APPENDIX C
EMISSIONS CALCULATIONS

Modification to Stationary Source Permit to Operate
Columbia Forest Products
100 Paul Road, SW
Chatham, Virginia 24531
Registration No. 30120
SECOR PN: B2OT.CFP01.VA
May 27, 2005

Table 1
Proposed New 12.6 MMBtu/hr Wood-Fired Boiler
Proposed Wood-Fired Boiler - Criteria Pollutant Emissions
Columbia Forest Products, Chatham, Virginia

Pollutant	Emission Factor [1] (lbs/MMBtu)	Estimated PTE Emissions	
		Hourly[a] (lbs/hr)	Annual[b] (tons/yr)
PM	0.30	3.78	16.6
PM_{10}	0.27	3.40	14.9
SO_2	0.025	0.32	1.38
NO_x	0.49	6.17	27.0
CO	0.60	7.56	33.1
VOC	0.017	0.21	0.94

Notes:

(a) Estimated PTE hourly emissions (lbs/hr) = (maximum boiler heat input [MMBtu/hr]) x (emission factor [lbs/MMBtu])
Maximum boiler heat input (MMBtu/hr) = 12.6 (c)

(b) Estimated PTE annual emissions (tons/yr) = (maximum boiler heat input [MMBtu/hr]) x (estimated PTE hours of operation [hrs/yr]) x (emission factor [lbs/MMBtu]) / (2000 lbs/ton)
Maximum boiler heat input (MMBtu/hr) = 12.6 (c)
Estimated PTE hours of operation (hrs/yr) = 8,760 (2)

(c) Maximum boiler heat input (MMBtu/hr) = (proposed maximum boiler horsepower [hp]) x (Btu conversion factor [Btu-input/hp] / 1,000,000)
Proposed maximum boiler horsepower (hp) = 300 (3)
Btu conversion factor (Btu-input/hp) = 42,000 (3)

References:

(1) Emission factors from AP-42, Chapter 1.6, Wood Residue Combustion in Boilers (September 2003).
(2) SECOR assumed operation 24 hours a day, 365 days a year.
(3) From the November 4, 2004 Hurst Boiler & Welding Company boiler quote for Columbia Forest Products, Chatham, Virginia.

Table 2
Proposed New 12.6 MMBtu/hr Wood-Fired Boiler
Proposed Wood-Fired Boiler - HAP Emissions
Columbia Forest Products, Chatham, Virginia

Pollutant	Emission Factor [1] (lbs/MMBtu)	Estimated PTE Emissions	
		Hourly[a] (lbs/hr)	Annual[b] (tons/yr)
1,1,1-Trichloroethane	3.1E-05	3.9E-04	1.7E-03
1,2-Dichloroethane	2.9E-05	3.7E-04	1.6E-03
1,2-Dichloropropane	3.3E-05	4.2E-04	1.8E-03
2,4-Dinitrophenol	1.8E-07	2.3E-06	9.9E-06
2-Butanone (MEK)	5.4E-06	6.8E-05	3.0E-04
4-Nitrophenol	1.1E-07	1.4E-06	6.1E-06
Acenaphthene	9.1E-07	1.1E-05	5.0E-05
Acenaphthylene	5.0E-06	6.3E-05	2.8E-04
Acetaldehyde	8.3E-04	1.0E-02	4.6E-02
Acetophenone	3.2E-09	4.0E-08	1.8E-07
Acrolein	4.0E-03	5.0E-02	2.2E-01
Anthracene	3.0E-06	3.8E-05	1.7E-04
Antimony	7.9E-06	1.0E-04	4.4E-04
Arsenic	2.2E-05	2.8E-04	1.2E-03
Benzene	4.2E-03	5.3E-02	2.3E-01
Benzo(a)anthracene	6.5E-08	8.2E-07	3.6E-06
Benzo(a)pyrene	2.6E-06	3.3E-05	1.4E-04
Benzo(b)fluoranthene	1.0E-07	1.3E-06	5.5E-06
Benzo(g,h,i)perylene	9.3E-08	1.2E-06	5.1E-06
Benzo(k)fluoranthene	3.6E-08	4.5E-07	2.0E-06
Beryllium	1.1E-06	1.4E-05	6.1E-05
bis(2-Ethylhexyl)phthalate	4.7E-08	5.9E-07	2.6E-06
Bromomethane	1.5E-05	1.9E-04	8.3E-04
Cadmium	4.1E-06	5.2E-05	2.3E-04
Carbon tetrachloride	4.5E-05	5.7E-04	2.5E-03
Chlorine	7.9E-04	1.0E-02	4.4E-02
Chlorobenzene	3.3E-05	4.2E-04	1.8E-03
Chloroform	2.8E-05	3.5E-04	1.5E-03
Chloromethane	2.3E-05	2.9E-04	1.3E-03
Chromium (total)	2.1E-05	2.6E-04	1.2E-03
Chrysene	3.8E-08	4.8E-07	2.1E-06
Cobalt	6.5E-06	8.2E-05	3.6E-04
Dibenzo(a,h)anthracene	9.1E-09	1.1E-07	5.0E-07
Dichloromethane	2.9E-04	3.7E-03	1.6E-02
Ethylbenzene	3.1E-05	3.9E-04	1.7E-03
Fluoranthene	1.6E-06	2.0E-05	8.8E-05
Fluorene	3.4E-06	4.3E-05	1.9E-04
Formaldehyde	4.4E-03	5.5E-02	2.4E-01

Table 2
Proposed New 12.6 MMBtu/hr Wood-Fired Boiler
Proposed Wood-Fired Boiler - HAP Emissions
Columbia Forest Products, Chatham, Virginia

Pollutant	Emission Factor (lbs/MMBtu)	Estimated PTE Emissions	
		Hourly[a] (lbs/hr)	Annual[b] (tons/yr)
Hydrogen chloride [2]	7.0E-03	8.8E-02	3.9E-01
Indeno(1,2,3,c,d)pyrene	8.7E-08	1.1E-06	4.8E-06
Lead	4.8E-05	6.0E-04	2.6E-03
Manganese	1.6E-03	2.0E-02	8.8E-02
Mercury	3.5E-06	4.4E-05	1.9E-04
Naphthalene	9.7E-05	1.2E-03	5.4E-03
Nickel	3.3E-05	4.2E-04	1.8E-03
Pentachlorophenol	5.1E-08	6.4E-07	2.8E-06
Phenanthrene	7.0E-06	8.8E-05	3.9E-04
Phenol	5.1E-05	6.4E-04	2.8E-03
Polychlorinated biphenyls	8.1E-09	1.0E-07	4.5E-07
Polychlorinated dibenzo-p-dioxins	1.7E-06	2.1E-05	9.2E-05
Polychlorinated dibenzo-p-furans	1.9E-09	2.4E-08	1.0E-07
Propionaldehyde	6.1E-05	7.7E-04	3.4E-03
Pyrene	3.7E-06	4.7E-05	2.0E-04
Selenium	2.8E-06	3.5E-05	1.5E-04
Styrene	1.9E-03	2.4E-02	1.0E-01
Tetrachloroethylene	3.8E-05	4.8E-04	2.1E-03
Toluene	9.2E-04	1.2E-02	5.1E-02
Trichloroethylene	3.0E-05	3.8E-04	1.7E-03
Vinyl chloride	1.8E-05	2.3E-04	9.9E-04
Xylene	2.5E-05	3.2E-04	1.4E-03
	Total HAPs	0.34	1.47

Notes:

(a) Estimated PTE hourly emissions (lbs/hr) = (maximum boiler heat input [MMBtu/hr]) x (emission factor [lbs/MMBtu])
Maximum boiler heat input (MMBtu/hr) = 12.6 (3)

(b) Estimated PTE annual emissions (tons/yr) = (maximum boiler heat input [MMBtu/hr]) x (estimated PTE hours of operation [hrs/yr]) x (emission factor [lbs/MMBtu]) / (2000 lbs/ton)
Maximum boiler heat input (MMBtu/hr) = 12.6 (3)
Estimated PTE hours of operation (hrs/yr) = 8,760 (4)

References:

(1) Emission factors from AP-42, Chapter 1.6, Wood Residue Combustion in Boilers (September 2003).
(2) The hydrogen chloride emission factor was taken from the August 2004 Forest Products Journal article "Potential Mercury and Hydrochloric Acid Emissions From Wood Fuels". The average stem wood emission factor was used.
(3) See Table 1, Proposed Wood-Fired Boiler - Criteria Pollutant Emissions.
(4) SECOR assumed operation 24 hours a day, 365 days a year.

Table 3
Proposed New 12.6 MMBtu/hr Wood-Fired Boiler
Revised Resin Usage - VOC/HAP Emissions
Columbia Forest Products, Chatham, Virginia

Resin Manufacturer	Estimated PTE Resin Usage [1]		Pollutant	Permit Limits			
	Hourly (lbs/hr)	Annual (tons/yr)		Hourly (lbs/hr)		Annual (tons/yr)	
Various	1,438	2,882	Total VOC	9.2	[2]	19.6	[2]
			Formaldehyde	4.9	[2]	9.56	[3]
			Methanol	4.9	[2]	9.8	[2]

References:

(1) Resin usages were taken from a December 3, 1997 fax to the Virginia DEQ, Lynchburg office, with revised resin usage emission calculation tables.

(2) Permit limits were taken from the August 28, 2003 Stationary Source Permit to Operate, Condition 14 resin emission limits.

(3) SECOR is requesting a revised emission limit for formaldehyde to stay a synthetic minor source for HAPs.

Table 4
Proposed New 12.6 MMBtu/hr Wood-Fired Boiler
Facility-Wide Emissions Summary
Columbia Forest Products, Chatham, Virginia

Emission Sources	Annual Emissions and Permit Limits (or emissions stated in permit applications) (tons/yr)						
	PM	PM_{10}	SO_2	No_x	CO	VOC	HAPs
UV Baghouse	3.4 (1)	3.4 (1)	--	--	--	--	--
Woodworking (Other Baghouses)	6.3 (2)	6.3 (2)	--	--	--	--	--
Proposed Wood-Fired Boiler	16.6	14.9	1.38	27.0	33.1	0.94	1.47
Roll Coaters	--	--	--	--	--	9.0 (3)	2.43 (4)
Resin Usage (Revised)	--	--	--	--	--	19.6	19.4
Facility-Wide VOC	--	--	--	--	--	0.56 (5)	0.005 (5)
Total:	26.3	24.6	1.38	27.0	33.1	30.1	23.3

References:

(1) August 28, 2003 Stationary Source Permit to Operate Condition 9 - PM and PM_{10} permit limits.

(2) August 28, 2003 Stationary Source Permit to Operate Condition 10 - PM and PM_{10} permit limits.

(3) August 28, 2003 Stationary Source Permit to Operate Condition 13 - VOC permit limit.

(4) February 23, 2000 application for new UV line roll coater, Attachment 2 emissions calculations on Table 1. HAP emissions of 0.81 tons/yr calculated for one roll coater would equal 2.43 tons/year for three roll coaters.

(5) November 20, 1996 revised air permit application, Table 6a - emissions from wood putty and cleaner.

Table 5
Proposed New 12.6 MMBtu/hr Wood-Fired Boiler
Individual HAP Emissions Summary
Columbia Forest Products, Chatham, Virginia

Pollutant	Annual HAP Emissions and Permit Limits (tons/yr)				HAP Total (tons/yr)
	Proposed Boiler [1]	Roll Coaters [2]	Resin Usage [3]	Facility Wide VOC [4]	
1,1,1-Trichloroethane	1.7E-03	--	--	8.0E-04	2.5E-03
1,2-Dichloroethane	1.6E-03	--	--	--	1.6E-03
1,2-Dichloropropane	1.8E-03	--	--	--	1.8E-03
2,4-Dinitrophenol	9.9E-06	--	--	--	9.9E-06
2-Butanone (MEK)	3.0E-04	--	--	--	3.0E-04
4-Nitrophenol	6.1E-06	--	--	--	6.1E-06
Acenaphthene	5.0E-05	--	--	--	5.0E-05
Acenaphthylene	2.8E-04	--	--	--	2.8E-04
Acetaldehyde	4.6E-02	--	--	--	4.6E-02
Acetophenone	1.8E-07	--	--	--	1.8E-07
Acrolein	2.2E-01	--	--	--	2.2E-01
Anthracene	1.7E-04	--	--	--	1.7E-04
Antimony	4.4E-04	--	--	--	4.4E-04
Arsenic	1.2E-03	--	--	--	1.2E-03
Benzene	2.3E-01	--	--	--	2.3E-01
Benzo(a)anthracene	3.6E-06	--	--	--	3.6E-06
Benzo(a)pyrene	1.4E-04	--	--	--	1.4E-04
Benzo(b)fluoranthene	5.5E-06	--	--	--	5.5E-06
Benzo(g,h,i)perylene	5.1E-06	--	--	--	5.1E-06
Benzo(k)fluoranthene	2.0E-06	--	--	--	2.0E-06
Beryllium	6.1E-05	--	--	--	6.1E-05
bis(2-Ethylhexyl)phthalate	2.6E-06	--	--	--	2.6E-06
Bromomethane	8.3E-04	--	--	--	8.3E-04
Cadmium	2.3E-04	--	--	--	2.3E-04
Carbon tetrachloride	2.5E-03	--	--	--	2.5E-03
Chlorine	4.4E-02	--	--	--	4.4E-02
Chlorobenzene	1.8E-03	--	--	--	1.8E-03
Chloroform	1.5E-03	--	--	--	1.5E-03
Chloromethane	1.3E-03	--	--	--	1.3E-03
Chromium (total)	1.2E-03	--	--	--	1.2E-03
Chrysene	2.1E-06	--	--	--	2.1E-06
Cobalt	3.6E-04	--	--	--	3.6E-04
Dibenzo(a,h)anthracene	5.0E-07	--	--	--	5.0E-07
Dichloromethane	1.6E-02	--	--	--	1.6E-02
Ethylbenzene	1.7E-03	--	--	8.0E-04	2.5E-03
Fluoranthene	8.8E-05	--	--	--	8.8E-05
Fluorene	1.9E-04	--	--	--	1.9E-04

Table 5
Proposed New 12.6 MMBtu/hr Wood-Fired Boiler
Individual HAP Emissions Summary
Columbia Forest Products, Chatham, Virginia

Pollutant	Annual HAP Emissions and Permit Limits (tons/yr)				HAP Total (tons/yr)
	Proposed Boiler [1]	Roll Coaters [2]	Resin Usage [3]	Facility Wide VOC [4]	
Formaldehyde	2.4E-01	--	9.6E+00	--	9.8E+00
Hydrogen chloride	3.9E-01	--	--	--	3.9E-01
Indeno(1,2,3,c,d)pyrene	4.8E-06	--	--	--	4.8E-06
Lead	2.6E-03	--	--	--	2.6E-03
Manganese	8.8E-02	--	--	--	8.8E-02
Mercury	1.9E-04	--	--	--	1.9E-04
Methanol	--	--	9.8E+00	--	9.8E+00
Naphthalene	5.4E-03	--	--	--	5.4E-03
Nickel	1.8E-03	--	--	--	1.8E-03
Pentachlorophenol	2.8E-06	--	--	--	2.8E-06
Perchloroethylene	--	--	--	8.0E-04	8.0E-04
Phenanthrene	3.9E-04	--	--	--	3.9E-04
Phenol	2.8E-03	--	--	--	2.8E-03
Polychlorinated biphenyls	4.5E-07	--	--	--	4.5E-07
Polychlorinated dibenzo-p-dioxins	9.2E-05	--	--	--	9.2E-05
Polychlorinated dibenzo-p-furans	1.0E-07	--	--	--	1.0E-07
Propionaldehyde	3.4E-03	--	--	--	3.4E-03
Pyrene	2.0E-04	--	--	--	2.0E-04
Selenium	1.5E-04	--	--	--	1.5E-04
Styrene	1.0E-01	--	--	--	1.0E-01
Tetrachloroethylene	2.1E-03	--	--	--	2.1E-03
Toluene	5.1E-02	--	--	8.0E-04	5.2E-02
Trichloroethylene	1.7E-03	--	--	--	1.7E-03
Vinyl chloride	9.9E-04	--	--	--	9.9E-04
Xylene	1.4E-03	2.4E+00	--	1.6E-03	2.4E+00
Total	1.47	2.43	19.4	0.005	23.3

References:

(1) See Table 2, Proposed Wood-Fired Boiler - HAP Emissions.

(2) February 23, 2000 application for new UV line roll coater, Attachment 2 emissions calculations on Table 1. HAP (xylene) emissions of 0.81 tons/yr calculated for one roll coater would equal 2.43 tons/year for three roll coaters.

(3) See Table 3, Revised Resin Usage - VOC/HAP Emissions.

(4) November 20, 1996 revised air permit application, Table 6a - emissions from wood putty and cleaner.

Table 6
Proposed New 12.6 MMBtu/hr Wood-Fired Boiler
Permit Exemption Levels - Criteria Pollutant Emissions
Columbia Forest Products, Chatham, Virginia

Pollutant	Emission Factor [1] (lbs/MMBtu)	Uncontrolled PTE Emission Rate[a] (tons/yr)	Past Actual Emissions[2] (tons/yr)	Net Emissions Increase[2] (tons/yr)	Modified Source Exemption Rate[3] (tons/yr)
PM	0.4	22.1	0	22.1	15
PM_{10}	0.36	19.9	0	19.9	10
SO_2	0.025	1.4	0	1.4	10
NO_x	0.49	27.0	0	27.0	10
CO	0.6	33.1	0	33.1	100
VOC	0.017	0.9	0	0.9	10
Lead	4.80E-05	0.003	0	0.003	0.6

Notes:

(a) Estimated uncontrolled PTE annual emissions (tons/yr) = (maximum boiler heat input [MMBtu/hr]) x (estimated PTE hours of operation [hrs/yr]) x (emission factor [lbs/MMBtu]) / (2000 lbs/ton)

Maximum boiler heat input (MMBtu/hr) = 12.6 (b)
Estimated PTE hours of operation (hrs/yr) = 8,760 (4)

(b) Maximum boiler heat input (MMBtu/hr) = (proposed maximum boiler horsepower [hp]) x (Btu conversion factor [Btu-input/hp] / 1,000,000)

Proposed maximum boiler horsepower (hp) = 300 (5)
Btu conversion factor (Btu-input/hp) = 42,000 (5)

References:

(1) Uncontrolled dry wood emission factors from AP-42, Chapter 1.6, Wood Residue Combustion in Boilers (September 2003).
(2) "Actual emissions" and "net emissions increase" as defined in 9 VAC 5-80-1110(C).
(3) Modified source exemption levels from 9 VAC 5-80-1320(D).
(4) SECOR assumed operation 24 hours a day, 365 days a year.
(5) From the November 4, 2004 Hurst Boiler & Welding Company boiler quote for Columbia Forest Products, Chatham, Virginia.

Table 7
Proposed New 12.6 MMBtu/hr Wood-Fired Boiler
Proposed Wood-Fired Boiler - Threshold Limit Value Calculations
Columbia Forest Products, Chatham, Virginia

Pollutant	Boiler Emissions		Threshold Limit Values (mg/m^3) [2]			Exempt Emission Rates [3]			Exemption (yes/no)		
	Hourly [a] (lbs/hr)	Annual [1] (tons/yr)	TLV - C	TLV - TWA	TLV - STEL	C/STEL [b] (lbs/hr)	TWA [c] (lbs/hr)	TWA [d] (tons/yr)	C/STEL	Hourly TWA	Annual TWA
1,1,1-Trichloroethane	3.9E-04	1.7E-03	--	1,910	2,460	8.1E+01	1.3E+02	2.8E+02	yes	yes	yes
1,2-Dichloroethane	3.7E-04	1.6E-03	--	40	--	--	2.6E+00	5.8E+00	--	yes	yes
1,2-Dichloropropane	4.2E-04	1.8E-03	--	347	508	1.7E+01	2.3E+01	5.0E+01	yes	yes	yes
2,4-Dinitrophenol	2.3E-06	9.9E-06	--	--	--	--	--	--	--	--	--
2-Butanone (MEK)	6.8E-05	3.0E-04	--	590	885	2.9E+01	3.9E+01	8.6E+01	yes	yes	yes
4-Nitrophenol	1.4E-06	6.1E-06	--	--	--	--	--	--	--	--	--
Acenaphthene	1.1E-05	5.0E-05	--	--	--	--	--	--	--	--	--
Acenaphthylene	6.3E-05	2.8E-04	--	--	--	--	--	--	--	--	--
Acetaldehyde	1.0E-02	4.6E-02	--	180	270	8.9E+00	1.2E+01	2.6E+01	yes	yes	yes
Acetophenone	4.0E-08	1.8E-07	--	--	--	--	--	--	--	--	--
Acrolein	5.0E-02	2.2E-01	--	0.23	0.69	2.3E-02	1.5E-02	3.3E-02	NO	NO	NO
Anthracene	3.8E-05	1.7E-04	--	--	--	--	--	--	--	--	--
Antimony	1.0E-04	4.4E-04	--	0.5	--	--	3.3E-02	7.3E-02	--	yes	yes
Arsenic	2.8E-04	1.2E-03	--	0.2	--	--	1.3E-02	2.9E-02	--	yes	yes
Benzene	5.3E-02	2.3E-01	--	32	--	--	2.1E+00	4.6E+00	--	yes	yes
Benzo(a)anthracene	8.2E-07	3.6E-06	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	3.3E-05	1.4E-04	--	--	--	--	--	--	--	--	--
Benzo(b)fluoranthene	1.3E-06	5.5E-06	--	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	1.2E-06	5.1E-06	--	--	--	--	--	--	--	--	--
Benzo(k)fluoranthene	4.5E-07	2.0E-06	--	--	--	--	--	--	--	--	--
Beryllium	1.4E-05	6.1E-05	--	0.002	--	--	1.3E-04	2.9E-04	--	yes	yes
bis(2-Ethylhexyl)phthalate	5.9E-07	2.6E-06	--	5	10	3.3E-01	3.3E-01	7.3E-01	yes	yes	yes
Bromomethane	1.9E-04	8.3E-04	--	19	--	--	1.3E+00	2.8E+00	--	yes	yes
Cadmium	5.2E-05	2.3E-04	--	0.05	--	--	3.3E-03	7.3E-03	--	yes	yes
Carbon tetrachloride	5.7E-04	2.5E-03	--	31	--	--	2.0E+00	4.5E+00	--	yes	yes

Table 7
Proposed New 12.6 MMBtu/hr Wood-Fired Boiler
Proposed Wood-Fired Boiler - Threshold Limit Value Calculations
Columbia Forest Products, Chatham, Virginia

Pollutant	Boiler Emissions		Threshold Limit Values (mg/m^3) [2]			Exempt Emission Rates [3]			Exemption (yes/no)		
	Hourly [a] (lbs/hr)	Annual [1] (tons/yr)	TLV - C	TLV - TWA	TLV - STEL	C/STEL [b] (lbs/hr)	TWA [c] (lbs/hr)	TWA [d] (tons/yr)	C/STEL	Hourly TWA	Annual TWA
Chlorine	1.0E-02	4.4E-02	--	1.5	2.9	9.6E-02	9.9E-02	2.2E-01	yes	yes	yes
Chlorobenzene	4.2E-04	1.8E-03	--	46	--	--	3.0E+00	6.7E+00	--	yes	yes
Chloroform	3.5E-04	1.5E-03	--	49	--	--	3.2E+00	7.1E+00	--	yes	yes
Chloromethane	2.9E-04	1.3E-03	--	103	207	6.8E+00	6.8E+00	1.5E+01	yes	yes	yes
Chromium (total)	2.6E-04	1.2E-03	--	0.5	--	--	3.3E-02	7.3E-02	--	yes	yes
Chrysene	4.8E-07	2.1E-06	--	--	--	--	--	--	--	--	--
Cobalt	8.2E-05	3.6E-04	--	0.05	--	--	3.3E-03	7.3E-03	--	yes	yes
Dibenzo(a,h)anthracene	1.1E-07	5.0E-07	--	--	--	--	--	--	--	--	--
Dichloromethane	3.7E-03	1.6E-02	--	174	--	--	1.1E+01	2.5E+01	--	yes	yes
Ethylbenzene	3.9E-04	1.7E-03	--	434	543	1.8E+01	2.9E+01	6.3E+01	yes	yes	yes
Fluoranthene	2.0E-05	8.8E-05	--	--	--	--	--	--	--	--	--
Fluorene	4.3E-05	1.9E-04	--	--	--	--	--	--	--	--	--
Formaldehyde	5.5E-02	2.4E-01	--	1.2	2.5	8.3E-02	7.9E-02	1.7E-01	yes	yes	NO
Hydrogen chloride	8.8E-02	3.9E-01	7.5	--	--	2.5E-01	--	--	yes	--	--
Indeno(1,2,3,c,d)pyrene	1.1E-06	4.8E-06	--	--	--	--	--	--	--	--	--
Lead	6.0E-04	2.6E-03	--	0.15	--	--	9.9E-03	2.2E-02	--	yes	yes
Manganese	2.0E-02	8.8E-02	--	1	--	--	6.6E-02	1.5E-01	--	yes	yes
Mercury	4.4E-05	1.9E-04	--	0.01	0.03	9.9E-04	6.6E-04	1.5E-03	yes	yes	yes
Naphthalene	1.2E-03	5.4E-03	--	52	79	2.6E+00	3.4E+00	7.5E+00	yes	yes	yes
Nickel	4.2E-04	1.8E-03	--	1	--	--	6.6E-02	1.5E-01	--	yes	yes
Pentachlorophenol	6.4E-07	2.8E-06	--	0.5	--	--	3.3E-02	7.3E-02	--	yes	yes
Phenanthrene	8.8E-05	3.9E-04	--	--	--	--	--	--	--	--	--
Phenol	6.4E-04	2.8E-03	--	19	--	--	1.3E+00	2.8E+00	--	yes	yes
Polychlorinated biphenyls	1.0E-07	4.5E-07	--	0.5	--	--	3.3E-02	7.3E-02	--	yes	yes

Table 7
Proposed New 12.6 MMBtu/hr Wood-Fired Boiler
Proposed Wood-Fired Boiler - Threshold Limit Value Calculations
Columbia Forest Products, Chatham, Virginia

Pollutant	Boiler Emissions		Threshold Limit Values (mg/m^3) [2]			Exempt Emission Rates [3]			Exemption (yes/no)		
	Hourly [a] (lbs/hr)	Annual [1] (tons/yr)	TLV - C	TLV - TWA	TLV - STEL	C/STEL [b] (lbs/hr)	TWA [c] (lbs/hr)	TWA [d] (tons/yr)	C/STEL	Hourly TWA	Annual TWA
Polychlorinated dibenzo-p-dioxins	2.1E-05	9.2E-05	--	--	--	--	--	--	--	--	--
Polychlorinated dibenzo-p-furans	2.4E-08	1.0E-07	--	--	--	--	--	--	--	--	--
Propionaldehyde	7.7E-04	3.4E-03	--	--	--	--	--	--	--	--	--
Pyrene	4.7E-05	2.0E-04	--	--	--	--	--	--	--	--	--
Selenium	3.5E-05	1.5E-04	--	0.2	--	--	1.3E-02	2.9E-02	--	yes	yes
Styrene	2.4E-02	1.0E-01	--	213	426	1.4E+01	1.4E+01	3.1E+01	yes	yes	yes
Tetrachloroethylene	4.8E-04	2.1E-03	--	339	1,357	4.5E+01	2.2E+01	4.9E+01	yes	yes	yes
Toluene	1.2E-02	5.1E-02	--	377	565	1.9E+01	2.5E+01	5.5E+01	yes	yes	yes
Trichloroethylene	3.8E-04	1.7E-03	--	269	1,070	3.5E+01	1.8E+01	3.9E+01	yes	yes	yes
Vinyl chloride	2.3E-04	9.9E-04	--	13	--	--	8.6E-01	1.9E+00	--	yes	yes
Xylene	3.2E-04	1.4E-03	--	434	651	2.1E+01	2.9E+01	6.3E+01	yes	yes	yes

Notes:

(a) Estimated PTE hourly boiler emissions (lbs/hr) = (estimated PTE annual boiler emissions [tons/yr]) x (2000 lbs/ton) / (8,760 hrs/yr)

(b) Hourly exempt emission rate (lbs/hr) = (TLV-C (or STEL) [mg/m^3]) x (0.033)

(c) Hourly exempt emission rate (lbs/hr) = (TLV-TWA [mg/m^3]) x (0.066)

(d) Annual exempt emission rate (tons/yr) = (TLV-TWA [mg/m^3]) x (0.145)

References:

(1) See Table 2, Proposed Wood-Fired Boiler - HAP Emissions.

(2) Threshold limit values (TLV) ceiling (C), short-term exposure limit (STEL), and time-weighted average (TWA) limits were taken from the 1991-1992 American Conference of Governmental Industrial Hygienist (ACGIH) TLV handbook.

(3) Exempt emission rate equations were taken from Virginia State Air Pollution Control Board, Regulations for the Control and Abatement of Air Pollution, 9 VAC 5 Chapter 60, Hazardous Air Pollutant Sources, Part II Emission Standards, Article 5.

Table 8
Proposed New 12.6 MMBtu/hr Wood-Fired Boiler
Ambient Air Concentrations
Columbia Forest Products, Chatham, Virginia

Pollutant	Significant Ambient Air Concentration		SCREEN 3 Maximum Concentration	
	One Hour[(a)] (mg/m^3)	Annual[(b)] (mg/m^3)	One Hour[(c)] (mg/m^3)	Annual[(d)] (mg/m^3)
Acrolein	0.017	0.00046	0.0007	0.00007
Formaldehyde	--	0.0024	0.0008	0.00008

Notes:

(a) One hour significant concentration = (TLV-STEL [mg/m^3]) / 40

Acrolein TLV-STEL = 0.69 (1)

(b) Annual significant concentration = (TLV-TWA [mg/m^3]) / 500

Acrolein TLV-TWA = 0.23 (1)

Formaldehyde TLV-TWA = 1.2 (1)

(c) Hourly SCREEN3 maximum concentration = (one hour concentration [$\mu g/m^3$]) x (mg/1,000 µg)

Acrolein one hour concentration ($\mu g/m^3$) = 0.694 (2)

Formaldehyde one hour concentration ($\mu g/m^3$) = 0.7634 (2)

(d) Annual SCREEN3 maximum concentration = (one hour concentration [$\mu g/m^3$]) x (mg/1,000 µg) x (conversion factor)

Acrolein one hour concentration ($\mu g/m^3$) = 0.694 (2)

Formaldehyde one hour concentration ($\mu g/m^3$) = 0.7634 (2)

Conversion factor = 0.1 (3)

References:

(1) 1991-1992 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices by the American Conference of Governmental Industrial Hygienists (ACGIH).

(2) Refer to SCREEN3 output files in Appendix D.

(3) EPA factor for converting one hour maximum concentrations to annual maximum concentrations.