton coal)	(lb/hr)	(lb/yr)	(tpy)
Manganese	1.34E-02	3.61E-04	1.75E+00	8.74E-04
Mercury***	3.73E-05	5.00E-04	2.42E+00	1.21E-03
Methyl bromide	1.60E-04	2.15E-03	1.04E+01	5.20E-03
Methyl chloride	5.30E-04	7.12E-03	3.45E+01	1.72E-02
Methyl ethyl ketone	3.90E-04	5.24E-03	2.54E+01	1.27E-02
Methyl hydrazine	1.70E-04	2.28E-03	1.11E+01	5.53E-03
Methyl methacrylate	2.00E-05	2.69E-04	1.30E+00	6.50E-04
Methyl tert butyl ether	3.50E-05	4.70E-04	2.28E+00	1.14E-03
Methylene chloride	2.90E-04	3.89E-03	1.89E+01	9.43E-03
Naphthalene	1.30E-05	1.75E-04	8.45E-01	4.23E-04
Nickel	6.40E-03	1.72E-04	8.32E-01	4.16E-04
Phenol	1.60E-05	2.15E-04	1.04E+00	5.20E-04
POM	5.39E-05	7.24E-04	3.50E+00	1.75E-03
Propionaldehyde	3.80E-04	5.10E-03	2.47E+01	1.24E-02
Styrene	2.50E-05	3.36E-04	1.63E+00	8.13E-04
2,3,7,8-TCDD	1.43E-11	1.92E-10	9.30E-07	4.65E-10
Tetrachloroethylene	4.30E-05	5.78E-04	2.80E+00	1.40E-03
Toluene	2.40E-04	3.22E-03	1.56E+01	7.80E-03
1,1,1-Trichloroethane	2.00E-05	2.69E-04	1.30E+00	6.50E-04
Vinyl acetate	7.60E-06	1.02E-04	4.94E-01	2.47E-04
Xylenes	3.70E-05	4.97E-04	2.41E+00	1.20E-03
Total HAPs		10.75	52,041.53	26.02

Greenhouse Gases

Pollutant	Factor		Emission Rates	
	(lb poll./ton coal)	(lb/hr)	(lb/yr)	(tpy)
Carbon dioxide	5494.70	73797.78	357,277,757	178,638.88
Methane	0.06	0.81	3,901	1.95
Nitrous Oxide	3.50	47.01	227,578	113.79

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
2008 Annual Emissions Inventory

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

Facility ID # 6800043
 Permit # 03069T22

Operating Scenario #2

User Input		Emissions Output (for operation 18.53 hr/yr)			Emission
Company Name:	University of North Carolina at Chapel Hill	Criteria Pollutants			Factor (lb/mmscf)
Plant County:	Orange County	Pollutant	lb/hr	lb/yr	tpy
Plant City:	Chapel Hill	PM	2.4E+00	8.4E+01	4.2E-02
Permit Number:	03069T18	PM-10	2.4E+00	8.4E+01	4.2E-02
User:	RST Engineering	PM-2.5	2.4E+00	8.4E+01	4.2E-02
Heat Input Capacity (mmBtu/hr):	323.17	NOx	**	**	**
Fuel Input Capacity (10 ⁶ scf/hr):	0.32	VOC	1.7E+00	6.1E+01	3.0E-02
Annual Fuel Throughput (10 ⁶ scf):	11.05	CO	2.7E+01	9.3E+02	4.6E-01
Latest Construction/Modification Date:	N/A	SO2	**	**	**
Enter the boiler type below ▾		Total HAP	6.0E-01	2.1E+01	1.0E-02
2		Largest HAP	5.7E-01	2.0E+01	9.9E-03
Other NOx Control		Toxic/Hazardous Air Pollutants			
4		Pollutant	lb/hr	lb/day	lb/yr
Large Wall-Fired Boilers (=>100 mmBtu/hr)		Arsenic	6.3E-05	NA	2.2E-03
1 = Uncontrolled (Pre-NSPS)		Benzene	6.7E-04	NA	2.3E-02
2 = Uncontrolled (Post-NSPS)		Cadmium	3.5E-04	NA	1.2E-02
3 = Controlled - Low NOx burners		Chromium	4.4E-04	NA	1.5E-02
4 = Controlled - Flue gas recirculation (FGR)		Chromium VI	4.4E-04	NA	1.5E-02
Small Boilers (<100 mmBtu/hr)		Dichlorobenzene	3.8E-04	NA	1.3E-02
5 = Uncontrolled		Formaldehyde	2.4E-02	NA	8.3E-01
6 = Controlled - Low NOx burners		Hexane	5.7E-01	1.4E+01	2.0E+01
7 = Controlled - Low NOx burners/FGR		Lead	1.6E-04	NA	5.5E-03
Tangential-Fired Boilers (All Sizes)		Manganese	1.2E-04	2.9E-03	4.2E-03
8 = Uncontrolled		Mercury	8.2E-05	2.0E-03	2.9E-03
9 = Controlled - FGR		Naphthalene	1.9E-04	NA	6.7E-03
Residential Furnaces (<0.3 mmBtu/hr)		Nickel	6.7E-04	1.6E-02	2.3E-02
10 = Uncontrolled		POM	2.1E-04	NA	7.3E-03
		Toluene	1.1E-03	2.6E-02	3.8E-02
		Greenhouse Gas Pollutants			Em. Factor (lb/mmscf)
		Pollutant	lb/hr	lb/yr	tpy
		Carbon dioxide	38,133	1,329,981	664.99
		Methane	0.73	25.42	0.013
		Nitrous Oxide	0.70	24.31	0.012

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 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 SO₂ emissions.

For the 2008 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 2008	0.17
February 2008	0.14
March 2008	0.17
April 2008	0.17
May 2008	0.17
June 2008	0.14
July 2008	0.12
August 2008	0.17
September 2008	0.10
October 2008	0.14
November 2008	0.17
December 2008	0.16
Annual Average	0.152

This average includes SO₂ 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 2008

Boiler #6		
Coal Tons/yr	Gas 1,000cf/yr	No. 2 Oil Gallons/yr
65,022	11,050	0
Coal (12,031 btu/lb)	Nat. Gas (1,030 btu/cf)	Oil (137,006 btu/gal)
MMBtu/yr		
1.56E+06	1.14E+04	0.00E+00

Total for Boiler #6 (MMBtu/yr)	1.58E+06
--------------------------------	----------

Total SO ₂ Emissions from Boiler #6 (lb/yr)	239,019
Total SO₂ Emissions from Boiler #6 (ton/yr)	119.51

SO₂ Emissions Associated with Coal Combustion (ton/yr)	119.51
SO₂ Emissions Associated with No. 2 Fuel Oil Combustion (ton/yr)	0.00

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 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 2008 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 2008	0.28
February 2008	0.32
March 2008	0.25
April 2008	0.20
May 2008	0.16
June 2008	0.19
July 2008	0.23
August 2008	0.21
September 2008	0.18
October 2008	0.19
November 2008	0.24
December 2008	0.29
Annual Average	0.23

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 2008

Boiler #6		
Coal Tons/yr	Gas 1,000cf/yr	No. 2 Oil Gallons/yr
65,022	11,050	0
Coal (12,031 btu/lb)	Nat. Gas (1,030 btu/cf)	Oil (137,006 btu/gal)
MMBtu/yr		
1.56E+06	1.14E+04	0.00E+00

Total for Boiler #6 (MMBtu/yr)	1.58E+06
--------------------------------	----------

Total NOx Emissions from Boiler #6 (lb/yr)	359,841
Total NOx Emissions from Boiler #6 (ton/yr)	179.92

NOx Emissions Associated with Coal Combustion (ton/yr)	178.62
NOx Emissions Associated with Fuel Oil No. 2 Combustion (ton/yr)	0.00
NOx Emissions Associated with Natural Gas Combustion (ton/yr)	1.30

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

Boiler No.6

CO₂ Emissions from Limestone.

(ES-3)

Assume that the amount of total limestone distributed between boilers is proportional to percentage of total coal burned in each boiler.

Boiler #6	65,022	Tons/yr	49.6%
Boiler #7	66,185	Tons/yr	50.4%
Total	131,208	Tons/yr	100.0%

Total Limestone Used **23,747** Tons/yr

Limestone Used in Boiler No.6 **11,768** Tons/yr

85.0% CaCO₃

100.09 MW, CaCO₃

44.01 MW, CO₂

5.00% MgCO₃

83.43 MW, MgCO₃

44.01 MW, CO₂

CO₂ emission rate 800.2 lb/ton

Boiler No.6 4,709 tons/yr, CO₂

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

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

Operating Scenarios

#1 - Coal Firing

#2 - Natural Gas Firing

#4 - No.2 Fuel Oil 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 and NO_x 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 2008 Annual Emission Inventory forms require that the emissions be divided among the three possible operating scenarios.

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

SO₂ emissions from natural gas combustion are insignificant, therefore, SO₂ 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

SO₂ and NO_x Emissions are taken from CEMs data

HCl emissions are based on stack testing for Boiler MACT HCl eligibility demonstration completed in year 2006

HF and Hg emissions are based on stack testing for Boiler MACT compliance planning completed in year 2004

All other estimates are from DAQ and EPA Emission Factors

Emission Source/Operating Scenario Data Page 1 of 2		Facility ID #: 680043					
<i>Boiler #7 - Operating Scenario #4 - No. 2 Fuel Oil</i> <small>If Emission Source has multiple Operating Scenarios, complete one form for each. (All permitted, Insignificant and/or Non-permitted Sources)</small>		Permit #: 03069T22					
Facility Name: University of North Carolina at Chapel Hill		County: Orange					
		DAQ Region: Raleigh					
North Carolina Department of Environment and Natural Resources Division of Air Quality Air Pollutant Point Source Emissions Inventory - Calendar Year 2008							
1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-002-Boiler #7					
2. Emission Source Description		Coal / Natural Gas / No. 6 Fuel Oil Fired Circulating Fluidized Bed Combustion - Steam Generating Unit					
3. Operating Scenario Description		Operating Scenario #4 - No. 2 Fuel Oil					
4. Maximum Permitted Operating Rate <small>With Units (Ex. gal/hr, mmBtu/hr)</small>		323.17 MMBtu/hr					
5. Throughput in CY (e.g. production or fuel use) <small>With Units (Ex. lbs/yr, gal/yr)</small>		0 gallons/yr					
6. Fuel Information (if fuel used)		% Sulfur	0.50%				
		% Ash					
		Heat Content (Btu/lb or mmCF)	137,006 Btu/gal				
<small>If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.</small>							
7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)		100%					
8. Control Device Information , if none, write "none"							
	Control Device ID # <small>(as listed in permit)</small>	Control Device Description					
<i>i. (nearest stack)</i>	CD-004	Bagfilter with Calcium Carbonate (CaCO ₃) Sorbent Injection					
<i>ii.</i>	N/A	N/A					
<i>iii.</i>	N/A	N/A					
<i>iv.</i>	N/A	N/A					
9. Stack Information (sources vented to more than one stack use additional entry lines)							
Stack ID #	Height <small>(in whole feet)</small>	Diameter (feet) <small>Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)</small>	Temperature <small>(F)</small>	Velocity <small>(feet/sec)</small>	Volume Flow Rate <small>(acfm)</small>	Release Point Description <small>(Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)</small>	
EP-14-136	220	9	305	56.1	214,000	Vertical	
--	--	--	--	--	--	--	
--	--	--	--	--	--	--	
10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)							
Hours/Day	24	Days/Week	7	Weeks/Year	50	Hours/Year	7,848 Total
Typical Start & End Times in CY:				Start:	N/A	End:	N/A
11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)							
Jan-Feb, 2002 + Dec, 2002	#DIV/0!	Mar-May	#DIV/0!	June-Aug	#DIV/0!	Sept-Nov	#DIV/0!

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed

Boiler #7 - Operating Scenario #4 - No. 2 Fuel OilIf Emission Source has multiple Operating Scenarios, complete one form for each.
(All permitted, Insignificant and/or Non-permitted Sources)Facility ID #: **6800043**Permit #: **03069T22**County: **Orange**DAQ Region: **Raleigh**Facility Name: **University of North Carolina at Chapel Hill**

**North Carolina Department of Environment and Natural Resources
Division of Air Quality
Air Pollutant Point Source Emissions Inventory - Calendar Year 2008**

Emissions: Attach calculations and documentation of emission factors or other estimation methods used.

Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)

ES-002-Boiler #7

Criteria (NAAQS) Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Monoxide	CO	0.00	8	N/A
NOx	NOx	0.00	1	N/A
PM Total	PM	0.00	8	99.0%
PM-2.5	PM-2.5	0.00	8	99.0%
PM-10	PM-10	0.00	8	99.0%
SO2	SO2	0.00	1	90.00%
VOC	VOC	0.00	8	N/A
HAP/TAP Pollutants (In Alphabetical Order)	CAS # (or other code - see instructions)	Emissions HAP/TAP (Pounds/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Antimony	ANTIMONYCPDS	0.00E+00	8	99.0%
Arsenic	ARSENICCPDS	0.00E+00	8	99.0%
Benzene	71-43-2	0.00E+00	8	N/A
Beryllium	BERYLCPDS	0.00E+00	8	99.0%
Cadmium	CADMIUMCPDS	0.00E+00	8	99.0%
Chromium	CROMCPDS	0.00E+00	8	99.0%
Chromium VI	CHROM6CPDS	0.00E+00	8	99.0%
Cobalt	COBALTCPDS	0.00E+00	8	99.0%
Ethylbenzene	100-41-4	0.00E+00	8	N/A
Fluoride	16984-48-8	0.00	8	N/A
Formaldehyde	50-00-0	0.00	8	N/A
Lead	LEADCPDS	0.00E+00	8	99.0%
Manganese	MANGCPDS	0.00E+00	8	99.0%
Mercury	MERCPDS	0.00E+00	8	99.0%
Methyl chloroform	71-55-6	0.00E+00	8	N/A
Napthalene	91-20-3	0.000	8	N/A
Nickel	NICKCPDS	0.00E+00	8	99.0%
POM	POM	0.00E+00	8	99.0%
Selenium	SEC	0.00E+00	8	99.0%
Toluene	108-88-3	0.00	8	N/A
Xylene	1330-20-7	0.00E+00	8	N/A
Greenhouse Gas Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Dioxide	CO ₂	0.00	8	N/A
Methane	CH ₄	0.00	8	N/A
Nitrous oxide	N ₂ O	0.00	8	N/A

Emissions and data on this form required to report or verify emissions cannot be held confidential.

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed.

Boiler #7 - Operating Scenario #1 - CoalIf Emission Source has multiple Operating Scenarios, complete one form for each.
(All permitted, Insignificant and/or Non-permitted Sources)Facility Name: University of North Carolina at Chapel HillFacility ID #: 6800043Permit #: 03069T22County: OrangeDAQ Region: Raleigh

North Carolina Department of Environment and Natural Resources
Division of Air Quality
Air Pollutant Point Source Emissions Inventory - Calendar Year 2008

1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-002-Boiler #7					
2. Emission Source Description		Coal / Natural Gas / No. 2 Fuel Oil Fired Circulating Fluidized Bed Combustion - Steam Generating Unit					
3. Operating Scenario Description		Operating Scenario #1 - Coal					
4. Maximum Permitted Operating Rate With Units (Ex. gal/hr, mmBtu/hr)		323.17 MMBtu/hr					
5. Throughput in CY (e.g. production or fuel use) With Units (Ex. lbs/yr, gal/yr)		66,185				tons/yr	
6. Fuel Information (if fuel used)		% Sulfur	1.46%	% Ash	12.52%	Heat Content (Btu/lb or mmCF)	12669 Btu/lb

If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.

7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)	100%
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8. Control Device Information, if none, write "none"

	Control Device ID # (as listed in permit)	Control Device Description
i. (nearest stack)	CD-004	Bagfilter with Calcium Carbonate (CaCO ₃) Sorbent Injection
ii.	N/A	N/A
iii.	N/A	N/A
iv.	N/A	N/A

9. Stack Information (sources vented to more than one stack use additional entry lines)

Stack ID #	Height (in whole feet)	Diameter (feet) Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)	Temperature (F)	Velocity (feet/sec)	Volume Flow Rate (acfm)	Release Point Description (Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)
EP-14-136	220	9	305	56.1	214,000	Vertical
--	--	--	--	--	--	--
--	--	--	--	--	--	--

10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)

Hours/Day	24	Days/Week	7	Weeks/Year	50	Hours/Year	8,154 Total
Typical Start & End Times in CY:				Start:	N/A	End:	N/A

11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)

Jan-Feb, 2002 + Dec, 2002	29.76%	Mar-May	20.09%	June-Aug	24.35%	Sept-Nov	25.80%
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To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed

Boiler #7 - Operating Scenario #1 - Coal

If Emission Source has multiple Operating Scenarios, complete one form for each.
(All permitted, Insignificant and/or Non-permitted Sources)

Facility ID #: **6800043**Permit #: **03069T22**County: **Orange**DAQ Region: **Raleigh**Facility Name: **University of North Carolina at Chapel Hill**

**North Carolina Department of Environment and Natural Resources
Division of Air Quality
Air Pollutant Point Source Emissions Inventory - Calendar Year 2008**

Emissions: Attach calculations and documentation of emission factors or other estimation methods used.

Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)

ES-002-Boiler #7

Criteria (NAAQS) Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Monoxide	CO	595.67	8	N/A
NOx	NOx	251.49	1	N/A
PM Total	PM	1.64	8	99.80%
PM-2.5	PM-2.5	0.97	8	97.90%
PM-10	PM-10	1.64	8	99.60%
SO2	SO2	125.46	1	90.00%
VOC	VOC	1.65	8	N/A
HAP/TAP Pollutants (In Alphabetical Order)	CAS # (or other code - see instructions)	Emissions HAP/TAP (Pounds/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Acetaldehyde	750-07-0	37.73	8	N/A
Acetophenone	98-86-2	0.99	8	N/A
Acrolein	107-02-8	19.19	8	N/A
Arsenic	ARSENICPDS	0.64	8	99.60%
Benzene	71-43-2	86.04	8	N/A
Benzo(a)pyrene	50-32-8	2.52E-03	8	N/A
Benzyl chloride	100-44-7	46.33	8	N/A
Beryllium	BERYLCPDS	0.06	8	N/A
Biphenyl	92-52-4	1.13E-01	8	N/A
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	4.83	8	N/A
Bromine	7726-95-6	13.06	8	99.60%
Bromoform	75-25-2	2.58	8	N/A
Cadmium	CADMIUMCPDS	2.63E-02	8	99.60%
Carbon disulfide	75-10-0	8.60	8	N/A
2-Chloroacetophenone	532-27-4	0.46	8	N/A
Chlorobenzene	108-90-7	1.46	8	N/A
Chloroform	67-66-3	3.90	8	N/A
Chromium	CROMCPDS	1.03	8	99.60%
Chromium (VI)	CHROM6CPDS	1.03	8	99.60%
Cumene	98-82-8	0.35	8	N/A
Cyanide	CNC	165.46	8	N/A
Dibenzofurans	132-64-9	1.33E-02	8	N/A
Dimethyl sulfate	77-78-1	3.18	8	N/A
2,4-Dinitrotoluene	121-14-2	1.85E-02	8	N/A
Ethyl benzene	100-41-4	6.22	8	N/A
Ethyl chloride	75-00-3	2.78	8	N/A
Ethylene dibromide	106-93-4	7.94E-02	8	N/A
Ethylene dichloride	107-06-2	2.65	8	N/A

Emissions and data on this form required to report or verify emissions cannot be held confidential.

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed.

Boiler #7 - Operating Scenario #1 - Coal

If Emission Source has multiple Operating Scenarios, complete one form for each.
(All permitted, Insignificant and/or Non-permitted Sources)

Facility ID #: 6800043

Permit #: 03069T22

County: Orange

DAQ Region: Raleigh

Facility Name: University of North Carolina at Chapel Hill

North Carolina Department of Environment and Natural Resources

Division of Air Quality

Air Pollutant Point Source Emissions Inventory - Calendar Year 2008

Emissions: Attach calculations and documentation of emission factors or other estimation methods used.

Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)

ES-002-Boiler #7

Criteria (NAAQS) Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Monoxide	CO	N/A	N/A	N/A
NOx	NOx	N/A	N/A	N/A
PM Total	PM	N/A	N/A	N/A
PM-2.5	PM-2.5	N/A	N/A	N/A
PM-10	PM-10	N/A	N/A	N/A
SO2	SO2	N/A	N/A	N/A
VOC	VOC	N/A	N/A	N/A
HAP/TAP Pollutants (In Alphabetical Order)	CAS # (or other code - see instructions)	Emissions HAP/TAP (Pounds/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Formaldehyde	50-00-00	15.88	8	N/A
Hexane	HEXANEISO	4.43	8	N/A
Hydrogen Chloride ***	7647-01-0	65655.97	8	N/A
Hydrogen Fluoride ***	7664-39-3	2912.16	8	90% Control with CaCO ₃
Isophorone	78-59-1	38.39	8	N/A
Lead	LEADCPDS	0.42	8	99.60%
Manganese	MANGCPDS	1.78	8	99.60%
Mercury***	MERCCPDS	2.47	8	N/A
Methyl bromide	74-83-9	10.59	8	N/A
Methyl chloride	74-87-3	35.08	8	N/A
Methyl ethyl ketone	78-93-3	25.81	8	N/A
Methyl hydrazine	60-34-4	11.25	8	N/A
Methyl methacrylate	80-62-6	1.32	8	N/A
Methyl tert butyl ether	1634-04-4	2.32	8	N/A
Methylene chloride	75-09-2	19.19	8	N/A
Naphthalene	91-20-3	0.86	8	N/A
Nickel	NICKCPDS	0.85	8	99.60%
Phenol	108-95-2	1.06	8	N/A
POM	POM	3.57	8	N/A
Propionaldehyde	123-38-6	25.15	8	N/A
Styrene	100-42-5	1.65	8	N/A
2,3,7,8-TCDD	1746-01-6	9.46E-07	8	N/A
Tetrachloroethylene	79-34-5	2.85	8	N/A
Toluene	108-88-3	15.88	8	N/A
1,1,1-Trichloroethane	79-00-5	1.32	8	N/A
Vinyl acetate	108-05-4	0.50	8	N/A
Xylenes	1330-20-7	2.45	8	N/A
Greenhouse Gas Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Dioxide	CO ₂	186,627.59	8	N/A
Methane	CH ₄	1.99	8	N/A
Nitrous oxide	N ₂ O	115.82	8	N/A

Emission Source/Operating Scenario Data Page 1 of 2		Facility ID #: 6800043					
<i>Boiler #7 - Operating Scenario #2 - Natural Gas</i> <small>If Emission Source has multiple Operating Scenarios, complete one form for each. (All permitted, Insignificant and/or Non-permitted Sources)</small>		Permit #: 03069T22					
Facility Name: University of North Carolina at Chapel Hill		County: Orange					
		DAQ Region: Raleigh					
North Carolina Department of Environment and Natural Resources Division of Air Quality Air Pollutant Point Source Emissions Inventory - Calendar Year 2008							
1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-002-Boiler #7					
2. Emission Source Description		Coal / Natural Gas / No. 2 Fuel Oil Fired Circulating Fluidized Bed Combustion - Steam Generating Unit					
3. Operating Scenario Description		Operating Scenario #2 - Natural Gas					
4. Maximum Permitted Operating Rate <small>With Units (Ex. gal/hr, mmBtu/hr)</small>		323.17 MMBtu/hr					
5. Throughput in CY (e.g. production or fuel use) <small>With Units (Ex. lbs/yr, gal/yr)</small>		8,750	1,000 ft ³ /yr				
6. Fuel Information (if fuel used)	% Sulfur	N/A	% Ash				
		N/A	Heat Content (Btu/lb or mmCF)				
			1,030 Btu/ft ³				
If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.							
7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)		100%					
8. Control Device Information , if none, write "none"							
	Control Device ID # <small>(as listed in permit)</small>	Control Device Description					
<i>i. (nearest stack)</i>	CD-004	Bagfilter with Calcium Carbonate (CaCO ₃) Sorbent Injection					
<i>ii.</i>	N/A	N/A					
<i>iii.</i>	N/A	N/A					
<i>iv.</i>	N/A	N/A					
9. Stack Information (sources vented to more than one stack use additional entry lines)							
Stack ID #	Height <small>(in whole feet)</small>	Diameter (feet) <small>Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)</small>	Temperature <small>(F)</small>	Velocity <small>(feet/sec)</small>	Volume Flow Rate <small>(acfm)</small>	Release Point Description <small>(Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)</small>	
EP-14-136	220	9	305	56.1	214,000	Vertical	
--	--	--	--	--	--	--	
--	--	--	--	--	--	--	
10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)							
Hours/Day	24	Days/Week	7	Weeks/Year	50	Hours/Year	7,848 Total
Typical Start & End Times in CY:				Start:	N/A	End:	N/A
11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)							
Jan-Feb, 2002 + Dec, 2002	55.42%	Mar-May	16.11%	June-Aug	20.01%	Sept-Nov	8.46%

Facility ID #: **6800043**
 Permit #: **03069T22**
 County: **Orange**
 DAQ Region: **Raleigh**

Facility Name: University of North Carolina at Chapel Hill

**North Carolina Department of Environment and Natural Resources
 Division of Air Quality
 Air Pollutant Point Source Emissions Inventory - Calendar Year 2008**

Emissions: Attach calculations and documentation of emission factors or other estimation methods used.

Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant) ES-002-Boiler #7

Criteria (NAAQS) Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Monoxide	CO	0.37	8	N/A
NOx	NOx	1.42	1	N/A
PM Total	PM	0.03	8	N/A
PM-2.5	PM-2.5	0.03	8	N/A
PM-10	PM-10	0.03	8	N/A
SO2	SO2	0.00	1	N/A
VOC	VOC	0.02	8	N/A
HAP/TAP Pollutants (In Alphabetical Order)	CAS # (or other code - see instructions)	Emissions HAP/TAP (Pounds/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Arsenic	ARSENICPDS	1.75E-03	8	N/A
Benzene	71-43-2	0.02	8	N/A
Cadmium	CADMIUMCPDS	9.63E-03	8	N/A
Chromium	CROMCPDS	1.23E-02	8	N/A
Chromium VI	CHROM6CPDS	1.23E-02	8	N/A
Dichlorobenzene	106-46-7	1.05E-02	8	N/A
Formaldehyde	50-00-0	0.66	8	N/A
Hexane	HEXANEISO	1.58E+01	8	N/A
Lead	LEADCPDS	4.38E-03	8	N/A
Manganese	MANGCPDS	3.33E-03	8	N/A
Mercury	MERCPDS	2.28E-03	8	N/A
Napthalene	91-20-3	5.34E-03	8	N/A
Nickel	NICKCPDS	0.02	8	N/A
POM	POM	5.79E-03	8	N/A
Toluene	108-88-3	0.03	8	N/A
Greenhouse Gas Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Dioxide	CO ₂	526.57	8	N/A
Methane	CH ₄	0.010	8	N/A
Nitrous oxide	N ₂ O	0.010	8	N/A

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

Boiler #7

(ES-002-Boiler #7)

Emissions Calculations

SO₂ and NO_x Emissions are Taken from CEMs data
HCl, HF, Hg emissions are based on stack test data
All other estimates are from DAQ Spreadsheets

Fuel Oil Combustion Emissions Calculator FO2000 Revision A
2008 Annual Emissions Inventory
Boiler #7
(ES-002-Boiler #7)
Facility ID # 6800043
Permit # 03069T22

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:	03069T22
User:	RST Engineering
Heat Input Capacity (mmBtu/hr):	323.17
Fuel Input Capacity (10 ³ gal/hr):	2.31
Annual Fuel Throughput (1000 gal):	0.000
Maximum fuel sulfur content (%):	0.5
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) <hr/> 19 = Vertical fired utility boiler <hr/> 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) <hr/> 26 = Residential Furnace
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Emission Controls

Particulate controls

Enter the control type below ▾	Message Area	Or enter a PM control efficiency below to override built in values.
	3	
Control Device	Avg. Cont. Effic.	User Input PM Cont. Effic.
0 = None/other		Message Area
1 = ESP		
2 = Scrubber		
3 = Bagfilter	99.0	
4 = Multiple cyclone		

Postcombustion SO₂ controls

Enter the control type below ▾	Message Area	Or enter an SO ₂ control efficiency
---------------------------------------	--------------	--

0	below to override built in values.
Control Technology/Process	User Input SO₂ Cont. Effic.
0 = None/other	90.0
1 = Wet scrubber, Lime/limestone	User entered control efficiency may be overestimated and should be documented.
2 = Wet scrubber, Sodium carbonate	Avg. Cont. Effic.
3 = Wet scrubber, Magnesium oxide/hydroxide	0.0
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		
Control Technology/Process	User Input NO_x Cont. Effic.	
0 = None/other	0.0	
1 = Low excess air (LEA)	Avg. Cont. Effic.	Message Area
2 = Staged combustion (SC)	0.0	
3 = Burners out of service (BOOS)	Remarks	
4 = Flue gas recirculation (FGR)	NA	
5 = Flue gas recirculation plus staged combustion		
6 = Low NO _x 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				Emission Factor¹
Pollutant	lb/hr ²	tpy	lb/yr ³	(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
NO _x 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
SO ₂ rates @ 90% control	see attached CEMs-based calculations			2.98E+02
Total HAP ⁶	4.17E-01	0.0000	0	1.81E-01
Largest HAP ⁶	1.84E-01	0.0000	0	7.97E-02

Toxic/Hazardous Air Pollutants.				Emission Factor¹
Pollutant	lb/hr ²	lb/day ⁷	lb/yr ³	(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	6.35E-03	NA	0.00E+00	2.75E-03
Beryllium rates @ 99% control	9.70E-06	NA	0.00E+00	4.20E-04
Cadmium rates @ 99% control	9.70E-06	NA	0.00E+00	4.20E-04
Chromium rates @ 99% control	9.70E-06	NA	0.00E+00	4.20E-04
Chromium VI rates @ 99% control	2.85E-06	NA	0.00E+00	1.23E-04
Cobalt rates @ 99% control	0.00E+00	NA	0.00E+00	0.00E+00
Ethylbenzene	1.89E-03	NA	0.00E+00	8.17E-04
Fluoride	8.61E-02	2.07E+00	0.00E+00	3.73E-02
Formaldehyde	1.11E-01	2.66E+00	0.00E+00	4.80E-02
Lead rates @ 99% control	2.91E-05	NA	0.00E+00	1.26E-03
Manganese rates @ 99% control	1.94E-05	4.65E-04	0.00E+00	8.40E-04
Mercury	9.70E-04	2.33E-02	0.00E+00	4.20E-04
Methyl chloroform (1,1,1-Trichloroethane)	5.45E-04	1.31E-02	0.00E+00	2.36E-04
Napthalene	7.69E-04	NA	0.00E+00	3.33E-04
Nickel rates @ 99% control	9.70E-06	2.33E-04	0.00E+00	4.20E-04
POM rates @ 99% control	7.62E-05	NA	0.00E+00	3.30E-03
Selenium rates @ 99% control	4.85E-05	NA	0.00E+00	2.10E-03

Toluene	1.84E-01	4.41E+00	0.00E+00	7.97E-02
Xylene	3.23E-03	7.76E-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	50,491	0.0	0	21873.00
Methane	4.99E-01	0.00E+00	0.00E+00	0.216
Nitrous Oxide	2.54E-01	0.00E+00	0.00E+00	0.11

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

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

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

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

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

⁶Total 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.

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

Bituminous Coal Combustion

2008 Annual Emissions Inventory

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

APP #/Fac ID **6800043**
 Input By **RST Engineering**
 Source ID **Boiler #7**

Operating Scenario #1

(ES-002-Boiler #7)

Data Input

Maximum Heat Input mmBtu/hr

Boiler Size/Type

Actual Fuel Usage ton/yr
 or
 Hours of Operation hr/yr
 and
 Heating Value Btu/lb

Sulfur Content %

Ash Content : %

(B)ituminous or (S)ubbituminous? (B/S)

Calcium to Sulfur Ratio

Boiler Type:

- | | |
|--------------------------------|-----------------------|
| <input type="text" value="7"/> | 6) Underfeed Stoker |
| 1) Pulverized/Dry Bottom | 7) Fluidized Bed Cir. |
| 2) Pulverized/Wet Bottom | 8) Fluidized Bed Bub. |
| 3) Cyclone Furnace | 9) Hand Fed |
| 4) Spreader Stoker | |
| 5) Overfeed Stoker | |

Control Device Efficiencies:

PM	<input type="text" value="99.80"/>	%
PM-10	<input type="text" value="99.60"/>	%
PM-2.5	<input type="text" value="97.90"/>	%
SOx*	<input type="text" value="90.00"/>	%
NOx*	<input type="text" value="0.00"/>	%

**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

2008 Annual Emissions Inventory

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

APP #/Fac ID **6800043**
 Input By **RST Engineering**
 Source ID **Boiler #7**

Operating Scenario #1

(ES-002-Boiler #7)

ACTUAL CRITERIA EMISSIONS

Pollutant	Factor		Emission Rates	
	(lb poll./ton coal)	(lb/hr)	(lb/yr)	(tpy)
PM	17	0.67	3,283	1.64
PM-10	12.4	0.67	3,283	1.64
PM-2.5*	1.4	0.39	1,946	0.97
SO ₂	12.71	**	**	**
SO ₃ *	0.09	**	**	**
NO _x	3.90	**	**	**
VOC	0.05	0.67	3,309	1.65
CO	18	241.75	1,191,338	595.67

ACTUAL TOXIC EMISSIONS

Pollutant	Factor		Emission Rates	
	(lb poll./ton coal)	(lb/hr)	(lb/yr)	(tpy)
Acetaldehyde	5.70E-04	7.66E-03	3.77E+01	1.89E-02
Acetophenone	1.50E-05	2.01E-04	9.93E-01	4.96E-04
Acrolein	2.90E-04	3.89E-03	1.92E+01	9.60E-03
Arsenic	4.87E-03	1.31E-04	6.45E-01	3.22E-04
Benzene	1.30E-03	1.75E-02	8.60E+01	4.30E-02
Benzo(a)pyrene	3.80E-08	5.10E-07	2.52E-03	1.26E-06
Benzyl chloride	7.00E-04	9.40E-03	4.63E+01	2.32E-02
Beryllium	4.52E-04	1.22E-05	5.99E-02	2.99E-05
Biphenyl	1.70E-06	2.28E-05	1.13E-01	5.63E-05
Bis(2-ethylhexyl)phthalate (DEHP)	7.30E-05	9.80E-04	4.83E+00	2.42E-03
Bromine	9.87E-02	2.65E-03	1.31E+01	6.53E-03
Bromoform	3.90E-05	5.24E-04	2.58E+00	1.29E-03
Cadmium	1.98E-04	5.33E-06	2.63E-02	1.31E-05
Carbon disulfide	1.30E-04	1.75E-03	8.60E+00	4.30E-03
2-Chloroacetophenone	7.00E-06	9.40E-05	4.63E-01	2.32E-04
Chlorobenzene	2.20E-05	2.95E-04	1.46E+00	7.28E-04
Chloroform	5.90E-05	7.92E-04	3.90E+00	1.95E-03
Chromium	7.78E-03	2.09E-04	1.03E+00	5.15E-04
Chromium (VI)	7.78E-03	2.09E-04	1.03E+00	5.15E-04
Cumene	5.30E-06	7.12E-05	3.51E-01	1.75E-04
Cyanide	2.50E-03	3.36E-02	1.65E+02	8.27E-02
Dibenzofurans	2.01E-07	2.70E-06	1.33E-02	6.65E-06
Dimethyl sulfate	4.80E-05	6.45E-04	3.18E+00	1.59E-03
2,4-Dinitrotoluene	2.80E-07	3.76E-06	1.85E-02	9.27E-06
Ethyl benzene	9.40E-05	1.26E-03	6.22E+00	3.11E-03
Ethyl chloride	4.20E-05	5.64E-04	2.78E+00	1.39E-03
Ethylene dibromide	1.20E-06	1.61E-05	7.94E-02	3.97E-05
Ethylene dichloride	4.00E-05	5.37E-04	2.65E+00	1.32E-03
Formaldehyde	2.40E-04	3.22E-03	1.59E+01	7.94E-03
Hexane	6.70E-05	9.00E-04	4.43E+00	2.22E-03
Hydrogen Chloride ***	9.92E-01	1.33E+01	6.57E+04	3.28E+01
Hydrogen Fluoride ***	4.40E-02	5.91E-01	2.91E+03	1.46E+00
Isophorone	5.80E-04	7.79E-03	3.84E+01	1.92E-02
Lead	3.14E-03	8.44E-05	4.16E-01	2.08E-04

**SO₂ and NO_x 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".

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

Bituminous Coal Combustion

2008 Annual Emissions Inventory

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

APP #/Fac ID **6800043**
 Input By **RST Engineering**
 Source ID **Boiler #7**

Operating Scenario #1

(ES-002-Boiler #7)

Actual Toxic Emissions (cont...)

Pollutant	Factor		Emission Rates	
	(lb poll./ton coal)	(lb/hr)	(lb/yr)	(tpy)
Manganese	1.34E-02	3.61E-04	1.78E+00	8.90E-04
Mercury***	3.73E-05	5.00E-04	2.47E+00	1.23E-03
Methyl bromide	1.60E-04	2.15E-03	1.06E+01	5.29E-03
Methyl chloride	5.30E-04	7.12E-03	3.51E+01	1.75E-02
Methyl ethyl ketone	3.90E-04	5.24E-03	2.58E+01	1.29E-02
Methyl hydrazine	1.70E-04	2.28E-03	1.13E+01	5.63E-03
Methyl methacrylate	2.00E-05	2.69E-04	1.32E+00	6.62E-04
Methyl tert butyl ether	3.50E-05	4.70E-04	2.32E+00	1.16E-03
Methylene chloride	2.90E-04	3.89E-03	1.92E+01	9.60E-03
Naphthalene	1.30E-05	1.75E-04	8.60E-01	4.30E-04
Nickel	6.40E-03	1.72E-04	8.47E-01	4.24E-04
Phenol	1.60E-05	2.15E-04	1.06E+00	5.29E-04
POM	5.39E-05	7.24E-04	3.57E+00	1.78E-03
Propionaldehyde	3.80E-04	5.10E-03	2.52E+01	1.26E-02
Styrene	2.50E-05	3.36E-04	1.65E+00	8.27E-04
2,3,7,8-TCDD	1.43E-11	1.92E-10	9.46E-07	4.73E-10
Tetrachloroethylene	4.30E-05	5.78E-04	2.85E+00	1.42E-03
Toluene	2.40E-04	3.22E-03	1.59E+01	7.94E-03
1,1,1-Trichloroethane	2.00E-05	2.69E-04	1.32E+00	6.62E-04
Vinyl acetate	7.60E-06	1.02E-04	5.03E-01	2.52E-04
Xylenes	3.70E-05	4.97E-04	2.45E+00	1.22E-03
Total HAPs		14.04	69,187.95	34.59

Greenhouse Gases

Pollutant	Factor		Emission Rates	
	(lb poll./ton coal)	(lb/hr)	(lb/yr)	(tpy)
Carbon dioxide	5494.70	73797.78	363,669,192	181,834.60
Methane	0.06	0.81	3,971	1.99
Nitrous Oxide	3.50	47.01	231,649	115.82

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,

Natural Gas Combustion Emissions Calculator NG2000 Revision C
2008 Annual Emissions Inventory
Boiler #7
(ES-002-Boiler #7)

Facility ID # 6800043
 Permit # 03069T22

Operating Scenario #2

User Input	Emissions Output (for operation 19.22 hr/yr)																																																																																																																																																																																										
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University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 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 SO₂ emissions.

For the 2008 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 2008	0.160
February 2008	0.150
March 2008	0.150
April 2008	0.100
May 2008	0.170
June 2008	0.180
July 2008	0.120
August 2008	0.170
September 2008	0.170
October 2008	0.170
November 2008	0.170
December 2008	0.170
Annual Average	0.157

This average includes SO₂ emissions from coal, fuel oil, and natural gas from Boiler #7 over the entire year, representing a composite average for all fuels combusted.

Fuel Inputs to Boiler #7 for 2008

Boiler #7		
Coal Tons/yr	Gas 1,000cf/yr	No. 2 Oil Gallons/yr
66,185	8,750	0
Coal (12,031btu/lb)	Nat. Gas (1,030 btu/cf)	Oil (137,006 btu/gal)
MMBtu/yr		
1.59E+06	9.01E+03	0.00E+00

Total for Boiler #7 (MMBtu/yr)	1.60E+06
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Total SO ₂ Emissions from Boiler #7 (lb/yr)	250,912
Total SO₂ Emissions from Boiler #7 (ton/yr)	125.456

SO ₂ Emissions Associated with Coal Combustion (ton/yr)	125.46
SO ₂ Emissions Associated with No. 2 Fuel Oil Combustion (ton/yr)	0.00000

University of North Carolina at Chapel Hill

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2008 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 2008 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 2008	0.37
February 2008	0.39
March 2008	0.37
April 2008	0.30
May 2008	0.21
June 2008	0.26
July 2008	0.29
August 2008	0.28
September 2008	0.28
October 2008	0.32
November 2008	0.35
December 2008	0.37
Annual Average	0.32

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

Fuel Inputs to Boiler #7 for 2008

Boiler #7		
Coal Tons/yr	Gas 1,000cf/yr	No. 2 Oil Gallons/yr
66,185	8,750	0
Coal (12,031 btu/lb)	Nat. Gas (1,030 btu/cf)	Oil (137,006 btu/gal)
MMBtu/yr		
1.59E+06	9.01E+03	0.00E+00

Total for Boiler #7 (MMBtu/yr)	1.60E+06
--------------------------------	----------

NOx Emissions from Boiler #7 (lb/yr)	505,828
NOx Emissions from Boiler #7 (ton/yr)	252.91

NOx Emissions Associated with Coal Combustion (ton/yr)	251.49
NOx Emissions Associated with Fuel Oil No. 2 Combustion (ton/yr)	0.0000
NOx Emissions Associated with Natural Gas Combustion (ton/yr)	1.42

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

Boiler No.7

CO₂ Emissions from Limestone.

(ES-3)

Assume that the amount of total limestone distributed between boilers is proportional to percentage of total coal burned in each boiler.

Boiler #6	65,022	Tons/yr	49.6%
Boiler #7	66,185	Tons/yr	50.4%
Total	131,208	Tons/yr	100.0%

Total Limestone Used **23,747** Tons/yr

Limestone Used in Boiler No.7 **11,979** Tons/yr

85.0% CaCO₃

100.09 MW, CaCO₃

44.01 MW, CO₂

5.00% MgCO₃

83.43 MW, MgCO₃

44.01 MW, CO₂

CO₂ emission rate 800.2 lb/ton

Boiler No.7 4,793 tons/yr, CO₂

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

Boiler #8

(ES-003-Boiler #8)

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

Emission Source/Operating Scenario Data Page 1 of 1

Boiler #8 - Operating Scenario #1 - Natural Gas
 If Emission Source has multiple Operating Scenarios, complete one form for each.
 (All permitted, Insignificant and/or Non-permitted Sources)

Facility ID #: **6800043**
 Permit #: **03069T22**
 County: **Orange**
 DAQ Region: **Raleigh**

Facility Name: University of North Carolina at Chapel Hill

North Carolina Department of Environment and Natural Resources
Division of Air Quality
Air Pollutant Point Source Emissions Inventory - Calendar Year 2007

1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-003-Boiler #8					
2. Emission Source Description		Natural Gas / No. 2 Fuel Oil Fired Boiler					
3. Operating Scenario Description		Operating Scenario #1 - Natural Gas					
4. Maximum Permitted Operating Rate With Units (Ex. gal/hr, mmBtu/hr)		338.0 MMBtu/hr					
5. Throughput in CY (e.g. production or fuel use) With Units (Ex. lbs/yr, gal/yr)		60,546			1,000 ft ³ /yr		
6. Fuel Information (if fuel used)	% Sulfur	N/A	% Ash	N/A	Heat Content (Btu/lb or mmCF)	1,030 Btu/ft ³	

If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.

7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)	N/A
--	-----

8. Control Device Information, if none, write "none"

	Control Device ID # (as listed in permit)	Control Device Description
i. (nearest stack)	None	None
ii.	None	None
iii.	None	None
iv.	None	None

9. Stack Information (sources vented to more than one stack use additional entry lines)

Stack ID #	Height (in whole feet)	Diameter (feet) Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)	Temperature (F)	Velocity (feet/sec)	Volume Flow Rate (acfm)	Release Point Description (Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)
N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	--	--	--	--	--	--
--	--	--	--	--	--	--

10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)

Hours/Day	Standby	Days/Week	Standby	Weeks/Year	Standby	Hours/Year	1,833 Total
Typical Start & End Times in CY:				Start:	N/A	End:	N/A

11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)

Jan-Feb, 2002 + Dec, 2002	54%	Mar-May	12%	June-Aug	30%	Sept-Nov	4%
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To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed

Facility ID #: **6800043**
 Permit #: **03069T22**
 County: **Orange**
 DAQ Region: **Raleigh**

Facility Name: University of North Carolina at Chapel Hill

**North Carolina Department of Environment and Natural Resources
 Division of Air Quality
 Air Pollutant Point Source Emissions Inventory - Calendar Year 2008**

Emissions: Attach calculations and documentation of emission factors or other estimation methods used.

Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant) ES-003-Boiler #8

Criteria (NAAQS) Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Monoxide	CO	2.54	8	N/A
NOx	NOx	4.26	8	N/A
PM Total	PM	0.23	8	N/A
PM-2.5	PM-2.5	0.23	8	N/A
PM-10	PM-10	0.23	8	N/A
SO2	SO2	0.02	8	N/A
VOC	VOC	0.17	8	N/A
HAP/TAP Pollutants (In Alphabetical Order)	CAS # (or other code - see instructions)	Emissions HAP/TAP (Pounds/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Arsenic	ARSENICPDS	1.21E-02	8	N/A
Benzene	71-43-2	0.13	8	N/A
Cadmium	CADMIUMCPDS	6.66E-02	8	N/A
Chromium	CROMCPDS	8.48E-02	8	N/A
Chromium VI	CHROM6CPDS	8.48E-02	8	N/A
Dichlorobenzene	106-46-7	7.27E-02	8	N/A
Formaldehyde	50-00-0	4.54	8	N/A
Hexane	HEXANEISO	1.09E+02	8	N/A
Lead	LEADCPDS	3.03E-02	8	N/A
Manganese	MANGCPDS	2.30E-02	8	N/A
Mercury	MERCPDS	1.57E-02	8	N/A
Napthalene	91-20-3	3.69E-02	8	N/A
Nickel	NICKCPDS	0.13	8	N/A
POM	POM	4.01E-02	8	N/A
Toluene	108-88-3	0.21	8	N/A
Greenhouse Gas Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Dioxide	CO ₂	3,643.57	8	N/A
Methane	CH ₄	0.070	8	N/A
Nitrous oxide	N ₂ O	0.067	8	N/A

Emission Source/Operating Scenario Data Page 1 of 1

Boiler #8 - Operating Scenario #2 - No. 2 Fuel Oil
 If Emission Source has multiple Operating Scenarios, complete one form for each.
 (All permitted, Insignificant and/or Non-permitted Sources)

Facility ID #: **6800043**
 Permit #: **03069T22**
 County: **Orange**
 DAQ Region: **Raleigh**

Facility Name: University of North Carolina at Chapel Hill

North Carolina Department of Environment and Natural Resources
Division of Air Quality
Air Pollutant Point Source Emissions Inventory - Calendar Year 2008

1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-003-Boiler #8					
2. Emission Source Description		Natural Gas / No. 2 Fuel Oil Fired Boiler					
3. Operating Scenario Description		Operating Scenario #2 - No. 2 Fuel Oil					
4. Maximum Permitted Operating Rate With Units (Ex. gal/hr, mmBtu/hr)		338.0 MMBtu/hr					
5. Throughput in CY (e.g. production or fuel use) With Units (Ex. lbs/yr, gal/yr)			0				gallons/year
6. Fuel Information (if fuel used)		% Sulfur	0.50%	% Ash		Heat Content (Btu/lb or mmCF)	135,344 Btu/gal

If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.

7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)	N/A
--	-----

8. Control Device Information, if none, write "none"

	Control Device ID # (as listed in permit)	Control Device Description
i. (nearest stack)	N/A	N/A
ii.	N/A	N/A
iii.	N/A	N/A
iv.	N/A	N/A

9. Stack Information (sources vented to more than one stack use additional entry lines)

Stack ID #	Height (in whole feet)	Diameter (feet) Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)	Temperature (F)	Velocity (feet/sec)	Volume Flow Rate (acfm)	Release Point Description (Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)
N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	--	--	--	--	--	--
--	--	--	--	--	--	--

10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)

Hours/Day	Standby	Days/Week	Standby	Weeks/Year	Standby	Hours/Year	1,833 Total
Typical Start & End Times in CY:				Start:	N/A	End:	N/A

11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)

Jan-Feb, 2002 + Dec, 2002	#DIV/0!	Mar-May	#DIV/0!	June-Aug	#DIV/0!	Sept-Nov	#DIV/0!
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To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed

Boiler #8 - Operating Scenario #2 - No. 2 Fuel Oil
 If Emission Source has multiple Operating Scenarios, complete one form for each.
 (All permitted, Insignificant and/or Non-permitted Sources)

Facility ID #: 6800043

Permit #: 03069T22

County: Orange

DAQ Region: Raleigh

Facility Name: University of North Carolina at Chapel Hill

**North Carolina Department of Environment and Natural Resources
 Division of Air Quality
 Air Pollutant Point Source Emissions Inventory - Calendar Year 2008**

Emissions: Attach calculations and documentation of emission factors or other estimation methods used.

Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)

ES-003-Boiler #8

Criteria (NAAQS) Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Monoxide	CO	0.00	8	N/A
NOx	NOx	0.00	8	N/A
PM Total	PM	0.00	8	N/A
PM-2.5	PM-2.5	0.00	8	N/A
PM-10	PM-10	0.00	8	N/A
SO2	SO2	0.00	8	N/A
VOC	VOC	0.00	8	N/A
HAP/TAP Pollutants (In Alphabetical Order)	CAS # (or other code - see instructions)	Emissions HAP/TAP (Pounds/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Arsenic	ARSENICPDS	0.00E+00	8	N/A
Benzene	71-43-2	0.00E+00	8	N/A
Beryllium	BERYLCPDS	0.00E+00	8	N/A
Cadmium	CADMIUMCPDS	0.00E+00	8	N/A
Chromium	CROMCPDS	0.00E+00	8	N/A
Chromium VI	CHROM6CPDS	0.00E+00	8	N/A
Ethylbenzene	100-41-4	0.00E+00	8	N/A
Fluoride	16984-48-8	0.00	8	N/A
Formaldehyde	50-00-0	0.00	8	N/A
Lead	LEADCPDS	0.00E+00	8	N/A
Manganese	MANGCPDS	0.00E+00	8	N/A
Mercury	MERCPDS	0.00E+00	8	N/A
Methyl chloroform	71-55-6	0.00E+00	8	N/A
Napthalene	91-20-3	0.0000	8	N/A
Nickel	NICKCPDS	0.00E+00	8	N/A
POM	POM	0.00E+00	8	N/A
Selenium	SEC	0.00E+00	8	N/A
Toluene	108-88-3	0.00	8	N/A
Xylene	1330-20-7	0.00E+00	8	N/A
Greenhouse Gas Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Dioxide	CO ₂	0.00	8	N/A
Methane	CH ₄	0.00	8	N/A
Nitrous oxide	N ₂ O	0.00	8	N/A

Emissions and data on this form required to report or verify emissions cannot be held confidential.

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed.

Natural Gas Combustion Emissions Calculator NG2000 Revision C
2008 Annual Emissions Inventory

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

Facility ID # 6800043
 Permit # 03069T22

Operating Scenario #1

User Input	
Company Name:	University of North Carolina at Chapel Hill
Plant County:	Orange County
Plant City:	Chapel Hill
Permit Number:	03069T22
User:	RST Engineering
Heat Input Capacity (mmBtu/hr):	338
Fuel Input Capacity (10 ⁶ scf/hr):	0.33
Annual Fuel Throughput (10 ⁶ scf):	60.55
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				Emission
Criteria Pollutants				Factor
Pollutant	lb/hr	lb/yr	tpy	(lb/mmscf)
PM	2.5E+00	4.6E+02	2.3E-01	7.6E+00
PM-10	2.5E+00	4.6E+02	2.3E-01	7.6E+00
PM-2.5	2.5E+00	4.6E+02	2.3E-01	7.6E+00
NOx	**	**	**	1.9E+02
VOC	1.8E+00	3.3E+02	1.7E-01	5.5E+00
CO	2.8E+01	5.1E+03	2.5E+00	8.4E+01
SO2	2.0E-01	3.6E+01	1.8E-02	6.0E-01
Total HAP	6.3E-01	1.1E+02	5.7E-02	1.9E+00
Largest HAP	6.0E-01	1.1E+02	5.4E-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	7.0E-04	NA	1.3E-01	2.1E-03
Cadmium	3.6E-04	NA	6.7E-02	1.1E-03
Chromium	4.6E-04	NA	8.5E-02	1.4E-03
Chromium VI	4.6E-04	NA	8.5E-02	1.4E-03
Dichlorobenzene	4.0E-04	NA	7.3E-02	1.2E-03
Formaldehyde	2.5E-02	NA	4.5E+00	7.5E-02
Hexane	6.0E-01	1.4E+01	1.1E+02	1.8E+00
Lead	1.7E-04	NA	3.0E-02	5.0E-04
Manganese	1.3E-04	3.0E-03	2.3E-02	3.8E-04
Mercury	8.6E-05	2.1E-03	1.6E-02	2.6E-04
Naphthalene	2.0E-04	NA	3.7E-02	6.1E-04
Nickel	7.0E-04	1.7E-02	1.3E-01	2.1E-03
POM	2.2E-04	NA	4.0E-02	6.6E-04
Toluene	1.1E-03	2.7E-02	2.1E-01	3.4E-03

Greenhouse Gas Pollutants				Em. Factor
Pollutant	lb/hr	lb/yr	tpy	(lb/mmscf)
Carbon dioxide	39,883	7,287,135	3643.57	120,357
Methane	0.76	139.26	0.070	2.3
Nitrous Oxide	0.73	133.20	0.067	2.2

Fuel Oil Combustion Emissions Calculator FO2000 Revision A

Boiler #8

2008 Annual Emissions Inventory

(ES-003-Boiler #8)

Facility ID # 6800043

Permit # 03069T22

Operating Scenario #2

User Input	
Company Name:	University of North Carolina at
Plant County:	Chapel Hill
Plant City:	Orange County
Permit Number:	Chapel Hill
User:	03069T22
Heat Input Capacity (mmBtu/hr):	RST Engineering
Fuel Input Capacity (10 ³ gal/hr):	338
Annual Fuel Throughput (1000 gal):	2.41
Maximum fuel sulfur content (%):	0.00
Latest Construction/Modification Date:	0.50
	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

2008 Annual Emissions Inventory

(ES-003-Boiler #8)

Facility ID # 6800043

Permit # 03069T22

Operating Scenario #2

User Input	
Company Name:	University of North Carolina at Chapel Hill
Plant County:	Orange County
Plant City:	Chapel Hill
Permit Number:	03069T22
User:	RST Engineering
Heat Input Capacity (mmBtu/hr):	338
Fuel Input Capacity (10 ³ gal/hr):	2.41
Annual Fuel Throughput (1000 gal):	0.00
Maximum fuel sulfur content (%):	0.50
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		
<u>Control Device</u>	<u>Avg. Cont. Effic.</u>	<u>User Input PM Cont. Effic.</u>
0 = None/other	0.0	0.0
1 = ESP		Message Area
2 = Scrubber		
3 = Bagfilter	0.0	
4 = Multiple cyclone		

Postcombustion SO₂ controls

Enter the control type below ▾	Message Area	Or enter an SO ₂ control efficiency below to override built in values.
0		
<u>Control Technology/Process</u>	<u>Avg. Cont. Effic.</u>	<u>User Input SO₂ Cont. Effic.</u>
0 = None/other		0.0
1 = Wet scrubber, Lime/limestone	0.0	Message Area
2 = Wet scrubber, Sodium carbonate		
3 = Wet scrubber, Magnesium oxide/hydroxide		
4 = Wet scrubber, Dual alkali		
5 = Spray drying, calcium hydroxide slurry, vap. in spray vessel	<u>Remarks</u>	
6 = Furnace injection, Dry calcium carbonate/hydrate inj. in upper furn. cavity	NA	
7 = Duct injection, Dry sorbent injection into duct, sometimes combined with water spray		

NO_x controls

Enter the control type below ▾		Or enter a NO _x control efficiency below to override built in values.
5 + 6		
<u>Control Technology/Process</u>	<u>Avg. Cont. Effic.</u>	<u>User Input NO_x Cont. Effic.</u>
0 = None/other		0.0
1 = Low excess air (LEA)	0.0	Message Area
2 = Staged combustion (SC)		
3 = Burners out of service (BOOS)		
4 = Flue gas recirculation (FGR)	<u>Remarks</u>	
5 = Flue gas recirculation plus staged combustion	NA	
6 = Low NO _x 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

Boiler #8

2008 Annual Emissions Inventory

(ES-003-Boiler #8)

Facility ID # 6800043

Permit # 03069T22

Operating Scenario #2

User Input	
Company Name:	University of North Carolina at Chapel Hill
Plant County:	Orange County
Plant City:	Chapel Hill
Permit Number:	03069T22
User:	RST Engineering
Heat Input Capacity (mmBtu/hr):	338
Fuel Input Capacity (10 ³ gal/hr):	2.41
Annual Fuel Throughput (1000 gal):	0.00
Maximum fuel sulfur content (%):	0.50
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)	8.0	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	**	**	**	2.40E+01
NMTOC	0	0.0000	0	2.00E-01
CO	12	0.0000	0	5.00E+00
SO2 rates uncontrolled	59.2	0.0000	0	2.45E+01
Total HAP ⁶	4.36E-01	0.0000	0	1.81E-01
Largest HAP ⁶	1.92E-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	6.64E-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	2.98E-04	NA	0.00E+00	1.23E-04
Cobalt rates uncontrolled	0.00E+00	NA	0.00E+00	0.00E+00
Ethylbenzene	1.97E-03	NA	0.00E+00	8.17E-04
Fluoride	9.01E-02	2.16E+00	0.00E+00	3.73E-02
Formaldehyde	1.16E-01	2.78E+00	0.00E+00	4.80E-02
Lead rates uncontrolled	3.04E-03	NA	0.00E+00	1.26E-03
Manganese rates uncontrolled	2.03E-03	4.87E-02	0.00E+00	8.40E-04
Mercury	1.01E-03	2.43E-02	0.00E+00	4.20E-04
Methyl chloroform (1,1,1-Trichloroethane)	5.70E-04	1.37E-02	0.00E+00	2.36E-04
Naphthalene	8.04E-04	NA	0.00E+00	3.33E-04
Nickel rates uncontrolled	1.01E-03	2.43E-02	0.00E+00	4.20E-04
POM rates uncontrolled	7.97E-03	NA	0.00E+00	3.30E-03
Selenium rates uncontrolled	5.07E-03	NA	0.00E+00	2.10E-03
Toluene	1.92E-01	4.62E+00	0.00E+00	7.97E-02
Xylene	3.38E-03	8.12E-02	0.00E+00	1.40E-03

Greenhouse Gases

Pollutant	lb/hr ²	tpy	lb/yr ³	Emission Factor (lb/10 ³ gal)
-----------	--------------------	-----	--------------------	---

Fuel Oil Combustion Emissions Calculator FO2000 Revision A

Boiler #8

2008 Annual Emissions Inventory

(ES-003-Boiler #8)

Facility ID # 6800043

Permit # 03069T22

Operating Scenario #2

User Input				
Company Name:	University of North Carolina at Chapel Hill			
Plant County:	Orange County			
Plant City:	Chapel Hill			
Permit Number:	03069T22			
User:	RST Engineering			
Heat Input Capacity (mmBtu/hr):	338			
Fuel Input Capacity (10 ³ gal/hr):	2.41			
Annual Fuel Throughput (1000 gal):	0.00			
Maximum fuel sulfur content (%):	0.50			
Latest Construction/Modification Date:	N/A			
Carbon dioxide	52,808	0.0	0	21873.00
Methane	5.21E-01	0.00E+00	0.00E+00	0.216
Nitrous Oxide	2.66E-01	0.00E+00	0.00E+00	0.11

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

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

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

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

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

⁶Total 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.

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

**SO₂ and NO_x emissions were estimated using CEMS data, please refer to the attached spreadsheets.

FO2000 Revision A dated March 9, 2000

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 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 2008 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 2008	0.07
February 2008	0.07
March 2008	0.07
April 2008	0.07
May 2008	0.07
June 2008	0.07
July 2008	0.07
August 2008	0.07
September 2008	0.07
October 2008	0.07
November 2008	0.06
December 2008	0.06
Annual Average	0.14

This average includes NOx emissions from coal, 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 2008

Boiler #8	
Gas 1,000cf/yr	Oil Gallons/yr
60,546	0
Nat. Gas (1,030 btu/cf)	Oil (137,006 btu/gal)
MMBtu/yr	
6.24E+04	0.00E+00

Total for Boiler #8 (MMBtu/yr)	6.24E+04
--------------------------------	----------

NOx Emissions from Boiler #8 (lb/yr)	8,523
NOx Emissions from Boiler #8 (ton/yr)	4.3

NOx Emissions Associated with Fuel Oil Combustion (ton/yr)	0.00
NOx Emissions Associated with Natural Gas Combustion (ton/yr)	4.26

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

**Coal Crusher/Conveyor Building
(ES-010A)**

Emission Source/Operating Scenario Data Page 1 of 2					Facility ID #: 6800043		
Coal Crusher/Conveyor Building <small>If Emission Source has multiple Operating Scenarios, complete one form for each. (All permitted, Insignificant and/or Non-permitted Sources)</small>					Permit #: 03069T22		
Facility Name: University of North Carolina at Chapel Hill					County: Orange		
					DAQ Region: Raleigh		
North Carolina Department of Environment and Natural Resources Division of Air Quality Air Pollutant Point Source Emissions Inventory - Calendar Year 2008							
1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)					ES-010A		
2. Emission Source Description			Coal Crusher / Conveyor Building				
3. Operating Scenario Description			N/A				
4. Maximum Permitted Operating Rate <small>With Units (Ex. gal/hr, mmBtu/hr)</small>			60 tons/hr				
5. Throughput in CY (e.g. production or fuel use) <small>With Units (Ex. lbs/yr, gal/yr)</small>				131,208		tons/yr	
6. Fuel Information (if fuel used)			% Sulfur	N/A	% Ash	N/A	Heat Content (Btu/lb or mmCF)
If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.							
7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)						100%	
8. Control Device Information , if none, write "none"							
	Control Device ID # <small>(as listed in permit)</small>		Control Device Description				
<i>i.</i> (nearest stack)	CD-013		Bagfilter				
<i>ii.</i>	N/A		N/A				
<i>iii.</i>	N/A		N/A				
<i>iv.</i>	N/A		N/A				
9. Stack Information (sources vented to more than one stack use additional entry lines)							
Stack ID #	Height <small>(in whole feet)</small>	Diameter (feet) <small>Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)</small>	Temperature (F)	Velocity (feet/sec)	Volume Flow Rate (acfm)	Release Point Description <small>(Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)</small>	
EP-12-053	47	1.8	Ambient	44	6,500	Vertical	
--	--	--	--	--	--	--	
--	--	--	--	--	--	--	
10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)							
Hours/Day	6	Days/Week	7	Weeks/Year	52	Hours/Year	2,187
Typical Start & End Times in CY:				Start:	N/A	End:	N/A
11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)							
Jan-Feb, 2002 + Dec, 2002	29.83%	Mar-May	22.63%	June-Aug	23.72%	Sept-Nov	23.82%

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 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 2008.

Boiler #6	65,022	Tons/yr
Boiler #7	66,185	Tons/yr
Total	131,208	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
2,186.8 hrs/yr, conveying time

$\text{lb/yr} = (6,650 \text{ acfm}) (60 \text{ min/hr}) (\text{hr/yr}) (0.015 \text{ gr/acfm}) (1/7000 \text{ lb/gr})$

Total Emissions from the Crusher	13,087,968	gr/yr
	1,870	lb/yr
	0.93	ton/yr

100% of these emissions are PM-10

95% of these emissions are PM-2.5

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

**Ash Silo with Loadout
(ES-030)**

Ash Silo with Loadout

If Emission Source has multiple Operating Scenarios, complete one form for each.
(All permitted, Insignificant and/or Non-permitted Sources)

Facility Name: University of North Carolina at Chapel Hill

Facility ID #:	6800043
Permit #:	03069T22
County:	Orange
DAQ Region:	Raleigh

**North Carolina Department of Environment and Natural Resources
Division of Air Quality
Air Pollutant Point Source Emissions Inventory - Calendar Year 2008**

1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-030					
2. Emission Source Description		Ash Silo with Loadout					
3. Operating Scenario Description		N/A					
4. Maximum Permitted Operating Rate With Units (Ex. gal/hr, mmBtu/hr)		16 tons/hr					
5. Throughput in CY (e.g. production or fuel use) With Units (Ex. lbs/yr, gal/yr)		42,291				tons/yr	
6. Fuel Information (if fuel used)		% Sulfur	N/A	% Ash	N/A	Heat Content (Btu/lb or mmCF)	N/A

If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.

7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)	100%
--	------

8. Control Device Information, if none, write "none"

	Control Device ID # (as listed in permit)	Control Device Description
i. (nearest stack)	CD-031	Bagfilter
ii.	N/A	N/A
iii.	N/A	N/A
iv.	N/A	N/A

9. Stack Information (sources vented to more than one stack use additional entry lines)

Stack ID #	Height (in whole feet)	Diameter (feet) Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)	Temperature (F)	Velocity (feet/sec)	Volume Flow Rate (acfm)	Release Point Description (Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)
Fugitive						
--	--	--	--	--	--	--
--	--	--	--	--	--	--

10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)

Hours/Day	10	Days/Week	7	Weeks/Year	52	Hours/Year	7,903
Typical Start & End Times in CY:				Start:	N/A	End:	N/A

11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)

Jan-Feb, 2002 + Dec, 2002	29.83%	Mar-May	22.63%	June-Aug	23.72%	Sept-Nov	23.82%
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University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 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 CaCO₃ / CaSO₃ from desulfurization. Ash is similar to flyash used in concrete batching operations.

42,291.00 ton/yr, ash loaded in 2008

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 based on conservatively high estimated 0.5 lb/ton emission factor (0.02 lb/ton AP-42 for batch truck loading at concrete plants).

42,291	ton/yr, Ash Generated
0.5	lb/ton, Emission Factor
95%	Capture Efficiency
1057.3	lb/yr, Emissions
0.53	ton/yr, Emissions

Fugitives from the Enclosure:

0.028	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
7,903	hrs/yr, Operating Hours
0.015	gr/acfm, Emission Factor from Baghouse
4,562	lb/yr, Emissions
2.28	ton/yr, Emissions

3. Total Emissions

0.53	ton/yr, Emissions Truck Loading
0.028	ton/yr, Emissions, Truck Fugitives
2.28	ton/yr, Emissions, Baghouse
2.84	ton/yr, Total Emissions PM
2.84	ton/yr, Total Emissions PM-10
2.70	ton/yr, Total Emissions PM-2.5

100% as PM-10

95% as PM-2.5

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

**Wet Ash Loadout
(ES-030A)**

(This unit was not in operation during CY 2008)

Facility ID #: 6800043

Wet Ash Loadout

If Emission Source has multiple Operating Scenarios, complete one form for each.
(All permitted, Insignificant and/or Non-permitted Sources)

Permit #: 03069T22

County: Orange

Facility Name: University of North Carolina at Chapel Hill

DAQ Region: Raleigh

**North Carolina Department of Environment and Natural Resources
Division of Air Quality
Air Pollutant Point Source Emissions Inventory - Calendar Year 2008**

1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-030A					
2. Emission Source Description		Wet Ash Loadout					
3. Operating Scenario Description		N/A					
4. Maximum Permitted Operating Rate <small>With Units (Ex. gal/hr, mmBtu/hr)</small>		N/A					
5. Throughput in CY (e.g. production or fuel use) <small>With Units (Ex. lbs/yr, gal/yr)</small>		0			ton/yr		
6. Fuel Information (if fuel used)		% Sulfur	N/A	% Ash	N/A	Heat Content (Btu/lb or mmCF)	N/A

If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.

7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)	N/A
--	-----

8. Control Device Information, if none, write "none"

	Control Device ID # <small>(as listed in permit)</small>	Control Device Description
i. (nearest stack)	None	None
ii.	None	None
iii.	None	None
iv.	None	None

9. Stack Information (sources vented to more than one stack use additional entry lines)

Stack ID #	Height <small>(in whole feet)</small>	Diameter (feet) <small>Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)</small>	Temperature <small>(F)</small>	Velocity <small>(feet/sec)</small>	Volume Flow Rate <small>(acfm)</small>	Release Point Description <small>(Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)</small>
N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	--	--	--	--	--	--
--	--	--	--	--	--	--

10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)

Hours/Day	N/A	Days/Week	N/A	Weeks/Year	N/A	Hours/Year	N/A
Typical Start & End Times in CY:				Start:	N/A	End:	N/A

11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)

Jan-Feb, 2002 + Dec, 2002	0%	Mar-May	0%	June-Aug	0%	Sept-Nov	0%
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This Unit Was Not in Operation During CY 2004.

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

Enclosed Sorbent Railcar Dump Pit (Insignificant Source)

IS-53

23,412 tons of sorbent delivered by rail in 2008. The remainder of the sorbent used was delivered by truck. There are no emission sources associated with truck delivery.

Emission Source/Operating Scenario Data Page 1 of 2		Facility ID #: 6800043					
Enclosed Sorbent Railcar Dump Pit <small>If Emission Source has multiple Operating Scenarios, complete one form for each. (All permitted, Insignificant and/or Non-permitted Sources)</small>		Permit #: 03069T22					
Facility Name: <u>University of North Carolina at Chapel Hill</u>		County: Orange					
		DAQ Region: Raleigh					
North Carolina Department of Environment and Natural Resources Division of Air Quality Air Pollutant Point Source Emissions Inventory - Calendar Year 2008							
1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)			"I" Insignificant - ID No. 020				
2. Emission Source Description		Enclosed Sorbent Railcar Dump Pit					
3. Operating Scenario Description		N/A					
4. Maximum Permitted Operating Rate <small>With Units (Ex. gal/hr, mmBtu/hr)</small>		50 ton/hr					
5. Throughput in CY (e.g. production or fuel use) <small>With Units (Ex. lbs/yr, gal/yr)</small>		23,412 tons/yr					
6. Fuel Information (if fuel used)	% Sulfur	N/A	% Ash				
		N/A	Heat Content (Btu/lb or mmCF)				
			N/A				
If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.							
7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)			N/A				
8. Control Device Information, if none, write "none"							
	Control Device ID # <small>(as listed in permit)</small>	Control Device Description					
i. (nearest stack)	None	None					
ii.	None	None					
iii.	None	None					
iv.	None	None					
9. Stack Information (sources vented to more than one stack use additional entry lines)							
Stack ID #	Height <small>(in whole feet)</small>	Diameter (feet) <small>Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)</small>	Temperature <small>(F)</small>	Velocity <small>(feet/sec)</small>	Volume Flow Rate <small>(acfm)</small>	Release Point Description <small>(Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)</small>	
Fugitive							
--	--	--	--	--	--	--	
--	--	--	--	--	--	--	
10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)							
Hours/Day	1	Days/Week	3	Weeks/Year	52	Hours/Year	156
Typical Start & End Times in CY:				Start:	N/A	End:	N/A
11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)							
Jan-Feb, 2002 + Dec, 2002	29.83%	Mar-May	22.63%	June-Aug	23.72%	Sept-Nov	23.82%

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 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.

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

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 minimum wind speed of 1.3 mph was used.

Total Sorbent 23,412 tons/yr

Emissions from the unloading of sorbent into the dump pit:

	Emission Factor (lb/ton)	Emissions (lb/yr)	Emissions (ton/yr)
PM	1.32E-04	41.84	2.09E-02
PM-10	6.25E-05	19.79	9.89E-03
PM-2.5	1.96E-05	6.22	3.11E-03

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

**Four Coal Bunkers
(ES-01, 02, 03 and 04)**

(These units do not discharge to the ambient air.)

Emission Source/Operating Scenario Data Page 1 of 2		Facility ID #: 6800043					
<i>Coal Storage Bunkers</i> <small>If Emission Source has multiple Operating Scenarios, complete one form for each. (All permitted, Insignificant and/or Non-permitted Sources)</small>		Permit #: 03069T22					
Facility Name: University of North Carolina at Chapel Hill		County: Orange					
		DAQ Region: Raleigh					
North Carolina Department of Environment and Natural Resources Division of Air Quality Air Pollutant Point Source Emissions Inventory - Calendar Year 2008							
1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-01, 02, 03, 04					
2. Emission Source Description		Four Coal Storage Bunkers					
3. Operating Scenario Description		N/A					
4. Maximum Permitted Operating Rate <small>With Units (Ex. gal/hr, mmBtu/hr)</small>		60 tons/hr (each)					
5. Throughput in CY (e.g. production or fuel use) <small>With Units (Ex. lbs/yr, gal/yr)</small>		131,208 tons/yr					
6. Fuel Information (if fuel used)		% Sulfur N/A	% Ash N/A				
		Heat Content (Btu/lb or mmCF)	N/A				
<small>If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.</small>							
7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)		100%					
8. Control Device Information , if none, write "none"							
	Control Device ID # <small>(as listed in permit)</small>	Control Device Description					
<i>i. (nearest stack)</i>	CD-014	Bagfilter on Bunker ES-01					
<i>ii.</i>	CD-015	Bagfilter on Bunker ES-02					
<i>iii.</i>	CD-016	Bagfilter on Bunker ES-03					
<i>iv.</i>	CD-017	Bagfilter on Bunker ES-04					
9. Stack Information (sources vented to more than one stack use additional entry lines)							
Stack ID #	Height <small>(in whole feet)</small>	Diameter (feet) <small>Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)</small>	Temperature <small>(F)</small>	Velocity <small>(feet/sec)</small>	Volume Flow Rate <small>(acfm)</small>	Release Point Description <small>(Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)</small>	
EP-14-054	137	0.52	Ambient	78	1,000	Horizontal	
EP-14-056	137	0.52	Ambient	78	1,000	Horizontal	
EP-15-054	137	0.52	Ambient	78	1,000	Horizontal	
EP-15-056	137	0.52	Ambient	78	1,000	Horizontal	
10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)							
Hours/Day	1.5	Days/Week	7	Weeks/Year	52	Hours/Year	546
Typical Start & End Times in CY:				Start:	N/A	End:	N/A
Jan-Feb, 2002		+ Dec, 2002					
Jan-Feb, 2002 + Dec, 2002	29.83%	Mar-May	22.63%	June-Aug	23.72%	Sept-Nov	23.82%

These Sources are Vented Inside the Boiler Building. There is NO Discharge to the Ambient Air.

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

4 Coal Bunker Storage Areas

(ES-01, 02, 03, 04)

Coal is transported from the coal crusher building in enclosed conveyors to the boiler building. Inside the boiler building the coal is stored in four coal bunkers.

Assume that the total amount of coal fed to the bunkers is equal to the total amount of coal combusted in 2008.

Boiler #6	65,022	Tons/yr
Boiler #7	66,185	Tons/yr
Total	131,208	Tons/yr

The bulk density of coal is 47 lb/ft³

Total volume of coal combusted is = 5,583,306 ft³/yr
(Volume of coal combusted = 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).

$$\text{lb/yr} = (\text{ft}^3/\text{yr}) (0.015 \text{ gr/acfm}) (1/7000 \text{ lb/gr})$$

Total Emissions from the bunkers	83,750	gr/yr
	11,964	lb/yr
	0.006	ton/yr

This baghouse is vented inside the Boiler Building, therefore there are no emissions to the ambient air.

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

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

(ES-007 & ES-008)

Emission Source/Operating Scenario Data Page 1 of 2		Facility ID #: 6800043					
<i>Emergency Generators Classified as Insignificant Sources</i>		Permit #: 03069T20					
Facility Name: University of North Carolina at Chapel Hill		County: Orange					
		DAQ Region: Raleigh					
North Carolina Department of Environment and Natural Resources Division of Air Quality Air Pollutant Point Source Emissions Inventory - Calendar Year 2008							
1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-007 & ES-008					
2. Emission Source Description		Two Blackstart Generators located at Cogeneration Facility					
3. Operating Scenario Description		Operating Scenario #1 - No. 2 Fuel Oil					
4. Maximum Permitted Operating Rate With Units (Ex. gal/hr, mmBtu/hr)		270 gal/hr - 2 units					
5. Throughput in CY (e.g. production or fuel use) With Units (Ex. lbs/yr, gal/yr)		4,673					
		gallons/year, Total No. 2 Fuel Oil					
6. Fuel Information (if fuel used)		% Sulfur	50.00%				
		% Ash	N/A				
		Heat Content (Btu/lb or mmCF)	137,006 Btu/gallon				
If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.							
7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)		N/A					
8. Control Device Information, if none, write "none"							
	Control Device ID # (as listed in permit)	Control Device Description					
i. (nearest stack)	None	None					
ii.	None	None					
iii.	None	None					
iv.	None	None					
9. Stack Information (sources vented to more than one stack use additional entry lines)							
Stack ID #	Height (in whole feet)	Diameter (feet) Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)	Temperature (F)	Velocity (feet/sec)	Volume Flow Rate (acfm)	Release Point Description (Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)	
Common Stack Parameters with 2-generators and Boiler No. 8 operating concurrently							
Stk No.4	208	6	400	70	118,752	Vertical	
--	--	--	--	--	--	--	
10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)							
Hours/Day	N/A	Days/Week	N/A	Weeks/Year	N/A	Hours/Year	N/A
Typical Start & End Times in CY:				Start:	N/A	End:	N/A
11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)							
Jan-Feb, 2007 + Dec, 2007	1.3%	Mar-May	3.0%	June-Aug	94.4%	Sept-Nov	1.3%

Two-2,000 kW No.2 oil-fired generators

Facility Name: University of North Carolina at Chapel Hill

**North Carolina Department of Environment and Natural Resources
Division of Air Quality
Air Pollutant Point Source Emissions Inventory - Calendar Year 2008**

Emissions: Attach calculations and documentation of emission factors or other estimation methods used.

Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)

ES-007 & ES-008

Criteria (NAAQS) Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Monoxide	CO	0.27	8	N/A
NOx	NOx	0.61	8	N/A
PM Total	PM	0.03	8	N/A
PM-2.5	PM-2.5	0.03	8	N/A
PM-10	PM-10	0.03	8	N/A
SO2	SO2	0.16	8	N/A
VOC	VOC	0.03	8	N/A
HAP/TAP Pollutants (In Alphabetical Order)	CAS # (or other code - see instructions)	Emissions HAP/TAP (Pounds/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Acetaldehyde	75-07-0	0.02	8	N/A
Acrolein	107-02-8	0.01	8	N/A
Benzene	71-43-2	0.50	8	N/A
Formaldehyde	50-00-0	0.05	8	N/A
Napthalene	91-20-3	0.08	8	N/A
Propylene	115-07-1	1.79	8	N/A
Toluene	108-88-3	0.18	8	N/A
Xylene	1330-20-7	0.12	8	N/A
Greenhouse Gas Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Dioxide	CO ₂	52.82	8	N/A
Methane	CH ₄	2.82E-03	8	N/A

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T22

2008 Annual Emissions Inventory

Blackstart Generators G1 & G2

(ES-007 & ES-008)

Fuel Input Rates	
Hourly Fuel Usage (gallons):	270 (2-units)
Annual Fuel Usage (gallons):	4,673 (2-units)
Fuel Sulfur Content (%)	0.5
Heat Input Rates	
Fuel Heating Values (Btu/gallon)	137,006
Hourly Fuel Usage (mmBtu):	36.99
Annual Fuel Usage (mmBtu):	640

Emissions Output				Emission Factor (lb/mmBtu)
Criteria Pollutants				
Pollutant	lb/hr	lb/yr	tpy	
PM	3.7E+00	6.4E+01	3.2E-02	1.00E-01
PM-10	3.7E+00	6.4E+01	3.2E-02	1.00E-01
PM-2.5	3.7E+00	6.4E+01	3.2E-02	1.00E-01
NOx	7.0E+01	1.2E+03	6.1E-01	1.90E+00
NMTOC, Total	3.0E+00	5.2E+01	2.6E-02	8.19E-02
CO	3.1E+01	5.4E+02	2.7E-01	8.50E-01
SO _x	1.9E+01	3.2E+02	1.6E-01	5.05E-01
Toxic/Hazardous Air Pollutants				
Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	9.3E-04	NA	1.6E-02	2.52E-05
Acrolein	2.9E-04	NA	5.0E-03	7.88E-06
Benzene	2.9E-02	NA	5.0E-01	7.76E-04
Formaldehyde	2.9E-03	NA	5.1E-02	7.89E-05
Naphthalene	4.8E-03	NA	8.3E-02	1.30E-04
Propylene	1.0E-01	NA	1.8E+00	2.79E-03
Toluene	1.0E-02	2.5E-01	1.8E-01	2.81E-04
Xylene	7.1E-03	1.7E-01	1.2E-01	1.93E-04
Greenhouse Gas Pollutants				Em. Factor (lb/mmBtu)
Pollutant	lb/hr	lb/yr	tpy	
Carbon dioxide	6,104	105,642	52.82	165
Methane	3.3E-01	5.6E+00	2.8E-03	8.82E-03

Emission factors are from AP-42 Chapter 3, Section 3.4, Large Stationary Diesel 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.

Daily emissions are based on operation at the hourly input rate for 24 hours.