

2006 Cogeneration Facility Annual Air Emissions Inventory

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

**Facility ID # 6800043
Permit # 03069T20**

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

June 2007

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Chapel Hill, North Carolina

Orange County

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2006 Annual Emissions Inventory

Supporting Documentation

Table of Contents

Supporting Documentation

Fuel Usage

Coal Usage

Emissions Calculations

<u>ES ID</u>	<u>Source/Operating Scenario Description</u>
ES-010	Enclosed Railcar Dump Pits
ES-1, ES-2	Coal Storage Silos
ES-3.1 - ES-3.5	Silo Conveyors
T-001	Fuel Oil Storage Tank
T-002	Fuel Oil Storage Tank
ES-001	Boiler #6 <ul style="list-style-type: none">- No. 2 Fuel Oil Firing- Coal Firing- Natural Gas Firing- No. 6 Fuel Oil Firing
ES-002	Boiler #7 <ul style="list-style-type: none">- No. 2 Fuel Oil Firing- Coal Firing- Natural Gas Firing- No. 6 Fuel Oil Firing
ES-003	Boiler #8 <ul style="list-style-type: none">- Natural Gas Firing- No. 2 Fuel Oil Firing
ES-007	Cogeneration - 2,000 kW Generator #1
ES-008	Cogeneration - 2,000 kW Generator #2
ES-009	Cogeneration - 2,000 kW Generator #3
ES-010A	Coal Crusher/Conveyor Building
ES-030	Ash Silo with Loadout
ES-030A	Wet Ash Loadout
IS-53	Enclosed Sorbent Railcar Dump Pit

Facility Total CY 2006 Emissions Summary

Facility ID #: 6800043

Permit #(s): 03069T20

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 2006**

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

Criteria Pollutants	ID #'s of Contributing Sources	Actual Emissions (Tons/Year)*	
			CY 2006
Carbon Monoxide (CO) (Reporting required, but no fees based on CO)	Boiler 6,7,8		1,027.5
Oxides of Nitrogen (NOx) (Report as tons of NO ₂ equivalent)	Boiler 6,7,8		533.9
PM/TSP - Particulate Matter (Total - not used for emission fees)	Boiler 6,7,8 & Coal and Ash Handling		5.7
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		5.7
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		4.3
Sulfur Dioxide (SO₂) Do not include Sulfur Trioxide and Sulfuric Acid	Boiler 6,7,8		181.8
VOC Volatile Organic Compounds - See instructions for Federal definition excluding some non-photochemically reactive organics	Boiler 6,7,8		3.1

On Next Page: Enter, in Alphabetical Order, All HAPs/TAPs Required by Instructions
(Sum Source Emissions From Emission Source / Operating Scenario Forms)

*Attach supporting documentation and calculations. For CY 2001 Inventory use a 1000 lb (facility total) threshold, except for compounds not previously reported to DAQ in 1999 or 2000 inventory. Report all for these.

(If using a blank form, you do not need to replicate the CY 2000 emissions column except to point out errors)

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 2006

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 2006
2,3,7,8-TCDD		Boilers 6,7,8		0.000002
2,4-Dinitrotoluene	121-14-2	Boilers 6,7,8		0.03
2-Chloroacetophenone	532-27-4	Boilers 6,7,8		0.80
Acetaldehyde	75-07-0	Boilers 6,7,8		65.01
Acetophenone	98-86-2	Boilers 6,7,8		1.71
Acrolein	107-02-8	Boilers 6,7,8		33.07
Arsenic	ARSENICCPDS	Boilers 6,7,8		1.20
Benzene	71-43-2	Boilers 6,7,8		148.36
Benzo(a)pyrene	50-32-8	Boilers 6,7,8		0.004
Benzyl Chloride	100-44-7	Boilers 6,7,8		79.83
Beryllium	BERYLCPDS	Boilers 6,7,8		55.52
Biphenyl	92-52-4	Boilers 6,7,8		0.19
Bis(2-ethylhexyl)phthalate (DEHP)		Boilers 6,7,8		8.33
Bromine	7726-95-6	Boilers 6,7,8		24.21
Bromoform	75-25-2	Boilers 6,7,8		4.45
Cadmium	CADMIUMCPDS	Boilers 6,7,8		0.08
Carbon Disulfide	75-15-0	Boilers 6,7,8		14.83
Chlorobenzene	108-90-7	Boilers 6,7,8		2.51
Chloroform	67-66-3	Boilers 6,7,8		6.73
Chromium	CROMCPDS	Boilers 6,7,8		1.95
Chromium VI	CHROM6CPDS	Boilers 6,7,8		1.95
Cobalt	COBALTCPDS	Boilers 6,7,8		0.00
Cumene	98-82-8	Boilers 6,7,8		0.60
Cyanide	CNC	Boilers 6,7,8		285
Dibenzofurans	132-64-9	Boilers 6,7,8		0.02
Dichlorobenzene	106-46-7	Boilers 6,7,8		0.03
Dimethyl Sulfate	77-78-1	Boilers 6,7,8		5.47
Ethyl Benzene	100-41-4	Boilers 6,7,8		10.74
Ethyl Chloride	75-00-3	Boilers 6,7,8		4.79
Ethylene Dibromide	106-93-4	Boilers 6,7,8		0.14
Ethylene Dichloride	107-06-2	Boilers 6,7,8		4.56

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

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Facility Total CY 2006 Emissions Summary

Facility ID #: 6800043

Facility Name: University of North Carolina at Chapel Hill

Permit #(s): 03069T20

North Carolina Department of Environment and Natural Resources
 Division of Air Quality
 Air Pollutant Point Source Emissions Inventory - Calendar Year 2006

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 2006
Fluoride	16984-48-8	Boilers 6,7,8		0.68
Formaldehyde	50-00-0	Boilers 6,7,8		30.18
Hexane	110-54-3	Boilers 6,7,8		53.99
Hydrogen Chloride	7647-01-0	Boilers 6,7,8		98,840.4
Hydrogen Fluoride	7664-39-3	Boilers 6,7,8		5,018.0
Isophorone	78-59-1	Boilers 6,7,8		66.15
Lead	LEADCPDS	Boilers 6,7,8		0.79
Manganese	MANGCPDS	Boilers 6,7,8		3.32
Mercury	MERCCPDS	Boilers 6,7,8		4.26
Methly Chloride	74-87-3	Boilers 6,7,8		60.44
Methly Ethyl Ketone	78-93-3	Boilers 6,7,8		44.48
Methyl Bromide	74-83-9	Boilers 6,7,8		18.25
Methyl Chloroform	71-55-6	Boilers 6,7,8		0.00
Methyl Hydrazine	60-34-4	Boilers 6,7,8		19.39
Methyl Methacrylate	80-62-6	Boilers 6,7,8		2.28
Methyl Tert Butyl Ether	1634-04-4	Boilers 6,7,8		3.99
Methylene Chloride	75-09-2	Boilers 6,7,8		33.07
Napthalene	91-20-3	Boilers 6,7,8		1.50
Nickel	NICKCPDS	Boilers 6,7,8		1.63
Phenol	108-95-2	Boilers 6,7,8		1.82
POM	POM	Boilers 6,7,8		6.65
Propionaldehyde	123-38-6	Boilers 6,7,8		43.34
Selenium	SEC	Boilers 6,7,8		1.14E-02
Styrene	100-42-5	Boilers 6,7,8		2.85
Tetrachloroethane	79-34-5	Boilers 6,7,8		4.90
Toluene	108-88-3	Boilers 6,7,8		28.91
Vinyl Acetate	108-05-4	Boilers 6,7,8		0.87
Xylenes	1330-20-7	Boilers 6,7,8		4.25

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 # 03069T20

2006 Annual Emissions Inventory

Facility Summary of Sources

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID# 6800043

Permit # 03069T20

2006 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		

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 Annual Emissions Inventory

Fuel Use Summary

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 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 2006	5,671	0	0	5,923	90	0	0	0
January 2006	4,883	373	0	5,531	169	0	2,088	0
February 2006	4,752	27	0	5,238	12	0	4,191	5,314
<i>1st Quarter Total</i>	<i>15,307</i>	<i>400</i>	<i>0</i>	<i>16,691</i>	<i>271</i>	<i>0</i>	<i>6,279</i>	<i>5,314</i>
March 2006	3,798	116	12,962	3,817	0	0	0	0
April 2006	4,983	334	0	1,314	759	0	851	0
May 2006	3,497	734	0	3,866	1,112	0	4,363	0
<i>2nd Quarter Total</i>	<i>12,279</i>	<i>1,184</i>	<i>12,962</i>	<i>8,997</i>	<i>1,871</i>	<i>0</i>	<i>5,214</i>	<i>0</i>
June 2006	5,667	192	0	3,915	723	0	0	0
July 2006	5,738	327	0	5,538	262	0	459	0
August 2006	6,511	6	0	6,206	107	0	0	0
<i>3rd Quarter Total</i>	<i>17,916</i>	<i>525</i>	<i>0</i>	<i>15,660</i>	<i>1,092</i>	<i>0</i>	<i>459</i>	<i>0</i>
September 2006	3,806	700	0	3,549	4,192	0	1,373	0
October 2006	3,240	1,681	0	5,644	103	0	70	0
November 2006	5,789	0	0	5,168	336	0	2	0
<i>4th Quarter Total</i>	<i>12,836</i>	<i>2,381</i>	<i>0</i>	<i>14,361</i>	<i>4,631</i>	<i>0</i>	<i>1,445</i>	<i>0</i>
2006 TOTAL	58,337	4,489	12,962	55,708	7,865	0	13,397	5,314

Seasonal Btu Breakdown

Coal (btu/lb)	12,945	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 2006	1.47E+11	0.00E+00	0	1.53E+11	9.27E+07	0	0.00E+00	0
January 2006	1.26E+11	384190000	0	1.43E+11	1.74E+08	0	2.15E+09	0
February 2006	1.23E+11	2.74E+07	0	1.36E+11	1.19E+07	0	4.32E+09	728049884
<i>1st Quarter Total</i>	<i>3.96E+11</i>	<i>4.12E+08</i>	<i>0</i>	<i>4.32E+11</i>	<i>2.79E+08</i>	<i>0</i>	<i>6.47E+09</i>	<i>728049884</i>
March 2006	9.83E+10	1.19E+08	1775912874	9.88E+10	0.00E+00	0	0	0
April 2006	1.29E+11	3.44E+08	0	3.40E+10	7.82E+08	0	8.77E+08	0
May 2006	9.05E+10	7.56E+08	0	1.00E+11	1.15E+09	0	4493890000	0
<i>2nd Quarter Total</i>	<i>3.18E+11</i>	<i>1.22E+09</i>	<i>1775912874</i>	<i>2.33E+11</i>	<i>1.93E+09</i>	<i>0</i>	<i>5.37E+09</i>	<i>0</i>
June 2006	1.47E+11	1.98E+08	0	1.01E+11	7.45E+08	0	0.00E+00	0
July 2006	1.49E+11	3.37E+08	0	1.43E+11	2.70E+08	0	4.73E+08	0
August 2006	1.69E+11	6.18E+06	0	1.61E+11	110210000	0	0.00E+00	0
<i>3rd Quarter Total</i>	<i>4.64E+11</i>	<i>5.41E+08</i>	<i>0</i>	<i>4.05E+11</i>	<i>1.12E+09</i>	<i>0</i>	<i>4.73E+08</i>	<i>0</i>
September 2006	9.85E+10	7.21E+08	0.00E+00	9.19E+10	4317760000	0.00E+00	1414190000	0
October 2006	8.39E+10	1.73E+09	0	1.46E+11	1.06E+08	0	7.21E+07	0
November 2006	1.50E+11	0.00E+00	0	1.34E+11	3.46E+08	0	2.06E+06	0.00E+00
<i>4th Quarter Total</i>	<i>3.32E+11</i>	<i>2.45E+09</i>	<i>0.00E+00</i>	<i>3.72E+11</i>	<i>4.77E+09</i>	<i>0.00E+00</i>	<i>1.49E+09</i>	<i>0.00E+00</i>
2006 TOTAL	1.51E+12	4.62E+09	1.78E+09	1.44E+12	8.10E+09	0.00E+00	1.38E+10	7.28E+08

Seasonal Total Fuel Usage (%)

	Boiler #6	Boiler #7	Boiler #8
Dec., Jan., Feb.	26.15	29.81	49.53
Mar., Apr., May	21.16	16.19	37
June, July, Aug.	30.62	28.03	3.25
Sept., Oct., Nov.	22.07	25.96	10.25
	100	100	100

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 Annual Emissions Inventory

Coal Usage Breakdown

Month	Boiler #6 Coal (tons)	Boiler #7 Coal (tons)
December 2006	5,671	5,923
January 2006	4,883	5,531
February 2006	4,752	5,238
<i>1st Quarter Total</i>	<i>15,307</i>	<i>16,691</i>
March 2006	3,798	3,817
April 2006	4,983	1,314
May 2006	3,497	3,866
<i>2nd Quarter Total</i>	<i>12,279</i>	<i>8,997</i>
June 2006	5,667	3,915
July 2006	5,738	5,538
August 2006	6,511	6,206
<i>3rd Quarter Total</i>	<i>17,916</i>	<i>15,660</i>
September 2006	3,806	3,549
October 2006	3,240	5,644
November 2006	5,789	5,168
<i>4th Quarter Total</i>	<i>12,836</i>	<i>14,361</i>
2005 TOTAL	58,337	55,708

Facility-Wide Coal Usage 114,045 Tons/year

Seasonal Coal Usage (%)

	Boiler #6	Boiler #7	Average (%)
Dec., Jan., Feb.	26.24%	29.96%	28.10%
Mar., Apr., May	21.05%	16.15%	18.60%
June, July, Aug.	30.71%	28.11%	29.41%
Sept., Oct., Nov.	22.00%	25.78%	23.89%
	100%	100%	100%

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 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 # 03069T20

2006 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 <small>If Emission Source has multiple Operating Scenarios, complete one form for each. (All permitted, Insignificant and/or Non-permitted Sources)</small>		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 2006							
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 <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>		114,045	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)			N/A				
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)	N/A	Enclosed Dump Pits					
<i>ii.</i>	CD-018	Wet Spray Dust Suppression System					
<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>	
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	28.10%	Mar-May	18.60%	June-Aug	29.41%	Sept-Nov	23.89%

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

Railcar Dump Pits

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 #: 03069T20

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 2006**

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-010

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	7.53E-03	2	67%
PM-2.5	PM-2.5	1.12E-03	2	40%
PM-10	PM-10	3.56E-03	2	63%
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)

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.

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 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 2006.

Boiler #6	58,337	Tons/yr
Boiler #7	55,708	Tons/yr
Total	114,045	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 114,045 tons/yr

Emissions from the unloading of coal:

	Emission Factor (lb/ton)	Emissions (lb/yr)	Emissions (ton/yr)
PM	1.32E-04	15.06	7.53E-03
PM-10	6.25E-05	7.12	3.56E-03
PM-2.5	1.96E-05	2.24	1.12E-03

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 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 #: 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 2006							
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>		114,045 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.</i> (nearest stack)	CD-011	Bagfilter Installed on Silo ES-1					
<i>ii.</i>	CD-012	Bagfilter Installed on Silo ES-2					
<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-12-028	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	28.10%	Mar-May	18.60%	June-Aug	29.41%	Sept-Nov	23.89%

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

Coal Silos
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

North Carolina Department of Environment and Natural Resources
Division of Air Quality
Air Pollutant Point Source Emissions Inventory - Calendar Year 2006

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-1 and ES-2

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	5.20E-03	2	99.80%
PM-2.5	PM-2.5	4.94E-03	2	97.90%
PM-10	PM-10	5.20E-03	2	99.60%
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)

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.

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 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 2006.

Boiler #6	58,337	Tons/yr
Boiler #7	55,708	Tons/yr
Total	114,045	Tons/yr

The bulk density of coal is 47 lb/ft³

Total volume of coal combusted is = 4,852,991 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	72,795	gr/yr
	10.399	lb/yr
	0.005	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 # 03069T20

2006 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 #: 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 2006							
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>		114,045 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 # <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	
--	--	--	--	--	--	--	
--	--	--	--	--	--	--	
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

Silo Feed Conveyors

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

Facility ID #: 680043
Permit #: 03069T20
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 2006

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-03

Table with 5 columns: Criteria (NAAQS) Pollutants, Pollutant Code, Emissions Criteria (Tons/Year), Emissions Estimation Method Code (see instructions for code), Control Efficiency (Net after all controls). Rows include Carbon Monoxide, NOx, PM Total, PM-2.5, PM-10, SO2, and VOC.

Table with 5 columns: 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). This table is mostly empty.

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.

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 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 2006.

Boiler #6	58,337	Tons/yr
Boiler #7	55,708	Tons/yr
Total	114,045	Tons/yr

The bulk density of coal is 47 lb/ft³

Total volume of coal combusted is = 4,852,991 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	72,795	gr/yr
	10.399	lb/yr
	0.005	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 # 03069T20

2006 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 #: 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 2006							
1. Emission Source ID No. (<i>same as in permit - Use "U" prefix for non-permitted and "I" for insignificant</i>)		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>		18,276 gal/yr					
6. Fuel Information (<i>if fuel used</i>)		% 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 (<i>% Emissions from Emission Source Vented to Control Device or Stack</i>)		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>	
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--	--	--	--	--	--	--	
--	--	--	--	--	--	--	
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

Facility ID #: 6800043

Silo Feed Conveyors
 If Emission Source has multiple Operat

Permit #: 03069T20

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 2006**

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) T-001, T-002

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	0.213	08	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)

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.

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 Air Emissions Inventory

Fuel Storage Tanks - Fugitive Emissions

<u>Tank</u>	<u>Emissions</u> <u>#/yr</u>	
Tank T-001	212.60	
Tank T-002	212.60	
TOTAL	425.2	0.213 ton/yr

Emissions calculated by USEPA Tanks 4.0 program based on annual throughput of 9,138 gallons and total storage volume of 500,000 gallons for each tank.

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 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)

The boilers 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 2006 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 Spreadsheets

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 #: **03069T20**
 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 2006

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)		12,962		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%
--	------

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
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--	--	--	--	--	--	--

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	0.00%	Mar-May	100.00%	June-Aug	0.00%	Sept-Nov	0.00%
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Facility ID #: **6800043**
 Permit #: **03069T20**
 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 2006**

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	0.03	8	N/A
NOx	NOx	0.32	1	N/A
PM Total	PM	0.009	8	99.0%
PM-2.5	PM-2.5	0.0021	8	99.0%
PM-10	PM-10	0.009	8	99.0%
SO2	SO2	0.11	1	90.0%
VOC	VOC	0.001	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	7.26E-05	8	99.0%
Benzene	71-43-2	3.56E-02	8	N/A
Beryllium	BERYLCPDS	5.44E-05	8	99.0%
Cadmium	CADMIUMCPDS	5.44E-05	8	99.0%
Chromium	CROMCPDS	5.44E-05	8	99.0%
Chromium VI	CHROM6CPDS	1.60E-05	8	99.0%
Cobalt	COBALTCPDS	0.00E+00	8	99.0%
Ethylbenzene	100-41-4	1.06E-02	8	N/A
Fluoride	16984-48-8	0.48	8	N/A
Formaldehyde	50-00-0	0.62	8	N/A
Lead	LEADCPDS	1.63E-04	8	99.0%
Manganese	MANGCPDS	1.09E-04	8	99.0%
Mercury	MERCPDS	5.44E-03	8	99.0%
Methyl chloroform	71-55-6	3.06E-03	8	N/A
Napthalene	91-20-3	4.32E-05	8	N/A
Nickel	NICKCPDS	5.44E-05	8	99.0%
POM	POM	4.28E-04	8	99.0%
Selenium	SEC	2.72E-04	8	99.0%
Toluene	108-88-3	1.03	8	N/A
Xylene	1330-20-7	1.82E-02	8	N/A

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 Name: University of North Carolina at Chapel Hill

Facility ID #:	6800043
Permit #:	03069T20
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 2006**

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)		58,337				tons/yr	
6. Fuel Information (if fuel used)		% Sulfur	1.39%	% Ash	9.80%	Heat Content (Btu/lb or mmCF)	13,327 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%
--	------

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	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	26.24%	Mar-May	21.05%	June-Aug	30.71%	Sept-Nov	22.00%
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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 #: **03069T20**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 2006

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	525.03	8	N/A
NOx	NOx	274.83	1	N/A
PM Total	PM	1.45	8	99.80%
PM-2.5	PM-2.5	0.86	8	97.90%
PM-10	PM-10	1.45	8	99.60%
SO2	SO2	92.16	1	90.00%
VOC	VOC	1.46	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	33.25	8	N/A
Acetophenone	98-86-2	0.88	8	N/A
Acrolein	107-02-8	16.92	8	N/A
Arsenic	ARSENICPDS	0.61	8	99.60%
Benzene	71-43-2	75.84	8	N/A
Benzo(a)pyrene	50-32-8	2.22E-03	8	N/A
Benzyl chloride	100-44-7	40.84	8	N/A
Beryllium	BERYLCPDS	28.40	8	N/A
Biphenyl	92-52-4	9.92E-02	8	N/A
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	4.26	8	N/A
Bromine	7726-95-6	12.38	8	99.60%
Bromoform	75-25-2	2.28	8	N/A
Cadmium	CADMIUMCPDS	2.49E-02	8	99.60%
Carbon disulfide	75-10-0	7.58	8	N/A
2-Chloroacetophenone	532-27-4	0.41	8	N/A
Chlorobenzene	108-90-7	1.28	8	N/A
Chloroform	67-66-3	3.44	8	N/A
Chromium	CROMCPDS	0.98	8	99.60%
Chromium (VI)	CHROM6CPDS	0.98	8	99.60%
Cumene	98-82-8	0.31	8	N/A
Cyanide	CNC	145.84	8	N/A
Dibenzofurans	132-64-9	1.17E-02	8	N/A
Dimethyl sulfate	77-78-1	2.80	8	N/A
2,4-Dinitrotoluene	121-14-2	1.63E-02	8	N/A
Ethyl benzene	100-41-4	5.48	8	N/A
Ethyl chloride	75-00-3	2.45	8	N/A
Ethylene dibromide	106-93-4	7.00E-02	8	N/A
Ethylene dichloride	107-06-2	2.33	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 #: 03069T20County: 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 2006**

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	14.00	8	N/A
Hexane	HEXANEISO	3.91	8	N/A
Hydrogen Chloride ***	7647-01-0	43577.70	8	N/A
Hydrogen Fluoride ***	7664-39-3	2566.83	8	90% Control with CaCO ₃
Isophorone	78-59-1	33.84	8	N/A
Lead	LEADCPDS	0.39	8	99.60%
Manganese	MANGCPDS	1.69	8	99.60%
Mercury***	MERCCPDS	2.17	8	N/A
Methyl bromide	74-83-9	9.33	8	N/A
Methyl chloride	74-87-3	30.92	8	N/A
Methyl ethyl ketone	78-93-3	22.75	8	N/A
Methyl hydrazine	60-34-4	9.92	8	N/A
Methyl methacrylate	80-62-6	1.17	8	N/A
Methyl tert butyl ether	1634-04-4	2.04	8	N/A
Methylene chloride	75-09-2	16.92	8	N/A
Naphthalene	91-20-3	0.76	8	N/A
Nickel	NICKCPDS	0.80	8	99.60%
Phenol	108-95-2	0.93	8	N/A
POM	POM	3.38	8	N/A
Propionaldehyde	123-38-6	22.17	8	N/A
Styrene	100-42-5	1.46	8	N/A
2,3,7,8-TCDD	1746-01-6	8.34E-07	8	N/A
Tetrachloroethylene	79-34-5	2.51	8	N/A
Toluene	108-88-3	14.00	8	N/A
1,1,1-Trichloroethane	79-00-5	1.17	8	N/A
Vinyl acetate	108-05-4	0.44	8	N/A
Xylenes	1330-20-7	2.16	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 #3 - Natural GasIf 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 #: 03069T20County: OrangeDAQ Region: Raleigh

North Carolina Department of Environment and Natural Resources

Division of Air Quality

Air Pollutant Point Source Emissions Inventory - Calendar Year 2006

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)		4,489			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%
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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
--	--	--	--	--	--	--
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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	8.90%	Mar-May	26.36%	June-Aug	11.70%	Sept-Nov	53.04%
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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 #: **03069T20**
 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 2006

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	0.19	8	N/A
NOx	NOx	0.84	1	N/A
PM Total	PM	0.02	8	N/A
PM-2.5	PM-2.5	0.02	8	N/A
PM-10	PM-10	0.02	8	N/A
SO2	SO2	0.00	1	N/A
VOC	VOC	0.01	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	8.98E-04	8	N/A
Benzene	71-43-2	0.01	8	N/A
Cadmium	CADMIUMCPDS	4.94E-03	8	N/A
Chromium	CROMCPDS	6.29E-03	8	N/A
Chromium VI	CHROM6CPDS	6.29E-03	8	N/A
Dichlorobenzene	106-46-7	5.39E-03	8	N/A
Formaldehyde	50-00-0	0.34	8	N/A
Hexane	HEXANEISO	8.08	8	N/A
Lead	LEADCPDS	2.24E-03	8	N/A
Manganese	MANGCPDS	1.71E-03	8	N/A
Mercury	MERCPDS	1.17E-03	8	N/A
Napthalene	91-20-3	2.74E-03	8	N/A
Nickel	NICKCPDS	0.01	8	N/A
POM	POM	2.97E-03	8	N/A
Toluene	108-88-3	0.02	8	N/A

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 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
2005 Annual Emissions Inventory**

**Boiler #6
(ES-001-Boiler #6)
Facility ID # 6800043
Permit # 03069T20**

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:	03069T20
User:	RST Engineering
Heat Input Capacity (mmBtu/hr):	323.17
Fuel Input Capacity (10 ³ gal/hr):	2.31
Annual Fuel Throughput (1000 gal):	12.96
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

2005 Annual Emissions Inventory

Boiler #6

(ES-001-Boiler #6)

Facility ID # 6800043

Permit # 03069T20

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:	03069T20
User:	RST Engineering
Heat Input Capacity (mmBtu/hr):	323.17
Fuel Input Capacity (10 ³ gal/hr):	2.31
Annual Fuel Throughput (1000 gal):	12.96
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		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 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		User entered control efficiency may be overestimated and should be documented.
2 = Wet scrubber, Sodium carbonate	0.0	
3 = Wet scrubber, Magnesium oxide/hydroxide		
4 = Wet scrubber, Dual alkali	Remarks	
5 = Spray drying, calcium hydroxide slurry, vap. in spray vessel	NA	
6 = Furnace injection, Dry calcium carbonate/hydrate inj. in upper furn. cavity		
7 = Duct injection, Dry sorbent injection into duct, sometimes combined with water spray		

NO_x controls

Enter the control type below ▾	Message Area	Or enter a NO _x control efficiency below to override built in values.
5		
Control Technology/Process	Avg. Cont. Effic.	User Input NO _x Cont. Effic.
0 = None/other		0.0
1 = Low excess air (LEA)		Message Area
2 = Staged combustion (SC)	39.0	
3 = Burners out of service (BOOS)		
4 = Flue gas recirculation (FGR)	Remarks	
5 = Flue gas recirculation plus staged combustion	Available for boilers with sufficient operational flexibility	
6 = Low 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
2005 Annual Emissions Inventory

Boiler #6
(ES-001-Boiler #6)
Facility ID # 6800043
Permit # 03069T20

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:	03069T20
User:	RST Engineering
Heat Input Capacity (mmBtu/hr):	323.17
Fuel Input Capacity (10 ³ gal/hr):	2.31
Annual Fuel Throughput (1000 gal):	12.96
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	0.009	17	3.30E+00
Filterable PM (FPM) rates @ 99% control	0.0	0.000	0	2.00E+00
Condensable PM (CPM) ⁴	3.0	0.008	17	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	0.001	3	2.00E-01
CO	12	0.032	65	5.00E+00
SO2 rates @ 90% control	**	**	**	2.98E+02
Total HAP ⁶	4.17E-01	0.001	2	1.81E-01
Largest HAP ⁶	1.84E-01	0.001	1	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	7.26E-05	5.60E-04
Benzene	6.35E-03	NA	3.56E-02	2.75E-03
Beryllium rates @ 99% control	9.70E-06	NA	5.44E-05	4.20E-04
Cadmium rates @ 99% control	9.70E-06	NA	5.44E-05	4.20E-04
Chromium rates @ 99% control	9.70E-06	NA	5.44E-05	4.20E-04
Chromium VI rates @ 99% control	2.85E-06	NA	1.60E-05	1.23E-04
Cobalt rates @ 99% control	0.00E+00	NA	0.00E+00	0.00E+00
Ethylbenzene	1.89E-03	NA	1.06E-02	8.17E-04
Fluoride	8.61E-02	2.07E+00	4.83E-01	3.73E-02
Formaldehyde	1.11E-01	2.66E+00	6.22E-01	4.80E-02
Lead rates @ 99% control	2.91E-05	NA	1.63E-04	1.26E-03
Manganese rates @ 99% control	1.94E-05	4.65E-04	1.09E-04	8.40E-04
Mercury	9.70E-04	2.33E-02	5.44E-03	4.20E-04
Methyl chloroform (1,1,1-Trichloroethane)	5.45E-04	1.31E-02	3.06E-03	2.36E-04
Naphthalene	7.69E-04	NA	4.32E-05	3.33E-04
Nickel rates @ 99% control	9.70E-06	2.33E-04	5.44E-05	4.20E-04
POM rates @ 99% control	7.62E-05	NA	4.28E-04	3.30E-03
Selenium rates @ 99% control	4.85E-05	NA	2.72E-04	2.10E-03
Toluene	1.84E-01	4.41E+00	1.03E+00	7.97E-02
Xylene	3.23E-03	7.76E-02	1.82E-02	1.40E-03

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.

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

Bituminous Coal Combustion

2006 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="58,337"/>	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="12,945"/>	Btu/lb	Control Device Efficiencies:	
		ton/yr	PM	<input type="text" value="99.80"/> %
Sulfur Content	<input type="text" value="1.39"/>	%	PM-10	<input type="text" value="99.60"/> %
Ash Content :	<input type="text" value="9.8"/>	%	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

2006 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	0.62	2,894	1.45
PM-10	12.4	0.62	2,894	1.45
PM-2.5*	1.4	0.37	1,715	0.86
SO2	12.10	**	**	**
SO3*	0.08	**	**	**
NOx	3.90	**	**	**
VOC	0.05	0.62	2,917	1.46
CO	18	224.68	1,050,065	525.03

ACTUAL TOXIC EMISSIONS

Pollutant	Factor		Emission Rates	
	(lb poll./ton coal)	(lb/hr)	(lb/yr)	(tpy)
Acetaldehyde	5.70E-04	7.11E-03	3.33E+01	1.66E-02
Acetophenone	1.50E-05	1.87E-04	8.75E-01	4.38E-04
Acrolein	2.90E-04	3.62E-03	1.69E+01	8.46E-03
Arsenic	5.24E-03	1.31E-04	6.12E-01	3.06E-04
Benzene	1.30E-03	1.62E-02	7.58E+01	3.79E-02
Benzo(a)pyrene	3.80E-08	4.74E-07	2.22E-03	1.11E-06
Benzyl chloride	7.00E-04	8.74E-03	4.08E+01	2.04E-02
Beryllium	4.87E-04	6.08E-03	2.84E+01	1.42E-02
Biphenyl	1.70E-06	2.12E-05	9.92E-02	4.96E-05
Bis(2-ethylhexyl)phthalate (DEHP)	7.30E-05	9.11E-04	4.26E+00	2.13E-03
Bromine	1.06E-01	2.65E-03	1.24E+01	6.19E-03
Bromoform	3.90E-05	4.87E-04	2.28E+00	1.14E-03
Cadmium	2.13E-04	5.33E-06	2.49E-02	1.24E-05
Carbon disulfide	1.30E-04	1.62E-03	7.58E+00	3.79E-03
2-Chloroacetophenone	7.00E-06	8.74E-05	4.08E-01	2.04E-04
Chlorobenzene	2.20E-05	2.75E-04	1.28E+00	6.42E-04
Chloroform	5.90E-05	7.36E-04	3.44E+00	1.72E-03
Chromium	8.38E-03	2.09E-04	9.77E-01	4.89E-04
Chromium (VI)	8.38E-03	2.09E-04	9.77E-01	4.89E-04
Cumene	5.30E-06	6.62E-05	3.09E-01	1.55E-04
Cyanide	2.50E-03	3.12E-02	1.46E+02	7.29E-02
Dibenzofurans	2.01E-07	2.51E-06	1.17E-02	5.86E-06
Dimethyl sulfate	4.80E-05	5.99E-04	2.80E+00	1.40E-03
2,4-Dinitrotoluene	2.80E-07	3.50E-06	1.63E-02	8.17E-06
Ethyl benzene	9.40E-05	1.17E-03	5.48E+00	2.74E-03
Ethyl chloride	4.20E-05	5.24E-04	2.45E+00	1.23E-03
Ethylene dibromide	1.20E-06	1.50E-05	7.00E-02	3.50E-05
Ethylene dichloride	4.00E-05	4.99E-04	2.33E+00	1.17E-03
Formaldehyde	2.40E-04	3.00E-03	1.40E+01	7.00E-03
Hexane	6.70E-05	8.36E-04	3.91E+00	1.95E-03
Hydrogen Chloride ***	7.47E-01	9.32E+00	4.36E+04	2.18E+01
Hydrogen Fluoride ***	4.40E-02	5.49E-01	2.57E+03	1.28E+00
Isophorone	5.80E-04	7.24E-03	3.38E+01	1.69E-02
Lead	3.38E-03	8.44E-05	3.94E-01	1.97E-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

2006 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	1.45E-02	3.61E-04	1.69E+00	8.44E-04
Mercury***	3.73E-05	4.65E-04	2.17E+00	1.09E-03
Methyl bromide	1.60E-04	2.00E-03	9.33E+00	4.67E-03
Methyl chloride	5.30E-04	6.62E-03	3.09E+01	1.55E-02
Methyl ethyl ketone	3.90E-04	4.87E-03	2.28E+01	1.14E-02
Methyl hydrazine	1.70E-04	2.12E-03	9.92E+00	4.96E-03
Methyl methacrylate	2.00E-05	2.50E-04	1.17E+00	5.83E-04
Methyl tert butyl ether	3.50E-05	4.37E-04	2.04E+00	1.02E-03
Methylene chloride	2.90E-04	3.62E-03	1.69E+01	8.46E-03
Naphthalene	1.30E-05	1.62E-04	7.58E-01	3.79E-04
Nickel	6.89E-03	1.72E-04	8.03E-01	4.02E-04
Phenol	1.60E-05	2.00E-04	9.33E-01	4.67E-04
POM	5.80E-05	7.24E-04	3.38E+00	1.69E-03
Propionaldehyde	3.80E-04	4.74E-03	2.22E+01	1.11E-02
Styrene	2.50E-05	3.12E-04	1.46E+00	7.29E-04
2,3,7,8-TCDD	1.43E-11	1.78E-10	8.34E-07	4.17E-10
Tetrachloroethylene	4.30E-05	5.37E-04	2.51E+00	1.25E-03
Toluene	2.40E-04	3.00E-03	1.40E+01	7.00E-03
1,1,1-Trichloroethane	2.00E-05	2.50E-04	1.17E+00	5.83E-04
Vinyl acetate	7.60E-06	9.49E-05	4.43E-01	2.22E-04
Xylenes	3.70E-05	4.62E-04	2.16E+00	1.08E-03
Total HAPs		10.00	46,719.76	23.36

Version 5b-1.0k by Tony Pendola; 06/17/97

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
2006 Annual Emissions Inventory**

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

Operating Scenario #2

Facility ID # 6800043
Permit # 03069T20

User Input	Emissions Output (for operation 18.53 hr/yr)																																																																																				
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University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 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 2006 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 2006	0.08
February 2006	0.09
March 2006	0.11
April 2006	0.12
May 2006	0.12
June 2006	0.12
July 2006	0.13
August 2006	0.12
September 2006	0.12
October 2006	0.12
November 2006	0.17
December 2006	0.16
Annual Average	0.122

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 2006

Boiler #6		
Coal Tons/yr	Gas 1,000cf/yr	No. 2 Oil Gallons/yr
58,337	4,489	12,962
Coal (12,945 btu/lb)	Nat. Gas (1,030 btu/cf)	Oil (137,006 btu/gal)
MMBtu/yr		
1.51E+06	4.62E+03	1.78E+03

Total for Boiler #6 (MMBtu/yr)	1.52E+06
--------------------------------	----------

Total SO ₂ Emissions from Boiler #6 (lb/yr)	184,537
Total SO₂ Emissions from Boiler #6 (ton/yr)	92.27

SO ₂ Emissions Associated with Coal Combustion (ton/yr)	92.16
SO ₂ Emissions Associated with No. 2 Fuel Oil Combustion (ton/yr)	0.11

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 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 2006 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 2006	0.39
February 2006	0.42
March 2006	0.32
April 2006	0.39
May 2006	0.35
June 2006	0.34
July 2006	0.38
August 2006	0.38
September 2006	0.30
October 2006	0.30
November 2006	0.38
December 2006	0.41
Annual Average	0.36

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 2006

Boiler #6		
Coal Tons/yr	Gas 1,000cf/yr	No. 2 Oil Gallons/yr
58,337	4,489	12,962
Coal (12,945 btu/lb)	Nat. Gas (1,030 btu/cf)	Oil (137,006 btu/gal)
MMBtu/yr		
1.51E+06	4.62E+03	1.78E+03

Total for Boiler #6 (MMBtu/yr)	1.52E+06
--------------------------------	----------

Total NOx Emissions from Boiler #6 (lb/yr)	551,985
Total NOx Emissions from Boiler #6 (ton/yr)	275.99

NOx Emissions Associated with Coal Combustion (ton/yr)	274.83
NOx Emissions Associated with Fuel Oil No. 2 Combustion (ton/yr)	0.32
NOx Emissions Associated with Natural Gas Combustion (ton/yr)	0.84

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 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)

The boilers 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 2006 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 Spreadsheets

Emission Source/Operating Scenario Data Page 1 of 2		Facility ID #: 680043					
Boiler #7 - 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)		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 2006							
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 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	0.50%				
		% 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%					
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	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 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 #: 03069T20

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 2006**

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	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	0.000	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

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 #: **03069T20**

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 2006**

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 <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>			55,708			tons/yr	
6. Fuel Information (if fuel used)		% Sulfur	1.39%	% Ash	9.80%	Heat Content (Btu/lb or mmCF)	12945 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 # <small>(as listed in permit)</small>	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 <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	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	29.96%	Mar-May	16.15%	June-Aug	28.11%	Sept-Nov	25.78%
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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 Name: University of North Carolina at Chapel HillFacility ID #: 6800043Permit #: 03069T20County: OrangeDAQ Region: Raleigh

**North Carolina Department of Environment and Natural Resources
Division of Air Quality
Air Pollutant Point Source Emissions Inventory - Calendar Year 2006**

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	501.38	8	N/A
NOx	NOx	256.01	1	N/A
PM Total	PM	1.38	8	99.80%
PM-2.5	PM-2.5	0.82	8	97.90%
PM-10	PM-10	1.38	8	99.60%
SO2	SO2	89.44	1	90.00%
VOC	VOC	1.39	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	31.75	8	N/A
Acetophenone	98-86-2	0.84	8	N/A
Acrolein	107-02-8	16.16	8	N/A
Arsenic	ARSENICPDS	0.58	8	99.60%
Benzene	71-43-2	72.42	8	N/A
Benzo(a)pyrene	50-32-8	2.12E-03	8	N/A
Benzyl chloride	100-44-7	39.00	8	N/A
Beryllium	BERYLCPDS	27.12	8	N/A
Biphenyl	92-52-4	9.47E-02	8	N/A
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	4.07	8	N/A
Bromine	7726-95-6	11.83	8	99.60%
Bromoform	75-25-2	2.17	8	N/A
Cadmium	CADMIUMCPDS	2.38E-02	8	99.60%
Carbon disulfide	75-10-0	7.24	8	N/A
2-Chloroacetophenone	532-27-4	0.39	8	N/A
Chlorobenzene	108-90-7	1.23	8	N/A
Chloroform	67-66-3	3.29	8	N/A
Chromium	CROMCPDS	0.93	8	99.60%
Chromium (VI)	CHROM6CPDS	0.93	8	99.60%
Cumene	98-82-8	0.30	8	N/A
Cyanide	CNC	139.27	8	N/A
Dibenzofurans	132-64-9	1.12E-02	8	N/A
Dimethyl sulfate	77-78-1	2.67	8	N/A
2,4-Dinitrotoluene	121-14-2	1.56E-02	8	N/A
Ethyl benzene	100-41-4	5.24	8	N/A
Ethyl chloride	75-00-3	2.34	8	N/A
Ethylene dibromide	106-93-4	6.69E-02	8	N/A
Ethylene dichloride	107-06-2	2.23	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 ID #: **6800043**Permit #: **03069T20**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 2006**

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	13.37	8	N/A
Hexane	HEXANEISO	3.73	8	N/A
Hydrogen Chloride ***	7647-01-0	55262.68	8	N/A
Hydrogen Fluoride ***	7664-39-3	2451.17	8	90% Control with CaCO ₃
Isophorone	78-59-1	32.31	8	N/A
Lead	LEADCPDS	0.38	8	99.60%
Manganese	MANGCPDS	1.61	8	99.60%
Mercury***	MERCCPDS	2.08	8	N/A
Methyl bromide	74-83-9	8.91	8	N/A
Methyl chloride	74-87-3	29.53	8	N/A
Methyl ethyl ketone	78-93-3	21.73	8	N/A
Methyl hydrazine	60-34-4	9.47	8	N/A
Methyl methacrylate	80-62-6	1.11	8	N/A
Methyl tert butyl ether	1634-04-4	1.95	8	N/A
Methylene chloride	75-09-2	16.16	8	N/A
Naphthalene	91-20-3	0.72	8	N/A
Nickel	NICKCPDS	0.77	8	99.60%
Phenol	108-95-2	0.89	8	N/A
POM	POM	3.23	8	N/A
Propionaldehyde	123-38-6	21.17	8	N/A
Styrene	100-42-5	1.39	8	N/A
2,3,7,8-TCDD	1746-01-6	7.97E-07	8	N/A
Tetrachloroethylene	79-34-5	2.40	8	N/A
Toluene	108-88-3	13.37	8	N/A
1,1,1-Trichloroethane	79-00-5	1.11	8	N/A
Vinyl acetate	108-05-4	0.42	8	N/A
Xylenes	1330-20-7	2.06	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.

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 #: 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 2006							
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>		7,865	1,000 ft³/yr				
6. Fuel Information (if fuel used)	% Sulfur	N/A	% Ash				
		N/A	Heat Content (Btu/lb or mmCF)				
			1,030 Btu/ft³				
<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 (CaCO₃) 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	3.44%	Mar-May	23.79%	June-Aug	13.89%	Sept-Nov	58.88%

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 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 2006

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	0.33	8	N/A
NOx	NOx	1.44	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	1.57E-03	8	N/A
Benzene	71-43-2	0.02	8	N/A
Cadmium	CADMIUMCPDS	8.65E-03	8	N/A
Chromium	CROMCPDS	1.10E-02	8	N/A
Chromium VI	CHROM6CPDS	1.10E-02	8	N/A
Dichlorobenzene	106-46-7	9.44E-03	8	N/A
Formaldehyde	50-00-0	0.59	8	N/A
Hexane	HEXANEISO	1.42E+01	8	N/A
Lead	LEADCPDS	3.93E-03	8	N/A
Manganese	MANGCPDS	2.99E-03	8	N/A
Mercury	MERCPDS	2.04E-03	8	N/A
Napthalene	91-20-3	4.80E-03	8	N/A
Nickel	NICKCPDS	0.02	8	N/A
POM	POM	5.20E-03	8	N/A
Toluene	108-88-3	0.03	8	N/A

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 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
2006 Annual Emissions Inventory
Boiler #7
(ES-002-Boiler #7)
Facility ID # 6800043
Permit # 03069T20

Operating Scenario #4 - No.2 Fuel Oil

User Input	
Company Name:	University of North Carolina at
Plant County:	Chapel Hill
Plant City:	Orange County
Permit Number:	Chapel Hill
User:	03069T20
Heat Input Capacity (mmBtu/hr):	RST Engineering
Fuel Input Capacity (10 ³ gal/hr):	323.17
Annual Fuel Throughput (1000 gal):	2.31
Maximum fuel sulfur content (%):	0.000
Latest Construction/Modification Date:	0.5
	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

Emission Controls

Particulate controls

Enter the control type below ▾	Message Area	Or enter a PM control efficiency below to override built in values.														
	3															
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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

Criteria Pollutants

Pollutant	lb/hr ²	tpy	lb/yr ³	Emission Factor ¹ (lb/10 ³ gal)
Total PM (FPM + CPM)	3.0	0.0000	0	3.30E+00
Filterable PM (FPM) rates @ 99% control	0.0	0.0000	0	2.00E+00
Condensable PM (CPM) ⁴	3.0	0.0000	0	1.30E+00
Filterable PM-10 ⁵	0.0	0.0000	0	1.00E+00
Filterable PM-2.5 ⁵	0.0	0.0000	0	2.50E-01
NO _x rates uncontrolled	**	**	**	2.40E+01
NMTOC	0	0.0000	0	2.00E-01
CO	12	0.0000	0	5.00E+00
SO ₂ rates @ 90% control	**	**	**	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.

Pollutant	lb/hr ²	lb/day ⁷	lb/yr ³	Emission Factor ¹ (lb/10 ³ gal)
Antimony rates @ 99% control	0.00E+00	NA	0.00E+00	0.00E+00
Arsenic rates @ 99% control	1.29E-05	NA	0.00E+00	5.60E-04
Benzene	6.35E-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

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

Bituminous Coal Combustion

2006 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
 ton/yr

Sulfur Content %

Ash Content : %

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

Calcium to Sulfur Ratio

Boiler Type:

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

Control Device Efficiencies:

PM	99.80	%
PM-10	99.60	%
PM-2.5	97.90	%
SOx*	90.00	%
NOx*	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

2006 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	0.62	2,763	1.38
PM-10	12.4	0.62	2,763	1.38
PM-2.5*	1.4	0.37	1,638	0.82
SO2	12.10	**	**	**
SO3*	0.08	**	**	**
NOx	3.90	**	**	**
VOC	0.05	0.62	2,785	1.39
CO	18	224.68	1,002,750	501.38

ACTUAL TOXIC EMISSIONS

Pollutant	Factor		Emission Rates	
	(lb poll./ton coal)	(lb/hr)	(lb/yr)	(tpy)
Acetaldehyde	5.70E-04	7.11E-03	3.18E+01	1.59E-02
Acetophenone	1.50E-05	1.87E-04	8.36E-01	4.18E-04
Acrolein	2.90E-04	3.62E-03	1.62E+01	8.08E-03
Arsenic	5.24E-03	1.31E-04	5.84E-01	2.92E-04
Benzene	1.30E-03	1.62E-02	7.24E+01	3.62E-02
Benzo(a)pyrene	3.80E-08	4.74E-07	2.12E-03	1.06E-06
Benzyl chloride	7.00E-04	8.74E-03	3.90E+01	1.95E-02
Beryllium	4.87E-04	6.08E-03	2.71E+01	1.36E-02
Biphenyl	1.70E-06	2.12E-05	9.47E-02	4.74E-05
Bis(2-ethylhexyl)phthalate (DEHP)	7.30E-05	9.11E-04	4.07E+00	2.03E-03
Bromine	1.06E-01	2.65E-03	1.18E+01	5.91E-03
Bromoform	3.90E-05	4.87E-04	2.17E+00	1.09E-03
Cadmium	2.13E-04	5.33E-06	2.38E-02	1.19E-05
Carbon disulfide	1.30E-04	1.62E-03	7.24E+00	3.62E-03
2-Chloroacetophenone	7.00E-06	8.74E-05	3.90E-01	1.95E-04
Chlorobenzene	2.20E-05	2.75E-04	1.23E+00	6.13E-04
Chloroform	5.90E-05	7.36E-04	3.29E+00	1.64E-03
Chromium	8.38E-03	2.09E-04	9.33E-01	4.67E-04
Chromium (VI)	8.38E-03	2.09E-04	9.33E-01	4.67E-04
Cumene	5.30E-06	6.62E-05	2.95E-01	1.48E-04
Cyanide	2.50E-03	3.12E-02	1.39E+02	6.96E-02
Dibenzofurans	2.01E-07	2.51E-06	1.12E-02	5.60E-06
Dimethyl sulfate	4.80E-05	5.99E-04	2.67E+00	1.34E-03
2,4-Dinitrotoluene	2.80E-07	3.50E-06	1.56E-02	7.80E-06
Ethyl benzene	9.40E-05	1.17E-03	5.24E+00	2.62E-03
Ethyl chloride	4.20E-05	5.24E-04	2.34E+00	1.17E-03
Ethylene dibromide	1.20E-06	1.50E-05	6.69E-02	3.34E-05
Ethylene dichloride	4.00E-05	4.99E-04	2.23E+00	1.11E-03
Formaldehyde	2.40E-04	3.00E-03	1.34E+01	6.69E-03
Hexane	6.70E-05	8.36E-04	3.73E+00	1.87E-03
Hydrogen Chloride ***	9.92E-01	1.24E+01	5.53E+04	2.76E+01
Hydrogen Fluoride ***	4.40E-02	5.49E-01	2.45E+03	1.23E+00
Isophorone	5.80E-04	7.24E-03	3.23E+01	1.62E-02
Lead	3.38E-03	8.44E-05	3.77E-01	1.88E-04

**SO₂ and NOx emissions were estimated using CEMS data, please refer to the attached data sheets entitled "Sulfur Dioxide Emissions from Boiler #7" and Nitrogen Dioxide Emissions from Boiler #7".

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

Bituminous Coal Combustion

2006 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	1.45E-02	3.61E-04	1.61E+00	8.06E-04
Mercury***	3.73E-05	4.65E-04	2.08E+00	1.04E-03
Methyl bromide	1.60E-04	2.00E-03	8.91E+00	4.46E-03
Methyl chloride	5.30E-04	6.62E-03	2.95E+01	1.48E-02
Methyl ethyl ketone	3.90E-04	4.87E-03	2.17E+01	1.09E-02
Methyl hydrazine	1.70E-04	2.12E-03	9.47E+00	4.74E-03
Methyl methacrylate	2.00E-05	2.50E-04	1.11E+00	5.57E-04
Methyl tert butyl ether	3.50E-05	4.37E-04	1.95E+00	9.75E-04
Methylene chloride	2.90E-04	3.62E-03	1.62E+01	8.08E-03
Naphthalene	1.30E-05	1.62E-04	7.24E-01	3.62E-04
Nickel	6.89E-03	1.72E-04	7.67E-01	3.84E-04
Phenol	1.60E-05	2.00E-04	8.91E-01	4.46E-04
POM	5.80E-05	7.24E-04	3.23E+00	1.62E-03
Propionaldehyde	3.80E-04	4.74E-03	2.12E+01	1.06E-02
Styrene	2.50E-05	3.12E-04	1.39E+00	6.96E-04
2,3,7,8-TCDD	1.43E-11	1.78E-10	7.97E-07	3.98E-10
Tetrachloroethylene	4.30E-05	5.37E-04	2.40E+00	1.20E-03
Toluene	2.40E-04	3.00E-03	1.34E+01	6.69E-03
1,1,1-Trichloroethane	2.00E-05	2.50E-04	1.11E+00	5.57E-04
Vinyl acetate	7.60E-06	9.49E-05	4.23E-01	2.12E-04
Xylenes	3.70E-05	4.62E-04	2.06E+00	1.03E-03
Total HAPs		13.05	58,263.16	29.13

Version 5b-1.0k by Tony Pendola; 06/17/97

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
2006 Annual Emissions Inventory
Boiler #7
(ES-002-Boiler #7)

Facility ID # 6800043
 Permit # 03069T20

Operating Scenario #2

User Input	Emissions Output (for operation 19.22 hr/yr)																																																																																																																																		
<p>Company Name: University of North Carolina at Chapel Hill</p> <p>Plant County: Orange County</p> <p>Plant City: Chapel Hill</p> <p>Permit Number: 03069T20</p> <p>User: RST Engineering</p> <p>Heat Input Capacity (mmBtu/hr): 323.17</p> <p>Fuel Input Capacity (10⁶ scf/hr): 0.32</p> <p>Annual Fuel Throughput (10⁶ scf): 7.86</p> <p>Latest Construction/Modification Date: N/A</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Criteria Pollutants</th> <th>lb/hr</th> <th>lb/yr</th> <th>tpy</th> <th>Emission Factor (lb/mmscf)</th> </tr> </thead> <tbody> <tr><td>PM</td><td>2.4E+00</td><td>6.0E+01</td><td>3.0E-02</td><td>7.6E+00</td></tr> <tr><td>PM-10</td><td>2.4E+00</td><td>6.0E+01</td><td>3.0E-02</td><td>7.6E+00</td></tr> <tr><td>PM-2.5</td><td>2.4E+00</td><td>6.0E+01</td><td>3.0E-02</td><td>7.6E+00</td></tr> <tr><td>NOx</td><td>**</td><td>**</td><td>**</td><td>1.9E+02</td></tr> <tr><td>VOC</td><td>1.7E+00</td><td>4.3E+01</td><td>2.2E-02</td><td>5.5E+00</td></tr> <tr><td>CO</td><td>2.7E+01</td><td>6.6E+02</td><td>3.3E-01</td><td>8.4E+01</td></tr> <tr><td>SO2</td><td>**</td><td>**</td><td>**</td><td>6.0E-01</td></tr> <tr><td>Total HAP</td><td>6.0E-01</td><td>1.5E+01</td><td>7.4E-03</td><td>1.9E+00</td></tr> <tr><td>Largest HAP</td><td>5.7E-01</td><td>1.4E+01</td><td>7.1E-03</td><td>1.8E+00</td></tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Toxic/Hazardous Air Pollutants</th> <th>lb/hr</th> <th>lb/day</th> <th>lb/yr</th> <th>Emission Factor (lb/mmscf)</th> </tr> </thead> <tbody> <tr><td>Arsenic</td><td>6.3E-05</td><td>NA</td><td>1.6E-03</td><td>2.0E-04</td></tr> <tr><td>Benzene</td><td>6.7E-04</td><td>NA</td><td>1.7E-02</td><td>2.1E-03</td></tr> <tr><td>Cadmium</td><td>3.5E-04</td><td>NA</td><td>8.7E-03</td><td>1.1E-03</td></tr> <tr><td>Chromium</td><td>4.4E-04</td><td>NA</td><td>1.1E-02</td><td>1.4E-03</td></tr> <tr><td>Chromium VI</td><td>4.4E-04</td><td>NA</td><td>1.1E-02</td><td>1.4E-03</td></tr> <tr><td>Dichlorobenzene</td><td>3.8E-04</td><td>NA</td><td>9.4E-03</td><td>1.2E-03</td></tr> <tr><td>Formaldehyde</td><td>2.4E-02</td><td>NA</td><td>5.9E-01</td><td>7.5E-02</td></tr> <tr><td>Hexane</td><td>5.7E-01</td><td>1.4E+01</td><td>1.4E+01</td><td>1.8E+00</td></tr> <tr><td>Lead</td><td>1.6E-04</td><td>NA</td><td>3.9E-03</td><td>5.0E-04</td></tr> <tr><td>Manganese</td><td>1.2E-04</td><td>2.9E-03</td><td>3.0E-03</td><td>3.8E-04</td></tr> <tr><td>Mercury</td><td>8.2E-05</td><td>2.0E-03</td><td>2.0E-03</td><td>2.6E-04</td></tr> <tr><td>Naphthalene</td><td>1.9E-04</td><td>NA</td><td>4.8E-03</td><td>6.1E-04</td></tr> <tr><td>Nickel</td><td>6.7E-04</td><td>1.6E-02</td><td>1.7E-02</td><td>2.1E-03</td></tr> <tr><td>POM</td><td>2.1E-04</td><td>NA</td><td>5.2E-03</td><td>6.6E-04</td></tr> <tr><td>Toluene</td><td>1.1E-03</td><td>2.6E-02</td><td>2.7E-02</td><td>3.4E-03</td></tr> </tbody> </table>	Criteria Pollutants	lb/hr	lb/yr	tpy	Emission Factor (lb/mmscf)	PM	2.4E+00	6.0E+01	3.0E-02	7.6E+00	PM-10	2.4E+00	6.0E+01	3.0E-02	7.6E+00	PM-2.5	2.4E+00	6.0E+01	3.0E-02	7.6E+00	NOx	**	**	**	1.9E+02	VOC	1.7E+00	4.3E+01	2.2E-02	5.5E+00	CO	2.7E+01	6.6E+02	3.3E-01	8.4E+01	SO2	**	**	**	6.0E-01	Total HAP	6.0E-01	1.5E+01	7.4E-03	1.9E+00	Largest HAP	5.7E-01	1.4E+01	7.1E-03	1.8E+00	Toxic/Hazardous Air Pollutants	lb/hr	lb/day	lb/yr	Emission Factor (lb/mmscf)	Arsenic	6.3E-05	NA	1.6E-03	2.0E-04	Benzene	6.7E-04	NA	1.7E-02	2.1E-03	Cadmium	3.5E-04	NA	8.7E-03	1.1E-03	Chromium	4.4E-04	NA	1.1E-02	1.4E-03	Chromium VI	4.4E-04	NA	1.1E-02	1.4E-03	Dichlorobenzene	3.8E-04	NA	9.4E-03	1.2E-03	Formaldehyde	2.4E-02	NA	5.9E-01	7.5E-02	Hexane	5.7E-01	1.4E+01	1.4E+01	1.8E+00	Lead	1.6E-04	NA	3.9E-03	5.0E-04	Manganese	1.2E-04	2.9E-03	3.0E-03	3.8E-04	Mercury	8.2E-05	2.0E-03	2.0E-03	2.6E-04	Naphthalene	1.9E-04	NA	4.8E-03	6.1E-04	Nickel	6.7E-04	1.6E-02	1.7E-02	2.1E-03	POM	2.1E-04	NA	5.2E-03	6.6E-04	Toluene	1.1E-03	2.6E-02	2.7E-02	3.4E-03
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CO	2.7E+01	6.6E+02	3.3E-01	8.4E+01																																																																																																																															
SO2	**	**	**	6.0E-01																																																																																																																															
Total HAP	6.0E-01	1.5E+01	7.4E-03	1.9E+00																																																																																																																															
Largest HAP	5.7E-01	1.4E+01	7.1E-03	1.8E+00																																																																																																																															
Toxic/Hazardous Air Pollutants	lb/hr	lb/day	lb/yr	Emission Factor (lb/mmscf)																																																																																																																															
Arsenic	6.3E-05	NA	1.6E-03	2.0E-04																																																																																																																															
Benzene	6.7E-04	NA	1.7E-02	2.1E-03																																																																																																																															
Cadmium	3.5E-04	NA	8.7E-03	1.1E-03																																																																																																																															
Chromium	4.4E-04	NA	1.1E-02	1.4E-03																																																																																																																															
Chromium VI	4.4E-04	NA	1.1E-02	1.4E-03																																																																																																																															
Dichlorobenzene	3.8E-04	NA	9.4E-03	1.2E-03																																																																																																																															
Formaldehyde	2.4E-02	NA	5.9E-01	7.5E-02																																																																																																																															
Hexane	5.7E-01	1.4E+01	1.4E+01	1.8E+00																																																																																																																															
Lead	1.6E-04	NA	3.9E-03	5.0E-04																																																																																																																															
Manganese	1.2E-04	2.9E-03	3.0E-03	3.8E-04																																																																																																																															
Mercury	8.2E-05	2.0E-03	2.0E-03	2.6E-04																																																																																																																															
Naphthalene	1.9E-04	NA	4.8E-03	6.1E-04																																																																																																																															
Nickel	6.7E-04	1.6E-02	1.7E-02	2.1E-03																																																																																																																															
POM	2.1E-04	NA	5.2E-03	6.6E-04																																																																																																																															
Toluene	1.1E-03	2.6E-02	2.7E-02	3.4E-03																																																																																																																															
<p>Enter the boiler type below ▾</p> <p style="text-align: right;">2</p>																																																																																																																																			
<p>Other NOx Control</p> <p style="text-align: right;">4</p>																																																																																																																																			
<p>Large Wall-Fired Boilers (=>100 mmBtu/hr)</p> <p>1 = Uncontrolled (Pre-NSPS)</p> <p>2 = Uncontrolled (Post-NSPS)</p> <p>3 = Controlled - Low NOx burners</p> <p>4 = Controlled - Flue gas recirculation (FGR)</p>																																																																																																																																			
<p>Small Boilers (<100 mmBtu/hr)</p> <p>5 = Uncontrolled</p> <p>6 = Controlled - Low NOx burners</p> <p>7 = Controlled - Low NOx burners/FGR</p>																																																																																																																																			
<p>Tangential-Fired Boilers (All Sizes)</p> <p>8 = Uncontrolled</p> <p>9 = Controlled - FGR</p>																																																																																																																																			
<p>Residential Furnaces (<0.3 mmBtu/hr)</p> <p>10 = Uncontrolled</p>																																																																																																																																			
	<p>** SOx and NOx emissions were estimated using CEMS data, please refer to the attached spreadsheets.</p> <p>Hourly emission rates for all pollutants based on hourly rated capacity.</p> <p>NG2000 Revision C dated March 9, 2000</p>																																																																																																																																		

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 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 2006 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 2006	0.080
February 2006	0.090
March 2006	0.120
April 2006	0.110
May 2006	0.120
June 2006	0.120
July 2006	0.140
August 2006	0.120
September 2006	0.130
October 2006	0.110
November 2006	0.170
December 2006	0.170
Annual Average	0.123

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 #7 for 2006

Boiler #7		
Coal Tons/yr	Gas 1,000cf/yr	No. 2 Oil Gallons/yr
55,708	7,865	0
Coal (12,945 btu/lb)	Nat. Gas (1,030 btu/cf)	Oil (137,006 btu/gal)
MMBtu/yr		
1.44E+06	8.10E+03	0.00E+00

Total for Boiler #7 (MMBtu/yr)	1.45E+06
--------------------------------	----------

Total SO ₂ Emissions from Boiler #7 (lb/yr)	178,881
Total SO₂ Emissions from Boiler #7 (ton/yr)	89.441

SO ₂ Emissions Associated with Coal Combustion (ton/yr)	89.44
SO ₂ Emissions Associated with No. 2 Fuel Oil Combustion (ton/yr)	0.00000

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 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 2006 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 2006	0.45
February 2006	0.44
March 2006	0.33
April 2006	0.31
May 2006	0.29
June 2006	0.23
July 2006	0.32
August 2006	0.37
September 2006	0.27
October 2006	0.39
November 2006	0.40
December 2006	0.46
Annual Average	0.36

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 2006

Boiler #7		
Coal Tons/yr	Gas 1,000cf/yr	No. 2 Oil Gallons/yr
55,708	7,865	0
Coal (12,945 btu/lb)	Nat. Gas (1,030 btu/cf)	Oil (137,006 btu/gal)
MMBtu/yr		
1.44E+06	8.10E+03	0.00E+00

Total for Boiler #7 (MMBtu/yr)	1.45E+06
--------------------------------	----------

NOx Emissions from Boiler #7 (lb/yr)	514,888
NOx Emissions from Boiler #7 (ton/yr)	257.44

NOx Emissions Associated with Coal Combustion (ton/yr)	256.01
NOx Emissions Associated with Fuel Oil No. 2 Combustion (ton/yr)	0.0000
NOx Emissions Associated with Natural Gas Combustion (ton/yr)	1.44

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 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 #: **03069T20**
 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 2006

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)		13,397			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	47%	Mar-May	39%	June-Aug	3%	Sept-Nov	11%
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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 #: **03069T20**
 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 2006

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	0.56	8	N/A
NOx	NOx	0.41	8	N/A
PM Total	PM	0.05	8	N/A
PM-2.5	PM-2.5	0.05	8	N/A
PM-10	PM-10	0.05	8	N/A
SO2	SO2	0.00	8	N/A
VOC	VOC	0.04	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	ARSENICCPDS	2.68E-03	8	N/A
Benzene	71-43-2	0.03	8	N/A
Cadmium	CADMIUMCPDS	1.47E-02	8	N/A
Chromium	CROMCPDS	1.88E-02	8	N/A
Chromium VI	CHROM6CPDS	1.88E-02	8	N/A
Dichlorobenzene	106-46-7	1.61E-02	8	N/A
Formaldehyde	50-00-0	1.00	8	N/A
Hexane	HEXANEISO	2.41E+01	8	N/A
Lead	LEADCPDS	6.70E-03	8	N/A
Manganese	MANGCPDS	5.09E-03	8	N/A
Mercury	MERCPDS	3.48E-03	8	N/A
Napthalene	91-20-3	8.17E-03	8	N/A
Nickel	NICKCPDS	0.03	8	N/A
POM	POM	8.87E-03	8	N/A
Toluene	108-88-3	0.05	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 #: **03069T20**

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 2006

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)			5,314			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	100%	Mar-May	0%	June-Aug	0%	Sept-Nov	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 #: **03069T20**
 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 2006**

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	0.01	8	N/A
NOx	NOx	0.02	8	N/A
PM Total	PM	0.01	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	0.07	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	2.98E-03	8	N/A
Benzene	71-43-2	1.46E-02	8	N/A
Beryllium	BERYLCPDS	2.23E-03	8	N/A
Cadmium	CADMIUMCPDS	2.23E-03	8	N/A
Chromium	CROMCPDS	2.23E-03	8	N/A
Chromium VI	CHROM6CPDS	6.55E-04	8	N/A
Ethylbenzene	100-41-4	4.34E-03	8	N/A
Fluoride	16984-48-8	0.20	8	N/A
Formaldehyde	50-00-0	0.26	8	N/A
Lead	LEADCPDS	6.70E-03	8	N/A
Manganese	MANGCPDS	4.46E-03	8	N/A
Mercury	MERCPDS	2.23E-03	8	N/A
Methyl chloroform	71-55-6	1.25E-03	8	N/A
Napthalene	91-20-3	0.0018	8	N/A
Nickel	NICKCPDS	2.23E-03	8	N/A
POM	POM	1.75E-02	8	N/A
Selenium	SEC	1.12E-02	8	N/A
Toluene	108-88-3	0.42	8	N/A
Xylene	1330-20-7	7.44E-03	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
2006 Annual Emissions Inventory
Boiler #8
(ES-003-Boiler #8)

Facility ID # 6800043
 Permit # 03069T20

Operating Scenario #1

User Input	Emissions Output																																																																																
<p>Company Name: University of North Carolina at Chapel Hill</p> <p>Plant County: Orange County</p> <p>Plant City: Chapel Hill</p> <p>Permit Number: 03069T20</p> <p>User: RST Engineering</p> <p>Heat Input Capacity (mmBtu/hr): 338</p> <p>Fuel Input Capacity (10⁶ scf/hr): 0.33</p> <p>Annual Fuel Throughput (10⁶ scf): 13.40</p> <p>Latest Construction/Modification Date: N/A</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Criteria Pollutants</th> <th>lb/hr</th> <th>lb/yr</th> <th>tpy</th> <th>Emission Factor (lb/mmscf)</th> </tr> </thead> <tbody> <tr><td>PM</td><td>2.5E+00</td><td>1.0E+02</td><td>5.1E-02</td><td>7.6E+00</td></tr> <tr><td>PM-10</td><td>2.5E+00</td><td>1.0E+02</td><td>5.1E-02</td><td>7.6E+00</td></tr> <tr><td>PM-2.5</td><td>2.5E+00</td><td>1.0E+02</td><td>5.1E-02</td><td>7.6E+00</td></tr> <tr><td>NOx</td><td>**</td><td>**</td><td>**</td><td>1.9E+02</td></tr> <tr><td>VOC</td><td>1.8E+00</td><td>7.4E+01</td><td>3.7E-02</td><td>5.5E+00</td></tr> <tr><td>CO</td><td>2.8E+01</td><td>1.1E+03</td><td>5.6E-01</td><td>8.4E+01</td></tr> <tr><td>SO2</td><td>2.0E-01</td><td>8.0E+00</td><td>4.0E-03</td><td>6.0E-01</td></tr> <tr><td>Total HAP</td><td>6.3E-01</td><td>2.5E+01</td><td>1.3E-02</td><td>1.9E+00</td></tr> <tr><td>Largest HAP</td><td>6.0E-01</td><td>2.4E+01</td><td>1.2E-02</td><td>1.8E+00</td></tr> </tbody> </table>	Criteria Pollutants	lb/hr	lb/yr	tpy	Emission Factor (lb/mmscf)	PM	2.5E+00	1.0E+02	5.1E-02	7.6E+00	PM-10	2.5E+00	1.0E+02	5.1E-02	7.6E+00	PM-2.5	2.5E+00	1.0E+02	5.1E-02	7.6E+00	NOx	**	**	**	1.9E+02	VOC	1.8E+00	7.4E+01	3.7E-02	5.5E+00	CO	2.8E+01	1.1E+03	5.6E-01	8.4E+01	SO2	2.0E-01	8.0E+00	4.0E-03	6.0E-01	Total HAP	6.3E-01	2.5E+01	1.3E-02	1.9E+00	Largest HAP	6.0E-01	2.4E+01	1.2E-02	1.8E+00																														
Criteria Pollutants	lb/hr	lb/yr	tpy	Emission Factor (lb/mmscf)																																																																													
PM	2.5E+00	1.0E+02	5.1E-02	7.6E+00																																																																													
PM-10	2.5E+00	1.0E+02	5.1E-02	7.6E+00																																																																													
PM-2.5	2.5E+00	1.0E+02	5.1E-02	7.6E+00																																																																													
NOx	**	**	**	1.9E+02																																																																													
VOC	1.8E+00	7.4E+01	3.7E-02	5.5E+00																																																																													
CO	2.8E+01	1.1E+03	5.6E-01	8.4E+01																																																																													
SO2	2.0E-01	8.0E+00	4.0E-03	6.0E-01																																																																													
Total HAP	6.3E-01	2.5E+01	1.3E-02	1.9E+00																																																																													
Largest HAP	6.0E-01	2.4E+01	1.2E-02	1.8E+00																																																																													
<p>Enter the boiler type below ▼</p> <p style="text-align: right;">3 + 4</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Toxic/Hazardous Air Pollutants</th> <th>lb/hr</th> <th>lb/day</th> <th>lb/yr</th> <th>Emission Factor (lb/mmscf)</th> </tr> </thead> <tbody> <tr><td>Arsenic</td><td>6.6E-05</td><td>NA</td><td>2.7E-03</td><td>2.0E-04</td></tr> <tr><td>Benzene</td><td>7.0E-04</td><td>NA</td><td>2.8E-02</td><td>2.1E-03</td></tr> <tr><td>Cadmium</td><td>3.6E-04</td><td>NA</td><td>1.5E-02</td><td>1.1E-03</td></tr> <tr><td>Chromium</td><td>4.6E-04</td><td>NA</td><td>1.9E-02</td><td>1.4E-03</td></tr> <tr><td>Chromium VI</td><td>4.6E-04</td><td>NA</td><td>1.9E-02</td><td>1.4E-03</td></tr> <tr><td>Dichlorobenzene</td><td>4.0E-04</td><td>NA</td><td>1.6E-02</td><td>1.2E-03</td></tr> <tr><td>Formaldehyde</td><td>2.5E-02</td><td>NA</td><td>1.0E+00</td><td>7.5E-02</td></tr> <tr><td>Hexane</td><td>6.0E-01</td><td>1.4E+01</td><td>2.4E+01</td><td>1.8E+00</td></tr> <tr><td>Lead</td><td>1.7E-04</td><td>NA</td><td>6.7E-03</td><td>5.0E-04</td></tr> <tr><td>Manganese</td><td>1.3E-04</td><td>3.0E-03</td><td>5.1E-03</td><td>3.8E-04</td></tr> <tr><td>Mercury</td><td>8.6E-05</td><td>2.1E-03</td><td>3.5E-03</td><td>2.6E-04</td></tr> <tr><td>Naphthalene</td><td>2.0E-04</td><td>NA</td><td>8.2E-03</td><td>6.1E-04</td></tr> <tr><td>Nickel</td><td>7.0E-04</td><td>1.7E-02</td><td>2.8E-02</td><td>2.1E-03</td></tr> <tr><td>POM</td><td>2.2E-04</td><td>NA</td><td>8.9E-03</td><td>6.6E-04</td></tr> <tr><td>Toluene</td><td>1.1E-03</td><td>2.7E-02</td><td>4.6E-02</td><td>3.4E-03</td></tr> </tbody> </table>	Toxic/Hazardous Air Pollutants	lb/hr	lb/day	lb/yr	Emission Factor (lb/mmscf)	Arsenic	6.6E-05	NA	2.7E-03	2.0E-04	Benzene	7.0E-04	NA	2.8E-02	2.1E-03	Cadmium	3.6E-04	NA	1.5E-02	1.1E-03	Chromium	4.6E-04	NA	1.9E-02	1.4E-03	Chromium VI	4.6E-04	NA	1.9E-02	1.4E-03	Dichlorobenzene	4.0E-04	NA	1.6E-02	1.2E-03	Formaldehyde	2.5E-02	NA	1.0E+00	7.5E-02	Hexane	6.0E-01	1.4E+01	2.4E+01	1.8E+00	Lead	1.7E-04	NA	6.7E-03	5.0E-04	Manganese	1.3E-04	3.0E-03	5.1E-03	3.8E-04	Mercury	8.6E-05	2.1E-03	3.5E-03	2.6E-04	Naphthalene	2.0E-04	NA	8.2E-03	6.1E-04	Nickel	7.0E-04	1.7E-02	2.8E-02	2.1E-03	POM	2.2E-04	NA	8.9E-03	6.6E-04	Toluene	1.1E-03	2.7E-02	4.6E-02	3.4E-03
Toxic/Hazardous Air Pollutants	lb/hr	lb/day	lb/yr	Emission Factor (lb/mmscf)																																																																													
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<p>Other NOx Control</p> <p>Enter 1 below if SNCR is applied to the boiler.</p> <p style="text-align: right;">0</p>	<p>** NOx emissions were estimated using CEMS data, please refer to the attached spreadsheets.</p> <p>Hourly emission rates for all pollutants based on hourly rated capacity.</p> <p><i>NG2000 Revision C dated March 9, 2000</i></p>																																																																																
<p>Large Wall-Fired Boilers (=>100 mmBtu/hr)</p> <p>1 = Uncontrolled (Pre-NSPS)</p> <p>2 = Uncontrolled (Post-NSPS)</p> <p>3 = Controlled - Low NOx burners</p> <p>4 = Controlled - Flue gas recirculation (FGR)</p>																																																																																	
<p>Small Boilers (<100 mmBtu/hr)</p> <p>5 = Uncontrolled</p> <p>6 = Controlled - Low NOx burners</p> <p>7 = Controlled - Low NOx burners/FGR</p>																																																																																	
<p>Tangential-Fired Boilers (All Sizes)</p> <p>8 = Uncontrolled</p> <p>9 = Controlled - FGR</p>																																																																																	
<p>Residential Furnaces (<0.3 mmBtu/hr)</p> <p>10 = Uncontrolled</p>																																																																																	

Fuel Oil Combustion Emissions Calculator FO2000 Revision A

Boiler #8

2006 Annual Emissions Inventory

(ES-003-Boiler #8)

Facility ID # 6800043

Permit # 03069T20

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:	03069T20
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 (%):	5.31
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

2006 Annual Emissions Inventory

(ES-003-Boiler #8)

Facility ID # 6800043

Permit # 03069T20

Operating Scenario #2

User Input	
Company Name:	University of North Carolina at Chapel Hill
Plant County:	Orange County
Plant City:	Chapel Hill
Permit Number:	03069T20
User:	RST Engineering
Heat Input Capacity (mmBtu/hr):	338
Fuel Input Capacity (10 ³ gal/hr):	2.41
Annual Fuel Throughput (1000 gal):	5.31
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

2006 Annual Emissions Inventory

(ES-003-Boiler #8)

Facility ID # 6800043

Permit # 03069T20

Operating Scenario #2

User Input	
Company Name:	University of North Carolina at Chapel Hill
Plant County:	Orange County
Plant City:	Chapel Hill
Permit Number:	03069T20
User:	RST Engineering
Heat Input Capacity (mmBtu/hr):	338
Fuel Input Capacity (10 ³ gal/hr):	2.41
Annual Fuel Throughput (1000 gal):	5.31
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	0.0088	18	3.30E+00
Filterable PM (FPM) rates uncontrolled	4.8	0.0053	11	2.00E+00
Condensable PM (CPM) ⁴	3.1	0.0035	7	1.30E+00
Filterable PM-10 ⁵	2.4	0.0027	5	1.00E+00
Filterable PM-2.5 ⁵	0.6	0.0007	1	2.50E-01
NOx rates uncontrolled	**	**	**	2.40E+01
NMTOC	0	0.0005	1	2.00E-01
CO	12	0.0133	27	5.00E+00
SO2 rates uncontrolled	59.2	0.0651	130	2.45E+01
Total HAP ⁶	4.36E-01	0.0005	1	1.81E-01
Largest HAP ⁶	1.92E-01	0.0002	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	2.98E-03	5.60E-04
Benzene	6.64E-03	NA	1.46E-02	2.75E-03
Beryllium rates uncontrolled	1.01E-03	NA	2.23E-03	4.20E-04
Cadmium rates uncontrolled	1.01E-03	NA	2.23E-03	4.20E-04
Chromium rates uncontrolled	1.01E-03	NA	2.23E-03	4.20E-04
Chromium VI rates uncontrolled	2.98E-04	NA	6.55E-04	1.23E-04
Cobalt rates uncontrolled	0.00E+00	NA	0.00E+00	0.00E+00
Ethylbenzene	1.97E-03	NA	4.34E-03	8.17E-04
Fluoride	9.01E-02	2.16E+00	1.98E-01	3.73E-02
Formaldehyde	1.16E-01	2.78E+00	2.55E-01	4.80E-02
Lead rates uncontrolled	3.04E-03	NA	6.70E-03	1.26E-03
Manganese rates uncontrolled	2.03E-03	4.87E-02	4.46E-03	8.40E-04
Mercury	1.01E-03	2.43E-02	2.23E-03	4.20E-04
Methyl chloroform (1,1,1-Trichloroethane)	5.70E-04	1.37E-02	1.25E-03	2.36E-04
Naphthalene	8.04E-04	NA	1.77E-03	3.33E-04
Nickel rates uncontrolled	1.01E-03	2.43E-02	2.23E-03	4.20E-04
POM rates uncontrolled	7.97E-03	NA	1.75E-02	3.30E-03
Selenium rates uncontrolled	5.07E-03	NA	1.12E-02	2.10E-03
Toluene	1.92E-01	4.62E+00	4.23E-01	7.97E-02
Xylene	3.38E-03	8.12E-02	7.44E-03	1.40E-03

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.

Fuel Oil Combustion Emissions Calculator **FO2000 Revision A**

Boiler #8

2006 Annual Emissions Inventory

(ES-003-Boiler #8)

Facility ID # 6800043

Permit # 03069T20

Operating Scenario #2

User Input	
Company Name:	University of North Carolina at Chapel Hill
Plant County:	Orange County
Plant City:	Chapel Hill
Permit Number:	03069T20
User:	RST Engineering
Heat Input Capacity (mmBtu/hr):	338
Fuel Input Capacity (10 ³ gal/hr):	2.41
Annual Fuel Throughput (1000 gal):	5.31
Maximum fuel sulfur content (%):	0.50
Latest Construction/Modification Date:	N/A

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 # 03069T20

2006 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 2006 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 2006	0.06
February 2006	0.06
March 2006	0.06
April 2006	0.06
May 2006	0.06
June 2006	0.06
July 2006	0.06
August 2006	0.06
September 2006	0.06
October 2006	0.06
November 2006	0.06
December 2006	0.06
Annual Average	0.06

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 2006

Boiler #8	
Gas 1,000cf/yr	Oil Gallons/yr
13,397	5,314
Nat. Gas (1,030 btu/cf)	Oil (137,006 btu/gal)
MMBtu/yr	
1.38E+04	7.28E+02

Total for Boiler #8 (MMBtu/yr)	1.45E+04
--------------------------------	----------

NOx Emissions from Boiler #8 (lb/yr)	872
NOx Emissions from Boiler #8 (ton/yr)	0.4

NOx Emissions Associated with Fuel Oil Combustion (ton/yr)	0.02
NOx Emissions Associated with Natural Gas Combustion (ton/yr)	0.41

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 Annual Emissions Inventory

**No.1 - 2,000 kW Generator
Cogeneration Facility**

(ES-007)

This unit was not in operation during CY 2006.

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 Annual Emissions Inventory

**No.2 - 2,000 kW Generator
Cogeneration Facility**

(ES-008)

This unit was not in operation during CY 2006.

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 Annual Emissions Inventory

**No.3 - 2,000 kW Generator
Cogeneration Facility**

(ES-009)

This unit was not in operation during CY 2006.

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 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 #: 03069T20					
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 2006							
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>		114,045	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-013	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 (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	1,901
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	28.10%	Mar-May	18.60%	June-Aug	29.41%	Sept-Nov	23.89%

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

Coal Crusher/Conveyor Building

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

Facility ID #: 6800043
 Permit #: 03069T20
 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 2006**

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-010A

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	0.81	2	99.80%
PM-2.5	PM-2.5	0.77	2	97.90%
PM-10	PM-10	0.81	2	99.60%
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)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 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 2006.

Boiler #6	58,337	Tons/yr
Boiler #7	55,708	Tons/yr
Total	114,045	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
1,900.8 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	11,376,019	gr/yr
	1,625	lb/yr
	0.81	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 # 03069T20

2006 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 #:	03069T20
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 2006**

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)		28,117			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%
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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-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	5,254
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	28.10%	Mar-May	18.60%	June-Aug	29.41%	Sept-Nov	23.89%
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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 ID #: 6800043

Permit #: 03069T20

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 2006

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-030

Table with 5 columns: Criteria (NAAQS) Pollutants, Pollutant Code, Emissions Criteria (Tons/Year), Emissions Estimation Method Code, Control Efficiency. Includes rows for Carbon Monoxide, NOx, PM Total, SO2, VOC, and HAP/TAP Pollutants.

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.

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 Annual Emissions Inventory

Ash Silo with Loadout

(ES-030)

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

28,116.77 ton/yr, ash loaded in 2006

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).

28,117	ton/yr, Ash Generated
0.5	lb/ton, Emission Factor
95%	Capture Efficiency
702.9	lb/yr, Emissions
0.35	ton/yr, Emissions

Fugitives from the Enclosure:

0.018	ton/yr, Emissions
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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.

$$\text{lb/yr} = (4,490 \text{ acfm}) (60 \text{ min/hr}) (\text{hr/yr}) (0.015 \text{ gr/acfm}) (1/7000 \text{ lb/gr})$$

4,490	acfm, Baghouse Flow Rate
5,254	hrs/yr, Operating Hours
0.015	gr/acfm, Emission Factor from Baghouse
3,033	lb/yr, Emissions
1.52	ton/yr, Emissions

3. Total Emissions

0.35	ton/yr, Emissions Truck Loading
0.018	ton/yr, Emissions, Truck Fugitives
1.52	ton/yr, Emissions, Baghouse
1.89	ton/yr, Total Emissions PM
1.89	ton/yr, Total Emissions PM-10
1.79	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 # 03069T20

2006 Annual Emissions Inventory

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

(This unit was not in operation during CY 2005)

Wet Ash Loadout

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

Facility ID #: **6800043**Permit #: **03069T20**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 2006

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 With Units (Ex. gal/hr, mmBtu/hr)		N/A					
5. Throughput in CY (e.g. production or fuel use) With Units (Ex. lbs/yr, gal/yr)		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 # (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	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.

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 # 03069T20

2006 Annual Emissions Inventory

Enclosed Sorbent Railcar Dump Pit (Insignificant Source)

IS-53

14,456 tons of sorbent delivered by rail in 2006. 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 #: 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 2006							
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>		14,456 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	28.10%	Mar-May	18.60%	June-Aug	29.41%	Sept-Nov	23.89%

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

Enclosed Sorbent Railcar Dump Pit

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

Facility ID #: 6800043

Permit #: 03069T20

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 2006

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)

"I" Insignificant - ID No. 020

Table with 5 columns: Criteria (NAAQS) Pollutants, Pollutant Code, Emissions Criteria (Tons/Year), Emissions Estimation Method Code (see instructions for code), Control Efficiency (Net after all controls). Rows include Carbon Monoxide, NOx, PM Total, PM-2.5, PM-10, SO2, and VOC.

Table with 5 columns: 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). This section is mostly empty.

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.

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 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 14,456 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	25.83	1.29E-02
PM-10	6.25E-05	12.22	6.11E-03
PM-2.5	1.96E-05	3.84	1.92E-03

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 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 #: 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 2006							
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>		114,045 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	28.10%	Mar-May	18.60%	June-Aug	29.41%	Sept-Nov	23.89%

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

Coal Storage Bunkers

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

Facility ID #: 6800043

Permit #: 03069T20

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 2006**

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-01, 02, 03, 04

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	0	2	Source is vented inside the boiler building.
PM-2.5	PM-2.5	0	2	Source is vented inside the boiler building.
PM-10	PM-10	0	2	Source is vented inside the boiler building.
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)

University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2006 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 2006.

Boiler #6	58,337	Tons/yr
Boiler #7	55,708	Tons/yr
Total	114,045	Tons/yr

The bulk density of coal is 47 lb/ft³

Total volume of coal combusted is = 4,852,991 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	72,795	gr/yr
	10.399	lb/yr
	0.005	ton/yr

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