ENVIVA PELLETS 2011
P/N 10203
NORTHAMPTON COUNTY

Comprehensive Application Report for 6600167.11A

08/29/2011

Enviva Pellets Northampton, LLC - Gaston (6600167)

Northampton County

General Information:

Permit/Latest Revision: 10203/

Permit code: PSD

Application type: Greenfield Facility

Engineer/Rev. location: Kevin Godwin/RCO

Regional Contact: Charles McEachern

Facility location: Raleigh Regional Office

Facility classification: Unknown

Clock is ON: Application is COMPLETE

Status is : In progress

Application Dates

Received	Completeness Due	Clock Start	Calculated Issue Due
08/26/2011	10/25/2011		

Fee Information

Initial amount:	Date received:	Amount Due:	Add. Amt Rcv'd:	Date Rcv'd:
$13488.00	08/29/2011			

Fund type:	Deposit Slip #:	Location rec'd:	Location deposited:
2331			

Contact Information

Type	Name	Address	City State ZIP	Telephone
Technical/Permit	Glenn Gray, Plant Manager	7200 Wisconsin Avenue	Bethesda, MD 20814	(757) 274-8377
Authorized	Norb Hintz, Vice President Engineering	7200 Wisconsin Avenue	Bethesda, MD 20814	(301) 657-5567

Acceptance Criteria

Received?	Acceptance Criteria Description
Yes	Application fee
Yes	Appropriate number of apps submitted
Yes	Zoning Addressed
Yes	Source recycling/reduction form
Yes	Authorized signature
Yes	PE Seal

Completeness Criteria

Received?	Complete Item Description

central files

Comprehensive Application Report for 6600167.11A

Enviva Pellets Northampton, LLC - Gaston (6600167)

Northampton County

Application Events

Event	Start	Due	Complete	Comments	Staff

Regulations Pertaining to this Permit

Reference Rule	Regulation Description

Audit Information Pertaining to this Application

Column Name	Date Changed	Old Value	New Value	Editor
perm_Code	08/29/2011	GRNTV (TV-Greenfield)	PSD (PSD)	Mark Cuilla
permit_No	08/29/2011		10203	Charles McEachern
reg_Cont	08/29/2011		821 (Charles McEachern)	Mark Cuilla

NCDENR

North Carolina Department of Environment and Natural Resources
Division of Air Quality

Beverly Eaves Perdue
Governor

Sheila C. Holman
Director

Dee Freeman
Secretary

August 29, 2011

Mr. Norb Hintz
Vice President Engineering
Enviva Pellets Northampton, LLC
7200 Wisconsin Avenue
Suite 1100
Bethesda, MD 20814

SUBJECT: Receipt of Permit Application
Greenfield Facility
Application No. 6600167.11A
Enviva Pellets Northampton, LLC
Facility ID: 6600167, Gaston, Northampton County

Dear Mr. Hintz:

Your air permit application (6600167.11A) for Enviva Pellets Northampton, LLC, located in Northampton County, North Carolina was received by this Division on August 26, 2011.

This application submittal **did** contain all the required elements as indicated and has been accepted for processing. Your application will be considered complete as of August 26, 2011, unless informed otherwise by this office within 60 days.

Should you have any questions concerning this matter, please contact Kevin Godwin at (919) 715-6255.

Sincerely,

for Donald van der Vaart, Ph.D., P.E., J.D.
Chief

cc: Raleigh Regional Office Files

6600167

One Copley Parkway | Suite 310 | Morrisville, NC 27560 | P (919) 462-9693 | F (919) 462-9694
trinityconsultants.com

Trinity Consultants

November 18, 2011

Mr. John Evans
North Carolina Division of Air Quality (NC DAQ)
217 West Jones Street
Raleigh, NC 27603

Received
NOV 12 2011
Air Permits Section

RE: ***Permit Application Addendum***
Enviva Pellets Northampton, LLC

Dear Mr. Name:

Dear Mr. Evans:

Enviva Pellets Northampton, LLC (Enviva) submitted a construction and operating permit application on August 21, 2011. This letter provides revised toxic air pollutant (TAP) emission rate calculations for the wood dryer and corresponding air dispersion modeling, as well as an update to greenhouse gas (GHG) calculations for the wood dryer.

REVISED EMISSIONS ESTIMATES

Originally, TAP and HAP emissions estimates for the direct-fired wood chip dryer were estimated using AP-42 emission factors for wood dryers that ostensibly should have included combustion by-products because the factors were identified as being applicable to direct contact, wood fired dryers. However during recent review of the calculations, we noticed that a number of TAPs and HAPs included in Section 1.6 of AP-42 (wood combustion) were not present in EPA's emission factors for wood dryers. Since it is reasonable to assume that these additional compounds would be present in the dryer exhaust, we have updated the emissions calculations for the dryer accordingly.

During a recent review of the calculation spreadsheets for the project, we discovered that a late change in dryer heat input to 207 MM Btu/hr was not updated in the GHG emissions calculations for the wood dryer.

Revised emission estimates are provided in Attachment 1. It should be noted that facility-wide emissions remain well below the HAP major source thresholds.

AIR DISPERSION MODELING

As presented in the updated emissions estimates in Attachment 1, the following additional TAPs were added to the calculations for the dryer and result in facility-wide emissions that

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exceed the TPERs: arsenic, benzo(a)pyrene, cadmium, chlorine, hexachlorodibenzo-p-dioxin, hydrogen chloride, mercury, nickel, and vinyl chloride.

AERMOD air dispersion modeling for TAPs exceeding the TPERs were conducted in accordance with NCDAQ modeling guidelines. Please note that air dispersion modeling for TAPs provided in the initial permit application remain unchanged.

All TAPs were modeled using each source's respective emission rate.

Modeling results indicate ambient concentrations well below the AALs. Since all concentrations fall below 50 percent of the AAL, only a single year (1992) of meteorological data was used. A summary of modeling parameters, a summary of modeling results, and a completed copy of the air dispersion modeling checklist are provided in Attachment 2.

CLOSING

Enviva would greatly appreciate prompt processing of this application. Feel free to contact me at 919-462-9693 or Glenn Gray of Enviva at 804-412-0227 with any questions or comments.

Sincerely,

TRINITY CONSULTANTS

Joe W. Sullivan

Joe Sullivan, PE, CM
Managing Consultant

cc: Glenn Gray (Enviva)

Attachments

ATTACHMENT 1

Updated Emissions Calculations

TABLE 3-1
PSD APPLICABILITY SUMMARY
ENVIVA PELLETS NORTHAMPTON, LLC

Source Description	Unit ID	CO (tpy)	NOx (tpy)	TSP (tpy)	PM-10 (tpy)	PM-2.5 (tpy)	SO2 (tpy)	VOC (tpy)	CO_{2e} (tpy)
Dryer System	ES-DRYER	275.50	187.63	36.79	36.79	36.79	22.67	356.25	187,561.92
Emergency Generator	ES-EG	0.50	0.58	0.03	0.03	0.03	0.00	0.00	93.04
Fire Water Pump	ES-FWP	0.43	0.49	0.02	0.02	0.02	0.00	0.00	79.75
Hammermills	ES-HM-1, -2, -3, -4	-	-	15.02	15.02	15.02	-	-	-
Hammermills Area Filter	ES-HMA	-	-	7.04	7.04	7.04	-	-	-
Pellet Mill Feed Silo	ES-PMFS	-	-	0.47	0.47	0.47	-	-	-
Pellet Coolers	ES-CLR	-	-	61.95	61.95	61.95	-	-	-
Log Debarking/Chipping	ES-CHIP-1	-	-	-	-	-	-	1.25	-
Diesel Storage Tanks	TK1 & TK2	-	-	-	-	-	-	3.79E-03	-
Total Project Emission Increases		**276.44**	**188.69**	**121.31**	**121.31**	**121.31**	**22.67**	**357.51**	**187,734.71**
PSD Significant Emission Rates		**100**	**40**	**25**	**10**	**15**	**40**	**40**	**100,000**
PSD Review Required?		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**Yes**	**Yes**

TABLE 3-2
FACILITYWIDE HAP EMISSIONS SUMMARY
ENVIVA PELLETS NORTHAMPTON, LLC

Description	ES-DRYER (tpy)	ES-EG (tpy)	ES-FWP (tpy)	ES-CHIP-1 (tpy)	Total (tpy)
1,3-Butadiene	-	2.39E-05	2.05E-05	-	4.45E-05
Acetaldehyde	2.60E+00	4.70E-04	4.03E-04	-	2.60
Acetophenone	2.90E-06	-	-	-	0.00
Acrolein	7.97E-01	5.67E-05	4.86E-05	-	0.80
Antimony & Compounds	5.19E-04	-	-	-	0.00
Arsenic & Compounds	1.45E-03	-	-	-	0.00
Benzene	2.63E-01	5.71E-04	4.90E-04	-	0.26
Beryllium metal (un-reacted) (Also include in BEC)	7.23E-05	-	-	-	0.00
Cadmium Metal (elemental un-reacted) -(Add w/CDC)	2.70E-04	-	-	-	0.00
Carbon tetrachloride	4.08E-02	-	-	-	0.04
Chlorine	7.16E-01	-	-	-	0.72
Chlorobenzene	2.99E-02	-	-	-	0.03
Chromium-Other compds (add w/chrom acid to get CRC)	1.15E-03	-	-	-	0.00
Cobalt compounds	4.27E-04	-	-	-	0.00
Chloroform	3.47E-03	-	-	-	3.47E-03
Cumene	6.93E-02	-	-	-	0.07
Dinitrophenol, 2,4-	1.63E-04	-	-	-	0.00
Di(2-ethylhexyl)phthalate (DEHP)	4.26E-05	-	-	-	0.00
Ethyl benzene	2.81E-02	-	-	-	0.03
Ethylene dichloride (1,2-dichloroethane)	2.63E-02	-	-	-	0.03
Formaldehyde	4.85E+00	7.23E-04	6.20E-04	-	4.85
Hydrogen chloride (hydrochloric acid)	1.72E+00	-	-	-	1.72
Lead and Lead compounds	3.16E-03	-	-	-	0.00
m-,p-Xylene	1.66E-01	1.75E-04	1.50E-04	-	0.17
Manganese & compounds	1.05E-01	-	-	-	0.11
Mercury, vapor (Include in Mercury&Compds)	3.17E-03	-	-	-	0.00
Methanol	3.81E+00	-	-	0.24	3.81
Methyl bromide (bromomethane)	1.36E-02	-	-	-	0.01
Methyl chloride (chloromethane)	2.09E-02	-	-	-	0.02
Methyl chloroform (1,1,1 trichloroethane)	2.81E-02	-	-	-	0.03
Methyl isobutyl ketone	2.39E-01	-	-	-	0.24
Methylene chloride	6.24E-02	-	-	-	0.06
Nickel metal (Component of Nickel & Compounds)	2.99E-02	-	-	-	0.03
o-Xylene	1.56E-02	-	-	-	0.02
Pentachlorophenol	4.62E-05	-	-	-	0.00
Perchloroethylene (tetrachloroethylene)	3.45E-02	-	-	-	0.03
Phenol	9.71E-01	-	-	-	0.97
Phosphorus Metal, Yellow or White	2.45E-02	-	-	-	0.02
Polychlorinated biphenyls	7.39E-06	-	-	-	0.00
Propionaldehyde	4.51E-01	-	-	-	0.45
Propylene dichloride (1,2 dichloropropane)	2.99E-02	-	-	-	0.03
Selenium compounds	2.54E-03	-	-	-	0.00
Styrene	1.25E-02	-	-	-	0.01
Toluene	4.51E-01	2.51E-04	2.15E-04	-	0.45
Total PAH (POM)	1.13E-01	1.03E-04	8.82E-05	-	1.14E-01
Trichloroethylene	2.72E-02	-	-	-	0.03
Trichlorophenol, 2,4,6-	1.99E-05	-	-	-	0.00
Vinyl chloride	1.63E-02	-	-	-	0.02
TOTAL HAP	**17.74**	**2.37E-03**	**2.03E-03**	**0.24**	**17.75**

TABLE 3-3
DETERMINATION OF POLLUTANTS SUBJECT TO AIR TOXICS PERMITTING
ENVIVA PELLETS NORTHAMPTON, LLC

TAP Emissions

Description		Dryer			Emergency Generator			Fire Water Pump			Total		
Pollutant	**CAS Number**	**(lb/hr)**	**(lb/day)**	**(lb/yr)**	**(lb/hr)**	**(lb/day)**	**(lb/yr)**	**(lb/hr)**	**(lb/day)**	**(lb/yr)**	**(lb/hr)**	**(lb/day)**	**(lb/yr)**
1,3-Butadiene	106-99-0			0.00E+00			4.79E-02			4.11E-02			8.90E-02
Acetaldehyde	75-07-0	4.61E+00			1.88E-03			1.61E-03			4.62E+00		
Acrolein	107-02-8	1.41E+00			2.27E-04			1.94E-04			1.41E+00		
Arsenic				2.89E+00									2.89E+00
Benzene	71-43-2			5.27E+02			1.14E+00			9.80E-01			5.29E+02
Benzo(a)pyrene	50-32-8			4.71E+00			2.30E-04			1.97E-04			4.72E+00
Beryllium				1.45E-01									1.45E-01
Cadmium				5.39E-01									5.39E-01
Carbon Tetrachloride				8.16E+01									8.16E+01
Chlorine		1.64E-01	3.92E+00								1.64E-01	3.92E+00	
Chlorobenzene			1.64E-01									1.64E-01	
Chloroform	67-66-3			6.93E+00									6.93E+00
Chromic acid (Chromium VI)	7738-94-5	5.25E-05	1.26E-03	4.60E-01								1.26E-03	
Di(2-ethylhexyl)phthalate (DEHP)			2.33E-04									2.33E-04	
Ethylene dichloride (1,2-dichloroethane)				5.26E+01									5.26E+01
Formaldehyde	50-00-0	8.61E+00			2.89E-03			2.48E-03			8.62E+00		
Hexachlorodibenzo-p-dioxin 1,2,3,6,7,8				2.90E+00									2.90E+00
Hydrogen chloride (hydrochloric acid)		3.93E-01									3.93E-01		
Manganese & compounds			5.76E-01									5.76E-01	
Mercury, vapor (Include in Mercury&Compds)			1.74E-02									1.74E-02	
Methyl chloroform (1,1,1 trichloroethane)		6.42E-03	1.54E-01								6.42E-03	1.54E-01	
Methyl ethyl ketone		1.12E-03	2.68E-02								1.12E-03	2.68E-02	
Xylene	1330-20-7	3.23E-01	7.75E+00		6.98E-04	1.68E-02		5.99E-04	1.44E-02		3.24E-01	7.78E+00	
Methyl isobutyl ketone	108-10-1	4.24E-01	1.02E+01								4.24E-01	1.02E+01	
Methylene chloride	75-09-2	1.11E-01		1.25E+02							1.11E-01		1.25E+02
Nickel metal (Component of Nickel & Compounds)			1.64E-01									1.64E-01	
Pentachlorophenol		1.06E-05	2.53E-04								1.06E-05	2.53E-04	
Perchloroethylene (tetrachloroethylene)				6.89E+01									6.89E+01
Phenol	108-95-2	1.72E+00									1.72E+00		
Polychlorinated biphenyls				1.48E-02									1.48E-02
Styrene	100-42-5	2.21E-02									2.21E-02		
Tetrachlorodibenzo-p-dioxin, 2,3,7,8-				1.56E-05									1.56E-05
Toluene	108-88-3		1.92E+01			2.40E-02			2.06E-02			1.92E+01	
Trichloroethylene				5.44E+01									5.44E+01
Trichlorofluoromethane (CFC 111)		8.49E-03									8.49E-03		
Vinyl chloride				3.26E+01									3.26E+01

TPER Comparison Table

Pollutant	CAS Number	Total			TPER (2Q .0711)			Modeling Required?
		(lb/hr)	(lb/day)	(lb/yr)	(lb/hr)	(lb/day)	(lb/yr)	
1,3-Butadiene	106-99-0			8.90E-02			1.10E+01	No
Acetaldehyde	75-07-0	4.62E+00			6.80E+00			No
Acrolein	107-02-8	1.41E+00			2.00E-02			Yes
Arsenic				2.89E+00			1.60E-02	Yes
Benzene	71-43-2			5.29E+02			8.10E+00	Yes
Benzo(a)pyrene	50-32-8			4.72E+00			2.20E+00	Yes
Beryllium				1.45E-01			2.80E-01	No
Cadmium				5.39E-01			3.70E-01	Yes
Carbon Tetrachloride				8.16E+01			4.60E+02	No
Chlorine		1.64E-01	3.92E+00		2.30E-01	7.90E-01		Yes
Chlorobenzene			1.64E-01			4.60E+01		No
Chloroform	67-66-3			6.93E+00			2.90E+02	No
Chromic acid (Chromium VI)	7738-94-5		1.26E-03			1.30E-02		No
Di(2-ethylhexyl)phthalate (DEHP)			2.33E-04			6.30E-01		No
Ethylene dichloride (1,2-dichloroethane)				5.26E+01			2.60E+02	No
Formaldehyde	50-00-0	8.62E+00			4.00E-02			Yes
Hexachlorodibenzo-p-dioxin 1,2,3,6,7,8				2.90E+00			5.10E-03	Yes
Hydrogen chloride (hydrochloric acid)		3.93E-01			1.80E-01			Yes
Manganese & compounds			5.76E-01			6.30E-01		No
Mercury, vapor (Include in Mercury&Compds)			1.74E-02			1.30E-02		Yes
Methyl chloroform (1,1,1 trichloroethane)		6.42E-03	1.54E-01		6.40E+01	2.50E+02		No
Methyl ethyl ketone		1.12E-03	2.68E-02		2.24E+01	7.80E+01		No
Xylene	1330-20-7	3.24E-01	7.78E+00		1.64E+01	5.70E+01		No
Methyl isobutyl ketone	108-10-1	4.24E-01	1.02E+01		7.60E+00	5.20E+01		No
Methylene chloride	75-09-2	1.11E-01		1.25E+02	3.90E-01		1.60E+03	No
Nickel metal (Component of Nickel & Compounds)			1.64E-01			1.30E-01		Yes
Pentachlorophenol		1.06E-05	2.53E-04		6.40E-03	6.30E-02		No
Perchloroethylene (tetrachloroethylene)				6.89E+01			1.30E+04	No
Phenol	108-95-2	1.72E+00			2.40E-01			Yes
Polychlorinated biphenyls				1.48E-02			5.60E+00	No
Styrene	100-42-5	2.21E-02			2.70E+00			No
Tetrachlorodibenzo-p-dioxin, 2,3,7,8-				1.56E-05			2.00E-04	No
Toluene	108-88-3		1.92E+01			9.80E+01		No
Trichloroethylene				5.44E+01			4.00E+03	No
Trichlorofluoromethane (CFC 111)		8.49E-03			1.40E+02			No
Vinyl chloride				3.26E+01			2.60E+01	Yes

Rotary Dryer - Criteria Pollutant Emissions

Dryer Inputs

Dryer Throughput (@ Dryer Exit)	527,778	tons/year @ 10% moisture
Annual Dried Wood Throughput of Dryer	475,000	ODT/year
Max. Hourly Dried Wood Throughput of Dryer	61.50	ODT/hr
Burner Heat Input	207.0	MMBtu/hr
Percent Hardwood	90%	
Percent Softwood	10%	
Potential Operation	8,760	hr/yr

Criteria Pollutant Calculations:

Pollutant	Biomass Emission Factor (lb/ODT)	Units	Emission Factor Source	Total Potential Emissions	
				(lb/hr)	(tpy)
CO	1.16	lb/ODT	Calculated from Guaranteed WESP Specifications[1]	71.34	275.5
NO_X	0.79	lb/ODT	Calculated from Guaranteed WESP Specifications[1]	48.59	187.6
$PM/PM_{10}/PM_{2.5}$ Condensible Fraction	0.017	lb/MMBtu	AP-42, Section 1.6[2]	3.52	15.4
TSP (Filterable)	0.090	lb/ODT	Calculated from Guaranteed WESP Specifications[1]	5.54	21.4
Total TSP (Filterable + Condensible)				9.05	36.8
PM_{10} (Filterable)	0.090	lb/ODT	Calculated from Guaranteed WESP Specifications[1]	5.54	21.4
Total PM_{10} (Filterable + Condensible)				9.05	36.8
$PM_{2.5}$ (Filterable)	0.090	lb/ODT	Calculated from Guaranteed WESP Specifications[1]	5.54	21.4
Total $PM_{2.5}$ (Filterable + Condensible)				9.05	36.8
SO_2	0.025	lb/MMBtu	AP-42, Section 1.6[3]	5.18	22.7
VOC	1.50	lb/ODT	Calculated from Guaranteed WESP Specifications[1]	92.25	356.3
Lead	0.00	N/A	N/A	0.00	0.0

Note:

[1] CO, NO_x, VOC, and filterable PM/PM_{10} emission factors were provided by the dryer system vendor. The $PM_{2.5}$ filterable emission factor is assumed to be the same as PM and PM_{10}.

[2] The vendor only provided the filterable fraction of particulate matter in the emission factors. The condensible fraction of particulate matter from a rotary dryer controlled by a WESP is not provided in AP-42, Section 10.6.2. Enviva has conservatively calculated the condensible fraction based upon the heat input of the dryer burners using an emission factor for wood combustion from AP-42, Section 1.6.

[3] No emission factor is provided in AP-42, Section 10.6.2 for SO_2 for rotary dryers. Enviva has conservatively calculated SO2 emissions based upon the heat input of the dryer burners using an emission factor for wood combustion from AP-42, Section 1.6.

Rotary Dryer - Federal Hazardous Air Pollutant (HAP) and North Carolina Toxic Air Pollutant (TAP) Emissions

Calculation Inputs:

Dryer Throughput (Ton/yr)	527,778
ODT/yr	475,000
ODT/hr	61.50
Hardwood Composition	90%
Softwood Composition	10%

HAP & TAP Emission Calculations:

HAP/TAP Pollutant	CAS Number	HAP (Yes/No)	NC TAP (Yes/No)	Direct wood-fired, hardwood			Green, Direct wood-fired (inlet moisture content >50%, dry basis), softwood[1]			MAXIMUM TOTAL EMISSIONS	
				Emission Factor[2] (lb/ODT)	Emissions[3]		Emission Factor (lb/ODT)	Emissions[3]			
					(lb/hr)	(tpy)		(lb/hr)	(tpy)	(lb/hr)	(tpy)
Acetaldehyde	75-07-0	**Yes**	**Yes**	3.83E-03	2.36E-01	8.19E-01	7.50E-02	4.61E+00	1.78E+00	4.61E+00	2.60E+00
Acrolein	107-02-8	**Yes**	**Yes**	1.17E-03	7.22E-02	2.51E-01	2.30E-02	1.41E+00	5.46E-01	1.41E+00	7.97E-01
Benzene	71-43-2	**Yes**	**Yes**	3.88E-04	2.39E-02	8.30E-02	7.60E-03	4.67E-01	1.81E-01	4.67E-01	2.63E-01
Chloroform	67-66-3	**Yes**	**Yes**	5.11E-06	3.14E-04	1.09E-03	1.00E-04	6.15E-03	2.38E-03	6.15E-03	3.47E-03
Chromic Acid (Chromium VI)	7738-94-5	**Yes**	**Yes**								
Cumene	98-82-8	**Yes**	No	1.02E-04	6.28E-03	2.18E-02	2.00E-03	1.23E-01	4.75E-02	1.23E-01	6.93E-02
Formaldehyde	50-00-0	**Yes**	**Yes**	7.15E-03	4.40E-01	1.53E+00	1.40E-01	8.61E+00	3.33E+00	8.61E+00	4.85E+00
m-,p-Xylene	1330-20-7	**Yes**	**Yes**	2.45E-04	1.51E-02	5.24E-02	4.80E-03	2.95E-01	1.14E-01	2.95E-01	1.66E-01
Methanol	67-56-1	**Yes**	No	5.62E-03	3.45E-01	1.20E+00	1.10E-01	6.77E+00	2.61E+00	6.77E+00	3.81E+00
Methyl isobutyl ketone	108-10-1	**Yes**	**Yes**	3.52E-04	2.17E-02	7.53E-02	6.90E-03	4.24E-01	1.64E-01	4.24E-01	2.39E-01
Methylene chloride	75-09-2	**Yes**	**Yes**	9.19E-05	5.65E-03	1.96E-02	1.80E-03	1.11E-01	4.28E-02	1.11E-01	6.24E-02
o-Xylene	95-47-6	**Yes**	No	2.30E-05	1.41E-03	4.91E-03	4.50E-04	2.77E-02	1.07E-02	2.77E-02	1.56E-02
Phenol	108-95-2	**Yes**	**Yes**	1.43E-03	8.79E-02	3.06E-01	2.80E-02	1.72E+00	6.65E-01	1.72E+00	9.71E-01
Propionaldehyde	123-38-6	**Yes**	No	6.64E-04	4.08E-02	1.42E-01	1.30E-02	8.00E-01	3.09E-01	8.00E-01	4.51E-01
Styrene	100-42-5	**Yes**	**Yes**	1.84E-05	1.13E-03	3.93E-03	3.60E-04	2.21E-02	8.55E-03	2.21E-02	1.25E-02
Toluene	108-88-3	**Yes**	**Yes**	6.64E-04	4.08E-02	1.42E-01	1.30E-02	8.00E-01	3.09E-01	8.00E-01	4.51E-01
									Total HAP	**2.62E+01**	**1.48E+01**

Note:

[1] HAP & TAP emission factors for "green, direct wood-fired (inlet moisture content >50%, dry basis" softwood were obtained from AP-42, Section 10.6.2, Table 10.6.2-3.

[2] To account for hardwood HAP & TAP emissions, factors were conservatively calculated by taking the AP-42 HAP factors for 100% softwood (green) and multiplying by the ratio of the total listed VOC emission factors for hardwood and softwood (0.24 / 4.7).

[3] Short-term HAP & TAP emissions were calculated based upon a worst-case scenario of 100% hardwood or softwood firing (in which case, softwood is always the overall worst case).

Rotary Dryer - Federal Hazardous Air Pollutant (HAP) and North Carolina Toxic Air Pollutant (TAP) Emissions from Combustion of Wood

Calculation Inputs:

Heat Input (MMBtu/hr)	207.00
Operating Schedule (hrs/yr)	8,760
Heat Input (MMBtu/yr)	1,813,320
WESP Metal HAP Control Efficiency[2]	92.75%
HCl Control Efficiency[3]	90.00%

HAP & TAP Emission Calculations:

Pollutant	Pollutant Type	Emission Factors			Emissions							
		Biomass			Biomass		Maximum Uncontrolled Total (per boiler)			Maximum Controlled Total (per boiler)		
		lb/mmBtu Uncontrolled	lb/mmBtu Controlled	Ref.	lb/hr		lb/hr	lb/yr	tpy	lb/hr	lb/yr	tpy
					Uncontrolled	Controlled						
Acetophenone	HAP	3.20E-09	3.20E-09	1	6.62E-07	6.62E-07	6.62E-07	5.80E-03	0.00	6.62E-07	5.80E-03	0.00
Antimony & Compounds	HAP	7.90E-06	5.73E-07	1, 2	1.64E-03	1.19E-04	1.64E-03	1.43E+01	0.01	1.19E-04	1.04E+00	0.00
Arsenic & Compounds	TAP/HAP	2.20E-05	1.60E-06	1, 2	4.55E-03	3.30E-04	4.55E-03	3.99E+01	0.02	3.30E-04	2.89E+00	0.00
Benzo(a)pyrene	TAP/HAP	2.60E-06	2.60E-06	1	5.38E-04	5.38E-04	5.38E-04	4.71E+00	0.00	5.38E-04	4.71E+00	0.00
Beryllium metal (un-reacted) (Also include in BEC)	TAP/HAP	1.10E-06	7.98E-08	1, 2	2.28E-04	1.65E-05	2.28E-04	1.99E+00	0.00	1.65E-05	1.45E-01	0.00
Cadmium Metal (elemental un-reacted) -(Add w/CDC)	TAP/HAP	4.10E-06	2.97E-07	1, 2	8.49E-04	6.15E-05	8.49E-04	7.43E+00	0.00	6.15E-05	5.39E-01	0.00
Carbon tetrachloride	TAP/HAP	4.50E-05	4.50E-05	1	9.32E-03	9.32E-03	9.32E-03	8.16E+01	0.04	9.32E-03	8.16E+01	0.04
Chlorine	TAP/HAP	7.90E-04	7.90E-04	1	1.64E-01	1.64E-01	1.64E-01	1.43E+03	0.72	1.64E-01	1.43E+03	0.72
Chlorobenzene	TAP/HAP	3.30E-05	3.30E-05	1	6.83E-03	6.83E-03	6.83E-03	5.98E+01	0.03	6.83E-03	5.98E+01	0.03
Chromic acid (Chromium VI)	TAP[4]	3.50E-06	2.54E-07	1, 2	7.25E-04	5.25E-05	7.25E-04	6.35E+00	0.00	5.25E-05	4.60E-01	0.00
Chromium–Other compds (add w/chrom acid to get CRC)	HAP	1.75E-05	1.27E-06	1, 2	3.62E-03	2.63E-04	3.62E-03	3.17E+01	0.02	2.63E-04	2.30E+00	0.00
Cobalt compounds	HAP	6.50E-06	4.71E-07	1, 2	1.35E-03	9.75E-05	1.35E-03	1.18E+01	0.01	9.75E-05	8.55E-01	0.00
Dinitrophenol, 2,4-	HAP	1.80E-07	1.80E-07	1	3.73E-05	3.73E-05	3.73E-05	3.26E-01	0.00	3.73E-05	3.26E-01	0.00
Di(2-ethylhexyl)phthalate (DEHP)	TAP/HAP	4.70E-08	4.70E-08	1	9.73E-06	9.73E-06	9.73E-06	8.52E-02	0.00	9.73E-06	8.52E-02	0.00
Ethyl benzene	HAP	3.10E-05	3.10E-05	1	6.42E-03	6.42E-03	6.42E-03	5.62E+01	0.03	6.42E-03	5.62E+01	0.03
Ethylene dichloride (1,2-dichloroethane)	TAP/HAP	2.90E-05	2.90E-05	1	6.00E-03	6.00E-03	6.00E-03	5.26E+01	0.03	6.00E-03	5.26E+01	0.03
Hexachlorodibenzo-p-dioxin 1,2,3,6,7,8	TAP	1.60E-06	1.60E-06	1	3.31E-04	3.31E-04	3.31E-04	2.90E+00	0.00	3.31E-04	2.90E+00	0.00
Hydrogen chloride (hydrochloric acid)	TAP/HAP	1.90E-02	1.90E-03	1, 3	3.93E+00	3.93E-01	3.93E+00	3.45E+04	17.23	3.93E-01	3.45E+03	1.72
Lead and Lead compounds	HAP	4.80E-05	3.48E-06	1, 2	9.94E-03	7.20E-04	9.94E-03	8.70E+01	0.04	7.20E-04	6.31E+00	0.00
Manganese & compounds	TAP/HAP	1.60E-03	1.16E-04	1, 2	3.31E-01	2.40E-02	3.31E-01	2.90E+03	1.45	2.40E-02	2.10E+02	0.11
Mercury, vapor (Include in Mercury&Compds)	TAP/HAP	3.50E-06	2.54E-07	1, 2	7.25E-04	5.25E-05	7.25E-04	6.35E+00	0.00	7.25E-04	6.35E+00	0.00
Methyl bromide (bromomethane)	HAP	1.50E-05	1.50E-05	1	3.11E-03	3.11E-03	3.11E-03	2.72E+01	0.01	3.11E-03	2.72E+01	0.01
Methyl chloride (chloromethane)	HAP	2.30E-05	2.30E-05	1	4.76E-03	4.76E-03	4.76E-03	4.17E+01	0.02	4.76E-03	4.17E+01	0.02
Methyl chloroform (1,1,1 trichloroethane)	TAP/HAP	3.10E-05	3.10E-05	1	6.42E-03	6.42E-03	6.42E-03	5.62E+01	0.03	6.42E-03	5.62E+01	0.03
Methyl ethyl ketone	TAP/HAP	5.40E-06	5.40E-06	1	1.12E-03	1.12E-03	1.12E-03	9.79E+00	0.00	1.12E-03	9.79E+00	0.00
Naphthalene	HAP	9.70E-05	9.70E-05	1	2.01E-02	2.01E-02	2.01E-02	1.76E+02	0.09	2.01E-02	1.76E+02	0.09
Nickel metal (Component of Nickel & Compounds)	TAP/HAP	3.30E-05	2.39E-06	1, 2	6.83E-03	4.95E-04	6.83E-03	5.98E+01	0.03	6.83E-03	5.98E+01	0.03
Nitrophenol, 4-	HAP	1.10E-07	1.10E-07	1	2.28E-05	2.28E-05	2.28E-05	1.99E-01	0.00	2.28E-05	1.99E-01	0.00
Pentachlorophenol	TAP/HAP	5.10E-08	5.10E-08	1	1.06E-05	1.06E-05	1.06E-05	9.25E-02	0.00	1.06E-05	9.25E-02	0.00
Perchloroethylene (tetrachloroethylene)	TAP/HAP	3.80E-05	3.80E-05	1	7.87E-03	7.87E-03	7.87E-03	6.89E+01	0.03	7.87E-03	6.89E+01	0.03
Phosphorus Metal, Yellow or White	HAP	2.70E-05	1.96E-06	1, 2	5.59E-03	4.05E-04	5.59E-03	4.90E+01	0.02	5.59E-03	4.90E+01	0.02
Polychlorinated biphenyls	TAP/HAP	8.15E-09	8.15E-09	1	1.69E-06	1.69E-06	1.69E-06	1.48E-02	0.00	1.69E-06	1.48E-02	0.00
Polycyclic Organic Matter	HAP	1.25E-04	1.25E-04	1	2.59E-02	2.59E-02	2.59E-02	2.27E+02	0.11	2.59E-02	2.27E+02	0.11
Propylene dichloride (1,2 dichloropropane)	HAP	3.30E-05	3.30E-05	1	6.83E-03	6.83E-03	6.83E-03	5.98E+01	0.03	6.83E-03	5.98E+01	0.03
Selenium compounds	HAP	2.80E-06	2.03E-07	1, 2	5.80E-04	4.20E-05	5.80E-04	5.08E+00	0.00	5.80E-04	5.08E+00	0.00
Tetrachlorodibenzo-p-dioxin, 2,3,7,8-	TAP/HAP	8.60E-12	8.60E-12	1	1.78E-09	1.78E-09	1.78E-09	1.56E-05	0.00	1.78E-09	1.56E-05	0.00
Trichloroethylene	TAP/HAP	3.00E-05	3.00E-05	1	6.21E-03	6.21E-03	6.21E-03	5.44E+01	0.03	6.21E-03	5.44E+01	0.03
Trichlorofluoromethane (CFC 111)	TAP	4.10E-05	4.10E-05	1	8.49E-03	8.49E-03	8.49E-03	7.43E+01	0.04	8.49E-03	7.43E+01	0.04
Trichlorophenol, 2,4,6-	HAP	2.20E-08	2.20E-08	1	4.55E-06	4.55E-06	4.55E-06	3.99E-02	0.00	4.55E-06	3.99E-02	0.00
Vinyl chloride	TAP/HAP	1.80E-05	1.80E-05	1	3.73E-03	3.73E-03	3.73E-03	3.26E+01	0.02	3.73E-03	3.26E+01	0.02

[1] Uncontrolled and controlled emission factors (criteria and HAP/TAP) for wood combustion in a stoker boiler from NCDAQ Wood waste Combustion Spreadsheet/AP-42; Compilation of Air Pollutant Emission Factors Vol. 1 - Stationary Sources USEPA, 5th ed. Section 1.6, 9/03

[2] The control efficiency of the wet electrostatic precipitator (WESP) for filterable particulate matter (88.9%) is applied to all metal hazardous and toxic pollutants.

[3] The WESP employs a caustic solution in its operation in which hydrochloric acid will have high water solubility. This caustic solution will neutralize the acid and effectively control it by 90%, per conversation on 10/18/2011 with Steven A. Jaasund, P.E. of Lundberg Associates, a manufacturer of WESPs.

[4] Chromic acid is a subset of chrome compounds, which is accounted for seperately as a HAP. As such, chromic acid is only calculated as a TAP.

Emergency Generator Emissions (ES-EG)

Equipment and Fuel Characteristics

Engine Output	0.26	MW
Engine Power	350	hp (brake)
Hours of Operation	500	hr/yr[1]
Heating Value of Diesel	19,300	Btu/lb
Power Conversion	2,545	Btu/hr/hp

Criteria Pollutant Emissions

Pollutant	Category	Emission Factor	Units	Potential Emissions	
				lb/hr	tpy
TSP	PSD	4.41E-04	lb/kW-hr (2)	0.12	2.88E-02
PM_{10}	PSD	4.41E-04	lb/kW-hr (2)	0.12	2.88E-02
$PM_{2.5}$	PSD	4.41E-04	lb/kW-hr (2)	0.12	2.88E-02
NO_x	PSD	8.82E-03	lb/kW-hr (5)	2.30	5.75E-01
SO_2	PSD	15	ppmw (3)	1.38E-03	3.46E-04
CO	PSD	7.72E-03	lb/kW-hr (2)	2.01	5.03E-01
VOC (NMHC)	PSD	2.51E-03	lb/MMBtu (4)	2.24E-03	5.59E-04
Toxic/Hazardous Air Pollutant Emissions					
Acetaldehyde	HAP/TAP	5.37E-06	lb/hp-hr (4)	1.88E-03	4.70E-04
Acrolein	HAP/TAP	6.48E-07	lb/hp-hr (4)	2.27E-04	5.67E-05
Benzene	HAP/TAP	6.53E-06	lb/hp-hr (4)	2.29E-03	5.71E-04
Benzo(a)pyrene[6]	HAP/TAP	1.32E-09	lb/hp-hr (4)	4.61E-07	1.15E-07
1,3-Butadiene	HAP/TAP	2.74E-07	lb/hp-hr (4)	9.58E-05	2.39E-05
Formaldehyde	HAP/TAP	8.26E-06	lb/hp-hr (4)	2.89E-03	7.23E-04
Total PAH (POM)	HAP	1.18E-06	lb/hp-hr (4)	4.12E-04	1.03E-04
Toluene	HAP/TAP	2.86E-06	lb/hp-hr (4)	1.00E-03	2.51E-04
Xylene	HAP/TAP	2.00E-06	lb/hp-hr (4)	6.98E-04	1.75E-04
Highest HAP (Formaldehyde)		8.26E-06	lb/hp-hr (4)	2.89E-03	7.23E-04
Total HAPs				9.49E-03	2.37E-03

Note:

[1] NSPS allows for only 100 hrs/yr of non-emergency operation of these engines (not the 500 hours shown). The PTE for the emergency generator is based on 500 hr/yr, though, because the regs allow non-emergency operation and EPA guidance is 500 hr/yr for emergency generators.

[2] Emissions factors from NSPS Subpart IIII (or 40 CFR 89.112 where applicable) in compliance with post-2009 construction.

[3] Sulfur content in accordance with Year 2010 standards of 40 CFR 80.510(a) as required by NSPS Subpart IIII.

[4] Emission factor obtained from AP-42 Section 3.3, Tables 3.3-1 Table 3.3-2.

[5] Emission factor for NOx is listed as NOx and NMHC (Non-Methane Hydrocarbons or VOC) in Table 4 of NSPS Subpart IIII. Conservatively assumed entire limit attributable to NOx.

[6] Benzo(a)pyrene is included as a HAP in Total PAH.

Firewater Pump Emissions (ES-FWP)

Equipment and Fuel Characteristics

Engine Output	0.22	MW
Engine Power	300	hp
Hours of Operation	500	hr/yr[1]
Heating Value of Diesel	19,300	Btu/lb
Power Conversion	2,545	Btu/hr/hp

Criteria Pollutant Emissions

Pollutant	Category	Emission Factor	Units	Potential Emissions	
				lb/hr	tpy
TSP	PSD	4.41E-04	lb/kW-hr (2)	0.10	2.47E-02
PM_{10}	PSD	4.41E-04	lb/kW-hr (2)	0.10	2.47E-02
$PM_{2.5}$	PSD	4.41E-04	lb/kW-hr (2)	0.10	2.47E-02
NO_x	PSD	8.82E-03	lb/kW-hr (5)	1.97	4.93E-01
SO_2	PSD	15	ppmw (3)	1.19E-03	2.97E-04
CO	PSD	7.72E-03	lb/kW-hr (2)	1.73	4.32E-01
VOC (NMHC)	PSD	2.51E-03	lb/MMBtu (4)	1.92E-03	4.79E-04
Toxic/Hazardous Air Pollutant Emissions					
Acetaldehyde	HAP/TAP	5.37E-06	lb/hp-hr (4)	1.61E-03	4.03E-04
Acrolein	HAP/TAP	6.48E-07	lb/hp-hr (4)	1.94E-04	4.86E-05
Benzene	HAP/TAP	6.53E-06	lb/hp-hr (4)	1.96E-03	4.90E-04
Benzo(a)pyrene[6]	HAP/TAP	1.32E-09	lb/hp-hr (4)	3.95E-07	9.87E-08
1,3-Butadiene	HAP/TAP	2.74E-07	lb/hp-hr (4)	8.21E-05	2.05E-05
Formaldehyde	HAP/TAP	8.26E-06	lb/hp-hr (4)	2.48E-03	6.20E-04
Total PAH (POM)	HAP	1.18E-06	lb/hp-hr (4)	3.53E-04	8.82E-05
Toluene	HAP/TAP	2.86E-06	lb/hp-hr (4)	8.59E-04	2.15E-04
Xylene	HAP/TAP	2.00E-06	lb/hp-hr (4)	5.99E-04	1.50E-04
Highest HAP (Formaldehyde)		8.26E-06	lb/hp-hr (4)	2.48E-03	6.20E-04
Total HAPs				8.13E-03	2.03E-03

Note:

[1] NSPS allows for only 100 hrs/yr of non-emergency operation of these engines (not the 500 hours shown). The PTE for the emergency generator is based on 500 hr/yr, though, because the regs allow non-emergency operation and EPA guidance is 500 hr/yr for emergency generators.

[2] Emissions factors from NSPS Subpart IIII (or 40 CFR 89.112 where applicable) in compliance with post-2009 construction.

[3] Sulfur content in accordance with Year 2010 standards of 40 CFR 80.510(a) as required by NSPS Subpart IIII.

[4] Emission factor obtained from AP-42 Section 3.3, Tables 3.3-1 Table 3.3-2.

[5] Emission factor for NOx is listed as NOx and NMHC (Non-Methane Hydrocarbons or VOC) in Table 4 of NSPS Subpart IIII. Conservatively assumed entire limit attributable to NOx.

[6] Benzo(a)pyrene is included as a HAP in Total PAH.

Potential GHG Emissions

Operating Data:

Dryer Heat Input	207.00 MMBtu/hr
Operating Schedule	8,760 hrs/yr
Emergency Generator Output	350 bhp
Operating Schedule	500 hrs/yr
No. 2 Fuel Input	16.7 gal/hr[1]
Energy Input	2.282 MMBtu/hr[2]
Fire Water Pump Output	300 bhp
Operating Schedule	500 hrs/yr
No. 2 Fuel Input	14.3 gal/hr[1]
Energy Input	1.956 MMBtu/hr[2]

Emission Unit ID	Fuel Type	Emission Factors from Table C-1 (kg/MMBtu)[3]			Tier 1 Emissions (metric tons)			
		CO2	CH4	N2O	CO2	CH4	N2O	Total CO2e
ES-DRYER	Wood and Wood Residuals	9.38E+01	3.20E-02	4.20E-03	187,490	64	8	187,562
ES-GN	No. 2 Fuel Oil (Distillate)	7.40E+01	3.00E-03	6.00E-04	93	3.77E-03	7.55E-04	93
ES-FWP	No. 2 Fuel Oil (Distillate)	7.40E+01	3.00E-03	6.00E-04	80	3.23E-03	6.47E-04	80

[1] Fuel consumption calculated using a factor of 0.0476 gal/hr-hp. Advanced Environmental Interface, Inc. (1998). General Permits for Emergency Engines. INSIGHTS, 98-2, 3.

[2] Energy calculated on a fuel consumption basis, using an energy factor of 0.137 MMBtu/gal.

[3] Emission factors from Table C-1 and C-2 of GHG Reporting Rule. Emission factors for methane and N2O already multiplied by their respective GWPs of 21 and 310.

ATTACHMENT 2

Air Dispersion Modeling

A.1

North Carolina Modeling Protocol Checklist

The North Carolina Modeling Protocol Checklist may be used in lieu of developing the traditional written modeling plan for North Carolina toxics and criteria pollutant modeling. The protocol checklist is designed to provide the same level of information as requested in a modeling protocol as discussed in Chapter 2 of the ***Guideline for Evaluating the Air Quality Impacts of Toxic Pollutants in North Carolina.*** The modeling protocol checklist is submitted with the modeling analysis.

Although most of the information requested in the modeling protocol checklist is self explanatory, additional comments are provided, where applicable, and are discussed in greater detail in the toxics modeling guidelines referenced above. References to sections, tables, figures, appendices, etc., in the protocol checklist are found in the toxics modeling guidelines.

INSTRUCTIONS: The modeling report supporting the compliance demonstration should include most of the information listed below. As appropriate, answer the following questions or indicate by check mark the information provided or action taken is reflected in your report.

FACILITY INFORMATION

Name: Enviva Pellets Northampton, LLC **Facility ID:** New Facility - TBD **Address:** Lebanon Church Road (Street Number TBD)	**Consultant (if applicable):** Trinity Consultants One Copley Parkway Suite 310 Morrisville, NC 27560
Contact Name: Glenn Gray	**Contact Name:** Joe Sullivan
Phone Number: (804) 412-0227 **Email:** Glenn.Gray@intrinergy.com	**Phone Number:** (919) 462-9693 **Email:** jhill@trinityconsultants.com

GENERAL

Description of New Source or Source / Process Modification: provide a short description of the new or modified source(s) and a brief discussion of how this change affects facility production or process operation.	X
Source / Pollutant Identification: provide a table of the affected pollutants, by source, which identifies the source type (point, area, or volume), maximum pollutant emission rates over the applicable averaging period(s), and, for point sources, indicate if the stack is capped or non-vertical (C/N).	X
Pollutant Emission Rate Calculations: indicate how the pollutant emission rates were derived (e.g., AP-42, mass balance, etc.) and where applicable, provide the calculations.	X
Site / Facility Diagram: provide a diagram or drawing showing the location of all existing and proposed emission sources, buildings or structures, public right-of-ways, and the facility property (toxics) / fence line (criteria pollutants) boundaries. The diagram should also include a scale, true north indicator, and the UTM or latitude/longitude of at least one point.	X
Certified Plat or Signed Survey: a certified plat (map) from the County Register of Deeds or a signed survey must be submitted to validate property boundaries modeled.	SS
Topographic Map: A topographic map covering approximately 5km around the facility must be submitted. The facility boundaries should be annotated on the map as accurately as possible.	X
Cavity Impact Analysis: If using SCREEN3, a cavity impact analysis must be conducted for all structures with a region of influence extending to one or more sources modeled to determine if cavity regions extend off property (toxics) or beyond the fence line (criteria pollutants). No separate cavity analysis is required if using AERMOD. *See Section 4.2*	N/A

GENERAL (continued)	
Background Concentrations (criteria pollutant analyses only): Background concentrations must be determined for each pollutant for each averaging period evaluated. The averaged background value used (e.g., high, high-second-high, high-third-high, etc.) is based on the pollutant and averaging period evaluated. The background concentrations are added to the modeled concentrations, which are then compared to the applicable air quality standard to determine compliance.	N/A
Offsite Source Inventories (criteria pollutant analyses only): Offsite source inventories must be developed and modeled for all pollutants for which onsite sources emissions are modeled in excess of the specific pollutant significant impact levels (SILs) as defined in the PSD New Source Review Workshop Manual. The DAQ AQAB must approve the inventories. An initial working inventory can be requested from the AQAB.	N/A

SCREEN LEVEL MODELING	
Model: The latest version of the SCREEN3 model must be used until AERSCREEN is developed and approved. The use of other screening models should be approved by NCDAQ prior to submitting the modeling report.	N/A
Source / Source emission parameters: Provide a table listing the sources modeled and the applicable source emission parameters. *See NC Form 3 – Appendix A.*	N/A
Merged Sources: Identify merged sources and show all appropriate calculations. *See Section 3.3*	N/A
GEP Analysis: SCREEN3 – for each source modeled, show all calculations identifying the critical structure used in the model run. *See section 3.2 and NC Form 1 - Appendix A.*	N/A
Cavity Impact Analysis: A cavity impact analysis using SCREEN3 must be conducted for all structures with a region of influence extending to one or more sources modeled to determine if cavity regions extend off property (toxics) or beyond the fence line (criteria pollutants). *See Section 4.2*	N/A
Terrain: Indicate the terrain modeled: simple *(Section 4.4)*, and complex *(Section 4.5 and NC Form 4 – Appendix A).* If complex terrain is within 5 kilometers of the facility, complex terrain must be evaluated. Simple terrain must include terrain elevations if any terrain is greater than the stack base of any source modeled. Simple: _______ Complex: _______	N/A
Meteorology: In SCREEN3, select full meteorology.	N/A
Receptors: SCREEN3 – use shortest distance to property boundary for each source modeled and use sufficient range to find maximum (*See Section 4.1 (i) and (j)*). Terrain above stack base must be evaluated.	N/A
Modeling Results: For each affected pollutant, modeling results should be summarized, converted to the applicable averaging period *(See Table 3)*, and presented in tabular format indicating compliance status with the applicable AAL, SIL or NAAQS. *See NC Form S5 – Appendix A.*	N/A
Modeling Files: Either electronic or hard copies of SCREEN3 output must be submitted.	N/A

REFINED LEVEL MODELING

Model: The latest version of AERMOD should be used, and may be found at http://www.epa.gov/scram001/dispersion_prefrec.htm. The use of other refined models must be approved by NCDAQ prior to submitting the modeling report.	X
Source / Source emission parameters: Provide a table listing the sources modeled and the applicable source emission parameters. *See NC Form 3 - Appendix A.*	X
GEP Analysis: Use BPIP-Prime with AERMOD.	X
Cavity Impact Analysis: No separate cavity analysis is required when using AERMOD as long as receptors are placed in cavity susceptible areas. *See Section 4.2 and 5.2.*	N/A
Terrain: Use digital elevation data from the USGS NED database (http://seamless.usgs.gov/index.php). Use of other sources of terrain elevations or the non-regulatory Flat Terrain option will require prior approval from DAQ AQAB.	X
Coordinate System: Specify the coordinate system used (e.g., NAD27, NAD83, etc.) to identify the source, building, and receptor locations. Note: Be sure to specify in the AERMAP input file the correct base datum (NADA) to be used for identifying source input data locations. Clearly note in both the protocol checklist and the modeling report which datum was used.	X
Receptors: The receptor grid should be of sufficient size and resolution to identify the maximum pollutant impact. *See Section 5.3.*	X
Meteorology: Indicate the AQAB, pre-processed, 5-year data set used in the modeling demonstration: (*See Section 5.5 and Appendix B)* AERMOD 1988-1992 Raleigh-Durham / Greensboro If processing your own raw meteorology, then pre-approval from AQAB is required. Additional documentation files (e.g. AERMET stage processing files) will also be necessary. For NC toxics, the modeling demonstration requires only the last year of the standard 5 year data set (e.g., 2005) provided the maximum impacts are less than 50% of the applicable AAL(s).	X
Modeling Results: For each affected pollutant and averaging period, modeling results should be summarized and presented in tabular format indicating compliance status with the applicable AAL, SIL or NAAQS. *See NC Form R5 - Appendix A.*	X
Modeling Files: Submit input and output files for AERMOD. Also include BPIP-Prime files, AERMAP files, DEM files, and any AERMET input and output files, including raw meteorological data.	X

MODELING INPUTS

AERMOD ID	Stack Ht. (m)	Stack Temp. (K)	Stack Vel. (m/s)	Stack Diam. (m)
DRYER	30.48	349.82	20.58	2.26
FWPSTACK	2.13	785.37	109.18	0.08
EMERGEN	1.52	766.48	78.30	0.10

Pollutant	EG Emission Rate (g/s)	FWP Emission Rate (g/s)	Dryer Emission Rate (g/s)
Arsenic	0.000E+00	0.000E+00	4.164E-05
Benzo(a)pyrene	5.809E-08	4.979E-08	6.787E-05
Cadmium	0.000E+00	0.000E+00	7.760E-06
Chlorine	0.000E+00	0.000E+00	2.062E-02
Hexachlorodibenzo-p-dioxin	0.000E+00	0.000E+00	4.177E-05
Hydrogen Chloride	0.000E+00	0.000E+00	4.960E-02
Mercury	0.000E+00	0.000E+00	9.137E-05
Nickel	0.000E+00	0.000E+00	8.615E-04
Vinyl Chloride	0.000E+00	0.000E+00	4.699E-04

FINAL MODELING RESULTS

Pollutant	Averaging Period	Max. Modeled Impact ($\mu g/m^3$)	Date/Time of Impact (YYMMDDHH)	Location of Maximum		AAL ($\mu g/m^3$)	% of AAL (%)
				UTM-E (m)	UTM-N (m)		
Arsenic	Annual	1.00E-05	1992	266,073.2	4.043.369.4	2.30E-04	4.35%
Benzo(a)pyrene	Annual	1.00E-05	1992	266,073.2	4,043,369.4	3.30E-02	0.03%
Cadmium	Annual	0.00E+00	1992	266,073.2	4,043,369.4	5.50E-03	0.00%
Chlorine	24-Hour	5.85E-02	92050724	265,518.8	4,042,557.8	3.75E+01	0.16%
Hexachlorodibenzo-p-dioxin	Annual	1.00E-05	1992	266,073.2	4.043,369.4	7.60E-05	13.16%
Hydrogen Chloride	1-Hour	2.72E-01	92080420	265,791.0	4,042,519.1	7.00E+02	0.04%
Mercury	24-Hour	2.60E-04	92050724	265.518.8	4,042,557.8	6.00E-01	0.04%
Nickel	1-Hour	4.73E-03	92080420	265,791.0	4,042,519.1	6.00E+00	0.08%
Vinyl Chloride	Annual	1.00E-04	1992	266,073.2	4,043,369.4	3.80E-01	0.03%

6600167

NCDENR
North Carolina Department of Environment and Natural Resources
Division of Air Quality

Beverly Eaves Perdue
Governor

Sheila C. Holman
Director

Dee Freeman
Secretary

October 13, 2011

OCT 14 2011

Mr. Norb Hintz
Vice President, Engineering
Enviva Pellets Northampton, LLC
7200 Wisconsin Avenue, Suite 1100
Bethesda, Maryland 20814

Dear Mr. Hintz:

Subject: PSD Completeness Review
Enviva Pellets Northampton, LLC
Gaston, Northampton County, North Carolina

Reference is made to your Prevention of Significant Deterioration (PSD) preconstruction air permit application received August 26, 2011 (6600167.11A) for proposed construction of a wood pellet manufacturing facility.

In accordance with the procedures required pursuant to 15A NCAC 2D .0530(o) and 40 CFR 51.166(q), this office considers your application complete for PSD review purposes. This determination does not prevent the NCDAQ from requesting additional information regarding previously submitted materials and technical issues involved in the application.

The application has been assigned to Kevin Godwin for review. If you have any questions regarding this matter please contact Kevin at (919) 715-6255.

Sincerely,

Donald R. van der Vaart, Ph.D., J.D., P.E.
Chief

c: Patrick Butler, Supervisor, Raleigh Regional Office

Permitting Section
1641 Mail Service Center, Raleigh, North Carolina 27699-1641
2728 Capital Blvd., Raleigh, North Carolina 27604
Phone: 919-715-6235 / FAX 919-733-5317 / Internet: www.ncair.org

NCDENR

North Carolina Department of Environment and Natural Resources
Division of Air Quality

Beverly Eaves Perdue
Governor

Sheila C. Holman
Director

Dee Freeman
Secretary

August 29, 2011

Mr. Norb Hintz
Vice President Engineering
Enviva Pellets Northampton, LLC
7200 Wisconsin Avenue
Suite 1100
Bethesda, MD 20814

SUBJECT: Receipt of Permit Application
Greenfield Facility
Application No. 6600167.11A
Enviva Pellets Northampton, LLC
Facility ID: 6600167, Gaston, Northampton County

Dear Mr. Hintz:

Your air permit application (6600167.11A) for Enviva Pellets Northampton, LLC, located in Northampton County, North Carolina was received by this Division on August 26, 2011.

This application submittal **did** contain all the required elements as indicated and has been accepted for processing. Your application will be considered complete as of August 26, 2011, unless informed otherwise by this office within 60 days.

Should you have any questions concerning this matter, please contact Kevin Godwin at (919) 715-6255.

Sincerely,

for Donald van der Vaart, Ph.D., P.E., J.D.
Chief

cc: Raleigh Regional Office Files

6600167

Received

AUG 3 0 2011

Permits Section

FORM A1

FACILITY (General Information)

REVISED 11/01/02 NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate **A1**

NOTE- APPLICATION WILL NOT BE PROCESSED WITHOUT THE FOLLOWING:

☑ Local Zoning Consistency Determination (if required) ☑acility Reduction & Recycling Survey Form (Form A4) A☑cation Fee

☑ Responsible Official/Authorized Contact Signature ☑ppropriate Number of Copies of Application P☑ Seal (if required)

GENERAL INFORMATION

Legal Corporate/Owner Name: Enviva Pellets Northampton, LLC

Site Name: Enviva Pellets Northampton, LLC

Site Address (911 Address) Line 1: Lebanon Church Road (Street Number TBD)

Site Address Line 2:

City: Gaston	State: North Carolina
Zip Code: 27866	County: Northampton

CONTACT INFORMATION

Permit/Technical Contact:	*Facility/Inspection Contact:*
Name/Title: Glenn Gray / Plant Manager	Name/Title: same as permit/technical contact
Mailing Address Line 1: 7200 Wisconsin Avenue	Mailing Address Line 1:
Mailing Address Line 2: Suite 1100	Mailing Address Line 2:
City: Bethesda State: Maryland Zip Code: 20814	City: State: Zip Code:
Phone No. (area code) (757) 274-8377 Fax No. (area code) (301) 657-5567	Phone No. (area code) Fax No. (area code)
Email Address: Glenn.Gray@envivabiomass.com	Email Address:
Responsible Official/Authorized Contact:	*Invoice Contact:*
Name/Title: Norb Hintz	Name/Title: same as permit/technical contact
Mailing Address Line 1: 7200 Wisconsin Avenue	Mailing Address Line 1:
Mailing Address Line 2: Suite 1100	Mailing Address Line 2:
City: Bethesda State: Maryland Zip Code: 20814	City: State: Zip Code:
Phone No. (area code) (301) 657-5567 Fax No. (area code) (301) 657-5567	Phone No. (area code) Fax No. (area code)
Email Address: Norb.Hintz@envivabiomass.com	Email Address:

APPLICATION IS BEING MADE FOR

☑ New Non-permitted Facility/Greenfield ☐ Modification of Facility (permitted) ☐ Renewal with Modification

☐ Renewal (TV Only)

FACILITY CLASSIFICATION AFTER APPLICATION (Check Only One)

☐eneral ☐mall ☐ Prohibitory Small ☐ Synthetic Minor ☑ Title V

FACILITY (Plant Site) INFORMATION

Describe nature of (plant site) operation(s): Facility ID No. : (to be assigned)

Wood pellet manufacturing facility

Primary SIC/NAICS Code: 2499 (Wood Products, Not Elsewhere Classified)	Current/Previous Air Permit No. N/A Expiration Date N/A
Facility Coordinates: Latitude: 256,700 UTM E	Longitude: 4,042,900 UTM N

Does this application contain confidential data? ☐ YES ☑NO

PERSON OR FIRM THAT PREPARED APPLICATION

Person Name: Joe Sullivan		Firm Name: Trinity Consultants, Inc.	
Mailing Address Line 1: One Copley Parkway		Mailing Address Line 2: Suite 310	
City: Morrisville	State: North Carolina	Zip Code: 27560	County: Wake
Phone No. (919) 462-9693	Fax No. (919) 462-9694	Email Address: Jsullivan@trinityconsultants.com	

SIGNATURE OF RESPONSIBLE OFFICIAL/AUTHORIZED CONTACT

Name (typed): Norb Hintz Title Vice President Engineering

X Signature(Blue Ink): Date: Aug 18, 2011

Attach Additional Sheets As Necessary

Comprehensive Application Report for 6600167.11A

08/29/2011

Enviva Pellets Northampton, LLC - Gaston (6600167)

Northampton County

6600167
RRO

General Information: Permit/Latest Revision: 10203/

Permit code: PSD
Application type: Greenfield Facility
Engineer/Rev. location: Kevin Godwin/RCO
Regional Contact: Charles McEachern
Facility location: Raleigh Regional Office
Facility classification: Unknown
Clock is ON Application is COMPLETE
Status is : In progress

Application Dates

Received	Completeness Due	Clock Start	Calculated Issue Due
08/26/2011	10/25/2011		

Fee Information

Initial amount:	Date received:	Amount Due:	Add. Amt Rcv'd:	Date Rcv'd:
$13488.00	08/29/2011			

Fund type:	Deposit Slip #:	Location rec'd:	Location deposited:
2331			

Contact Information

Type	Name	Address	City State ZIP	Telephone
Technical/Permit	Glenn Gray, Plant Manager	7200 Wisconsin Avenue	Bethesda, MD 20814	(757) 274-8377
Authorized	Norb Hintz, Vice President Engineering	7200 Wisconsin Avenue	Bethesda, MD 20814	(301) 657-5567

Acceptance Criteria

Received?	Acceptance Criteria Description
Yes	Application fee
Yes	Appropriate number of apps submitted
Yes	Zoning Addressed
Yes	Source recycling/reduction form
Yes	Authorized signature
Yes	PE Seal

Completeness Criteria

Received?	Complete Item Description

Application Events

Event	Start	Due	Complete	Comments	Staff

Regulations Pertaining to this Permit

Reference Rule	Regulation Description

Audit Information Pertaining to this Application

Column Name	Date Changed	Old Value	New Value	Editor
perm_Code	08/29/2011	GRNTV (TV-Greenfield)	PSD (PSD)	Mark Cuilla
permit_No	08/29/2011		10203	Charles McEachern
reg_Cont	08/29/2011		821 (Charles McEachern)	Mark Cuilla

AIR QUALITY CONSTRUCTION AND OPERATING PERMIT APPLICATION
VOLUME I
ENVIVA PELLETS NORTHAMPTON, LLC • GASTON, NORTH CAROLINA

Prepared by:

TRINITY CONSULTANTS
One Copley Parkway, Suite 310
Morrisville, North Carolina 27560
919.463.9693
Fax: 919.462.9694
trinityconsultants.com

Prepared for:

ENVIVA PELLETS NORTHAMPTON, LLC
Lebanon Church Rd.
Gaston, NC 27832

August 2011

Project 113401.0047

Trinity Consultants

AIR QUALITY CONSTRUCTION AND OPERATING PERMIT APPLICATION
VOLUME I
ENVIVA PELLETS NORTHAMPTON, LLC • GASTON, NORTH CAROLINA

Prepared by:

TRINITY CONSULTANTS
One Copley Parkway, Suite 310
Morrisville, North Carolina 27560
919.463.9693
Fax: 919.462.9694
trinityconsultants.com

Prepared for:

ENVIVA PELLETS NORTHAMPTON, LLC
Lebanon Church Rd.
Gaston, NC 27832

August 2011

Project 113401.0047

Trinity Consultants

TABLE OF CONTENTS

TABLES

FIGURES

1.1 EXECUTIVE SUMMARY

Enviva Pellets, LLC (Enviva) is planning to construct and operate a wood pellets manufacturing plant in the town of Gaston, NC.

The proposed plant consists of the following:

- A raw material receiving and processing yard;
- Wood handling equipment;
- One 207 mmBtu/hr green wood direct-fired dryer system with pollution control equipment consisting of a cyclone dust collector and wet electrostatic precipitator (WESP) for particulate matter abatement;
- Four hammermills controlled by fabric filtration systems;
- Wood pellet coolers controlled via cyclones;
- A wood pellet storage silo;
- An emergency electric generator; and
- Fire water pump.

Air emission sources and associated pollution controls are described in detail in Section 2.

This document in its entirety comprises an air quality construction and operating permit application for the project. The project will result in air emissions increases of various compounds that exceed the thresholds triggering the Prevention of Significant Deterioration (PSD) preconstruction permitting program, as well as certain other federal and state regulations. This application fully conforms to all permitting requirements and demonstrates compliance in accordance with those requirements. It should be noted that the project will not cause or contribute to violations of the National and State Ambient Air Quality Standards (NAAQS and SAAQS) and PSD Increments, will not result in adverse impacts to federally protected Class I areas, and will utilize Best Available Control Technology (BACT) for each compound subject to PSD review.

In addition to application report Sections 1 through 6, key elements of this application are provided as the following appendices to this report:

1. Permit application forms (Appendix A);
2. Emissions calculations (Appendix B); and
3. Local Zoning Consistency determination (Appendix C).

Six copies of the application addendum have been provided and two electronic copies of the air dispersion modeling-related files have also been provided.

1.2 ORGANIZATION OF APPLICATION

Six copies of the application have been provided along with the $13,488 permit application processing fee. This application consists of two (2) volumes, comprised of the following:

Volume I:

- Section 1 provides an Executive Summary,
- Section 2 provides a project description and discusses air emissions,
- Section 3 discusses regulatory applicability, and
- Section 4 summarizes the BACT analysis.
- Appendix A contains air permit application forms,
- Appendix B presents air emissions calculations, and
- Appendix C contains the required local zoning consistency determination.

Volume II: Air Dispersion Modeling Report.

The proposed wood pellets plant is designed to produce up to 500,000 tons per year of wood pellets, assuming a residual 5 percent weight (wt %) moisture content of the pellets. Pellets will typically consist of pressed hardwoods, but could contain up to 10 percent softwoods on an annual basis. This section discusses the Northampton Plant's pelletizing process and associated air emissions. Detailed air emissions calculations are presented for each source discussed in this section in Appendix B. A process flow diagram is presented in Figure 2-1.

2.1 GREEN CHIPPED WOOD HANDLING AND SIZING (ES-GWHS), LOG DEBARKING AND CHIPPING (ES-CHIP-1) AND FUEL STORAGE BIN (ES-GWFB)

"Green" (i.e., wet) wood will be delivered to the facility via trucks as either pre-chipped wood or whole logs (for on-site chipping). Pre-chipped wood will be screened and oversized chips will undergo additional chipping. Whole logs will be chipped and debarked to specification for drying in the on-site electric-powered chipper (ES-CHIP-1). Chipped wood for drying is conveyed to wood storage while wood/bark is conveyed to a green wood dryer fuel storage bin (ES-GWFB).

Green wood contains a high moisture content approaching 50 percent by weight and handling operations for wet wood therefore has negligibly small emissions. The moisture content of wet wood is well above the applicability range of aggregate handling emissions estimation methodologies provided in AP-42, so no emission calculations are included for green wood transfer points.

Emissions estimates for ES-CHIP-1 are based on limited emission factors available for wood chipping. As shown in the attached emissions calculations (Appendix B), VOC emissions from the chipper are calculated using emission factors from NCASI technical bulletins.[1] Methanol emissions are also calculated using factors from AP-42 Sections 10.6.3 and 10.6.4. Particulate matter (PM) emissions will be negligible from the green wood chipper because the exhaust is directed downward towards the ground.

2.2 WOOD DRYER (ES-DRYER)

Green wood is conveyed to a single rotary dryer system. Direct contact heat is provided to the system via a 207 mmBtu/hr total heat input burner system. Air emissions are controlled by a cyclone for bulk particulate removal and additional particulate is removed utilizing a wet electrostatic precipitator (WESP) operating after the cyclones.

Emissions are calculated using a combination of dryer vendor emission guarantees (criteria pollutants only) and AP-42 emissions factors.

---

[1] NCASI Technical Bulletins containing emission factors for wood-chipping were provided to Trinity Consultants by South Carolina Department of Health and Environmental Control (SC DHEC) in the course of developing emissions for an electric powered chipper.

2.3 DRIED AND SIZED WOOD HANDLING (ES-DWH)

Dried materials are transferred from the dryer via conveyors to hammermills for further size reduction prior to pelletization. In total there are four uncontrolled dried wood transfer points, two occurring prior to the hammermills and two after the hammermills.

The following dried wood transfer points are included in this emissions grouping:

- Drop Point 1 (DP1): Dryer discharger to dryer collection conveyor belt
- DP2: Pre-screen feeder fines overs to hammermills infeed and distribution
- DP3: Hammermills cyclone diverter gates to hammermills system discharge collection conveyor belt
- DP4: Hammermills system discharge collection conveyor belt to pellet mill feed silo infeed screw

As shown in the calculations in Appendix B, emissions from any source within the Dried and Sized Wood Handling emission grouping are insignificant.

2.4 HAMMERMILLS (ES-HM-1, -2, -3, -4)

Prior to pellitization, dried materials are reduced to the appropriate size needed for pelletization using four hammermills operating in parallel. A conveyor system receives the ground wood from the hammermills and sends the ground wood to to the pellet mill feed silo.

Particulate emissions from the hammermills are controlled using four cyclones in series with two bagfilters. A third bagfilter located in the hammermills area controls fugitive dust emissions from a variety of sources (discussed in a separate section to follow). Appendix B summarizes the emissions from each hammermill bagfilter system.

2.5 HAMMERMILL AREA FILTER

A number of dried- and sized-wood transport and transfer point emissions sources are controlled by the Hammermill Area Filter baghouse. Sources controlled by this bagfilter include, but are not limited to, the following sources (indicated by alphabetical designations prescribed in Figure 2-1):

- A, B, C, & D: Emissions from the four dry hammermill metering bins
- E: Hammermills infeed and distribution transfer
- F: Pellet cooler transfer (particulate emissions from pellet cooler cyclones large enough to drop out of entrainment) & pellet screening
- G: Hammermill pre-screen feeder emissions
- H: Pellet screen fines cyclone

Emissions from this bagfilter are calculated assuming an average grain loading factor for the wood particulates and the maximum nominal stack flow rate.

2.6 PELLET MILL FEED SILO (ES-PMFS)

Sized wood from the hammermills is transported on a set of conveyors to the infeed screw for the pellet mill feed silo prior to pelletization. Emissions from the Pellet Mill Feed Silo are controlled using a separate bagfilter.

2.7 PELLET PRESS SYSTEM AND CONVEYORS (ES-PP)

Dried ground wood is mechanically compacted in the presence of water in several screw presses in the Pellet Press System. Exhaust from the Pellet Press and Pellet Presses conveyors are vented to the atmosphere with negligible particulate matter emissions, as shown in Appendix B. No chemical binding agents are needed for pelletization.

2.8 PELLET COOLERS (ES-CLR)

Pellet Press conveyors discharge wood pellets through one of six Pellet Coolers. Cooling air is passed through the pellets. At this point, the Pellets contain a small amount of wood fines, which are swept out with the cooling air and are controlled utilizing three cyclones operating in parallel (one for each two coolers) prior to discharge to the atmosphere.

2.9 FINISHED PRODUCT HANDLING (ES-FPH)

Pelletized product is conveyed to storage and load-out operations with no air emissions to the atmosphere.

2.10 EMERGENCY GENERATOR (ES-EG), FIRE WATER PUMP (ES-FWP) AND ASSOCIATED FUEL OIL STORAGE TANKS

The plant will utilize a 350 brake horsepower emergency generator for emergency operations and a 300 brake horsepower fire water pump engine. Both engines will combust diesel fuel. Aside from maintenance and readiness testing, these sources will only be utilized for emergency operations. Diesel for the emergency generator will be stored in up to a 2,500 gallon storage tank and diesel for the fire water pump will be stored in up to a 500 gallon storage tank. Emissions from both fuel oil storage tanks are insignificant.

3. REGULATORY APPLICABILITY ANALYSIS

This section summarizes the applicability and requirements of key federal and state regulations.

3.1 FEDERAL REGULATIONS

3.1.1 PREVENTION OF SIGNIFICANT DETERIORATION (PSD), 40 CFR PART 51.166

North Carolina has implemented most of the federal PSD requirements of 40 CFR 51.166 under North Carolina Regulation 15A NCAC 2D .0530. Under the PSD regulations, a major stationary source for PSD is defined as any source in one of the 28 named source categories with the potential to emit 100 tpy or more of any regulated pollutant, or any source not in one of the 28 named source categories with the potential to emit 250 tpy or more of any regulated pollutant other that GHGs.[2] Neither wood pellet production nor operation of associated combustion sources qualifies the facility for classification in one of the 28 listed source categories.

Federal PSD requirements for GHGs have been implemented in North Carolina under 15A NCAC 2D .0544, which essentially adopts the U.S. EPA's "GHG Tailoring Rule." The GHG Tailoring Rule establishes higher emission rates triggering PSD review for GHGs with the major source threshold being 100,000 tpy of CO_2 equivalent (CO_2e) and a significant emission rate of 75,000 tpy CO_2e.

As shown in Table 3-1, the proposed project constitutes a major stationary source of CO, VOC and CO_2e. In addition, the facility exceeds the PSD significant emission rates (SERs) for PM, NO_x, and VOC. Therefore, Enviva is submitting this PSD construction and operating permit application in accordance with all federal and state PSD requirements.

3.1.2 TITLE V OPERATING PERMIT PROGRAM, 40 CFR PART 70

40 CFR Part 70 establishes the federal Title V operating permit program. North Carolina has incorporated the provisions of this federal program in its Title V operating permit program under 15A NCAC 2Q .0500. The major source thresholds with respect to the North Carolina Title V operating permit program regulations are 10 tons per year of a single HAP, 25 tpy of any combination of HAP, and 100 tpy of certain other regulated pollutants.

The site will be a major Title V source for only criteria pollutants. Enviva is requesting that the procedures of 15A NCAC 2Q .0504 be applied to this project allowing direct issuance of a construction and operating permit under 15A NCAC 2D .0300. Enviva will submit a permit application for a Title V permit within one year after commencement of operation.

---

[2] 40 CFR §52.21(b)(1)(i)

3.1.3 NEW SOURCE PERFORMANCE STANDARDS, 40 CFR PART 60 (15A NCAC 2D .0524 NEW SOURCE PERFORMANCE STANDARDS)

New Source Performance Standards (NSPS), located in 40 CFR Part 60 and implemented in North Carolina Regulation 15A NCAC 2D .0524, require certain categories of new, modified, or reconstructed sources to control emissions to specified levels. Three potentially applicable NSPS are addressed below.

3.1.3.1 NSPS SUBPART IIII

NSPS Subpart IIII applies to owners or operators of compression ignition (CI) internal combustion engines (ICE) manufactured after April 1, 2006 that are not fire pump engines, and fire pump engines manufactured after July 1, 2006. As noted in Section 2, the plant will have a 350 hp emergency generator and a 300 hp fire pump. The emergency generator and fire pump will be manufactured after the dates specified above. Therefore, the emergency generator and fire pump are subject to the provisions of NSPS Subpart IIII.

Under NSPS Subpart IIII, owners and operators of emergency generators manufactured in CY 2007 or later with a maximum engine power greater than or equal to 50 hp are required to comply with the emission limits referenced in 40 CFR §60.4205(b). These limits are as follows: 0.20 g/kW for PM, 3.5 g/kW for CO, and 4 g/kW for NO_x + nonmethane hydrocarbons (NMHC).

Enviva will comply with the emission limits by operating the generator as instructed in the manufacturer's operating manual in accordance with 40 CFR §60.4211(a), and purchasing an engine certified to meet the referenced emission limits in accordance with 40 CFR §60.4211(c). The engine will be equipped with a non-resettable hour meter in accordance with 40 CFR §60.4209(a). Emergency and readiness testing of the unit will be limited to 100 hours per year.

In accordance with NSPS Subpart IIII, owners and operators of fire pump engines manufactured after July 1, 2006 must comply with the emission limits in Table 4 of NSPS Subpart IIII, which are organized based on the size of the unit. These limits are as follows: 0.20 g/kW for PM, 3.5 g/kW for CO, and 4 g/kW for NO_x + nonmethane hydrocarbons (NMHC).

Enviva will comply with these emission limits by operating the fire pump as instructed in the manufacturer's operating manual in accordance with 40 CFR §60.4211(a), and purchasing an engine certified to meet the referenced emission limits in accordance with 40 CFR §60.4211(b). The engine will be equipped with a non-resettable hour meter in accordance with 40 CFR §60.4209(a). Emergency and readiness testing of the unit will be limited to 100 hours per year.

In addition, both the proposed emergency generator and fire pump will be required to comply with the fuel requirements in 40 CFR §60.4207, which limit sulfur to a maximum of 15 ppmw and a cetane index of at least 40.

3.1.3.2 NSPS SUBPARTS DB AND KB

The proposed plant will utilize direct fired drying of chipped wood and, therefore, will not trigger the NSPS Subpart Db (Industrial-Commercial-Institutional Steam Generating Units) regulations. Diesel fuel oil storage tank capacities are well below the NSPS Subpart Kb (Volatile Organic Liquid Storage Vessels, for which construction, reconstruction, or modification commenced after 7/23/1984) applicability storage capacity threshold of approximately 20,000 gallons.

3.1.4 NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS, 40 CFR PART 63 (15A NCAC 2D .1111 MAXIMUM ACHIEVABLE CONTROL TECHNOLOGY)

The National Emission Standards for Hazardous Air Pollutants (NESHAP) listed in 40 CFR Part 63 and implementing North Carolina regulation 15A NCAC 2D .1111 are source category-specific regulations that limit emissions of HAPs. Two potentially applicable NESHAPs are addressed below.

3.1.4.1 40 CFR PART 63 SUBPART ZZZZ

40 CFR 63 Subpart ZZZZ applies to reciprocating internal combustion engines (RICE) located at a major or area source of HAP emissions. An affected source is any existing, new, or reconstructed stationary RICE located at a major or area source of HAP emissions. Emergency power and limited use units are subject to limited requirements under 40 CFR 63.6590(b)(i) and 40 CFR 63.6590(b)(ii). Emergency stationary RICE are defined in 40 CFR 63.6675 as any stationary RICE that operates in an emergency situation. These situations include engines used for power generation when power from the local utility is interrupted, or engines used to pump water in the case of fire or flood.

The proposed emergency generator and the emergency fire pump at the site will be classified as emergency stationary RICE under the NESHAP and will comply with the requirements listed under this subpart.

3.1.4.2 40 CFR PART 63 SUBPART DDDD

40 CFR Subpart DDDD applies to Plywood and Composite Wood Products facilities classified as major sources of hazardous air pollutants (HAPs), having the potential to emit of 10 tons per year of a single HAP or 25 tons per year aggregate HAP. As indicated in Table 3-2, facility-wide potential HAP emissions are less than the major source threshold.

3.2 NORTH CAROLINA REGULATIONS

For the sources that are included for review in this application package, the North Carolina State Implementation Plan (SIP) rules and regulations have been evaluated for applicability. Applicable rules are identified below.

3.2.1 15A NCAC 02D .0515 PARTICULATES FROM MISCELLANEOUS INDUSTRIAL PROCESSES

Particulate emissions from all emissions sources subject to permitting, including the wood pellet dryer are regulated under 15A NCAC 2D .0515. This regulation limits the particulate emissions based on total throughput. This regulation limits the particulate emissions based on process throughput using the equation $E = 4.10 \times P^{0.67}$, for process rates (P) less than 30 tons per hour (ton/hr) and $E=55 \times P^{0.11}-40$ for process rates greater than 30 tons per hour.

All emissions from particulate matter sources are either negligible or well-controlled. The most significant emission unit at the site, the process dryer operating a 61.5 ODT/hr, has an emission limit of 46.5 lb/hr. Maximum emissions from the dryer are approximately 8.5 lb/hr, well below the standard.

3.2.2 15A NCAC 02D .0516 SULFUR DIOXIDE EMISSIONS FROM COMBUSTION SOURCES

Under this regulation, emissions of sulfur dioxide from combustion sources cannot exceed 2.3 pounds of sulfur dioxide per million Btu input. Wood is fired in the dryer and low sulfur diesel is combusted in the two emergency engines, resulting in operation well below regulatory limits.

3.2.3 15A NCAC 02D .0521 CONTROL OF VISIBLE EMISSIONS

Under this regulation, for sources manufactured after July 1, 1971, visible emissions cannot be more than 20 percent opacity when averaged over a six-minute period. However, six-minute averaging periods may exceed 20 percent opacity under the following conditions:

- No six-minute period exceeds 87 percent opacity,
- No more than one six-minute period exceeds 20 percent opacity in any hour, and
- No more than four six-minute periods exceed 20 percent opacity in any 24-hour period.

This rule applies to all processes that may have a visible emission, including the dryer, other particulate matter emissions sources controlled by cyclone and/or baghouse, and the diesel-fired engines.

3.2.4 15A NCAC 02Q .0700 TOXIC AIR POLLUTANT PROCEDURES

This regulation requires that new and modified sources of toxic air pollutants with emissions exceeding specified de minimis values apply for an air toxics permit. Facility-wide emissions of several compounds emitted from the site exceed the permitting de minimis level. A comparison of emissions to de minimis values are summarized in Table 3-3. Modeling for compounds triggering permitting is discussed in Volume 2 of this application.

4. BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION

4.1 INTRODUCTION

Any major stationary source or major modification subject to PSD must conduct an analysis to ensure the use of "best available control technology" (BACT). BACT is an emission limitation for NSR-regulated pollutants that applies to each individual new emission unit at a major stationary source when the project, in its entirety, has a significant net emissions increase for that pollutant. Significant emissions thresholds are set forth in 40 C.F.R. §52.21(b)(23). Individual BACT determinations are performed on a unit-by-unit, pollutant-by-pollutant basis taking into account energy, environmental, and economic impacts. This numerical limit can be based on the application of air pollution equipment or specific production processes, methods, systems, or techniques.

4.1.1 APPLICABILITY

The proposed plant is a major PSD source as described in Section 3. The compounds subject to PSD review and for which a BACT analysis is required are:

- Nitrogen oxides (NO_x),
- Particulate matter ($PM/PM_{10}/PM_{2.5}$),
- Carbon monoxide (CO),
- Volatile organic compounds (VOC), and
- Carbon dioxide equivalent (CO_2e).

The emission units and compounds for which a BACT analysis is required are listed below:

Regulated NSR Pollutants	**Dryer System**	**Emergency Generator**	**Firewater Pump**	**Pellet Coolers**	**Hammermills and Area Filters**	**Pellet Press Silo**
NO_x	x	x	x			
$PM/PM_{10}/PM_{2.5}$	x	x	x	x	x	x
CO	x	x	x			
VOC	x	x	x			
CO_{2e}	x	x	x			

4.1.2 TECHNICAL APPROACH

The definition of BACT may be found in Section 169(3) of the Clean Air Act and in the PSD regulations under 40 CFR 52.21(j). BACT is defined as:

> *"...an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under the Clean Air Act which would be emitted from any proposed major stationary source or*

> *major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of the measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology."*

On December 1, 1987, the U.S. EPA Assistant Administrator for Air and Radiation issued a memorandum that implemented certain program initiatives to improve the effectiveness of the PSD program within the confines of existing regulations and state implementation plans. Among the initiatives was a "top-down" approach for determining BACT. This "top down" approach was used to determine BACT for all sources indicated in Section 4.1.1.

The first step in this analysis was to identify all possible control options. Next, all technically infeasible or undemonstrated control options were eliminated and the remaining options were ranked in order of control effectiveness. After ranking control options, the most stringent emission level was considered BACT unless economic, energy, or environmental impacts preclude its selection. If adverse impacts precluded selection of the most stringent option, the next most stringent emission level was evaluated. This process continued until a control option could not be eliminated and was selected as BACT.

Control options for each compound for this analysis were developed using information from the following resources:

- RBLC database (RACT/BACT/LAER Clearinghouse) located on EPA's Technology Transfer Network in the EPA electronic bulletin board system,
- Various EPA reports on emissions control technologies,
- Various air pollution control technology vendors,
- Pending permit applications and issued permits for similar facilities, and
- Compilation of Air Pollution Emission Factors (AP-42) published by EPA.

It should be noted that the RBLC only includes one determination for a wood pellet mill, determination VA-0298, This project was permitted a number of years ago using an conceptual "wood-fired RTO" technology for VOC control, but the plant was never constructed because, according the VA Department of Environmental Quality, the project was unable to obtain financing. Therefore, the only RBLC information presented in this application for the proposed facility is for NO_x emissions from the dryer, assumed to be similar to wood-fired stoker boilers. All other pollutants emitted from the dryer are not believed to be similar to any other types of emission units included in the RBLC. For instance, namely because emissions are directly impacted by the effect of the rotary drying process (even CO is evolved from wood being dried).

4.1.3 PSD IMPACT ANALYSIS OF CONTROL ALTERNATIVES

As mentioned above, the economic, environmental, and energy impacts of technically feasible BACT options were evaluated according to the top-down BACT process. The first step involves a technical feasibility analysis of all potential control options, and the next step involves an evaluation of the economic impacts of feasible control alternatives with primary consideration to the cost effectiveness (dollars per ton of compound removed) for each option. The economic analysis is typically based on vendor quotes and/or established EPA cost estimating procedures. An environmental impact analysis was then performed to determine whether any adverse "non-air" impacts were associated with an alternative. The last analysis involved calculating energy impacts, or increased energy requirements, associated with each option.

4.2 DRYER SYSTEM

Enviva plans to use utilize a rotary drying kiln to reduce wood moisture from approximately 50 percent to 5 to 10 percent prior to pelletization. Direct contact heat will be provided to the system via a 207 mmBtu/hr burner system. Air emissions will be controlled by a multiclone followed by a wet electrostatic precipitator (WESP) operating in series. Emissions are calculated using a combination of dryer vendor emission guarantees (criteria pollutants only) and AP-42 emissions factors. The pollutants emitted from the dryers that are subject to BACT review are NO_x, $TSP/PM_{10}/PM_{2.5}$, VOC, CO, and CO_2e. The control technology assessment for each compound subject to PSD review is provided below

4.2.1 NITROGEN OXIDES (NO_X)

The formation of NO_x is determined by the interaction of chemical and physical processes occurring within the flame zone of the furnace of the proposed boiler. There are two principal forms of NO_x designated as "thermal" NO_x and "fuel" NO_x. Thermal NO_x formation is the result of oxidation of atmospheric nitrogen contained in the inlet gas in the high-temperature, post-flame region of the combustion zone. The major factors influencing thermal NO_x formation are temperature, concentrations of combustion gases (primarily nitrogen and oxygen) in the inlet air and residence time within the combustion zone. Fuel NO_x is formed by the oxidation of fuel-bound nitrogen. NO_x formation can be controlled by adjusting the combustion process and/or installing post-combustion controls.

4.2.1.1 IDENTIFY CONTROL TECHNOLOGIES

A summary of results from the RBLC is provided in Table 4-1.

Potentially applicable NO_x control technologies are:

- Conventional Selective Catalytic Reduction (SCR),
- Regenerative Selective Catalytic Reduction (RSCR), and
- Selective Non-Catalytic Reduction (SNCR).

Conventional Selective Catalytic Reduction and Regenerative Selective Catalytic Reduction Technologies: Conventional Selective Catalytic Reduction (SCR) is a post combustion NO_x add-on control device that is placed in the flue gas stream following the boiler. SCR involves the injection of ammonia (NH_3) into the flue gas stream ahead of a catalyst bed. On the catalyst surface, ammonia reacts with NO_x contained within the air to form nitrogen gas (N_2) and water (H_2O) in accordance with the following chemical equations:

$$4NH_3 + 4NO + O_2 \rightarrow 4N_2 + 6H_2O$$
$$4NH_3 + 2NO_2 + O_2 \rightarrow 3N_2 + 6H_2O$$

The catalyst's active surface is usually either a noble metal (platinum), base metal (titanium or vanadium), or a zeolite-based material. Metal-based catalysts are usually applied as a coating over a metal or ceramic substrate. Zeolite catalysts are typically a homogenous material that forms both the active surface and the substrate. The geometric configuration of the catalyst body is designed for maximum surface area and minimum obstruction of the flue gas flow path in order to achieve maximum conversion efficiency and minimum back pressure. The most common configuration is a "honeycomb" design. In a typical ammonia injection system, ammonia is drawn from a storage tank, vaporized and injected upstream of the catalyst bed. Excess ammonia that is not reacted in the catalyst bed and emitted is referred to as ammonia slip. An important factor that affects the performance of an SCR is operating temperature. The temperature range for standard base metal catalyst is between 400-800°F.

The flue gas in conventional SCR systems in wood-fired systems prior to final particulate matter controls contain alkali metals such as sodium, potassium and zinc and trace heavy metals that poison and "blind" the SCR catalyst. It is believed that there are no conventional SCR systems operating after wood-fired combustion systems in the U.S. There are a few systems reportedly operating in Europe utilizing such systems; however, these are specialized systems operating on power plants utilizing bubbling fluidized bed and circulating fluidized bed boilers and these systems reportedly require unusually high maintenance.

Babcock Power Inc. developed a new SCR system that can be installed after the final particulate matter emissions controls. This relatively new technology, called Regenerative Selective Catalytic Reduction or "RSCR " utilizes beds of ceramic media to raise the temperature of the flue gas after particulate control, to a temperature needed for reaction. The main advantage of an RSCR system is that it operates in a cleaner environmental providing improved catalyst performance and high thermal efficiency. In the RSCR, the gas passes through a preheated bed where it is heated from the temperature of the exhaust exiting the final PM control device (approximately 170 °F). Burners then raise the flue gas temperature to 470 °F before it flows across the adjacent catalyst canister, where NO_x reduction occurs. The exhaust gas from the catalyst bed then heats an adjacent bed containing heat transfer media. This heated bed then becomes the preheater for the exhaust. Flow direction continues to alternate in this fashion.

Selective Non-Catalytic Reduction: Selective Non-Catalytic Reduction (SNCR) describes a process by which NO_X is reduced to molecular nitrogen (N_2) and water (H_2O) by injecting an ammonia or urea ($CO(NH_2)_2$) spray into the post-combustion area of the unit. Typically, injection nozzles are located in the upper area of the furnace and convective passes. Once injected, the urea or ammonia decomposes into NH_3 or NH_2 free radicals, reacts with NO_X molecules, and reduces to nitrogen and water. The ammonia and urea reduction equations are provided below. These reactions are endothermic and use the heat of the burners as energy to drive the reduction reaction:

$$2NO + 2NH_3 + \tfrac{1}{2}O_2 \longrightarrow 2N_2 + 3H_2O$$

$$2NO + CO(NH_2)_2 + \tfrac{1}{2}O_2 \longrightarrow 2N_2 + CO_2 + 2H_2O$$

Both ammonia and urea have been successfully employed as reagents in SNCR systems and have certain advantages and disadvantages. Ammonia is less expensive than urea and results in substantially less operating costs at comparable levels of effectiveness. Urea, however, is able to penetrate further into flue gas streams, making it more effective in larger scale burners and combustion units with high exhaust flow rates.

SNCR is considered a selective chemical process because, under a specific temperature range, the reduction reactions described above are favored over reactions with other flue gas components. Although other operating parameters such as residence time and oxygen availability can significantly affect performance, temperature remains one of the most prominent factors affecting SNCR performance.

The SNCR process requires the installation of reagent storage facilities, a system capable of metering and diluting the stock reagent into the appropriate solution, and an atomization/injection system at the appropriate locations in the combustion unit. The reagent solution is typically injected along the post-combustion section of the combustion unit. Injection sites around the unit must be optimized for reagent effectiveness and must balance residence time with flue gas stream temperature.

For ammonia, the optimum reaction temperature range is approximately 880 to 1,100 degrees Celsius (°C) (1,615 to 2,000 °F). Below the SNCR operating temperature range, the NH_3/NO_x reaction will not occur. The unreacted NH_3 will either be emitted as NH_3 slip or it will react with SO_3 to form ammonium salts. Above the optimal temperature range, the amount of NH_3 that oxidizes to NO_x increases and NO_x reduction performance deteriorates.

4.2.1.2 ELIMINATE TECHNICALLY INFEASIBLE OPTIONS

Conventional SCR and Regenerative SCR: As discussed in the previous section, there are substantial technical concerns about poisoning/blinding of catalysts utilized within a conventional SCR system and our research indicates that there are no such systems operating on source similar to the wood-fired dryer burner system anywhere in the world. RSCR has not been demonstrated on a wood chip dryer in the past. Potential impacts of salts carry over from the WESP needed for particulate matter control may poison catalyst and, furthermore, the low temperate of the exhaust from the WESP (~170 °F) makes reheat necessary for appropriate catalyst operating temperature impracticable. Thus, both conventional SCR and RSCR are both considered undemonstrated/technically infeasible technologies for wood dryers.

4.2.1.3 RANK REMAINING CONTROL TECHNOLOGIES BY EFFECTIVENESS

There is one technically feasible NO_x control technologies for the rotary dryer – SNCR. After collaboration between Enviva and a major SNCR vendor, an SNCR control option of 0.515 lb/ODT (equivalent to 0.15 lb/mmBtu) was determined to be the lowest achievable emission rate due to inherent limitations on the effectiveness of this control device in the proposed burner system.

4.2.1.4 EVALUATE MOST EFFECTIVE CONTROL OPTION (IMPACTS ANALYSIS)

4.2.1.4.1 SNCR (0.515 LB/ODT)

Economic Impacts
As shown in Tables 4-3 and 4-4, the SNCR can achieve a NO_x level of 0.515 lb/mmBtu at approximately $6,701/ton of NO_x reduction. This cost is considered prohibitive and, thus, SNCR is rejected from consideration in the BACT analysis.

Energy Impacts
Energy requirements for an SNCR system primarily consist of the power needed for ammonia injection. It is estimated that the energy impact associated with SNCR control is approximately 2.54×10^4 KWH/yr. Enviva Pellets, LLC does not consider this quantity of electric generation capacity to be a significant "adverse impact."

Environmental Impacts
There are no major adverse environmental impacts.

4.2.1.5 SELECT BACT

The baseline emission rate proposed by the dryer vendor of 0.79 lb/ODT utilizing good combustion practices and optimal burner design is proposed as BACT.

4.2.2 PARTICULATE MATTER (TSP/PM_{10}/$PM_{2.5}$)

Particulate matter (TSP/PM_{10}) is emitted as both filterable and condensable particulate matter. Enviva has designed the rotary dryer system with a multiclone, considered the baseline level of control, for particulate matter removal.

4.2.2.1 IDENTIFY CONTROL TECHNOLOGIES

Potentially applicable TSP/PM_{10} add-on control technologies (in addition to the base multiclone) are:

- Baghouse and
- WESP.

Baghouse: A fabric filtration device (baghouse) consists of a number of filtering elements (bags) along with a bag cleaning system contained in a main shell structure incorporating dust hoppers. Fabric filters use fabric bags as filters to collect particulate matter. The particulate-laden gas enters a fabric filter compartment and passes through a layer of particulate and filter bags. The collected particulate forms a cake on the bag, which enhances the bag's filtering efficiency. However, excessive caking will increase the pressure drop across the fabric filter and reduce its efficiency. A phenomenon known as "blinding" occurs when cake builds up to the point that air can no longer pass through the baghouse during normal operation or the baghouse becomes clogged with wet and/or resinous compounds.

The particulate removal efficiency of fabric filters is dependent upon a variety of particle and operational characteristics. Particle characteristics that affect the collection efficiency include particle size distribution, particle cohesion characteristics, and particle electrical resistivity. Operational parameters that affect fabric filter collection efficiency include air-to-cloth ratio, operating pressure loss, cleaning sequence, interval between cleanings, cleaning method, and cleaning intensity. In addition, the particle collection efficiency and size distribution can be affected by certain fabric properties (e.g., structure of fabric, fiber composition, and bag properties).

Wet Electrostatic Precipitator: WESPs remove particles from a gas stream through the use of electrical forces. Discharge electrodes apply a negative charge to particles passing through a strong electrical field. These charged particles then migrate to a collecting electrode having an opposite, or positive, charge. Collected particles are removed from the collecting electrodes by washing utilizing a mild hydroxide solution to prevent buildup of resinous materials present in the dryer exhaust. Wet ESPs versus dry ESPs are utilized in the forest products industries for control of emissions from similar dryer sources because dry ESPs cannot reliably operate due to resin buildup on collection electrodes.

4.2.2.2 ELIMINATE TECHNICALLY INFEASIBLE OPTIONS

Although an effective form of particulate control in many applications, use of a baghouse is technically infeasible due to condensation of resinous compounds on the baghouse leading to blinding. Wood chip dryers are optimized for thermal efficiency to recirculate as much air through the system without leading to excess moisture and condensation problems within the drying system. However, as the exhaust leaves the process it is sufficiently laden with moisture and resinous compounds that condensation in a baghouse occurs readily.

4.2.2.3 RANK REMAINING CONTROL TECHNOLOGIES BY EFFECTIVENESS

There is only one feasible control technology for the rotary dryer, a WESP.

4.2.2.4 EVALUATE MOST EFFECTIVE CONTROL OPTION (IMPACTS ANALYSIS)

Enviva does not consider the cost of WESP control excessive. Based on their extensive experience with the wood products industry, use of a WESP is a reliable method of excellent PM control. There are numerous sources utilizing this method of control on forest products dryers, so there are no adverse energy impacts. Wastewater is pretreated prior to permitted discharge to the local wastewater treatment plant, so there will be no adverse environmental impacts.

4.2.2.5 SELECT BACT

Since the baghouse was deemed cost prohibitive the plant will utilize the current process design controls of multiclones followed by WESP to minimize total PM emissions. Although WESPs control filterable and condensable PM, the degree to which condensable PM is controlled is not well characterized and cannot be estimated with confidence. Since WESP control efficiency for filterable PM in a wood-fired application is well-characterized, but condensable PM is not, Enviva proposes a filterable PM limit of 0.09 lb/MM Btu, equivalent to approximately 0.007 gr/cubic foot of exhaust. It should be noted that for conservatism, condensable PM from the dryer included in air dispersion modeling included in the application was based on AP-42.

4.2.3 CARBON MONOXIDE (CO) AND VOLATILE ORGANIC COMPOUNDS (VOC)

Carbon monoxide and VOC emissions result due to imperfect combustion of carbonaceous material in the fuel. CO is a by-product of the combustion process in which carbon is not fully oxidized to CO_2. Likewise, VOC is emitted when the carbonaceous matter in the fuel is not converted to CO_2 or CO. Control of both species involves forcing the oxidation of carbon to CO_2.

The VOC emissions from a wood pellet mill are almost entirely from the wood drying process. Enviva will design the pellet milling equipment to utilize at least 90 percent hardwood. Hardwood species emit far less VOC than the more common softwood species and it is anticipated that the plant would emit almost 70 percent less VOC than a traditional softwood mill. It should be noted that wood chip drying systems such as the one proposed recirculate approximately 30 percent of dryer air into the combustion makeup air for the burner to optimize thermal efficiency and partial VOC destruction.

A variety of forest products industries sometimes utilize VOC and CO oxidation abatement equipment. Use of such controls is often fraught with operational difficulties requiring regular, significant capital investments to replace various equipment in the oxidation system. The following analysis ignores these additional costs; however, the useful economic life of oxidation controls has been assumed to be 10 years, which is still conservatively long because experience with the forest products industry has shown that the major components of these systems are typically replaced at a more frequent schedule such that essentially the entire cost of an oxidation system will occur more frequently than 10 years.

4.2.3.1 IDENTIFY CONTROL TECHNOLOGIES

VOC and CO emissions from the wood drying kiln can be controlled by process design and/or VOC and CO add-on oxidation technologies. Based upon a search of RBLC results and commercially demonstrated technology, only the following control technologies were considered in this evaluation:

- Process design,
- Regenerative thermal oxidation (RTO),
- Regenerative catalytic oxidation (RCO),
- Thermal Catalytic Oxidation (TCO),
- Packed-Bed Catalytic Wet Scrubber, and
- Bio-oxidation / Bio-filtration.

PROCESS DESIGN: Enviva will design the pellet milling equipment to utilize at least 90 percent hardwood species. Utilizing 90% hardwood for pellet production would achieve a VOC emission rate of 1.50 lb/oven-dried ton (ODT), which equates to a 68 percent reduction in VOC compared to the AP-42[3] emission factor of 4.7 lbs/ODT for comparable rotary dryer utilizing softwood.

REGENERATIVE THERMAL OXIDATION: RTOs use a high-density media such as a ceramic-packed bed still hot from a previous cycle to preheat an incoming VOC-laden waste gas stream. The preheated, partially oxidized gases then enter a combustion chamber where they are heated by auxiliary fuel (natural gas) combustion to a final oxidation temperature typically between 760 to 820 °C (1400 to 1500 °F) and maintained at this temperature to achieve maximum VOC destruction. The purified, hot gases exit this chamber and are directed to one or more different ceramic-packed beds cooled by an earlier cycle. Heat from the purified gases is absorbed by these beds before the gases are exhausted to the atmosphere. The reheated packed-bed then begins a new cycle by heating a new incoming waste gas stream.

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[3] US EPA Compilation of Air Pollutant Emission Factors, Chapter 10.6 Table 10.6.2-3.

REGENERATIVE CATALYTIC OXIDATION: Regenerative catalytic oxidation (RCO) technology is widely used in the reduction of VOC emissions. It operates in the same fashion as the RTO, but it requires only moderate reheating to the operating range of the catalyst, approximately 450 °F. Furthermore, RCOs can achieve a high thermal efficiency of 95% because they utilize a ceramic bed to recapture the heat of the stream exiting the combustion zone. Particulate control must be placed upstream of an RCO.

THERMAL CATALYTIC OXIDATION: Operating much in the same fashion as an RCO, thermal catalytic oxidation (TCO), passes heated gases through a catalyst without the regenerative properties attributed by the ceramic bed used to recapture heat.

PACKED-BED CATALYTIC WET SCRUBBER: This technology was considered for its ability to oxidize the volatile organic hazardous air pollutants (HAPs) formaldehyde and methanol, which comprise a considerable portion of the VOC emissions. This technology, combined with the existing wet scrubbing system, is reportedly capable of achieving 90 percent control efficiency of either compound and roughly 30 percent overall VOC control efficiency.

BIO-OXIDATION / BIO-FILTRATION: Bio-filtration offers an alternative to costly thermal or catalytic units. It is an air pollution control technology – offering upwards of 80% or more control efficiency – in which VOCs are oxidized using living micro-organisms on a media bed (sometimes referred to a "bioreactor"). A fan is typically used to collect or draw contaminated air from a building or process. If the air is not properly conditioned (heat, humidity, solids), then pre-treatment may be a necessary step to obtain optimum gas stream conditions before introducing it into the bioreactor. As the emissions flow through the bed media, the pollutants are absorbed by moisture on the bed media and come into contact with the microbes. The microbes consume and metabolize the excess organic pollutants, converting them into CO_2 and water, much like a traditional oxidation process.

"Mesophilic" microbes are typically used in these systems. Mesophilic microbes can survive and metabolize VOC materials at conditions up to 110°F to 120°F. One company is attempting to develop a commercial-scale technology that employs "thermophilic" microbes, but that technology has only been demonstrated on a single pilot scale installation that has a similar – but not exactly the same – exhaust stream profile as Enviva. Thermophilic microbes live and metabolize VOC at higher operating temperatures (~160°F).

4.2.3.2 ELIMINATE TECHNICALLY INFEASIBLE OPTIONS

As indicated in the previous subsection, there are a variety of combustion techniques that can be used to control VOC. However, the following technologies are not practical for VOC control at the Enviva plant:

- Packed Bed Catalytic Scrubber, and
- Bio-oxidation / Bio-filtration.

PACKED BED WET SCRUBBER: This technology is still within a startup mode of operation at its first full-scale demonstration in Moncure, NC. Until the technology can demonstrated to operate reliably with an established VOC control efficiency over an extended period of time, this technology is not considered to be a clearly feasible control technology.

BIO-OXIDATION / BIO-FILTRATION: In the case of the bio-oxidation or bio-filtration, many questions still remain on the technology's efficacy to remove VOC and HAP emissions at the Enviva plant.

A primary problem with this technology is the sensitivity of the microbes to stream conditions. At the normal exhaust temperature ranges (~170°F) after a wet ESP that would be used for PM control, mesophilic microbes would die. To cool the exhaust stream to conditions in which mesophiles live, Enviva would need to install a recirculating water heat exchanger which is ineffective during the hotter summer months. At such a high operating temperature, use of thermophilic microbes would be required. However, this technology has only been demonstrated on the pilot scale to date. Additionally, questions still remain as to how to "feed" the thermophiles during common two week downtimes, or during other non-operational periods. Therefore, use of a bio-filtration system is not considered a technically feasible means of VOC control for the Enviva plant.

REGENERATIVE CATALYTIC/THERMAL OXIDATION: Even though RTO and RCO are assumed to be technically feasible it is important to note that other facilities have had problems with RTO/RCOs in the past. Even with efficient PM/PM_{10} control, catalyst blinding/poisoning reduces catalyst life. There are also corrosion problems that currently occur in both the RTO and RCO.

4.2.3.3 RANK REMAINING CONTROL TECHNOLOGIES BY EFFECTIVENESS

After eliminating the technically infeasible control options, Enviva has determined the following options remain and has ranked them in order of greatest to least control of VOC emissions:

- Regenerative thermal oxidation (RTO) designed for 90% control efficiency
- Regenerative catalytic oxidation (RCO) designed for 70% control efficiency

4.2.3.4 EVALUATE MOST EFFECTIVE CONTROL OPTION (IMPACTS ANALYSIS)

4.2.3.4.1 REGENERATIVE THERMAL OXIDATION (0.150 LB/ODT VOC AND 0.116 LB/ODT CO)

Economic Impacts
Results of the economic impacts evaluation for operation of the RTO are presented in Tables 4-5, 4-7 and 4-8. Capital and operating costs were based on vendor quotes, OAQPS Manual, and past permitting experience. Other cost impacts were estimated using EPA cost methodologies. Table 4-5 presents a breakout of costs used in the economic impacts evaluation. A detailed discussion of key cost estimates is provided in the following text.

Capital Costs for the RTO were provided to Enviva by GEOENERGY. Economic Life of the RTO of 10 years was also supplied by the vendor, which is also consistent with Trinity experience.

As shown in Tables 4-7 and 4-8, the cost-effectiveness of continued operation of the RTO is approximately $5,566/ton VOC and $8,023/ton CO, which is considered cost prohibitive.

Energy Impacts
The additional energy required to operate the RTO is about 3,560,000 kW-hr/yr.

Environmental Impacts
There are no adverse impacts from the operation of an RTO, except for increased emissions of criteria pollutants and GHGs emitted as by-products of natural gas used for supplemental fuel.

4.2.3.4.2 REGENERATIVE CATALYTIC OXIDATION (0.450 LB/ODT VOC AND 0.348 LB/ODT CO)

Economic Impacts
Results of the economic impacts evaluation for operation of the RCO are presented in Tables 4-6 through 4-8. Capital and operating costs were based on vendor quotes and the OAQPS Manual. Other cost impacts were estimated using EPA cost methodologies. Table 4-7 presents a breakout of costs used in the economic impacts evaluation. A detailed discussion of key cost estimates is provided in the following text.

As shown in Tables 4-7 and 4-8, the cost-effectiveness of the RCO is approximately $7,197/ton VOC and $10,375, which is considered cost prohibitive.

Energy Impacts
The additional energy required to operate the RCO is approximately 3,600,000 kW-hr/yr.

Environmental Impacts
There are no adverse impacts from the operation of a RCO, except for increased emissions of criteria pollutants and GHGs emitted as by-products of natural gas used for supplemental fuel.

4.2.3.4.3 PROCESS DESIGN (1.50 LB/ODT VOC & 1.16 LB/ODT CO)

There are no adverse economic, energy, or environmental impacts associated with designing the process to utilize at least 90% hardwood. Use of primarily hardwood has been used to establish baseline emissions and results in an approximate 68% VOC reduction compared to a traditional softwood mill.

4.2.3.5 SELECT BACT

Since both RTO and RCO add-on abatement technologies were deemed cost prohibitive, the plant would utilize process design to minimize total VOC emissions to 1.50 lb/ODT and CO emissions to 1.16 lb/ODT.

4.2.4 GREENHOUSE GAS EMISSIONS (CO_2, CH_4, N_2O)

On July 1, 2011, EPA signed the *Deferral for CO_2 Emissions from Bioenergy and Other Biogenic Sources under the Prevention of Significant Deterioration (PSD) and Title V Programs*. The final rule becomes effective immediately upon the date of its publication in the Federal Register, which is expected to follow the rule signing by one to two weeks. However, the applicability and effective date of this deferral in a particular state will vary. The deferral is optional for any state, local, or tribal permitting authorities that implement the Title V and PSD permitting programs (i.e., SIP-approved programs). Though not mandatory, EPA encourages states that expect to receive permit applications from a number of biomass facilities to submit the necessary SIP revisions or Title V program revisions to implement this three-year deferral. Since Enviva is submitting this application prior to North Carolina amending its own SIP-approved program to reflect the deferred rule, Enviva is addressing the CO_2 emissions from the new facility. Based on future developments of the updated SIP, Enviva will discuss any permitting implications with NCDAQ at that time.

Therefore, since there will be significant emissions increases from the project, a BACT analysis for GHG is being conducted on the dryer. From a combustion unit, GHG emissions of CO, CH_4, and N_2O are anticipated as a result of the combustion processes; therefore, a BACT review must be conducted for each of these pollutants. The following sections outline Steps 1 through 5 of the BACT analysis for CO_2.

On November 10, 2010 (and later with a revision in March 2011), U.S. EPA issued several new guidance documents related to the completion of GHG BACT analyses. The following guidance documents were utilized as resources in completing the GHG BACT evaluation for the proposed project:

- *PSD and Title V Permitting Guidance For Greenhouse Gases* (hereafter referred to as General GHG Permitting Guidance)[4]
- *Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from Industrial, Commercial, and Institutional Boiler* (hereafter referred to as GHG BACT Guidance for Boilers)[5]

To complete the GHG BACT evaluation, Enviva also relied on additional resources such as:

- Specifications provided by the dryer system vendor
- RBLC database – Searching the newly enhanced RBLC database returned no results on permitting decisions for biomass furnaces for GHGs.[6]
- GHG Mitigation Strategies Database – The GHG Mitigation Strategies Database did not contain any green wood furnaces and dryer system installations for the forest products industry comparable to this project.[7]

4.2.4.1 IDENTIFY CONTROL TECHNOLOGIES

CO_2: The following potential CO_2 control strategies for the dryer system were considered as part of this BACT analysis:

- Selection of the lowest carbon fuel
- Installation of energy efficient options for the Dryer System

SELECTION OF LOWEST CARBON FUEL: For GHG BACT analyses, low-carbon intensity fuel selection is the primary control option that can be considered a lower emitting process. The dryer system's furnace will combust biomass (green wood) as the primary fuel.

Firing natural gas as a primary fuel is considered an available option, as natural gas is a lower emitting GHG fuel on a direct carbon basis than biomass (not accounting for the life cycle carbon neutral benefits of biomass combustion). Other "clean fuels" options are not required to be considered according to the General GHG Permitting Guidance since that would fundamentally redefine the source by requiring the permit applicant to

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[4] U.S. EPA, Office of Air and Radiation, Office of Air Quality Planning and Standards, (Research Triangle Park, NC: U.S. EPA EPA-HQ-OAR-2010-0841-0001, November 2010). http://www.epa.gov/nsr/ghgdocs/epa-hq-oar-2010-0841-0001.pdf

[5] U.S. EPA, Office of Air and Radiation, Office of Air Quality Planning and Standards, (Research Triangle Park, NC: October 2010). http://www.epa.gov/nsr/ghgdocs/iciboilers.pdf

[6] http://cfpub.epa.gov/RBLC/

[7] http://ghg.ie.unc.edu:8080/GHGMDB/

switch to a primary fuel type other than the type of fuel that the applicant proposes to use for its combustion processes.[8]

INSTALLATION OF ENERGY EFFICIENCY OPTIONS: Operating practices that increase energy efficiency are a potential control option for improving the fuel efficiency of the Dryer System and therefore, providing benefit with respect to GHG emissions.

In November 2010, the U.S. EPA provided a white paper that addresses control technologies, energy efficiency measures, and fuel switching options for industrial, commercial and institutional boilers. Several of the energy efficiency options for boilers discussed in this document were also listed in the U.S. EPA's white paper specifically directed to the pulp and paper industry, which has some relevant sections for the forest products industry. These options primarily focus on improved process control, reduced heat loss, and improved heat recovery, and are expected to be part of the design of "state-of-the-art boiler systems."[9] The energy efficiency options (applicable to a wood chip drying system) listed in the GHG BACT Guidance for the Pulp and Paper Industry are:

- Furnace maintenance
- Furnace process control
- Heat recovery
- Reduction of excess air

Note that additional options were recognized in the GHG BACT Guidance documents such as condensate return and minimizing boiler blow down, but were not included above since these features do not apply to a furnace and drying system such as the one proposed for the Northampton facility.

CH_4 and N_2O Options: Available control options for minimizing CH_4 emissions from the Dryer System include operating practices that promote energy efficiency to reduce fuel usage.

N_2O catalysts have been used in nitric/adipic acid plant applications to minimize N_2O emissions.[10] Tailgas from the nitric acid production process is routed to a reactor vessel with a N_2O catalyst followed by ammonia injection and a NO_X catalyst.

Energy efficient operating practices are additionally available control technology options for N_2O reduction.

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[8] US EPA, Office of Air Quality Planning and Standards, "PSD and Title V Permitting Guidance for Greenhouse Gases", March 2011, p. 29.

[9] U.S. EPA Office of Air and Radiation, Office of Air Quality Planning and Standards, *Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from the Pulp and Paper Manufacturing Industry, October 2010,* http://www.epa.gov/nsr/ghgdocs/pulpandpaper.pdf, p. 11-16.

[10] http://www.catalysts.basf.com/Main/mediaroom/10years_worldscale_experience_in_reducing_nitrous_.be

4.2.4.2 ELIMINATE TECHNICALLY INFEASIBLE OPTIONS

CO_2:

SELECTION OF THE LOWEST CARBON FUEL: Additional firing of a lower carbon fuel (natural gas) is a technically feasible option for CO_2 control of the Dryer System.

INSTALLATION OF ENERGY EFFICIENCY OPTIONS ON THE NO. 3 BIOMASS BOILER: Each of the aforementioned energy efficiency options in Step 1 is technically feasible for CO_2 control of the Dryer System.

CH_4 and N_2O Options: Energy efficient operating practices are the only technically feasible control options for reducing CH_4 emissions from the Dryer System.

N_2O catalysts have not been used to control N_2O emissions in industrial applications as yet. In addition, the very low N_2O concentrations present in the Dryer System exhaust stream would make installation of N_2O catalysts technically infeasible. In comparison, the application of a catalyst in the nitric acid industry sector has been effective due to the high (1,000-2,000 ppm) N_2O concentration in those exhaust streams. N_2O catalysts are eliminated as a technically feasible option for the proposed project.

With N_2O catalysts eliminated, energy efficient operating practices are the only available and technically feasible control options for N_2O reduction from the Dryer System.

4.2.4.3 RANK REMAINING CONTROL TECHNOLOGIES BY EFFECTIVENESS

CO_2: Lower carbon fuel selection and installation of energy efficient options are the remaining technically feasible control options for minimizing CO_2 emissions from the Dryer System. It is unclear which option has a more significant impact on emissions of CO_2 from the facility.

CH_4 and N_2O: Energy efficient operating practices are the only remaining control option for reducing CH_4 and N_2O emissions from the Dryer System.

4.2.4.4 EVALUATE MOST EFFECTIVE CONTROL OPTION (IMPACTS ANALYSIS)

CO_2:

4.2.4.4.1 SELECTION OF THE LOWEST CARBON FUEL

While natural gas may be a lower emitting carbon fuel than biomass, combustion of clean biomass (as a primary fuel), is a renewable fuel that has clean energy and GHG benefits, and has financial benefits to the facility in terms of cost reductions. This assertion is supported by U.S. EPA in the General GHG Permitting Guidance:

> *Even before EPA takes further action, however, permitting authorities may consider, when carrying out their BACT analyses for GHG, the environmental, energy and economic benefits that may accrue from the use of certain types of biomass and other biogenic sources (e.g., biogas from landfills) for energy generation, consistent with existing air quality standards. In particular, a variety of federal and state policies have recognized that some types of biomass can be part of a national strategy to reduce dependence on fossil fuels and to reduce emissions of GHGs.*

The General GHG Permitting Guidance goes on to state that combustion of biomass can be considered carbon neutral.[11] The combustion of biomass as a fuel is environmentally beneficial since biomass is a renewable fuel source and contributes to additional renewable energy on the grid. Reliance on natural gas as the primary fuel would eliminate the renewable energy benefits of the overall project as this would simply mean the displacement of one fossil-fuel with another fossil fuel, as opposed to allowing for the increased reliance on a renewable energy source.

Therefore, combustion of biomass demonstrates significant environmental and energy benefits when considering the impacts to climate change, GHG emissions, and renewable energy generation.

CH_4 and N_2O: No adverse energy, environmental, or economic impacts are associated with good combustion/operating practices for reducing CH_4 and N_2O emissions from the wood-fired furnace.

4.2.4.4.2 INSTALLATION OF ENERGY EFFICIENCY OPTIONS

CO_2: No adverse energy, environmental, or economic impacts are associated with energy efficient operating practices for reducing CO_2 emissions from the Dryer System.

The environmental benefits include fuel savings and reduction of GHG emissions, as well as other criteria pollutant emissions, due to the efficiency gains.

CH_4 and N_2O: Energy efficient operating practices resulting in minimized fuel consumption are the only technically feasible control options for reducing CH_4 and N_2O emissions from the Dryer System.

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[11] US EPA, Office of Air Quality Planning and Standards, "PSD and Title V Permitting Guidance for Greenhouse Gases", March 2011, p 9.

4.2.4.5 SELECT BACT

CO_2: Therefore, biomass is the best fuel selection for the facility from a renewable source. With respect to energy efficiency, the drying system has been designed for optimal thermal efficiency, recirculating about 30 percent of the dryer air as combustion makeup air in the burners. Excess combustion air will be optimized to further improve thermal efficiency of the system and the dryer system will be regularly maintained (e.g., burner maintenance) according to a regular schedule, taking into account manufacturer's recommendations, to maintain the high thermal efficiency of the system.

CH_4 and N_2O: Enviva is implementing the energy efficiency efforts as described above. Through these efforts to maximize the unit's efficiency, N_2O emissions from the dryer system are inherently reduced and kept to a minimum.

Since there is some potential variability in final thermal efficiency of the system, establishing a specific emissions limitation, such as a lb CO_2e per ODT is impractical. Instead, Enviva proposes the following design/work practice standards:

- Biomass to be utilized for drying system fuel,
- Energy-efficient design (which is considered by Enviva to be self-implementing and necessary as part of the inherent design of the equipment since thermal energy supplied to the dryer is the most significant operating cost at the facility), and
- Regular maintenance at minimum intervals to be established taking into account manufacturer's recommendations and standard industry practices.

4.3 PELLET COOLERS

Pellet Press conveyors discharge wood pellets through one of six Pellet Coolers. Cooling air is passed through the pellets. At this point, the Pellets contain a small amount of wood fines, which are swept out with the cooling air and are controlled utilizing three high cyclones operating in parallel (one for every two coolers) prior to discharge to the atmosphere. These cyclones will not only provide high-efficiency PM control, but are also inherent process equipment because they are needed to effect cooling through the intimate mixing of air through the pellets. The only pollutant emitted from the pellet coolers that are subject to BACT review is TSP/PM_{10}/$PM_{2.5}$. The control technology assessment for each compound subject to PSD review is provided below.

4.3.1 PARTICULATE MATTER (TSP/PM_{10})

Particulate matter (TSP/PM_{10}/$PM_{2.5}$) is emitted as a both filterable and condensable particulate matter. As stated earlier, Enviva has designed the pellet coolers dual high efficiency cyclones operating in parallel (one for every two coolers) prior to discharge to the atmosphere. Therefore, baseline emissions are based on use of the cyclones.

4.3.1.1 IDENTIFY CONTROL TECHNOLOGIES

Potentially applicable PM add-on control technologies are:

- Baghouse and
- Electrostatic Precipitator (ESP).

Baghouse: A fabric filtration device (baghouse) consists of a number of filtering elements (bags) along with a bag cleaning system contained in a main shell structure incorporating dust hoppers. Fabric filters use fabric bags as filters to collect particulate matter. The particulate-laden gas enters a fabric filter compartment and passes through a layer of particulate and filter bags. The collected particulate forms a cake on the bag, which enhances the bag's filtering efficiency. However, excessive caking will increase the pressure drop across the fabric filter and reduce its efficiency.

Electrostatic Precipitator: Electrostatic precipitators (ESPs) remove particles from a gas stream through the use of electrical forces. Discharge electrodes apply a negative charge to particles passing through a strong electrical field. These charged particles then migrate to a collecting electrode having an opposite, or positive, charge. Collected particles are removed from the collecting electrodes by periodic mechanical rapping.

4.3.1.2 ELIMINATE TECHNICALLY INFEASIBLE OPTIONS

Baghouses and ESPs are not designed to operate under conditions in which the gas stream contains water vapor or other moist/sticky elements. Because of the nature of the moist, sticky exhaust stream from the pellet coolers, baghouses are anticipated to provide it would be expected to see particulate agglomeration on dry ESPs and baghouses. Therefore both the dry ESP and baghouse is technically infeasible to control PM.

4.3.1.3 IMPACTS ANALYSIS

The annualized costs of WESP control for the pellet cooler cyclones is approximately $1,065,000, as presented in Table 4-9. Baseline emissions from the cooler cyclones is 61.95 tpy at 0.022 grains per actual cubic foot (gr/acf) outlet grain loading. The WESP system presented in Table 4-9 is estimated to reduce emissions to 0.008 gr/acf, which would result in a control efficiency of approximately 63.6%, equivalent to a 39.4 tpy emission reduction. Thus, the cost effectiveness of WESP control is estimated to be approximately $27,000/ton, clearly cost prohibitive.

4.3.1.4 SELECT BACT

The proposed BACT emission rate for the pellet cooler cyclones is 0.022 gr PM/acf, a level considered near the lowest levels reliably achieved via cyclone control.[12]

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[12] Air & Waste Management Association, Table 4 - Cyclone and Fabric Filter Performance, "Air Pollution Control Manual," 2000.

4.4 DIESEL ENGINES

One 350 kW emergency generator and a 300 hp fire pump powered by diesel will be installed as part of this project. Other than for use during emergency service, both engines are limited to a maximum of 100 hours per year of operation for maintenance and readiness testing under the NSPS standards of Subpart IIII. Add-on controls are impractical given the intermittent operation of these sources. Accordingly, Enviva proposes the NSPS IIII standards as BACT for NO_x, PM, and CO for these engines.

GHG emissions will be limited by limiting the use of the NSPS-compliant engines to maintenance, readiness testing and emergency use only. The only appropriate method of reducing GHG emissions is selection of fuel-efficient engines, which obviously minimizes CO_2, CH_4, and N_2O emissions. Since new, NSPS-compliant engines will be utilized, the engines will be fuel efficient. Since ultimate engine selection must necessarily take into account reliability in emergency operation, instead of a specific emissions standard Enviva proposes a work practice standard of limiting operation of the engines to maintenance, readiness testing and emergency use only.

4.5 HAMMERMILLS/ HAMMERMILL AREA BAGHOUSE/ PELLET PRESS SILO

TSP/PM_{10}/$PM_{2.5}$ emissions from the hammermills, hammermills area bagfilter, and pellet press silo will be controlled with fabric filtration sytems. Baghouses are capable of achieving the lowest achievable emission rates of potentially applicable particulate matter control devices for filterable PM. The proposed BACT is based on an outlet grain loading factor of 0.005 gr/acf, which is essentially approaching the lowest emission levels reliably achieved using fabric filter control.

4.6 SUMMARY OF PROPOSED BACT EMISSION LIMITS

A summary of proposed BACT emission levels and associated control technologies for each emission source is provided in Table 4-10.

TABLES

TABLE 3-1
PSD APPLICABILITY SUMMARY
ENVIVA PELLETS NORTHAMPTON, LLC

Source Description	Unit ID	CO (tpy)	NOx (tpy)	TSP (tpy)	PM-10 (tpy)	PM-2.5 (tpy)	SO2 (tpy)	VOC (tpy)	CO_{2e} (tpy)
Dryer System	ES-DRYER	275.50	187.63	36.79	36.79	36.79	22.67	356.25	158,566.84
Emergency Generator	ES-EG	0.50	0.58	0.03	0.03	0.03	0.00	0.00	93.04
Fire Water Pump	ES-FWP	0.43	0.49	0.02	0.02	0.02	0.00	0.00	79.75
Hammermills	ES-HM-1, -2, -3, -4	-	-	15.02	15.02	15.02	-	-	-
Hammermills Area Filter	ES-HMA	-	-	7.04	7.04	7.04	-	-	-
Pellet Mill Feed Silo	ES-PMFS	-	-	0.47	0.47	0.47	-	-	-
Pellet Coolers	ES-CLR	-	-	61.95	61.95	61.95	-	-	-
Log Debarking/Chipping	ES-CHIP-1	-	-	-	-	-	-	1.25	-
Diesel Storage Tanks	TK1 & TK2	-	-	-	-	-	-	3.79E-03	-
Total Project Emission Increases		**276.44**	**188.69**	**121.31**	**121.31**	**121.31**	**22.67**	**357.51**	**158,739.64**
PSD Significant Emission Rates		**100**	**40**	**25**	**10**	**15**	**40**	**40**	**100,000**
PSD Review Required?		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**Yes**	**Yes**

TABLE 3-2
FACILITYWIDE HAP EMISSIONS SUMMARY
ENVIVA PELLETS NORTHAMPTON, LLC

Description	ES-DRYER (tpy)	ES-EG (tpy)	ES-FWP (tpy)	ES-CHIP-1 (tpy)	Total (tpy)
1,3-Butadiene	-	2.39E-05	2.05E-05	-	4.45E-05
Acetaldehyde	2.60	4.70E-04	4.03E-04	-	2.60
Acrolein	0.80	5.67E-05	4.86E-05	-	0.80
Benzene	0.26	5.71E-04	4.90E-04	-	0.26
Chloroform	3.47E-03	-	-	-	3.47E-03
Cumene	0.07	-	-	-	0.07
Formaldehyde	4.85	7.23E-04	6.20E-04	-	4.85
m-,p-Xylene	0.17	1.75E-04	1.50E-04	-	0.17
Methanol	3.81	-	-	0.24	3.81
Methyl isobutyl ketone	0.24	-	-	-	0.24
Methylene chloride	0.06	-	-	-	0.06
o-Xylene	0.02	-	-	-	0.02
Phenol	0.97	-	-	-	0.97
Propionaldehyde	0.45	-	-	-	0.45
Styrene	0.01	-	-	-	0.01
Toluene	0.45	2.51E-04	2.15E-04	-	0.45
Total PAH (POM)	-	1.03E-04	8.82E-05	-	1.91E-04
TOTAL HAP	**14.77**	**2.37E-03**	**2.03E-03**	**0.24**	**14.77**

TABLE 3-3
DETERMINATION OF POLLUTANTS SUBJECT TO AIR TOXICS PERMITTING
ENVIVA PELLETS NORTHAMPTON, LLC

TAP Emissions

Description		Dryer			Emergency Generator			Fire Water Pump			Total		
Pollutant	CAS Number	(lb/hr)	(lb/day)	(lb/yr)	(lb/hr)	(lb/day)	(lb/yr)	(lb/hr)	(lb/day)	(lb/yr)	(lb/hr)	(lb/day)	(lb/yr)
1,3-Butadiene	106-99-0						4.79E-02			4.11E-02			8.90E-02
Acetaldehyde	75-07-0	4.61E+00			1.88E-03			1.61E-03			4.62E+00		
Acrolein	107-02-8	1.41E+00			2.27E-04			1.94E-04			1.41E+00		
Benzene	71-43-2			5.27E+02			1.14E+00			9.80E-01			5.29E+02
Benzo(a)pyrene	50-32-8						2.30E-04			1.97E-04			4.28E-04
Chloroform	67-66-3			6.93E+00									6.93E+00
Formaldehyde	50-00-0	8.61E+00			2.89E-03			2.48E-03			8.62E+00		
Xylene	1330-20-7	3.23E-01	7.75E+00		6.98E-04	1.68E-02		5.99E-04	1.44E-02		3.24E-01	7.78E+00	
Methyl isobutyl ketone	108-10-1	4.24E-01	1.02E+01								4.24E-01	1.02E+01	
Methylene chloride	75-09-2	1.11E-01		1.25E+02							1.11E-01		1.25E+02
Phenol	108-95-2	1.72E+00									1.72E+00		
Styrene	100-42-5	2.21E-02									2.21E-02		
Toluene	108-88-3		1.92E+01			2.40E-02			2.06E-02			1.92E+01	

TPER Comparison Table

		Total			TPER (2Q .0711)			Modeling
Pollutant	CAS Number	(lb/hr)	(lb/day)	(lb/yr)	(lb/hr)	(lb/day)	(lb/yr)	Required?
1,3-Butadiene	106-99-0			8.90E-02			1.10E+01	No
Acetaldehyde	75-07-0	4.62E+00			6.80E+00			No
Acrolein	107-02-8	1.41E+00			2.00E-02			Yes
Benzene	71-43-2			5.29E+02			8.10E+00	Yes
Benzo(a)pyrene	50-32-8			4.28E-04			2.20E+00	No
Chloroform	67-66-3			6.93E+00			2.90E+02	No
Formaldehyde	50-00-0	8.62E+00			4.00E-02			Yes
Xylene	1330-20-7	3.24E-01	7.78E+00		1.64E+01	5.70E+01		No
Methyl isobutyl ketone	108-10-1	4.24E-01	1.02E+01		7.60E+00	5.20E+01		No
Methylene chloride	75-09-2	1.11E-01		1.25E+02	3.90E-01		1.60E+03	No
Phenol	108-95-2	1.72E+00			2.40E-01			Yes
Styrene	100-42-5	2.21E-02			2.70E+00			No
Toluene	108-88-3		1.92E+01			9.80E+01		No

TABLE 4-1
DRYER BACT INPUT PARAMETERS AND EMISSIONS ESTIMATES
ENVIVA PELLETS NORTHAMPTON, LLC

Operating Assumptions:

Total Dryer heat input capacity =	207 MMBtu/hr
Operating hours and days =	8,760 hrs/yr
WESP Outlet flow rate =	175,000 ACFM
WESP Outlet flow rate =	146,389 SCFM assuming 171 deg. F
Total Plant estimated heat input =	1,813,320 MMBtu/yr
Dryer Temperature =	171 deg. F
Dryer Production =	500,000 tons/year
Annual Dried Wood Throughput of Dryer =	475,000 ODT/year
Nominal Hourly Dried Wood Throughput of Dryer =	54.22 ODT/hr
Maximum Hourly Dried Wood Throughput of Dryer =	61.50 ODT/hr
Percent Hardwood	90%
Percent Softwood	10%

Criteria Pollutant Calculations:

Pollutant	Biomass Emission Factor (lb/MMBtu)	Biomass Emission Factor (lb/ODT)	Emission Factor Source	Total Potential Emissions	
				(lb/hr)	(tpy)
CO		1.16	Calculated from Guaranteed WESP Specifications[1]	71.34	275.5
NO_X		0.79	Calculated from Guaranteed WESP Specifications[1,4]	48.59	187.6
$PM/PM_{10}/PM_{2.5}$ Condensable Fraction	0.017		AP-42, Section 1.6[2]	3.52	15.4
TSP (Filterable)		0.09	Calculated from Guaranteed WESP Specifications[1]	5.54	21.4
Total TSP (Filterable+ Condensable)				9.05	36.8
PM_{10} (Filterable)		0.09	Calculated from Guaranteed WESP Specifications[1]	5.54	21.4
Total PM_{10} (Filterable+ Condensable)				9.05	36.8
$PM_{2.5}$ (Filterable)		0.09	Calculated from Guaranteed WESP Specifications[1]	5.54	21.4
Total $PM_{2.5}$(Filterable+ Condensable)				9.05	36.8
SO_2	0.025		AP-42, Section 1.6[3]	5.18	22.7
VOC		1.50	Calculated from Guaranteed WESP Specifications[1]	92.25	356.3

Note:

1. CO, NO_x, VOC, and filterable PM/PM_{10} emission factors were provided by the dryer system vendor. The $PM_{2.5}$ filterable emission factor is assumed to be the same as PM and PM_{10}.
2. The vendor only provided the filterable fraction of particulate matter in the emission factors. The condensable fraction of particulate matter from a rotary dryer controlled by a WESP is not provided in AP-42, Section 10.6.2. Enviva has conservatively calculated the condensable fraction based upon the heat input of the dryer burners using an emission factor for wood combustion from AP-42, Section 1.6.
3. No emission factor is provided in AP-42, Section 10.6.2 for SO_2 for rotary dryers. Enviva has conservatively calculated SO2 emissions based upon the heat input of the dryer burners using an emission factor for wood combustion from AP-42, Section 1.6.
4. Equivalent to a 0.235 lb/MM Btu level at the rated burner capacity of 207 mmBtu/hr.

TABLE 4-2
STOKER BOILER NO_X DATA FROM RBLC
ENVIVA PELLETS NORTHAMTON, LLC

Company	Location	Boiler (MMBtu/hr)	Limit (lb/MMBtu)	NOx Control Technology
SIERRA PACIFIC INDUSTRIES	Grays Harbor, WA	310	0.15 (24-hour) 0.1 (annual)	Spreader Stoker, SNCR
MULTITRADE OF	Virginia	373.3	0.1 (30-Day Roll)	Spreader Stoker Boilers, SNCR
DARRINGTON ENERGY LLC	Washington	403	0.12 (24-hr ave)	SNCR
SIERRA PACIFIC	Washington	430	0.13	SNCR
DISTRICT ENERGY ST.	Ramsey, MN	550	0.15	SNCR
BEAVER- ASHLAND ALTERNATIVE ENERGY	Maine	534	0.15	SNCR
ADM NORTHERN SUN	North Dakota	280	0.2 (30-day roll)	Combustion Controls
SD WARREN	Somerset, ME	1,300	0.2	Multi-fuel boiler, SNCR
BORALEX CHATEAUGAY	Arkansas	275	0.23	
DEL-TIN FIBER, LLC	Union, AR	291	0.3	Closed Loop Gasification System gasifies biomass fuel in a rotary kiln to produce a combustible gas used as fuel in a secondary combustion chamber. Low NO_X combustors, SNCR.
CLEWISTON SUGAR MILL AND REFINERY	Florida	812	0.31	Boiler #7 Spreader Stoker
MEADWESTVACO	Wickliffe, KY	631	0.4	Multi-fuel boiler, including NCGs
INLAND PAPERBOARD AND PACKAGAING	Louisiana	787.5	0.45	OFA,LNB, Good Combustion

TABLE 4-3
SELECTIVE NON-CATALYTIC REACTOR COST ANALYSIS FOR ROTARY DRYER
ENVIVA PELLETS NORTHAMPTON, LLC

Cost Item		**Notes**	**Reference**
Direct Capital Costs			
Total Equipment Cost	$575,468		2(a), 4
Installation Estimate	$1,056,250		2(b)
Total Capital Investment	**$1,631,718**		
Operating Cost			
Direct Annual Costs			
Capacity Factor For Direct Annual Costs	88.2%		3(a)
Operation and Maintenance Costs	$25,000		2(c)
Reagent Costs (50% Urea Solution)			
Reagent Consumption	8.15	gph	2(d), 5
Reagent Cost	$2.00	($/gal)	2(d)
Total	$125,935		
Compressed Air			
Compressed Air	41	scfm	2(e), 5
Air Price	$0.15	$/1000 ft^3 air	
Total	$2,869		
Water Consumption			
Water	162	gph	2(f), 5
Water Price	$1.65	$/1000 gallons	3(b)
Total	$2,059		
Electricity			
Power	3	kW	3(c), 5
Unit Cost	$0.075	$/kWh	
Total	$1,671		
Total Direct Annual Costs	*$157,534*		
Indirect Annual Costs			
Administrative Charges	$32,634	2% of TCI	
Property tax	$16,317	1% of TCI	
Insurance	$16,317	1% of TCI	
Annual Interest Rate	10%		
Economic life of SNCR	15		
Capital Recovery Factor	0.131		1(b)
Total Capital Recovery Cost	$214,528		
Total Indirect Annual Costs	$279,797		
Total Annual Cost	**$437,331**		

TABLE 4-3
SELECTIVE NON-CATALYTIC REACTOR COST ANALYSIS FOR ROTARY DRYER
ENVIVA PELLETS NORTHAMPTON, LLC

1. U.S. EPA OAQPS, *EPA Air Pollution Control Cost Manual (6th Edition)*, March 2003, Section 4.2, Chapter 2.
   - [a] No taxes, Insurance, Admin applies (OAQPS 1-37)
   - [b] Equation 1.34 for CFI (OAQPS 1-38)

2. Fuel Tech Vendor Quote provided for Hertford Renewable Energy PSD Application (Hertford, North Carolina). Submitted 2008, Approved 2009.
   - a Cost of SNCR System
   - b BOP Interface Design Engineering and Erection - Assumes Install = 1.25 x Mat'l & Engineering
   - c Estimated Value, Parts and Labor
   - d Reagent Consumption (gph) and Cost ($/gal) from vendor-90% Capacity
   - e Plant air + instrument air, based on $0.15 per 1000 cubic feet of air
   - f Assumes 1 gpm per injector total flow and $2.50 per 1000 gallons filtered water

3 Sources as follows:
   - a Capacity factor calculated as 8760 times the average hourly annual throughput divided by maximum hourly throughput (54.22 ODT/hr / 61.5 ODT/hr)
   - b Base water price from Hertford Renewable Energy PSD Application (Hertford, North Carolina). Submitted 2008, Approved 2009.
   - c Base electricity price from Hertford Renewable Energy PSD Application (Hertford, North Carolina). Submitted 2008, Approved 2009.

4. Scale-up capital cost factor from Ulrich, Gael D. Chemical Engineering Process Design and Economics, 2004 $(C1*(S2/S1)^{0.6})$ where S1 is Hertford boiler flow rate of 331,969 ACFM and S2 is the flow rate of 175,000 ACFM 0.53

5. Scaled original quoted reagent consumption based on the Herford NOx emissions reduction at 762.5 MMBTU/hr versus the dryer heat input rating of 175 MMBtu/hr. Herford had a reduction from a NOx reduction from 0.30 lb/MMBTU to 0.15 lb/MMBTU at 762.5 MMBTU/hr or 114.4 lb/hr reduction. The dryer will have a NOx reduction of 0.23 lb/mmBtu to 0.15 lb/mmBtu or 16.56 lbs/hr reduction.
Thus, multiply the Hertford quote by 16.56/114.4, which is equal to 0.145
Electricity, Water, and Compressed air were also scaled accordingly

TABLE 4-4
NO$_x$ BACT IMPACTS SUMMARY FOR ROTARY DRYER
ENVIVA PELLETS NORTHAMPTON, LLC

Control Options (lb/ODT)	Baseline Emissions (tons/yr)	Control Efficiency	Emissions Reduction (tons/year)	Economic Impacts				Energy Impacts	Environmental Impacts
				Total Capital Cost ($)	Annual Cost ($/year)	Cost Effectiveness ($/ton)	Incremental Cost Effectiveness ($/ton)	Increase Over Baseline (kW*hr/yr)	Adverse Environmental Impacts? (Yes/No)
SNCR = 0.515 lb/ODT (0.15 lb/MM Btu)	187.63	34.8%	65.3	$1,631,718	$437,331	$6,701	$6,701	3.56E+06	No
Baseline = 0.79 lb/ODT (0.235 lb/MM Btu)	187.63	N/A	N/A	N/A	N/A	N/A	N/A	3598469.789	No

TABLE 4-5
REGENERATIVE THERMAL OXIDATION COST ANALYSIS FOR ROTARY DRYER
ENVIVA PELLETS NORTHAMPTON, LLC

Cost Item		Notes	Reference
Direct Costs			
Purchased Equipment Costs			
RTO Price+ Freight+Instrumentation	$2,950,000	A	2(a)
Sales Tax	$88,500	0.03A	1(a)
Purchased Equipment Cost, PEC	$3,038,500	B	
Direct Installation Costs			
Foundations and Support	$243,080	0.08B	1(a)
Handling & Erection	$425,390	0.14B	1(a)
Electrical	$121,540	0.04B	1(a)
Piping	$60,770	0.02B	1(a)
Insulation for ductwork	$30,385	0.01B	1(a)
Painting	$30,385	0.01B	1(a)
Direct Installation Costs	$911,550		
Total Direct Costs, DC	$3,950,050		
Indirect Costs (Installation)			
Engineering	$303,850	0.10B	1(a)
Construction and field expenses	$151,925	0.05B	1(a)
Contractor Fees	$303,850	0.10B	1(a)
Start-up	$60,770	0.02B	1(a)
Performance test	$30,385	0.01B	1(a)
Contingencies	$91,155	0.03B	1(a)
Total Indirect Costs, IC	$941,935		
Total Capital Investment	$4,891,985	**TCI = DC + IC**	
Operating Cost			
Direct Annual Costs			
Capacity Factor For Direct Annual Costs	88.2%	used to establish hours/yr of operation	
Operating Labor			
Operator	$24,753	0.5 hr/s, 3 s/d, d/yr, $51.26/hr, CF	1(b), 3(a)
Supervisor	$3,713	15% of operator	1(b)
Total	$28,466		
Maintenance			
Labor	$24,753	0.5 hr/s, 3 s/d, d/yr, $51.26/hr, CF	1(b), 3(a)
Material	$24,753	100% of maintenance labor	1(b)
Total	$49,506		
Electricity			
Total Requirement	461	KW	2(c)
Unit cost	$0.075	$/kW-hr	2(c)
Total	$267,155		
Fuel			
Natural Gas	8.64	MMBTU/hr	3(a)
Cost	$6.00	$/MMBtu	2(b)
Total	$400,735		
Total Direct Annual Costs	*$745,863*		
Indirect Annual Costs			
Overhead	$46,784	60% of operating labor + maintenance	1(b)
Administrative Charges	$97,840	2% of TCI	1(b)
Property tax	$48,920	1% of TCI	1(b)
Insurance	$48,920	1% of TCI	1(b)
Annual Interest Rate	10%		
Economic life of RTO	10		
Capital Recovery Factor	0.163		
Total Capital Recovery Cost	$796,148		
Total Indirect Annual Costs	*$1,038,611*		
Total Annual Cost	**$1,784,474**	*TAC = DAC + IDAC*	

TABLE 4-5
REGENERATIVE THERMAL OXIDATION COST ANALYSIS FOR ROTARY DRYER
ENVIVA PELLETS NORTHAMPTON, LLC

1. U.S. EPA OAQPS, *EPA Air Pollution Control Cost Manual (6th Edition)*, September 2000, Section 3, Chapter 2.
   [a] Table 2.8: Capital Cost Factors for Thermal and Catalytic Incinerators (OAQPS 2-42); Vendor quote usually includes instrumentation
   [b] Table 2.10: Annual Costs for Thermal and Catalytic Incinerators Example Problem (OAQPS 2-45)
2. Provided to Wallace Lasonde of Enviva by Steve Jaasund from GEOENERGY Division of A.H. Lundberg Associates, Inc on March 21, 2011.
   a RTO Price/Quote
   b Natural Gas Cost and usage.
   c Electricity cost and power requirement.
3. Taken from *Methodology for Estimating Control Costs for Industrial, Commercial, Institutional Boilers and Process Heaters Nation Emissions Standards for Hazardous Air Pollutants* -- Major Source ERG Memo April 2010.
   a Conservative estimate of loaded hourly wage
   b Compressed Air Cost from Memo
4. U.S. EPA OAQPS, *EPA Air Pollution Control Cost Manual (6th Edition)*, July 2002, Section 6, Chapter 2.
   a Equation 2.40 for fan HP (OAQPS 2-42)

TABLE 4-6
REGENERATIVE CATALYTIC OXIDATION COST ANALYSIS FOR ROTARY DRYER
ENVIVA PELLETS NORTHAMPTON, LLC

Cost Item		Notes	Reference
Direct Costs			
Purchased Equipment Costs			
RCO Price + auxiliary equipment + freight	$3,881,854	A	2(a), 6
Sales Tax	$116,456	0.03A	1(a)
Purchased Equipment Cost, PEC	$3,998,309	B	
Direct Installation Costs			
Foundations and Support	$319,865	0.08B	1(a)
Handling & Erection	$559,763	0.14B	1(a)
Electrical	$159,932	0.04B	1(a)
Piping	$79,966	0.02B	1(a)
Insulation for ductwork	$39,983	0.01B	1(a)
Painting	$39,983	0.01B	1(a)
Direct Installation Costs	$1,199,493		
Total Direct Costs, DC	$5,197,802		
Indirect Costs (Installation)			
Engineering	$399,831	0.10B	1(a)
Construction and field expenses	$199,915	0.05B	1(a)
Contractor Fees	$399,831	0.10B	1(a)
Start-up	$79,966	0.02B	1(a)
Performance test	$39,983	0.01B	1(a)
Contingencies	$119,949	0.03B	1(a)
Total Indirect Costs, IC	$1,239,476		
Total Capital Investment	$6,437,278	TCI = DC + IC	
Operating Cost			
Direct Annual Costs			
Capacity Factor For Direct Annual Costs	88.2%	used to establish hours/yr of operation	
Operating Labor			
Operator	$24,753	0.5 hr/s, 3 s/d, d/yr, $51.26/hr, CF	1(b), 4(a)
Supervisor	$3,713	15% of operator	1(b)
Total	$28,466		
Maintenance			
Labor	$24,753	0.5 hr/s, 3 s/d, d/yr, $51.26/hr, CF	1(b), 4(a)
Material	$24,753	100% of maintenance labor	1(b)
Total	$49,506		
Electricity			
Combustion Air Fan	16	HP	2(a), (d), 7
Hydraulic Power unit	5	HP	2(a), (d), 7
Misc./Instruments, Hydraulic Heaters	8	KW	2(a), (d), 7
Fan Power to Overcome Catalyst Pressure	593	HP (14 iwc), Assumed 65% Efficiency, Flowrate 87,222 ACFM	2(d), 5(a)
Total Requirement	466	KW	
Unit cost	$0.075	$/kW-hr	3(b)
Total	$269,885		
Fuel			
Natural Gas or fuel	1.6	MBTU/hr	3(a), 7
Cost	$6.00	$/MMBtu	6
Conversion	1020	Btu/ft^3	
Total	$80,591		
Compressed Air			
Requirement	38	SCFM	2(a), 4(b), 7
Cost	$0.31	$/1000 ft^3 air	4(b)
Total	$5,394		
Catalyst Costs			
Catalyst Cost (Present Value)	$421,726		2(b), 7
Catalyst Life	2		2(b)
Catalyst Cost (Future Value)	$451,669	F/P, 3.5%, 2 years	
Catalyst Cost (Annualized) Total	$215,085	A/F, 10%, 2 years	
Total Direct Annual Costs	*$648,927*		

TABLE 4-6
REGENERATIVE CATALYTIC OXIDATION COST ANALYSIS FOR ROTARY DRYER
ENVIVA PELLETS NORTHAMPTON, LLC

Cost Item		Notes	Reference
Indirect Annual Costs			
Overhead	$46,784	60% of operating labor + maintenance	1(b)
Administrative Charges	$128,746	2% of TCI	1(b)
Property tax	$64,373	1% of TCI	1(b)
Insurance	$64,373	1% of TCI	1(b)
Annual Interest Rate	10%		
Economic life of RCO	10		
Capital Recovery Factor	0.163		
Total Capital Recovery Cost	$1,047,637		
Total Indirect Annual Costs	*$1,351,912*		
Total Annual Cost	**$2,000,839**	*TAC = DAC + IDAC*	

1. U.S. EPA OAQPS, *EPA Air Pollution Control Cost Manual (6th Edition)*, September 2000, Section 3, Chapter 2.
    - [a] Table 2.8: Capital Cost Factors for Thermal and Catalytic Incinerators (OAQPS 2-42); Vendor quote usually includes instrumentation
    - [b] Table 2.10: Annual Costs for Thermal and Catalytic Incinerators Example Problem (OAQPS 2-45)
2. Hertford Renewable Energy PSD Application (Hertford, North Carolina). Submitted 2008, Approved 2009.
    - a RCO Price/Quote
    - b Catalyst costs and life
    - c Fuel Requirement was 2.5 MBTU/hr
    - d 14 iwc for pressure drop and RCO electricity and utility usage were similar to RSCR
3. Enviva Vendor
    - a Natural Gas Cost
    - b Electricity cost
4. Taken from *Methodology for Estimating Control Costs for Industrial, Commercial, Institutional Boilers and Process Heaters Nation Emissions Standards for Hazardous Air Pollutants* -- Major Source ERG Memo April 2010.
    - a Conservative estimate of loaded hourly wage
    - b Electricity and Compressed Air Cost from Memo
5. U.S. EPA OAQPS, *EPA Air Pollution Control Cost Manual (6th Edition)*, July 2002, Section 6, Chapter 2.
    - a Equation 2.40 for fan HP (OAQPS 2-42)
6. Scale-up capital cost factor from Ulrich, Gael D. Chemical Engineering Process Design and Economics, 2004 $(C1*(S2/S1)^{0.6})$ where S1 is Hertford boiler flow rate of 279,736ACFM and S2 is the Enviva boiler flow rate of 175,000 ACFM
7. Scaled up Direct Annual Costs linearly based on Hertford Application boiler flow rate of 279,736 ACFM and Enviva flow rate of of 175,000 ACFM. The resulting Qnew/Qinitial = 0.63

TABLE 4-7
VOC BACT IMPACTS SUMMARY FOR ROTARY DRYER
ENVIVA PELLETS NORTHAMPTON, LLC

				Economic Impacts			Energy Impacts	Environmental Impacts
Control Options (lb/ODT)	**Uncontrolled Emissions (tons/yr)**	**Control Efficiency**	**Emissions Reduction (tons/year)**	**Total Capital Cost ($)**	**Annual Cost ($/year)**	**Cost Effectiveness ($/ton)**	**Increase Over Baseline (kW*hr/yr)**	**Adverse Environmental Impacts? (Yes/No)**
0.15 (RTO)	356.25	90%	320.6	$4,891,985	$1,784,474	$5,566	3.56E+06	No
0.45 (RCO)	356.25	70%	249.4	$6,437,278	$2,000,839	$8,023	3.60E+06	No
1.50 lb/ODT (Process Design)[2]	356.25	N/A	N/A	N/A	N/A	N/A	N/A	No

[1] For purposes of streamlining this evaluation, use of at least 90% hardwood species is assumed to be "baseline." However, it should be recognized that emissions are estimated to be approximately 68% less than a traditional softwood mill.

TABLE 4-8
CO BACT IMPACTS SUMMARY FOR ROTARY DRYER
ENVIVA PELLETS NORTHAMPTON, LLC

Control Options (lb/ODT)	Baseline Emissions (tons/yr)	Control Efficiency	Emissions Reduction (tons/year)	Economic Impacts				Energy Impacts	Environmental Impacts
				Total Capital Cost ($)	Annual Cost ($/year)	Cost Effectiveness ($/ton)	Incremental Cost Effectiveness ($/ton)	Increase Over Baseline (kW*hr/yr)	Adverse Environmental Impacts? (Yes/No)
0.116 (RTO)	275.50	90%	248.0	$4,891,985	$1,784,474	$7,197	$7,197	3.56E+06	No
0.348 (RCO)	275.50	70%	192.9	$6,437,278	$2,000,839	$10,375	$10,375	3.60E+06	No
1.16 (Baseline)	275.50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No

TABLE 4-9
WET ESP COST ANALYSIS FOR PELLET COOLERS
ENVIVA PELLETS NORTHAMPTON, LLC

Cost Item		Notes	Ref.
Total Capital Investment			
Direct Costs			
Purchased Equipment Costs			
ESP	$1,832,031	A	1, 11
Freight Estimate	$164,539		1(a), 11
Instrumentation	$183,203	0.10A	2
Sales Tax	$54,961	0.03A	2
Purchased Equipment Cost, PEC	**$2,234,733**	B	
Direct Installation Costs			
Foundations and Support	$89,389	0.04B	2
Handling & Erection	$1,117,367	0.50B	2
Electrical	$178,779	0.08B	2
Piping	$22,347	0.01B	2
Insulation for ductwork	$44,695	0.02B	2
Painting	$44,695	0.02B	2
Total	**$1,497,271**		
Total Direct Costs, DC	**$3,732,005**	*DC = B + 0.67 * B*	
Indirect Costs (Installation)			
Engineering	$446,947	0.20B	2
Construction and field expenses	$446,947	0.20B	2
Contractor Fees	$223,473	0.10B	2
Start-up	$22,347	0.01B	2
Performance test	$22,347	0.01B	2
Model study	$44,695	0.02B	2
Contingencies	$67,042	0.03B	2
Total Indirect Costs, IC	**$1,273,798**	*IC = 0.57 * B*	
Total Capital Investment	**$5,005,803**	**TCI = DC + IC**	
Operating Cost			
Direct Annual Costs			
Capacity Factor For Direct Annual Costs	88.2%	used to establish hours/yr of operation	
Operating Labor			
Operator	$49,506	3 hr/d * d/y * $51.26/hr	3(a), 5
Supervisor	$7,426	15% of operator	3(b)
Coordinator	$16,502	1/3 of operator	3(c)
Total	**$73,434**		
Maintenance			
Labor	$1,031	0.825*ESP Plate Area (ft^2)	4, 12
Material	$22,347		3(d)
Total	**$23,378**		
Electricity Costs			
Requirement	94	kw/HR	6(a), 9, 11
Unit cost	$0.070	$/kW-hr	9
Total	**$50,704**		
Water Costs			
Wastewater Disposal	$954		6(b), 7

TABLE 4-9
WET ESP COST ANALYSIS FOR PELLET COOLERS
ENVIVA PELLETS NORTHAMPTON, LLC

Cost Item		Notes	Ref.
Municipal Water Usage	$159		6(b), 8
	$1,113		
Total Direct Annual Costs	***$148,629***		
Indirect Annual Costs			
Overhead	$58,088	60% * (operating labor + maintenance)	3(e)
Administrative Charges	$100,116	2% of TCI	3(e)
Property tax	$50,058	1% of TCI	3(e)
Insurance	$50,058	1% of TCI	3(e)
Annual Interest Rate	10.0%		10
Economic life of ESP	15		10
Capital Recovery Factor	0.1315		10
Total Capital Recovery Cost	$658,132		10
Total Indirect Annual Costs	***$916,452***		
Total Annual Cost	**$1,065,081**	*TAC = DAC + IDAC*	

1. Cost estimate of $3.3 provided by TurboSonic (6/22/2010) for Unilin wood products dryer (PSD application processed by NCDAQ).
    a Email from Rod Pennington (TurboSonic) to Joe Sullivan (Trinity) June 26, 2010 that stated additional freight costs not included.
2. Direct and Indirect capital costs associated with the purchase of the ESP determined in accordance with EPA OAQPS APCCM Sec.6, Ch.3, Table 3.16
3. EPA OAQPS APCCM Sec.6, Ch.3, Table 3.21
    (a) Operator costs calculated @ 3 hr per day and 88.2% operating factor
    (b) Supervisor labor costs calculated @ 15% of operator cost as per APCCM guidance
    (c) Coordinator costs calculated @ 1/3 of operator costs as per APCCM guidance
    (d) Maintenance material(s) calculated @ 1% of purchased equipment cost as per APCCM guidance
    (e) Indirect annual costs calculated in accordance with APCCM guidance
4. EPA OAQPS APCCM Sec.6, Ch.3, Equation 3.45 for Maintenance Materials
5. US Dept. of Labor - Bureau of Labor Statistics - $51.26/hr (Stationary Engineers and Boiler Operators, 2008 dollars)
6. Provided by TurboSonic, ESP supplier/vendor
    (a) Electrical power requirements
    (b) Wastewater blowdown rate (0.6 gallons / minute); assumes water usage (blowdown rate + 50% sump vol); assumes 6,000 hrs of operation.
7. Waste water disposal cost - $0.0054/gal - provided by Air Compliance Advisor User Guide - Version 7.5
8. Municipal water usage cost - $0.0006 /gal - provided by Electric Power Research Institute
9. Electricity unit cost provided by the Energy Information Administration (Electrical costs calculated assuming 88.2% operating factor)
10. Capital recovery calculated assuming 20 years of equipment life @ a recovery rate of 13.5%
    Capital Recovery Factor (CRF)
    = (IR*(1+IR)^n)/((1+IR)^n - 1) = 0.1315
11. Scale-up capital cost factor from Ulrich, Gael D. Chemical Engineering Process Design and Economics, 2004 ($C1*(S2/S1)^{0.6}$) where S1 is Unilin heating plant flow rate and S2 is Enviva pellet cooler cyclone flow rate.
12. Scaled up Direct Annual Costs linearly based on initial flow rate of 200,000 ACFM and pellet cooler cyclones flow rate of 75,000 ACFM. The resulting Qnew/Qinitial 0.38

TABLE 4-10
SUMMARY OF PROPOSED BACT LIMITS
ENVIVA PELLETS, LLC

Source	Pollutant	Control/Operation	Proposed Emission
Rotary Dryer System	**NO_x**	Good combustion practices/design	0.79 lb/ODT
	$PM/PM_{10}/PM_{2.5}$	Process Design (multiclones + WESP)	0.09 lb/ODT (filterable only)
	VOC / CO	Process Design	1.50 lb/ODT VOC & 1.16 lb/ODT CO
	CO_{2e}	Biomass-fired / Energy Efficient Operation	N/A
Emergency Generator and Firewater Pump	**$PM/PM_{10}/PM_{2.5}$, NO_x, VOC, CO**	Good combustion practices/design, minimize	NSPS Subpart IIII
Pellet Cooler	**$PM/PM_{10}/PM_{2.5}$**	Cyclones	0.022 gr/cf
Hammermills, Hammermill Area Filter, Pellet Press Silo	**$PM/PM_{10}/PM_{2.5}$**	Fabric filter	0.005 gr/cf

FIGURES

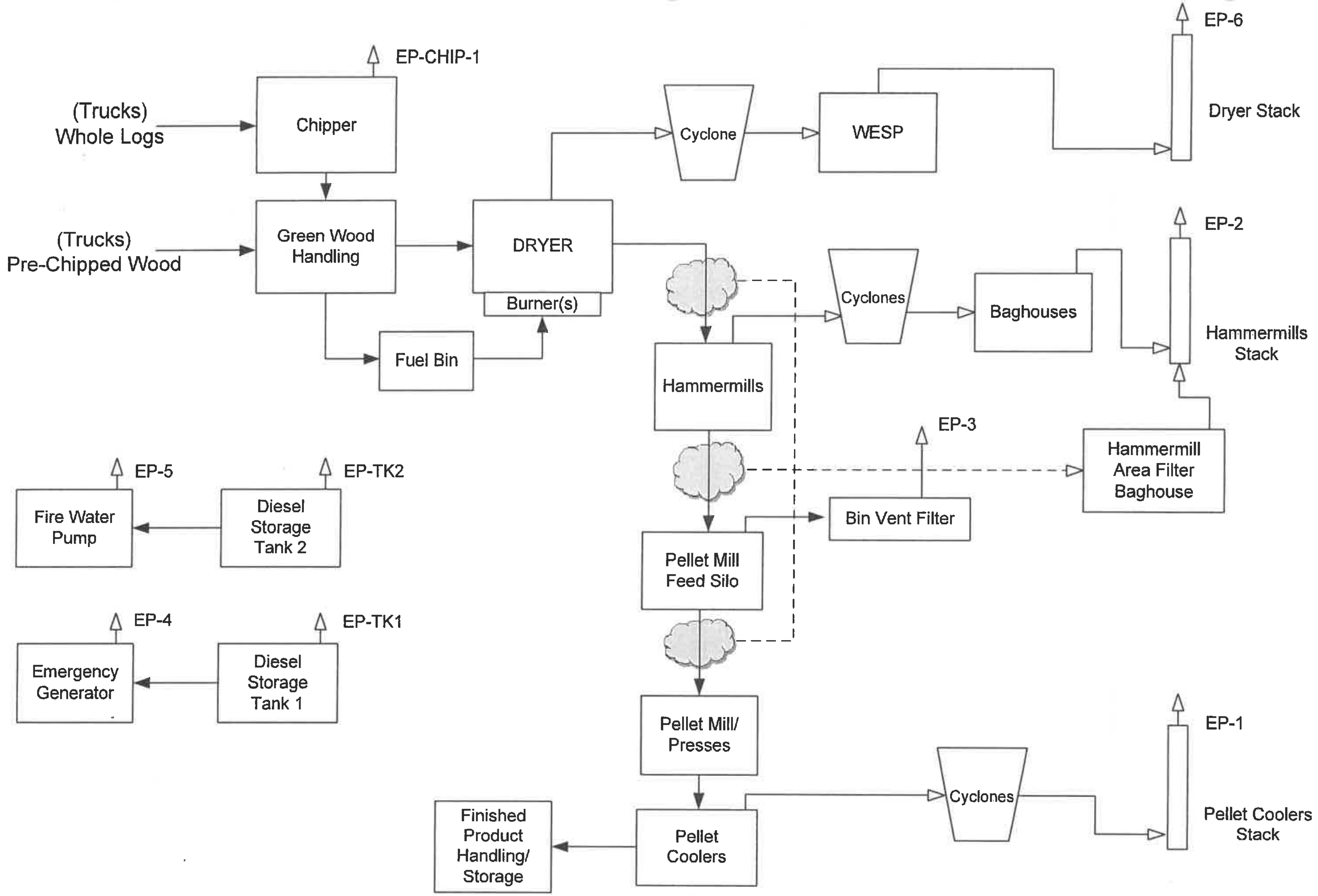

Figure 2-1. Process Flow Diagram

APPENDIX A – NCDAQ APPLICATION FORMS

AUG 30 2011

NCDENR Raleigh Regional Office

Received
AUG 26 2011
Air Permits Section

FORM A1

FACILITY (General Information)

A1

EVISED 11/01/02

NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate

NOTE- APPLICATION WILL NOT BE PROCESSED WITHOUT THE FOLLOWING:

☑ Local Zoning Consistency Determination (if required) ☑Facility Reduction & Recycling Survey Form (Form A4) A☑cation Fee

☑ Responsible Official/Authorized Contact Signature ☑ppropriate Number of Copies of Application P☑ Seal (if required)

GENERAL INFORMATION

Legal Corporate/Owner Name: Enviva Pellets Northampton, LLC

Site Name: Enviva Pellets Northampton, LLC

Site Address (911 Address) Line 1: Lebanon Church Road (Street Number TBD)

Site Address Line 2:

City: Gaston

State: North Carolina

Zip Code: 27866

County: Northampton

CONTACT INFORMATION

Permit/Technical Contact:

Name/Title: Glenn Gray / Plant Manager

Mailing Address Line 1: 7200 Wisconsin Avenue

Mailing Address Line 2: Suite 1100

City: Bethesda State: Maryland Zip Code: 20814

Phone No. (area code) (757) 274-8377 Fax No. (area code) (301) 657-5567

Email Address: Glenn.Gray@envivabiomass.com

Facility/Inspection Contact:

Name/Title: same as permit/technical contact

Mailing Address Line 1:

Mailing Address Line 2:

City: State: Zip Code:

Phone No. (area code) Fax No. (area code)

Email Address:

Responsible Official/Authorized Contact:

Name/Title: Norb Hintz

Mailing Address Line 1: 7200 Wisconsin Avenue

Mailing Address Line 2: Suite 1100

City: Bethesda State: Maryland Zip Code: 20814

Phone No. (area code) (301) 657-5567 Fax No. (area code) (301) 657-5567

Email Address: Norb.Hintz@envivabiomass.com

Invoice Contact:

Name/Title: same as permit/technical contact

Mailing Address Line 1:

Mailing Address Line 2:

City: State: Zip Code:

Phone No. (area code) Fax No. (area code)

Email Address:

APPLICATION IS BEING MADE FOR

☑ New Non-permitted Facility/Greenfield ☐ Modification of Facility (permitted) ☐ Renewal with Modification

☐ Renewal (TV Only)

FACILITY CLASSIFICATION AFTER APPLICATION (Check Only One)

☐eneral ☐mall ☐ Prohibitory Small ☐Synthetic Minor ☑Title V

FACILITY (Plant Site) INFORMATION

Describe nature of (plant site) operation(s): Facility ID No. : (to be assigned)

Wood pellet manufacturing facility

Primary SIC/NAICS Code: 2499 (Wood Products, Not Elsewhere Classified)

Current/Previous Air Permit No. N/A Expiration Date N/A

Facility Coordinates: Latitude: 256,700 UTM E Longitude: 4,042,900 UTM N

Does this application contain confidential data? ☐ YES ☑NO

PERSON OR FIRM THAT PREPARED APPLICATION

Person Name: Joe Sullivan

Firm Name: Trinity Consultants, Inc.

Mailing Address Line 1: One Copley Parkway

Mailing Address Line 2: Suite 310

City: Morrisville State: North Carolina

Zip Code: 27560 County: Wake

Phone No. (919) 462-9693 Fax No. (919) 462-9694

Email Address: Jsullivan@trinityconsultants.com

SIGNATURE OF RESPONSIBLE OFFICIAL/AUTHORIZED CONTACT

Name (typed): Norb Hintz Title: Vice President Engineering

X Signature(Blue Ink): Date: Aug 18, 2011

Attach Additional Sheets As Necessary

FORMs A2, A3

EMISSION SOURCE LISTING FOR THIS APPLICATION - A2

112r APPLICABILITY INFORMATION - A3

REVISED 04/10/07

NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate

A2

EMISSION SOURCE LISTING: New, Modified, Previously Unpermitted, Replaced, Deleted

EMISSION SOURCE ID NO.	EMISSION SOURCE DESCRIPTION	CONTROL DEVICE ID NO.	CONTROL DEVICE DESCRIPTION
Equipment To Be ADDED By This Application (New, Previously Unpermitted, or Replacement)			
ES-DRYER	Green Wood Direct-Fired Dryer System	CD-DC	Single Cyclone
		CD-WESP	Wet Electrostatic Precipitator
ES-GN	Emergency Generator (250 kw, 350 bhp)	N/A	N/A
ES-FWP	Fire Water Pump (300 bhp)	N/A	N/A
ES-HM-1,-2,-3,-4	Four (4) Hammermills	CD-HM-CYC-1	Single Cyclone
		CD-HM-CYC-2	Single Cyclone
		CD-HM-CYC-3	Single Cyclone
		CD-HM-CYC-4	Single Cyclone
		CD-HM-BF1	Bagfilter
		CD-HM-BF2	Bagfilter
ES-HMA	Hammermill Area Filter	CD-HMA-BF	Bagfilter
ES-PPS	Pellet Mill Feed Silo	CD-PPS-BV	Bin vent filter
ES-CLR-1,2,3,4,5, 6	Six (6) Pellet Coolers	CD-CLR-1	Pellet Cooler Cyclone
		CD-CLR-2	Pellet Cooler Cyclone
		CD-CLR-3	Pellet Cooler Cyclone
Existing Permitted Equipment To Be MODIFIED By This Application			
Equipment To Be DELETED By This Application			

112(r) APPLICABILITY INFORMATION

A 3

Is your facility subject to 40 CFR Part 68 "Prevention of Accidental Releases" - Section 112(r) of the Federal Clean Air Act? Yes / No

If No, please specify in detail how your facility avoided applicability: ____________________

If your facility is Subject to 112(r), please complete the following:

A. Have you already submitted a Risk Management Plan (RMP) to EPA Pursuant to 40 CFR Part 68.10 or Part 68.150?

Yes ☐ No ☐ Specify required RMP submittal date: ____________ If submitted, RMP submittal date: ____________

B. Are you using administrative controls to subject your facility to a lesser 112(r) program standard?

Yes ☐ No ☐ If yes, please specify: ____________________

Attach Additional Sheets As Necessary

FORM A4

SURVEY OF AIR EMISSIONS AND FACILITY - WIDE REDUCTION & RECYCLING ACTIVITIES

DATE:

Does facility have an environmental mangement system in place? ( ) YES (X) NO If so, is facility ISO 14000 Certified? ( ) YES (X) NO

Facility Name:	Enviva Pellets Northampton, LLC			Permit Number:	N/A		
ility ID:	N/A (to be assigned)	County:	Northampton	Environmental Contact:	Glenn Gray / Plant Manager		
Mailing Address Line 1:		Lebanon Church Road		Phone No. ( )	(804) 412-0227	Fax No. ( )	(804) 412-0229
Mailing Address Line 2:				Zip Code:	27866	County:	Northampton
City:	Gaston	State:	North Carolina	Email Address:	Glenn.Gray@envivabiomass.com		

AIR EMISSIONS SOURCE REDUCTIONS

Any Air Emissions Source Reductions in the past year? ( ) YES (X) NO

Source Description and ID	Air Pollutant	Enter Code for Emission Reduction Option (See Codes)	Date Reduction Option Implemented (mo/yr)	Quantity Emitted from prior annual report to DAQ (lb/yr)	Quantity Emitted from current annual report to DAQ (lb/yr)	Has reduction activity been discontinued? If so, when was it discontinued? (mo/yr)	Addition detail about source
N/A							

Comments:

CILITY - WIDE REDUCTIONS & RECYCLING ACTIVITIES

Any Reductions or Recycling Activities in the past year? ( ) YES (X) NO

Source Description or Activity	Pollutant or Recycled or Reduced Materials	Enter Code for Emission Reduction Option (See Codes)	Date Reduction Option Implemented (mo/yr)	Quantity Emitted from prior annual report	Quantity Emitted from current annual report	Has reduction activity been discontinued? If so, when was it discontinued? (mo/yr)	Addition detail about source
N/A							

Comments:

The requested information above shall be used for fulfilling the requirements of North Carolina General Statute 143-215.108(g). The permit holder shall submit to the Department a written description of current and projected plans to reduce the emissions of air pollutants by source reduction or recycling. The written description shall accompany any application for a new permit, modification of an existing permit and for each annual air quality permit fee payment. Source reduction is defined as reducing the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment (including fugitive emissions) prior to recycling, treatment, or disposal. If no activity has taken place since the previous report, simply indicate so by checking the no box in that section. ce completed, this form should be submitted along with your fee payment. Examples are listed on the first line of each section of the form for your benefit.

N.C. Division of Pollution Prevention and Environmental Assistance

POLLUTION PREVENTION PAYS

REVISED 1/07

Attach Additional Sheets As Necessary

FORM D1

FACILITY-WIDE EMISSIONS SUMMARY

REVISED 12/01/01

NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate

D1

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION - FACILITY-WIDE

	EXPECTED ACTUAL EMISSIONS (AFTER CONTROLS / LIMITATIONS)	OTENTIAL EMISSION BEFORE CONTROLS LIMITATIONS)	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITATIONS)
AIR POLLUTANT EMITTED	tons/yr	tons/yr	tons/yr
PARTICULATE MATTER (PM)	**See Table 3-1 in the accompanying application document**		
PARTICULATE MATTER < 10 MICRONS (PM_{10})			
PARTICULATE MATTER < 2.5 MICRONS ($PM_{2.5}$)			
SULFUR DIOXIDE (SO2)			
NITROGEN OXIDES (NOx)			
CARBON MONOXIDE (CO)			
VOLATILE ORGANIC COMPOUNDS (VOC)			
LEAD			
OTHER			

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION - FACILITY-WIDE

		EXPECTED ACTUAL EMISSIONS (AFTER CONTROLS / LIMITATIONS)	OTENTIAL EMISSION EFORE CONTROLS LIMITATIONS)	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITATIONS)
HAZARDOUS AIR POLLUTANT EMITTED	CAS NO.	tons/yr	tons/yr	tons/yr
		See Table 3-2 in the accompanying application document		

TOXIC AIR POLLUTANT EMISSIONS INFORMATION - FACILITY-WIDE

INDICATE REQUESTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS. EMISSIONS ABOVE THE TOXIC PERMIT EMISSION RATE (TPER) IN 15A NCAC 2Q .0711 MAY REQUIRE AIR DISPERSION MODELING. USE NETTING FORM D2 IF NECESSARY.

					Modeling Required ?		
TOXIC AIR POLLUTANT EMITTED	CAS NO.	lb/hr	lb/day	lb/year	Yes	No	
		See Table 3-3 in the accompanying application document					

COMMENTS:

Attach Additional Sheets As Necessary

FORM D4

EXEMPT AND INSIGNIFICANT ACTIVITIES SUMMARY

REVISED: 12/01/01 NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate **D4**

ACTIVITIES EXEMPTED PER 2Q .0102 OR INSIGNIFICANT ACTIVITIES PER 2Q .0503 FOR TITLE V SOURCES

DESCRIPTION OF EMISSION SOURCE	SIZE OR PRODUCTION RATE	BASIS FOR EXEMPTION OR INSIGNIFICANT ACTIVITY
1. Green Wood Handling and Sizing Operations ES-GWHS	~900,000 tpy	15A NCAC 02Q .0102 (c)(2)(E) - no quantifiable emissions
2. Green Wood Fuel Bin ES-GWFB	~150,000 tpy	15A NCAC 02Q .0102 (c)(2)(E) - no quantifiable emissions
3. Dried Wood Handling ES-DWH	520,951 tpy	15A NCAC 02Q .0102 (c)(2)(E) - no quantifiable emissions
4. Pellet Presses ES-PP	520,951 tpy	15A NCAC 02Q .0102 (c)(2)(E) - no quantifiable emissions
Final Product Handling ES-FPH	451,128 tpy	15A NCAC 02Q .0102 (c)(2)(E) - no quantifiable emissions
6. Emergency Generator Diesel Fuel Tank TK1	2,500 gallons	15A NCAC 02Q .0102 (c)(1)(D)
7. Fire Water Pump Diesel Fuel Tank TK2	500 gallons	15A NCAC 02Q .0102 (c)(1)(D)
8. Electric Powered Wood Chipper - EPWC	950,000 wet wood	15A NCAC 02Q .0102 (c)(2)(E) - low emissions, see Appendix B
9.		
10.		

Attach Additional Sheets As Necessary

FORM D

TECHNICAL ANALYSIS TO SUPPORT PERMIT APPLICATION

REVISED: 12/01/01

NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate

D5

PROVIDE DETAILED TECHNICAL CALCULATIONS TO SUPPORT ALL EMISSION, CONTROL, AND REGULATORY DEMONSTRATIONS MADE IN THIS APPLICATION. INCLUDE A COMPREHENSIVE PROCESS FLOW DIAGRAM AS NECESSARY TO SUPPORT AND CLARIFY CALCULATIONS AND ASSUMPTIONS. ADDRESS THE FOLLOWING SPECIFIC ISSUES ON SEPARATE PAGES:

A **SPECIFIC EMISSIONS SOURCE (EMISSION INFORMATION) (FORM B)** - SHOW CALCULATIONS USED, INCLUDING EMISSION FACTORS, MATERIAL BALANCES, AND/OR OTHER METHODS FROM WHICH THE POLLUTANT EMISSION RATES IN THIS APPLICATION WERE DERIVED. INCLUDE CALCULATION OF POTENTIAL BEFORE AND, WHERE APPLICABLE, AFTER CONTROLS. CLEARLY STATE ANY ASSUMPTIONS MADE AND PROVIDE ANY REFERENCES AS NEEDED TO SUPPORT MATERIAL BALANCE CALCULATIONS.

B **SPECIFIC EMISSION SOURCE (REGULATORY INFORMATION)(FORM E2 - TITLE V ONLY)** - PROVIDE AN ANALYSIS OF ANY REGULATIONS APPLICABLE TO INDIVIDUAL SOURCES AND THE FACILITY AS A WHOLE. INCLUDE A DISCUSSION OUTING METHODS (e.g. FOR TESTING AND/OR MONITORING REQUIREMENTS) FOR COMPLYING WITH APPLICABLE REGULATIONS, PARTICULARLY THOSE REGULATIONS LIMITING EMISSIONS BASED ON PROCESS RATES OR OTHER OPERATIONAL PARAMETERS. PROVIDE JUSTIFICATION FOR AVOIDANCE OF ANY FEDERAL REGULATIONS (PREVENTION OF SIGNIFICANT DETERIORATION (PSD), NEW SOURCE PERFORMANCE STANDARDS (NSPS), NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAPS), TITLE V), INCLUDING EXEMPTIONS FROM THE FEDERAL REGULATIONS WHICH WOULD OTHERWISE BE APPLICABLE TO THIS FACILITY. SUBMIT ANY REQUIRED TO DOCUMENT COMPLIANCE WITH ANY REGULATIONS. INCLUDE EMISSION RATES CALCULATED IN ITEM "A" ABOVE, DATES OF MANUFACTURE, CONTROL EQUIPMENT, ETC. TO SUPPORT THESE CALCULATIONS.

C **CONTROL DEVICE ANALYSIS (FORM C)** - PROVIDE A TECHNICAL EVALUATION WITH SUPPORTING REFERENCES FOR ANY CONTROL EFFICIENCIES LISTED ON SECTION C FORMS, OR USED TO REDUCE EMISSION RATES IN CALCULATIONS UNDER ITEM "A" ABOVE. INCLUDE PERTINENT OPERATING PARAMETERS (e.g. OPERATING CONDITIONS, MANUFACTURING RECOMMENDATIONS, AND PARAMETERS AS APPLIED FOR IN THIS APPLICATION) CRITICAL TO ENSURING PROPER PERFORMANCE OF THE CONTROL DEVICES). INCLUDE AND LIMITATIONS OR MALFUNCTION POTENTIAL FOR THE PARTICULAR CONTROL DEVICES AS EMPLOYED AT THIS FACILITY. DETAIL PROCEDURES FOR ASSURING PROPER OPERATION OF THE CONTROL DEVICE INCLUDING MONITORING SYSTEMS AND MAINTENANCE TO BE PERFORMED.

D **PROCESS AND OPERATIONAL COMPLIANCE ANALYSIS - (FORM E3 - TITLE V ONLY)** - SHOWING HOW COMPLIANCE WILL BE ACHIEVED WHEN USING PROCESS, OPERATIONAL, OR OTHER DATA TO DEMONSTRATE COMPLIANCE. REFER TO COMPLIANCE REQUIREMENTS IN THE REGULATORY ANALYSIS IN ITEM "B" WHERE APPROPRIATE. LIST ANY CONDITIONS OR PARAMETERS THAT CAN BE MONITORED AND REPORTED TO DEMONSTRATE COMPLIANCE WITH THE APPLICABLE REGULATIONS.

E **PROFESSIONAL ENGINEERING SEAL** - PURSUANT TO 15A NCAC 2Q .0112 "APPLICATION REQUIRING A PROFESSIONAL ENGINEERING SEAL," A PROFESSIONAL ENGINEER REGISTERED IN NORTH CAROLINA SHALL BE REQUIRED TO SEAL TECHNICAL PORTIONS OF THIS APPLICATION FOR NEW SOURCES AND MODIFICATIONS OF EXISTING SOURCES. (SEE INSTRUCTIONS FOR FURTHER APPLICABILITY).

I, Joe Sullivan, attest that this application for Enviva Pellets Northampton, LLC has been reviewed by me and is accurate, complete and consistent with the information supplied in the engineering plans, calculations, and all other supporting documentation to the best of my knowledge. I further attest that to the best of my knowledge the proposed design has been prepared in accordance with the applicable regulations. Although certain portions of this submittal package may have been developed by other professionals, inclusion of these materials under my seal signifies that I have reviewed this material and have judged it to be consistent with the proposed design. Note: In accordance with NC General Statutes 143-215.6A and 143-215.6B, any person who knowingly makes any false statement, representation, or certification in any application shall be guilty of a Class 2 misdemeanor which may include a fine not to exceed $10,000 as well as civil penalties up to $25,000 per violation.

(PLEASE USE BLUE INK TO COMPLETE THE FOLLOWING)

NAME: **Joe Sullivan**

DATE:

COMPANY: **Trinity Consultants, Inc.**

ADDRESS: **One Copley Parkway, Suite 310**
Morrisville, NC 27560

TELEPHONE: **(919) 462-9693**

SIGNATURE: Joe Sullivan

PAGES CERTIFIED: All control device application forms ("C Forms")

(IDENTIFY ABOVE EACH PERMIT FORM AND ATTACHMENT THAT IS BEING CERTIFIED BY THIS SEAL)

PLACE NORTH CAROLINA SEAL HERE

SEAL 023037

JOE W. SULLIVAN

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSIONS SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 12/01/01 NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate **B**

EMISSION SOURCE DESCRIPTION: **Green Wood Direct-Fired Dryer System**

EMISSION SOURCE ID NO: **ES-DRYER**

CONTROL DEVICE ID NO(S): **CD-DC, CD-WESP**

OPERATING SCENARIO 1 OF 1

EMISSION POINT (STACK) ID NO(S): **EP-6**

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):

Green wood is conveyed to either a rotary dryer system. Direct contact heat is provided to the system via a 207 mmBtu/hr burner system. Air emissions are controlled by cyclones for bulk particulate removal and additional particulate is removed utilitizing a wet electrostatic precipitator (WESP) operating after the cyclones.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

☒ Coal,wood,oil, gas, other burner (Form B1)
☐ Int.combustion engine/generator (Form B2)
☐ Liquid storage tanks (Form B3)
☐ Woodworking (Form B4)
☐ Coating/finishing/printing (Form B5)
☐ Storage silos/bins (Form B6)
☐ Manufact. of chemicals/coatings/inks (Form B7)
☐ Incineration (Form B8)
☐ Other (Form B9)

START CONSTRUCTION DATE: **TBD**

OPERATION DATE: **TBD**

DATE MANUFACTURED: **TBD**

MANUFACTURER / MODEL NO.: **TBD**

EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR

IS THIS SOURCE SUBJECT TO? NSPS (SUBPART?):______ NESHAP (SUBPART?):______ MACT (SUBPART?):______

PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB **25%** MAR-MAY **25%** JUN-AUG **25%** SEP-NOV **25%**

EXPECTED ANNUAL HOURS OF OPERATION **8,760**

VISIBLE STACK EMISSIONS UNDER NORMAL OPERATION: <20 % OPACITY

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL		POTENTIAL EMSSIONS			
		(AFTER CONTROLS / LIMITS)		(BEFORE CONTROLS / LIMITS)		(AFTER CONTROLS / LIMITS)	
AIR POLLUTANT EMITTED		lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
PARTICULATE MATTER (PM)	**See Emission Calculations in Appendix B**						
PARTICULATE MATTER<10 MICRONS (PM_{10})							
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)							
SULFUR DIOXIDE (SO2)							
NITROGEN OXIDES (NOx)							
CARBON MONOXIDE (CO)							
VOLATILE ORGANIC COMPOUNDS (VOC)							
LEAD							
OTHER							

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL		POTENTIAL EMSSIONS			
		(AFTER CONTROLS / LIMITS)		(BEFORE CONTROLS / LIMITS)		(AFTER CONTROLS / LIMITS)	
HAZARDOUS AIR POLLUTANT AND CAS NO.		lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
	See Emission Calculations in Appendix B						

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

INDICATE EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS

TOXIC AIR POLLUTANT AND CAS NO.	EF SOURCE	lb/hr	lb/day	lb/yr
	See Emission Calculations in Appendix B			

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B1

EMISSION SOURCE (WOOD, COAL, OIL, GAS, OTHER FUEL-FIRED BURNER)

REVISED 12/01/01

NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate

B1

EMISSION SOURCE DESCRIPTION: Green Wood Direct-Fired Dryer System

EMISSION SOURCE ID NO: ES-DRYER

CONTROL DEVICE ID NO(S): CD-DC, CD-WESP

OPERATING SCENARIO: 1 OF 1

EMISSION POINT (STACK) ID NO(S): EP-6

DESCRIBE USE: [✓ PROCESS HEAT] SPACE HEAT ELECTRICAL GENERATION
CONTINUOUS USE STAND BY/EMERGENCY OTHER (DESCRIBE): ________

HEATING MECHANISM: INDIRECT [✓ DIRECT]

MAX. FIRING RATE (MMBTU/HOUR): 207

WOOD-FIRED BURNER

WOOD TYPE: BARK [✓ WOOD/BARK] WET WOOD DRY WOOD OTHER (DESCRIBE): ________

PERCENT MOISTURE OF FUEL: 20 to 50%

UNCONTROLLED CONTROLLED WITH FLYASH REINJECTION [✓ CONTROLLED W/O REINJECTION]

FUEL FEED METHOD:

HEAT TRANSFER MEDIA: STEAM [✓ AIR] OTHER

METHOD OF TUBE CLEANING: N/A

COAL-FIRED BURNER

TYPE OF BOILER

IF OTHER DESCRIBE:

PULVERIZED
☐ WET BED
☐ DRY BED

OVERFEED STOKER
UNCONTROLLED
CONTROLLED

UNDERFEED STOKER
UNCONTROLLED
CONTROLLED

SPREADER STOKER
UNCONTROLLED
FLYASH REINJECTION
NO FLYASH REINJECTION

FLUIDIZED BED ________
CIRCULATING
RECIRCULATING

METHOD OF LOADING: CYCLONE HANDFIRED TRAVELING GRATE OTHER (DESCRIBE): ________

METHOD OF TUBE CLEANING:

CLEANING SCHEDULE:

OIL/GAS-FIRED BURNER

TYPE OF BOILER: ☐ UTILITY ☐ INDUSTRIAL ☐ COMMERCIAL ☐ RESIDENTIAL

TYPE OF FIRING: ☐ NORMAL ☐ TANGENTIAL ☐ LOW NOX BURNERS ☐ NO LOW NOX BURNER

METHOD OF TUBE CLEANING:

CLEANING SCHEDULE:

OTHER FUEL-FIRED BURNER

TYPE OF FUEL: ________

PERCENT MOISTURE: ________

TYPE OF BOILER: ☐ UTILITY ☐ INDUSTRIAL ☐ COMMERCIAL ☐ RESIDENTIAL

TYPE OF FIRING: ________

TYPE OF CONTROL (IF ANY): ________

FUEL FEED METHOD: ________

METHOD OF TUBE CLEANING:

CLEANING SCHEDULE:

FUEL USAGE (INCLUDE STARTUP/BACKUP FUELS)

FUEL TYPE	UNITS	MAXIMUM DESIGN CAPACITY (UNIT/HR)	REQUESTED CAPACITY LIMITATION (UNIT/HR)
Bark/Wet Wood	Tons	Nominal 10.9 (bark basis)	

FUEL CHARACTERISTICS (COMPLETE ALL THAT ARE APPLICABLE)

FUEL TYPE	SPECIFIC BTU CONTENT	SULFUR CONTENT (% BY WEIGHT)	ASH CONTENT (% BY WEIGHT)
Bark/Wet Wood	Nominal 4,200 BTU/lb	0.011	

SAMPLING PORTS, COMPLIANT WITH EPA METHOD 1 WILL BE INSTALLED ON THE STACKS: [✓ YES] NO

COMMENTS:

Attach Additional Sheets As Necessary

FORM C4

CONTROL DEVICE (CYCLONE, MULTICYCLONE, OR OTHER MECHANICAL)

REVISED 12/01/01 **NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate** **C4**

CONTROL DEVICE ID NO: **CD-DC**	CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NO(S): **ES-DRYER**
EMISSION POINT (STACK) ID NO(S): **EP-6**	POSITION IN SERIES OF CONTROLS NO. 1 OF 2 UNITS
MANUFACTURER: **TBD**[1]	MODEL NO:
DATE MANUFACTURE **TBD**	PROPOSED OPERATION DATE: **TBD**
OPERATING SCENARIO:	PROPOSED START CONSTRUCTION DATE: **TBD**
____1___ OF ___1____	P.E. SEAL REQUIRED (PER 2Q .0112)? ☐ YES ☐ NO

DESCRIBE CONTROL SYSTEM :

Three identical convential efficiency cyclones are equipped to the discharge of the rotary dryer system to capture bulk PM emissions. Emissions from each the cyclones are combined into a common duct and are routed to the WESP. The parameters presented here are per each cyclone:

POLLUTANT(S) COLLECTED:	**PM**	**PM_{10}**	**$PM_{2.5}$**	
BEFORE CONTROL EMISSION RATE (LB/HR):				
CAPTURE EFFICIENCY:	98.5 %	98.5 %	98.5 %	%
CONTROL DEVICE EFFICIENCY:	%	%	%	%
CORRESPONDING OVERALL EFFICIENCY:	%	%	%	%
EFFICIENCY DETERMINATION CODE:				
TOTAL EMISSION RATE (LB/HR):				

PRESSURE DROP (IN. H_20): MIN MAX **6.0"** WARNING ALARM? ☐ YES ☐ NO

INLET TEMPERATURE (°F): MIN MAX **Nominal 400**	OUTLET TEMPERATURE (°F): MIN MAX **Nominal 400**
INLET AIR FLOW RATE (ACFM): **95,000**	BULK PARTICLE DENSITY (LB/FT^3): **3.43E-05**
POLLUTANT LOADING RATE (GR/FT^3 **0.24**	

SETTLING CHAMBER	**CYCLONE**			**MULTICYCLONE**
LENGTH (INCHES):	INLET VELOCITY (FT/SEC): 95		[✓ CIRCULAR] ☐ RECTANGLE	NO. TUBES:
WIDTH (INCHES):	*DIMENSIONS (INCHES) See instructions*		*IF WET SPRAY UTILIZED*	DIAMETER OF TUBES:
HEIGHT (INCHES):	H:	Dd:	LIQUID USED:	HOPPER ASPIRATION SYSTEM?
VELOCITY (FT/SEC.):	W:	Lb: 217"	FLOW RATE (GPM):	☐ YES ☐ NO
NO. TRAYS:	De: 74"	Lc: 254"	MAKE UP RATE (GPM):	LOUVERS?
NO. BAFFLES:	D: 149"	S:		☐ YES ☐ NO
	TYPE OF CYCLONE [✓ CONVENTIONAL]		☐ HIGH EFFICIENCY	☐ OTHER

DESCRIBE MAINTENANCE PROCEDURES:

Periodic inspection of mechanical integrity during plant outages as specified by manufacturer

DESCRIBE INCOMING AIR STREAM:

The flue gas from the dryer will be split and distributed through a set of three cyclones before entering the WESP. After the cyclones, the gas stream will be combined into a single duct and directed to the WESP inlet point.

PARTICLE SIZE DISTRIBUTION

SIZE (MICRONS)	WEIGHT % OF TOTAL	CUMULATIVE %
0-1	**Unknown**	
1-10		
10-25		
25-50		
50-100		
>100		
	TOTAL = 100	

DESCRIBE ANY MONITORING DEVICES, GAUGES, TEST PORTS, ETC:

None

ON A SEPARATE PAGE, ATTACH A DIAGRAM OF THE RELATIONSHIP OF THE CONTROL DEVICE TO ITS EMISSION SOURCE(S):

Attach Additional Sheets As Necessary

---

[1] Final equipment selection has not yet occurred but will be similar in design to specifications shown.

FORM C2

CONTROL DEVICE (Electrostatic Precipitator)

REVISED 12/01/01

NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate

C2

ONTROL DEVICE ID NO:	CD-WESP	CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NC	ES-DRYER
SSION POINT (STACK) ID NO(S):	EP-6	POSITION IN SERIES OF CONTROLS:	NO. 2 OF 2 UNITS
MANUFACTURER:	SonicKleen	MODEL NO.	SonicKleen WESP-304L-567-12H19
MANUFACTURE DATE:	TBD	PROPOSED OPERATION DATE:	TBD
OPERATING SCENARIO:		PROPOSED START CONSTRUCTION DATE:	TBD
_______ OF _______		P.E. SEAL REQUIRED (PER 2Q .0112)?	[✓ YES] ☐ NO
EQUIPMENT SPECIFICATIONS		GAS DISTRIBUTION GRIDS:	[✓ YES] ☐ NO

TYPE: [✓ WET] ☐ DRY [✓ SINGLE-STAGE] ☐ TWO-STAGE

TOTAL COLLECTION PLATE AREA (FT ^{2}):	29,904	NO. FIELDS 2 NO. COLLECTOR PLATE PER FIELD:	567 tubes
COLLECTOR PLATES SIZE (FT): LENGTH: WIDTH:		SPACING BETWEEN COLLECTOR PLATES (INCHES):	12" hextube
TOTAL DISCHARGE ELECTRODE LENGTH(FT):	19"-0"	GAS VISCOSITY (POISE):	2.054E-04 Poise
NUMBER OF DISCHARGE ELECTRODES:	567	NUMBER OF COLLECTING ELECTRODE RAPPERS:	none
MAXIMUM INLET AIR FLOW RATE (ACFM):	190,000	PARTICLE MIGRATION VELOCITY (FT/SEC):	0.234
MINIMUM GAS TREATMENT TIME (SEC):	2.3	BULK PARTICLE DENSITY (LB/FT ^{3}):	45 lb/cu. ft.
FIELD STRENGTH (VOLTS) CHARGING: 83 kVA COLLECTING: N/A		CORONA POWER (WATTS/1000 CFM):	4000

ELECTRICAL USAGE (kw/HOUR): 141.5

CLEANING PROCEDURES: ☐ RAPPING ☐ PLATE VIBRATING [✓ WASHING] ☐ OTHER ________

OPERATING PARAMETERS PRESSURE DROP (IN. H20): MIN 2" MAX 2" WARNING ALARM? ☐ YES ☐ NO

RESISTIVITY OF POLLUTANT (OHM-CM):	N/A	GAS CONDITIONING [✓ YES] ☐ NO TYPE OF AGENT (IF YES):	
INLET GAS TEMPERATURE (°F):	MIN 200 MAX 300	OUTLET GAS TEMPERATURE (°F):	MIN 150 MAX 190
VOLUME OF GAS HANDLED (ACFM):	185,000	INLET MOISTURE PERCENT:	MIN 40% MAX 50%

POWER REQUIREMENTS IS AN ENERGY MANAGEMENT SYSTEM USED? ☐ YES ☐ NO

FIELD NO.	NO. OF SETS	CHARGING	EACH TRANSFORMER (kVA)	EACH RECTIFIER Kv Ave/Peak Ma Dc
1	1		118	83 / 1265
2	1		118	83 / 1265

POLLUTANT(S) COLLECTED:	PM / PM$_{10}$ / PM$_{2.5}$			
BEFORE CONTROL EMISSION RATE (LB/HR):	125.00			
CAPTURE EFFICIENCY:	%	%	%	%
CONTROL DEVICE EFFICIENCY:	%	%	%	%
CORRESPONDING OVERALL EFFICIENCY:	%	%	%	%
EFFICIENCY DETERMINATION CODE:				
TOTAL EMISSION RATE (LB/HR):	See calculations in Appendix B			

PARTICLE SIZE DISTRIBUTION

SIZE (MICRONS)	WEIGHT % OF TOTAL	CUMULATIVE %
0-1	Unknown	
1-10		
10-25		
25-50		
50-100		
>100		
	TOTAL = 100	

DESCRIBE STARTUP PROCEDURES:

See attached

DESCRIBE MAINTENANCE PROCEDURES:

See attached

DESCRIBE ANY AUXILIARY MATERIALS INTRODUCED INTO THE CONTROL SYSTEM:

NOAH

ESCRIBE ANY MONITORING DEVICES, GAUGES, OR TEST PORTS AS ATTACHMENTS:

PLC

ATTACH A DIAGRAM OF THE TOP VIEW OF THE ESP WITH DIMENSIONS (include at a minimum the plate spacing and wire spacing and indicate the electrode type), AND THE RELATIONSHIP OF THE CONTROL DEVICE TO ITS EMISSION SOURCE(S):

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSIONS SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 12/01/01 NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate **B**

EMISSION SOURCE DESCRIPTION: **Four (4) Hammermills**	EMISSION SOURCE ID NO: **ES-HM-1,-2,-3,-4** CONTROL DEVICE ID NO(S): **CD-HM-BV1,-BV2**
OPERATING SCENARIO 1 OF 1	EMISSION POINT (STACK) ID NO(S): **EP-2**

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Dried materials are reduced to the appropriate size needed for pelletization using four hammermills

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

☐ Coal,wood,oil, gas, other burner (Form B1)	☐ Woodworking (Form B4)	☐ Manufact. of chemicals/coatings/inks (Form B7)
☐ Int.combustion engine/generator (Form B2)	☐ Coating/finishing/printing (Form B5)	☐ Incineration (Form B8)
☐ Liquid storage tanks (Form B3)	☐ Storage silos/bins (Form B6)	☒ Other (Form B9)

START CONSTRUCTION DATE: **TBD** OPERATION DATE: **TBD** DATE MANUFACTURED: **TBD**

MANUFACTURER / MODEL NO.: **TBD** EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR

IS THIS SOURCE SUBJECT TO? NSPS (SUBPART?):____ NESHAP (SUBPART?):____ MACT (SUBPART?):____

PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB **25%** MAR-MAY **25%** JUN-AUG **25%** SEP-NOV **25%**

EXPECTED ANNUAL HOURS OF OPERATION **8,760** VISIBLE STACK EMISSIONS UNDER NORMAL OPERATION: <20 % OPACITY

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS)		POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS)	
AIR POLLUTANT EMITTED		lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
PARTICULATE MATTER (PM)	See Emission Calculations in Appendix B						
PARTICULATE MATTER<10 MICRONS (PM_{10})							
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)							
SULFUR DIOXIDE (SO2)							
NITROGEN OXIDES (NOx)							
CARBON MONOXIDE (CO)							
VOLATILE ORGANIC COMPOUNDS (VOC)							
LEAD							
OTHER							

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS)		POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS)	
HAZARDOUS AIR POLLUTANT AND CAS NO.		lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
N/A							

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

INDICATE EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS

TOXIC AIR POLLUTANT AND CAS NO.	EF SOURCE	lb/hr	lb/day	lb/yr
N/A				

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B9

EMISSION SOURCE (OTHER)

REVISED: 12/01/01 | NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate | **B9**

EMISSION SOURCE DESCRIPTION: **Four (4) Hammermills**

EMISSION SOURCE ID NO: **ES-HM-1,-2,-3,-4**

CONTROL DEVICE ID NO(S): **CD-HM-BV1,-BV2**

OPERATING SCENARIO: 1 OF 1

EMISSION POINT (STACK) ID NO(S): **EP-2**

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM):

Dried materials are reduced to the appropriate size needed for pelletization using four hammermills.

MATERIALS ENTERING PROCESS - CONTINUOUS PROCESS		MAX. DESIGN CAPACITY (UNIT/HR)	REQUESTED CAPACITY LIMITATION(UNIT/HR)
TYPE	UNITS		
Dried Wood	Tons	68.3	

MATERIALS ENTERING PROCESS - BATCH OPERATION		MAX. DESIGN CAPACITY (UNIT/BATCH)	REQUESTED CAPACITY LIMITATION (UNIT/BATCH)
TYPE	UNITS		

MAXIMUM DESIGN (BATCHES / HOUR):

REQUESTED LIMITATION (BATCHES / HOUR): (BATCHES/YR):

FUEL USED: N/A

TOTAL MAXIMUM FIRING RATE (MILLION BTU/HR): N/A

MAX. CAPACITY HOURLY FUEL USE: N/A

REQUESTED CAPACITY ANNUAL FUEL USE: N/A

COMMENTS:

Attach Additional Sheets as Necessary

FORM C4

CONTROL DEVICE (CYCLONE, MULTICYCLONE, OR OTHER MECHANICAL)

C4

REVISED 12/01/01

NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate

CONTROL DEVICE ID NO: CD-HM-CYC-1,-2,-3,-4	CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NO(S): ES-HM-1,-2,-3,-4
EMISSION POINT (STACK) ID NO(S): EP-2	POSITION IN SERIES OF CONTROLS NO. 1 OF 2 UNITS
MANUFACTURER: TBD[1]	MODEL NO:
DATE MANUFACTURED: TBD	PROPOSED OPERATION DATE: TBD
OPERATING SCENARIO:	PROPOSED START CONSTRUCTION DATE: TBD
1 OF 1	P.E. SEAL REQUIRED (PER 2Q .0112)? [✓ YES] ☐ NO

DESCRIBE CONTROL SYSTEM :

One cyclone is equipped for each coarse hammermills to capture bulk PM emissions. The emissions from the cyclone are routed to a bagfilter. Each bagfilter handles the air flow of two cyclones.

The parameters presented here are per each cyclone.

POLLUTANT(S) COLLECTED:	PM	PM_{10}	$PM_{2.5}$	
BEFORE CONTROL EMISSION RATE (LB/HR):	34,000	34,000	34,000	
CAPTURE EFFICIENCY:	98.0% %	98.0% %	98.0% %	%
CONTROL DEVICE EFFICIENCY:	%	%	%	%
CORRESPONDING OVERALL EFFICIENCY:	%	%	%	%
EFFICIENCY DETERMINATION CODE:				
TOTAL EMISSION RATE (LB/HR):	680	680	680	

PRESSURE DROP (IN. H_20): MIN MAX 6.0" WARNING ALARM? ☐ YES ☐ NO

INLET TEMPERATURE (°F): MIN 160 Ambient	OUTLET TEMPERATURE (°F): MIN MAX Ambient
INLET AIR FLOW RATE (ACFM): 20,000	BULK PARTICLE DENSITY (LB/FT^3): 2.83E-02
POLLUTANT LOADING RATE (GR/FT^3): 198.33	

SETTLING CHAMBER	**CYCLONE**					**MULTICYCLONE**
LENGTH (INCHES):	INLET VELOCITY (FT/SEC):			90.4	[✓ CIRCULAR] ☐ RECTANGLE	NO. TUBES:
WIDTH (INCHES):	*DIMENSIONS (INCHES) See instructions*				*IF WET SPRAY UTILIZED*	DIAMETER OF TUBES:
HEIGHT (INCHES):	H:	48"	Dd:	24"	LIQUID USED:	HOPPER ASPIRATION SYSTEM?
VELOCITY (FT/SEC.):	W:	22"	Lb:	68"	FLOW RATE (GPM):	☐ YES ☐ NO
NO. TRAYS:	De:	57"	Lc:	192"	MAKE UP RATE (GPM):	LOUVERS?
NO. BAFFLES:	D:	120"	S:	67"		☐ YES ☐ NO
	TYPE OF CYCLONE:	[✓ CONVENTIONAL]		☐ HIGH EFFICIENCY		☐ OTHER

DESCRIBE MAINTENANCE PROCEDURES:

Periodic inspection of mechanical integrity during plant outages as specified by manufacturer

DESCRIBE INCOMING AIR STREAM:

The material will be pulled through the cyclone under negative pressure. The cyclone will separate the material from the air stream and the air will discharge to an associated bag filter prior to being discharge to atmosphere via a discharge stack common to all fitlers in this area.

PARTICLE SIZE DISTRIBUTION

SIZE (MICRONS)	WEIGHT % OF TOTAL	CUMULATIVE %
0-1	Unknown	
1-10		
10-25		
25-50		
50-100		
>100		
		TOTAL = 100

DESCRIBE ANY MONITORING DEVICES, GAUGES, TEST PORTS, ETC:

None

ON A SEPARATE PAGE, ATTACH A DIAGRAM OF THE RELATIONSHIP OF THE CONTROL DEVICE TO ITS EMISSION SOURCE(S):

Attach Additional Sheets As Necessary

[1] Final equipment selection has not yet occurred but will be similar in design to specifications shown.

FORM C1

CONTROL DEVICE (FABRIC FILTER)

C1

REVISED 12/01/01

NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate

CONTROL DEVICE ID NO: **CD-HM-BF1 & CD-HM-BF2**

CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NO(S): **ES-HM-1,-2,-3,-4**

EMISSION POINT (STACK) ID NO(S): **EP-2**

POSITION IN SERIES OF CONTROLS NO. 2 OF 2 UNITS

MANUFACTURER: **TBD**[1]

MODEL NO: **TBD**

DATE MANUFACTURED: **TBD**

PROPOSED OPERATION DATE: **TBD**

OPERATING SCENARIO: 1 OF 1

PROPOSED START CONSTRUCTION DATE: **TBD**

P.E. SEAL REQUIRED (PER 2Q .0112)? [✓ YES] ☐ NO

DESCRIBE CONTROL SYSTEM:

Two (2) bagfilters will be utilized for emission control on four of the hammermill cyclones. Two hammermill cylcones will be routed to a single baghouse.

POLLUTANT(S) COLLECTED:	PM	PM-10	PM-2.5	
BEFORE CONTROL EMISSION RATE (LB/HR):	1,750	1,750	1,750	
CAPTURE EFFICIENCY:	~99.9 %	~99.9 %	~99.9 %	%
CONTROL DEVICE EFFICIENCY:	%	%	%	%
CORRESPONDING OVERALL EFFICIENCY:	%	%	%	%
EFFICIENCY DETERMINATION CODE:				
TOTAL EMISSION RATE (LB/HR):	See calculations in Appendix B			

PRESSURE DROP (IN. H_2O): MIN: MAX: 6" GAUGE? [✓ YES] NO **WARNING ALARM?** [✓ YES] ☐ NO

BULK PARTICLE DENSITY (LB/FT³): **7.29E-04**

INLET TEMPERATURE (°F): **120**

POLLUTANT LOADING RATE: **5.10** ☐ LB/HR [✓ GR/FT³]

OUTLET TEMPERATURE (°F): **100**

INLET AIR FLOW RATE (ACFM): **40,000**

FILTER MAX OPERATING TEMP. (°F): **N/A**

NO. OF COMPARTMENTS: **1**

NO. OF BAGS PER COMPARTMENT: **412**

LENGTH OF BAG (IN.): **144**

DIAMETER OF BAG (IN.): **5.75**

DRAFT: ☐ INDUCED/NEG. [✓ FORCED/POS.]

FILTER SURFACE AREA (FT²): **7,442**

AIR TO CLOTH RATIO: **6.00**

FILTER MATERIAL: **Polyester or equivalent**

☐ WOVEN [✓ FELTED]

DESCRIBE CLEANING PROCEDURES:

☐ AIR PULSE

[✓ REVERSE FLOW]

☐ MECHANICAL/SHAKER

☐ OTHER

☐ SONIC

☐ SIMPLE BAG COLLAPSE

☐ RING BAG COLLAPSE

PARTICLE SIZE DISTRIBUTION

SIZE (MICRONS)	WEIGHT % OF TOTAL	CUMULATIVE %
0-1	**Unknown**	
1-10		
10-25		
25-50		
50-100		
>100		
	TOTAL = 100	

DESCRIBE INCOMING AIR STREAM:

The air stream will contain wood dust particles. Larger particles will have been removed by the upstream cyclone. The filters will discharge to a common stack. This stack will also accept the discharge air flow from a third bag filter (CD-HMA-BF) (located in this area.)

METHOD FOR DETERMINING WHEN TO CLEAN:

[✓ AUTOMATIC] ☐ TIMED ☐ MANUAL

METHOD FOR DETERMINING WHEN TO REPLACE THE BAGS:

☐ ALARM [✓ INTERNAL INSPECTION] ☐ VISIBLE EMISSION ☐ OTHER

SPECIAL CONDITIONS: **None**

☐ MOISTURE BLINDING ☐ CHEMICAL RESISTIVITY ☐ OTHER

EXPLAIN:

DESCRIBE MAINTENANCE PROCEDURES: **Per manufacturer recommendations**

ON A SEPARATE PAGE, ATTACH A DIAGRAM SHOWING THE RELATIONSHIP OF THE CONTROL DEVICE TO ITS EMISSION SOURCE(S):

Attach Additional Sheets As Necessary

[1] Final equipment selection has not yet occurred but will be similar in design to specifications shown.

FORM B

SPECIFIC EMISSIONS SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 12/01/01 NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate **B**

EMISSION SOURCE DESCRIPTION: **Hammermill Area Filter**

EMISSION SOURCE ID NO: **ES-HMA**

CONTROL DEVICE ID NO(S): **CD-HMA-BV**

OPERATING SCENARIO **1** OF **1**

EMISSION POINT (STACK) ID NO(S): **EP-2**

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):

One set of conveyors after the hammermills transports material to the pellet press silo. A second set of conveyors transports the material from the pellet press silo to the pellet presses. Particulate emissions are routed to a common dust collection system. See main report for full description.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

☐ Coal,wood,oil, gas, other burner (Form B1)
☐ Int.combustion engine/generator (Form B2)
☐ Liquid storage tanks (Form B3)
☐ Woodworking (Form B4)
☐ Coating/finishing/printing (Form B5)
☐ Storage silos/bins (Form B6)
☐ Manufact. of chemicals/coatings/inks (Form B7)
☐ Incineration (Form B8)
☒ Other (Form B9)

START CONSTRUCTION DATE: **TBD**

OPERATION DATE: **TBD**

DATE MANUFACTURED: **TBD**

MANUFACTURER / MODEL NO.: **TBD**

EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR

IS THIS SOURCE SUBJECT TO? NSPS (SUBPART?):______ NESHAP (SUBPART?):______ MACT (SUBPART?):______

PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB **25%** MAR-MAY **25%** JUN-AUG **25%** SEP-NOV **25%**

EXPECTED ANNUAL HOURS OF OPERATION **8,760**

VISIBLE STACK EMISSIONS UNDER NORMAL OPERATION: <20 % OPACITY

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS)		POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS)	
		lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
PARTICULATE MATTER (PM)	**See Emission Calculations in Appendix B**						
PARTICULATE MATTER<10 MICRONS (PM_{10})							
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)							
SULFUR DIOXIDE (SO2)							
NITROGEN OXIDES (NOx)							
CARBON MONOXIDE (CO)							
VOLATILE ORGANIC COMPOUNDS (VOC)							
LEAD							
OTHER							

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT AND CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS)		POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS)	
		lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
N/A							

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

INDICATE EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS

TOXIC AIR POLLUTANT AND CAS NO.	EF SOURCE	lb/hr	lb/day	lb/yr
N/A				

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B9

EMISSION SOURCE (OTHER)

B9

REVISED: 12/01/01

NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate

EMISSION SOURCE DESCRIPTION: Hammermill Area Filter

OPERATING SCENARIO: 1 OF 1

EMISSION SOURCE ID NO: ES-HMA

CONTROL DEVICE ID NO(S): CD-HMA-BF

EMISSION POINT (STACK) ID NO(S): EP-2

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM):

One set of conveyors after the hammermills transports material to the pellet press silo. A second set of conveyors transports the material from the pellet press silo to the pellet presses. Particulate emissions are routed to a common dust collection system. See main report for full description.

MATERIALS ENTERING PROCESS - CONTINUOUS PROCESS		MAX. DESIGN CAPACITY (UNIT/HR)	REQUESTED CAPACITY LIMITATION(UNIT/HR)
TYPE	UNITS		
Dried Wood	Tons	68.3	

MATERIALS ENTERING PROCESS - BATCH OPERATION		MAX. DESIGN CAPACITY (UNIT/BATCH)	REQUESTED CAPACITY LIMITATION (UNIT/BATCH)
TYPE	UNITS		

MAXIMUM DESIGN (BATCHES / HOUR):

REQUESTED LIMITATION (BATCHES / HOUR):

(BATCHES/YR):

FUEL USED: N/A

TOTAL MAXIMUM FIRING RATE (MILLION BTU/HR): N/A

MAX. CAPACITY HOURLY FUEL USE: N/A

REQUESTED CAPACITY ANNUAL FUEL USE: N/A

COMMENTS:

Attach Additional Sheets as Necessary

FORM C1

CONTROL DEVICE (FABRIC FILTER)

REVISED 12/01/01 **NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate** **C1**

CONTROL DEVICE ID NO: **CD-HMA-BF** CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NO(S): **ES-HMA**

EMISSION POINT (STACK) ID NO(S): **EP-2** POSITION IN SERIES OF CONTROLS NO. **1** OF **1** UNITS

MANUFACTURER: **TBD**[1] MODEL NO: **TBD**

DATE MANUFACTURED: **TBD** PROPOSED OPERATION DATE: **TBD**

OPERATING SCENARIO: PROPOSED START CONSTRUCTION DATE: **TBD**

__1__ OF __1__ P.E. SEAL REQUIRED (PER 2Q .0112)? [✓ YES] ☐ NO

DESCRIBE CONTROL SYSTEM:

This bagfilter will be utilized for emission control of sources described in B forms.

POLLUTANT(S) COLLECTED:	**PM**	**PM_{10}**	**$PM_{2.5}$**	
BEFORE CONTROL EMISSION RATE (LB/HR):	1,500	1,500	1,500	
CAPTURE EFFICIENCY:	~99.9 %	~99.9 %	~99.9 %	%
CONTROL DEVICE EFFICIENCY:	%	%	%	%
CORRESPONDING OVERALL EFFICIENCY:	%	%	%	%
EFFICIENCY DETERMINATION CODE:				
TOTAL EMISSION RATE (LB/HR):	See calculations in Appendix B			

PRESSURE DROP (IN. H_2O): MIN: MAX: 6" GAUGE? [✓ YES] NO WARNING ALARM? [✓ YES] ☐ NO

BULK PARTICLE DENSITY (LB/FT^3): **6.67E-04** INLET TEMPERATURE (°F): **120**

POLLUTANT LOADING RATE: **4.67** ☐ LB/HR [✓ GR/FT^3] OUTLET TEMPERATURE (°F): **100**

INLET AIR FLOW RATE (ACFM): **37,500** FILTER MAX OPERATING TEMP. (°F): **N/A**

NO. OF COMPARTMENTS: **1** NO. OF BAGS PER COMPARTMENT: **412** LENGTH OF BAG (IN.): **144**

DIAMETER OF BAG (IN.): **5.75** DRAFT: ☐ INDUCED/NEG. [✓ FORCED/POS.] FILTER SURFACE AREA (FT^2): **7,442**

AIR TO CLOTH RATIO: **6.00** FILTER MATERIAL: **Polyester or equivalent** ☐ WOVEN [✓ FELTED]

DESCRIBE CLEANING PROCEDURES:

☐ **AIR PULSE** ☐ SONIC

[✓ REVERSE FLOW] ☐ SIMPLE BAG COLLAPSE

☐ MECHANICAL/SHAKER ☐ RING BAG COLLAPSE

☐ OTHER

PARTICLE SIZE DISTRIBUTION

SIZE (MICRONS)	WEIGHT % OF TOTAL	CUMULATIVE %
0-1	**Unknown**	
1-10		
10-25		
25-50		
50-100		
>100		
	TOTAL = 100	

DESCRIBE INCOMING AIR STREAM:

The air stream will contain wood dust particles. Larger particles will have been removed by the upstream cyclone. This filter will discharge to a common stack (same stack as CD-HM-BF1 & BF2).

METHOD FOR DETERMINING WHEN TO CLEAN:

[✓ AUTOMATIC] ☐ **TIMED** ☐ MANUAL

METHOD FOR DETERMINING WHEN TO REPLACE THE BAGS:

☐ ALARM [✓ INTERNAL INSPECTION] ☐ VISIBLE EMISSION ☐ **OTHER**

SPECIAL CONDITIONS: None

☐ MOISTURE BLINDING ☐ CHEMICAL RESISTIVITY ☐ OTHER

EXPLAIN:

DESCRIBE MAINTENANCE PROCEDURES: **Per manufacturer recommendations**

ON A SEPARATE PAGE, ATTACH A DIAGRAM SHOWING THE RELATIONSHIP OF THE CONTROL DEVICE TO ITS EMISSION SOURCE(S):

Attach Additional Sheets As Necessary

[1] Final equipment selection has not yet occurred but will be similar in design to specifications shown.

FORM B

SPECIFIC EMISSIONS SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 12/01/01 NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate **B**

EMISSION SOURCE DESCRIPTION: **Pellet Mill Feed Silo**

EMISSION SOURCE ID NO: **ES-PMFS**

CONTROL DEVICE ID NO(S): **CD-PMFS-BV**

EMISSION POINT (STACK) ID NO(S): **EP-3**

OPERATING SCENARIO 1 OF 1

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
A pellet press silo stores dried ground wood prior to transport to the pellet presses.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

☐ Coal,wood,oil, gas, other burner (Form B1)
☐ Int.combustion engine/generator (Form B2)
☐ Liquid storage tanks (Form B3)
☐ Woodworking (Form B4)
☐ Coating/finishing/printing (Form B5)
☒ Storage silos/bins (Form B6)
☐ Manufact. of chemicals/coatings/inks (Form B7)
☐ Incineration (Form B8)
☐ Other (Form B9)

START CONSTRUCTION DATE: **TBD** OPERATION DATE: **TBD** DATE MANUFACTURED: **TBD**

MANUFACTURER / MODEL NO.: **TBD** EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR

IS THIS SOURCE SUBJECT TO? NSPS (SUBPART?):________ NESHAP (SUBPART?):________ MACT (SUBPART?):________

PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB **25%** MAR-MAY **25%** JUN-AUG **25%** SEP-NOV **25%**

EXPECTED ANNUAL HOURS OF OPERATION **8,760** VISIBLE STACK EMISSIONS UNDER NORMAL OPERATION: <20 % OPACITY

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS)		POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS)	
		lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
PARTICULATE MATTER (PM)	**See Emission Calculations in Appendix B**						
PARTICULATE MATTER<10 MICRONS (PM_{10})							
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)							
SULFUR DIOXIDE (SO2)							
NITROGEN OXIDES (NOx)							
CARBON MONOXIDE (CO)							
VOLATILE ORGANIC COMPOUNDS (VOC)							
LEAD							
OTHER							

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT AND.CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS)		POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS)	
		lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
N/A							

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

INDICATE EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS

TOXIC AIR POLLUTANT AND CAS NO.	EF SOURCE	lb/hr	lb/day	lb/yr
N/A				

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B6

EMISSION SOURCE (STORAGE SILO/BINS)

REVISED 12/01/01 **NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate** **B6**

ISSION SOURCE DESCRIPTION:	**Pellet Mill Feed Silo**	EMISSION SOURCE ID NO:	**ES-PMFS**
		CONTROL DEVICE ID NO(S):	**CD-PMFS-BV**
OPERATING SCENARIO:	________ OF ________	EMISSION POINT(STACK) ID NO(S):	**EP-3**

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM):

A pellet press silo stores dried ground wood prior to transport to the pellet presses.

MATERIAL STORED:			DENSITY OF MATERIAL (LB/FT3):	**40**
CAPACITY	CUBIC FEET: **TBD**		TONS: **TBD**	
DIMENSIONS (FEET)	HEIGHT:	DIAMETER: *(OR)*	LENGTH:	WIDTH: HEIGHT:
ANNUAL PRODUCT THROUGHPUT (TONS)	ACTUAL:		MAXIMUM DESIGN CAPACITY:	

PNEUMATICALLY FILLED	MECHANICALLY FILLED		FILLED FROM
☐ BLOWER	☐ SCREW CONVEYOR	MOTOR HP:	☐ RAILCAR
☐ COMPRESSOR	[✓ ☐ BELT CONVEYOR]		☐ TRUCK
☐ OTHER:	☐ BUCKET ELEVATOR		☐ STORAGE PILE
	☐ OTHER:		[✓ ☐ OTHER:] **Conveyor**

NO. FILL TUBES:

XIMUM ACFM:

MATERIAL IS FILLED TO:

BY WHAT METHOD IS MATERIAL UNLOADED FROM SILO?

MAXIMUM DESIGN FILLING RATE OF MATERIAL (TONS/HR): **~75**

MAXIMUM DESIGN UNLOADING RATE OF MATERIAL (TONS/HR): **~75**

COMMENTS:

Attach Additional Sheets As Necessary

FORM C1

CONTROL DEVICE (FABRIC FILTER)

C1

REVISED 12/01/01

NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate

CONTROL DEVICE ID NO: **CD-PPS-BV**

CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NO(S): **ES-PPS**

EMISSION POINT (STACK) ID NO(S): **EP-7**

POSITION IN SERIES OF CONTROLS NO. **1** OF **1** UNITS

MANUFACTURER: **TBD**

MODEL NO: **TBD**

DATE MANUFACTURED: **TBD**

PROPOSED OPERATION DATE: **TBD**

OPERATING SCENARIO:

__1__ OF __1__

PROPOSED START CONSTRUCTION DATE: **TBD**

P.E. SEAL REQUIRED (PER 2Q .0112)? [✓ YES] ☐ NO

DESCRIBE CONTROL SYSTEM:

A bin vent filter collects dust from when wood enters or exits the silo and displaces air.

POLLUTANT(S) COLLECTED:	**PM**	**PM_{10}**	**$PM_{2.5}$**	
BEFORE CONTROL EMISSION RATE (LB/HR):				
CAPTURE EFFICIENCY:	**~99.9** %	**~99.9** %	**~99.9** %	%
CONTROL DEVICE EFFICIENCY:	%	%	%	%
CORRESPONDING OVERALL EFFICIENCY:	%	%	%	%
EFFICIENCY DETERMINATION CODE:				
TOTAL EMISSION RATE (LB/HR):	**See calculations in Appendix B**			

PRESSURE DROP (IN. H_2O): MIN: **TBD** MAX: **TBD** GAUGE? [✓ YES] ☐ NO WARNING ALARM? [✓ YES] ☐ NO

BULK PARTICLE DENSITY (LB/FT^3): **1.43E-06**

INLET TEMPERATURE (°F): **Ambient**

POLLUTANT LOADING RATE: **0.02** ☐ LB/HR [✓ GR/FT^3]

OUTLET TEMPERATURE (°F): **Ambient**

INLET AIR FLOW RATE (ACFM): **2,500**

FILTER MAX OPERATING TEMP. (°F): **N/A**

NO. OF COMPARTMENTS: **TBD**

NO. OF BAGS PER COMPARTMENT: **TBD**

LENGTH OF BAG (IN.): **TBD**

DIAMETER OF BAG (IN.):

DRAFT: [✓ INDUCED/NEG.] ☐ FORCED/POS.

FILTER SURFACE AREA (FT^2): **TBD**

AIR TO CLOTH RATIO: **TBD**

FILTER MATERIAL: ☐ WOVEN ☐ FELTED

DESCRIBE CLEANING PROCEDURES:

☐ AIR PULSE
☐ REVERSE FLOW
☐ MECHANICAL/SHAKER
[✓ OTHER]
☐ SONIC
☐ SIMPLE BAG COLLAPSE
☐ RING BAG COLLAPSE

PARTICLE SIZE DISTRIBUTION

SIZE (MICRONS)	WEIGHT % OF TOTAL	CUMULATIVE %
0-1		
1-10		
10-25		
25-50		
50-100		
>100		
		TOTAL = 100

DESCRIBE INCOMING AIR STREAM:

The air stream will contain wood dust particles

METHOD FOR DETERMINING WHEN TO CLEAN:

[✓ AUTOMATIC] ☐ TIMED ☐ MANUAL

METHOD FOR DETERMINING WHEN TO REPLACE THE BAGS:

☐ ALARM [✓ INTERNAL INSPECTION] ☐ VISIBLE EMISSION ☐ OTHER

SPECIAL CONDITIONS:

☐ MOISTURE BLINDING ☐ CHEMICAL RESISTIVITY ☐ OTHER

EXPLAIN:

DESCRIBE MAINTENANCE PROCEDURES:

Per manufacturer recommendations or common industry practices.

ON A SEPARATE PAGE, ATTACH A DIAGRAM SHOWING THE RELATIONSHIP OF THE CONTROL DEVICE TO ITS EMISSION SOURCE(S):

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSIONS SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 12/01/01 NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate **B**

EMISSION SOURCE DESCRIPTION: **Pellet Coolers**

EMISSION SOURCE ID NO: **ES-CLR-1,2,3,4,5, 6**

CONTROL DEVICE ID NO(S): **CD-CLR-1,-2,-3**

OPERATING SCENARIO 1 OF 1

EMISSION POINT (STACK) ID NO(S): **EP-1**

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):

Three Pellet Coolers follow the pellet presses to cool the newly formed pellets down to an acceptable storage temperature.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

☐ Coal,wood,oil, gas, other burner (Form B1)
☐ Int.combustion engine/generator (Form B2)
☐ Liquid storage tanks (Form B3)
☐ Woodworking (Form B4)
☐ Coating/finishing/printing (Form B5)
☐ Storage silos/bins (Form B6)
☐ Manufact. of chemicals/coatings/inks (Form B7)
☐ Incineration (Form B8)
☒ Other (Form B9)

START CONSTRUCTION DATE: **TBD**

OPERATION DATE: **TBD**

DATE MANUFACTURED: **TBD**

MANUFACTURER / MODEL NO.: **TBD**

EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR

IS THIS SOURCE SUBJECT TO? NSPS (SUBPART?):________ NESHAP (SUBPART?):________ MACT (SUBPART?):________

PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB **25%** MAR-MAY **25%** JUN-AUG **25%** SEP-NOV **25%**

EXPECTED ANNUAL HOURS OF OPERATION **8,760**

VISIBLE STACK EMISSIONS UNDER NORMAL OPERATION: <20 % OPACITY

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS)		POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS)	
		lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
PARTICULATE MATTER (PM)	**See Emission Calculations in Appendix B**						
PARTICULATE MATTER<10 MICRONS (PM_{10})							
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)							
SULFUR DIOXIDE (SO2)							
NITROGEN OXIDES (NOx)							
CARBON MONOXIDE (CO)							
VOLATILE ORGANIC COMPOUNDS (VOC)							
LEAD							
OTHER							

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT AND CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS)		POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS)	
		lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
N/A							

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

INDICATE EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS

TOXIC AIR POLLUTANT AND CAS NO.	EF SOURCE	lb/hr	lb/day	lb/yr
N/A				

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B9

EMISSION SOURCE (OTHER)

REVISED: 12/01/01

NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate

B9

MISSION SOURCE DESCRIPTION:

ellet Coolers

OPERATING SCENARIO: **1** OF **1**

EMISSION SOURCE ID NO: **ES-CLR-1,2,3,4,5, 6**

CONTROL DEVICE ID NO(S): **CD-CLR-1,-2,-3**

EMISSION POINT (STACK) ID NO(S): **EP-1**

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM):

Three Pellet Coolers follow the pellet presses to cool the newly formed pellets down to an acceptable storage temperature.

MATERIALS ENTERING PROCESS - CONTINUOUS PROCESS		MAX. DESIGN CAPACITY (UNIT/HR)	REQUESTED CAPACITY LIMITATION(UNIT/HR)
TYPE	UNITS		
Dried Wood	**Tons**	**72.8**	

MATERIALS ENTERING PROCESS - BATCH OPERATION		MAX. DESIGN CAPACITY (UNIT/BATCH)	REQUESTED CAPACITY LIMITATION (UNIT/BATCH)
TYPE	UNITS		

MAXIMUM DESIGN (BATCHES / HOUR):

REQUESTED LIMITATION (BATCHES / HOUR): (BATCHES/YR):

FUEL USED: **N/A**

TOTAL MAXIMUM FIRING RATE (MILLION BTU/HR): **N/A**

MAX. CAPACITY HOURLY FUEL USE: **N/A**

REQUESTED CAPACITY ANNUAL FUEL USE: **N/A**

COMMENTS:

Attach Additional Sheets as Necessary

FORM C4

CONTROL DEVICE (CYCLONE, MULTICYCLONE, OR OTHER MECHANICAL)

REVISED 12/01/01 NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate **C4**

CONTROL DEVICE ID NO: CD-CLR-1,-2,-3	CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NO(S): ES-CLR-1,2,3,4,5, 6
EMISSION POINT (STACK) ID NO(S): EP-1	POSITION IN SERIES OF CONTROLS NO. 1 OF 1 UNITS
MANUFACTURER: TBD[1]	MODEL NO:
DATE MANUFACTURED: TBD	PROPOSED OPERATION DATE: TBD
OPERATING SCENARIO:	PROPOSED START CONSTRUCTION DATE: TBD
___1___ OF ___1___	P.E. SEAL REQUIRED (PER 2Q .0112)? [✓ YES] ☐ NO

DESCRIBE CONTROL SYSTEM :

Three identical dual high efficiency cyclones are to be used to capture bulk PM emissions from six (6) pellet coolers. Two coolers vent to each of the three cyclones. The cyclones will operate under negative pressure. The parameters presented here are per each dual high efficiency cyclone.

POLLUTANT(S) COLLECTED:	**PM**	**PM_{10}**	**$PM_{2.5}$**	
BEFORE CONTROL EMISSION RATE (LB/HR):	300	300	300	
CAPTURE EFFICIENCY:	98-99 %	98-99 %	98-99 %	%
CONTROL DEVICE EFFICIENCY:	%	%	%	%
CORRESPONDING OVERALL EFFICIENCY:	%	%	%	%
EFFICIENCY DETERMINATION CODE:				
TOTAL EMISSION RATE (LB/HR):	See Emissions Calculations in Appendix B			

PRESSURE DROP (IN. H_20): MIN MAX 6.0" WARNING ALARM? ☐ YES ☐ NO

INLET TEMPERATURE (°F): MIN MAX Ambient	OUTLET TEMPERATURE (°F): MIN MAX Ambient
INLET AIR FLOW RATE (ACFM): 12,500 per Cyclone/25,000 per Dual Cycl. Sys.	BULK PARTICLE DENSITY (LB/FT³): 0.0002
POLLUTANT LOADING RATE (GR/FT³): 1.40	

SETTLING CHAMBER	**CYCLONE**					**MULTICYCLONE**
LENGTH (INCHES):	INLET VELOCITY (FT/SEC	58			☐ CIRCULAR ☐ RECTANGLE	NO. TUBES:
WIDTH (INCHES):	*DIMENSIONS (INCHES) See instructions*				*IF WET SPRAY UTILIZED*	DIAMETER OF TUBES:
HEIGHT (INCHES):	H:	36"	Dd:	12"	LIQUID USED:	HOPPER ASPIRATION SYSTEM?
VELOCITY (FT/SEC.):	W:	14.25"	Lb:	72"	FLOW RATE (GPM):	☐ YES ☐ NO
NO. TRAYS:	De:	30"	Lc:	84"	MAKE UP RATE (GPM):	LOUVERS?
NO. BAFFLES:	D:	50"	S:	39"		☐ YES ☐ NO
	TYPE OF CYCLONE:	☐ CONVENTIONAL			[✓ HIGH EFFICIENCY]	☐ OTHER

DESCRIBE MAINTENANCE PROCEDURES:

Periodic inspection of mechanical integrity during plant outages as specified by manufacturer

DESCRIBE INCOMING AIR STREAM:

The dual cyclones used for particulate capture the pellet coolers will be ducted to a discharge stack. The stack will be common to all cooler aspiration systems.

PARTICLE SIZE DISTRIBUTION

SIZE (MICRONS)	WEIGHT % OF TOTAL	CUMULATIVE %
0-1	**Unknown**	
1-10		
10-25		
25-50		
50-100		
>100		
		TOTAL = 100

DESCRIBE ANY MONITORING DEVICES, GAUGES, TEST PORTS, ETC:

None

ON A SEPARATE PAGE, ATTACH A DIAGRAM OF THE RELATIONSHIP OF THE CONTROL DEVICE TO ITS EMISSION SOURCE(S):

Attach Additional Sheets As Necessary

[1] Final equipment selection has not yet occurred but will be similar in design to specifications shown.

FORM B

SPECIFIC EMISSIONS SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 12/01/01 NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate **B**

EMISSION SOURCE DESCRIPTION: **Emergency Generator (250kw, 350 bhp)**	EMISSION SOURCE ID NO: **ES-EG**
	CONTROL DEVICE ID NO(S): **N/A**
OPERATING SCENARIO **1** OF **1**	EMISSION POINT (STACK) ID NO(S): **EP-4**

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Diesel-fired internal combustion generator to provide power in the case of an emergency.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ■ Int.combustion engine/generator (Form B2)
- ☐ Liquid storage tanks (Form B3)
- ☐ Woodworking (Form B4)
- ☐ Coating/finishing/printing (Form B5)
- ☐ Storage silos/bins (Form B6)
- ☐ Manufact. of chemicals/coatings/inks (Form B7)
- ☐ Incineration (Form B8)
- ☐ Other (Form B9)

START CONSTRUCTION DATE: **TBD** | OPERATION DATE: **TBD** | DATE MANUFACTURED: **TBD**

MANUFACTURER / MODEL NO.: **TBD** | EXPECTED OP. SCHEDULE: **24** HR/DAY **7** DAY/WK **52** WK/YR

IS THIS SOURCE SUBJECT TO? NSPS (SUBPART?): IIII NESHAP (SUBPART?):________ MACT (SUBPART?): ZZZZ

PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB **25%** MAR-MAY **25%** JUN-AUG **25%** SEP-NOV **25%**

EXPECTED ANNUAL HOURS OF OPERATION **500** | VISIBLE STACK EMISSIONS UNDER NORMAL OPERATION: **<20** % OPACITY

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS)		POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS)	
AIR POLLUTANT EMITTED		lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
PARTICULATE MATTER (PM)	**See Emission Calculations in Appendix B**						
PARTICULATE MATTER<10 MICRONS (PM_{10})							
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)							
SULFUR DIOXIDE (SO2)							
NITROGEN OXIDES (NOx)							
CARBON MONOXIDE (CO)							
VOLATILE ORGANIC COMPOUNDS (VOC)							
LEAD							
OTHER							

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS)		POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS)	
HAZARDOUS AIR POLLUTANT AND CAS NO.		lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
	See Emission Calculations in Appendix B						

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

INDICATE EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS

TOXIC AIR POLLUTANT AND CAS NO.	EF SOURCE	lb/hr	lb/day	lb/yr
	See Emission Calculations in Appendix B			

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B2

EMISSION SOURCE (INTERNAL COMBUSTION ENGINES/GENERATORS)

REVISED 12/01/01 NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate **B2**

EMISSION SOURCE DESCRIPTION: Emergency Generator (250 kw, 350 bhp)

EMISSION SOURCE ID NO: ES-GN

CONTROL DEVICE ID NO(S): N/A

EMISSION POINT (STACK) ID NO(S): EP-4

OPERATING SCENARIO: 1 OF 1

CHECK ALL THAT APPLY [✓ ☐ EMERGENCY] ☐ SPACE HEAT ☐ ELECTRICAL GENERATION ☐ PEAK SHAVER ☐ OTHER (DESCRIBE): ____________

GENERATOR OUTPUT (KW):

ANTICIPATED ACTUAL HOURS OF OPERATION AS PEAK SHAVER (HRS/YR):

ENGINE OUTPUT (HP):

TYPE ICE: ☐ GASOLINE ENGINE [✓ ☐ DIESEL ENGINE UP TO 600 HP] ☐ DIESEL ENGINE GREATER THAN 600 HP ☐ DUAL FUEL ENGINE ☐ OTHER (DESCRIBE): ____________ (complete below)

ENGINE TYPE ☐ RICH BURN ☐ LEAN BURN [✓ N/A]

EMISSION REDUCTION MODIFICATIONS ☐ INJECTION TIMING RETARD ☐ PREIGNITION CHAMBER COMBUSTION ☐ OTHER ________

OR ☐ STATIONARY GAS TURBINE (complete below)

FUEL ☐ NATURAL GAS ☐ OIL ☐ OTHER (DESCRIBE): ____________

CYCLE: ☐ COGENERATION ☐ SIMPLE ☐ REGENERATIVE ☐ COMBINED

CONTROLS: ☐ WATER-STEAM INJECTION ☐ UNCONTROLLED ☐ LEAN-PREMIX

☐ NATURAL GAS PIPELINE COMPRESSOR OR TURBINE (complete below)

ENGINE TYPE: ☐ 2-CYCLE LEAN BURN ☐ 4-CYCLE LEAN ☐ TURBINE ☐ 4-CYCLE RICH BURN ☐ OTHER (DESCRIBE): ____________

CONTROLS: ☐ COMBUSTION MODIFICATIONS (DESCRIBE): ____________ ☐ NONSELECTIVE CATALYTIC REDUCTION ☐ SELECTIVE CATALYTIC REDUCTION ☐ CLEAN BURN AND PRECOMBUSTION CHAMBER ☐ UNCONTROLLED

FUEL USAGE (INCLUDE STARTUP/BACKUP FUEL)

FUEL TYPE	UNITS	MAXIMUM DESIGN CAPACITY (UNIT/HR)	REQUESTED CAPACITY LIMITATION (UNIT/HR)
No. 2 Fuel Oil	gal	6.55	6.55

FUEL CHARACTERISTICS (COMPLETE ALL THAT ARE APPLICABLE)

FUEL TYPE	BTU/UNIT	UNITS	SULFUR CONTENT (% BY WEIGHT)
No. 2 Fuel Oil	19,300	lb	<15 ppmw

MANUFACTURER'S SPECIFIC EMISSION FACTORS (IF AVAILABLE)

POLLUTANT	NOX	CO	PM	PM10	VOC	OTHER
EMISSION FACTOR LB/UNIT						
UNIT						

DESCRIBE METHODS TO MINIMIZE VISIBLE EMISSIONS DURING IDLING, OR LOW LOAD OPERATIONS:

Periodic equipment maintenance will minimize opacity by following manufacturers specification or common industry practices.

COMMENTS:

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSIONS SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

B

REVISED 12/01/01 NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate

EMISSION SOURCE DESCRIPTION: **Fire Water Pump (300 bhp)**

EMISSION SOURCE ID NO: **ES-FWP**

CONTROL DEVICE ID NO(S): **N/A**

EMISSION POINT (STACK) ID NO(S): **EP-5**

OPERATING SCENARIO 1 OF 1

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Diesel-fired internal combustion pump to provide water in the case of a fire emergency.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

☐ Coal,wood,oil, gas, other burner (Form B1)
☒ Int.combustion engine/generator (Form B2)
☐ Liquid storage tanks (Form B3)
☐ Woodworking (Form B4)
☐ Coating/finishing/printing (Form B5)
☐ Storage silos/bins (Form B6)
☐ Manufact. of chemicals/coatings/inks (Form B7)
☐ Incineration (Form B8)
☐ Other (Form B9)

START CONSTRUCTION DATE: **TBD**

OPERATION DATE: **TBD**

DATE MANUFACTURED: **TBD**

MANUFACTURER / MODEL NO.: **TBD**

EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR

IS THIS SOURCE SUBJECT TO? NSPS (SUBPART?): IIII NESHAP (SUBPART?): ______ MACT (SUBPART?): ZZZZ

PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB **25%** MAR-MAY **25%** JUN-AUG **25%** SEP-NOV **25%**

EXPECTED ANNUAL HOURS OF OPERATION **100**

VISIBLE STACK EMISSIONS UNDER NORMAL OPERATION: <20 % OPACITY

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS)		POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS)	
		lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
PARTICULATE MATTER (PM)	**See Emission Calculations in Appendix B**						
PARTICULATE MATTER<10 MICRONS (PM_{10})							
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)							
SULFUR DIOXIDE (SO2)							
NITROGEN OXIDES (NOx)							
CARBON MONOXIDE (CO)							
VOLATILE ORGANIC COMPOUNDS (VOC)							
LEAD							
OTHER							

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT AND CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS)		POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS)	
		lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
	See Emission Calculations in Appendix B						

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

INDICATE EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS

TOXIC AIR POLLUTANT AND CAS NO.	EF SOURCE	lb/hr	lb/day	lb/yr
	See Emission Calculations in Appendix B			

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B2

EMISSION SOURCE (INTERNAL COMBUSTION ENGINES/GENERATORS)

REVISED 12/01/01 NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate **B2**

EMISSION SOURCE DESCRIPTION: Fire Water Pump (300 bhp)

EMISSION SOURCE ID NO: ES-FWP

CONTROL DEVICE ID NO(S): N/A

OPERATING SCENARIO: 1 OF 1

EMISSION POINT (STACK) ID NO(S): EP-5

CHECK ALL THAT APPLY [✓ EMERGENCY] ☐ SPACE HEAT ☐ ELECTRICAL GENERATION ☐ PEAK SHAVER ☐ OTHER (DESCRIBE): ______

GENERATOR OUTPUT (KW):

ANTICIPATED ACTUAL HOURS OF OPERATION AS PEAK SHAVER (HRS/YR):

ENGINE OUTPUT (HP):

TYPE ICE: ☐ GASOLINE ENGINE [✓ DIESEL ENGINE UP TO 600 HP] ☐ DIESEL ENGINE GREATER THAN 600 HP ☐ DUAL FUEL ENGINE (complete below) ☐ OTHER (DESCRIBE): ______

ENGINE TYPE ☐ RICH BURN ☐ LEAN BURN [✓ N/A]

EMISSION REDUCTION MODIFICATIONS ☐ INJECTION TIMING RETARD ☐ PREIGNITION CHAMBER COMBUSTION ☐ OTHER ______

OR ☐ STATIONARY GAS TURBINE (complete below)

FUEL ☐ NATURAL GAS ☐ OIL ☐ OTHER (DESCRIBE): ______

CYCLE: ☐ COGENERATION ☐ SIMPLE ☐ REGENERATIVE ☐ COMBINED

CONTROLS: ☐ WATER-STEAM INJECTION ☐ UNCONTROLLED ☐ LEAN-PREMIX

☐ NATURAL GAS PIPELINE COMPRESSOR OR TURBINE (complete below)

ENGINE TYPE: ☐ 2-CYCLE LEAN BURN ☐ 4-CYCLE LEAN ☐ TURBINE ☐ 4-CYCLE RICH BURN ☐ OTHER (DESCRIBE): ______

CONTROLS: ☐ COMBUSTION MODIFICATIONS (DESCRIBE): ______ ☐ NONSELECTIVE CATALYTIC REDUCTION ☐ SELECTIVE CATALYTIC REDUCTION ☐ CLEAN BURN AND PRECOMBUSTION CHAMBER ☐ UNCONTROLLED

FUEL USAGE (INCLUDE STARTUP/BACKUP FUEL)

FUEL TYPE	UNITS	MAXIMUM DESIGN CAPACITY (UNIT/HR)	REQUESTED CAPACITY LIMITATION (UNIT/HR)
No. 2 Fuel Oil	gal	6.55	6.55

FUEL CHARACTERISTICS (COMPLETE ALL THAT ARE APPLICABLE)

FUEL TYPE	BTU/UNIT	UNITS	SULFUR CONTENT (% BY WEIGHT)
No. 2 Fuel Oil	19,300	lb	<15 ppmw

MANUFACTURER'S SPECIFIC EMISSION FACTORS (IF AVAILABLE)

POLLUTANT	NOX	CO	PM	PM10	VOC	OTHER
EMISSION FACTOR LB/UNIT						
UNIT						

DESCRIBE METHODS TO MINIMIZE VISIBLE EMISSIONS DURING IDLING, OR LOW LOAD OPERATIONS:

Periodic equipment maintenance will minimize opacity by following manufacturers specification or common industry practices.

COMMENTS:

Attach Additional Sheets As Necessary

APPENDIX B – EMISSIONS CALCULATIONS

Rotary Dryer - Criteria Pollutant Emissions

Dryer Inputs

Dryer Throughput (@ Dryer Exit)	527,778	tons/year @ 10% moisture
Annual Dried Wood Throughput of Dryer	475,000	ODT/year
Max. Hourly Dried Wood Throughput of Dryer	61.50	ODT/hr
Burner Heat Input	207.0	MMBtu/hr
Percent Hardwood	90%	
Percent Softwood	10%	
Potential Operation	8,760	hr/yr

Criteria Pollutant Calculations:

Pollutant	Biomass Emission Factor (lb/ODT)	Units	Emission Factor Source	Total Potential Emissions	
				(lb/hr)	(tpy)
CO	1.16	lb/ODT	Calculated from Guaranteed WESP Specifications[1]	71.34	275.5
NO_X	0.79	lb/ODT	Calculated from Guaranteed WESP Specifications[1]	48.59	187.6
$PM/PM_{10}/PM_{2.5}$ Condensible Fraction	0.017	lb/MMBtu	AP-42, Section 1.6[2]	3.52	15.4
TSP (Filterable)	0.090	lb/ODT	Calculated from Guaranteed WESP Specifications[1]	5.54	21.4
Total TSP (Filterable + Condensible)				9.05	36.8
PM_{10} (Filterable)	0.090	lb/ODT	Calculated from Guaranteed WESP Specifications[1]	5.54	21.4
Total PM_{10} (Filterable + Condensible)				9.05	36.8
$PM_{2.5}$ (Filterable)	0.090	lb/ODT	Calculated from Guaranteed WESP Specifications[1]	5.54	21.4
Total $PM_{2.5}$ (Filterable + Condensible)				9.05	36.8
SO_2	0.025	lb/MMBtu	AP-42, Section 1.6[3]	5.18	22.7
VOC	1.50	lb/ODT	Calculated from Guaranteed WESP Specifications[1]	92.25	356.3
Lead	0.00	N/A	N/A	0.00	0.0

Note:

[1] CO, NO_x, VOC, and filterable PM/PM_{10} emission factors were provided by the dryer system vendor. The $PM_{2.5}$ filterable emission factor is assumed to be the same as PM and PM_{10}.

[2] The vendor only provided the filterable fraction of particulate matter in the emission factors. The condensible fraction of particulate matter from a rotary dryer controlled by a WESP is not provided in AP-42, Section 10.6.2. Enviva has conservatively calculated the condensible fraction based upon the heat input of the dryer burners using an emission factor for wood combustion from AP-42, Section 1.6.

[3] No emission factor is provided in AP-42, Section 10.6.2 for SO_2 for rotary dryers. Enviva has conservatively calculated SO2 emissions based upon the heat input of the dryer burners using an emission factor for wood combustion from AP-42, Section 1.6.

Rotary Dryer - Federal Hazardous Air Pollutant (HAP) and North Carolina Toxic Air Pollutant (TAP) Emissions

Calculation Inputs:

Dryer Throughput (Ton/yr)	527,778
ODT/yr	475,000
ODT/hr	61.50
Hardwood Composition	90%
Softwood Composition	10%

HAP & TAP Emission Calculations:

HAP/TAP Pollutant	CAS Number	HAP (Yes/No)	NC TAP (Yes/No)	Direct wood-fired, hardwood			Green, Direct wood-fired (inlet moisture content >50%, dry basis), softwood[1]			MAXIMUM TOTAL EMISSIONS	
				Emission Factor[2] (lb/ODT)	Emissions[3]		Emission Factor (lb/ODT)	Emissions[3]			
					(lb/hr)	(tpy)		(lb/hr)	(tpy)	(lb/hr)	(tpy)
Acetaldehyde	75-07-0	Yes	Yes	3.83E-03	2.36E-01	8.19E-01	7.50E-02	4.61E+00	1.78E+00	4.61E+00	2.60E+00
Acrolein	107-02-8	Yes	Yes	1.17E-03	7.22E-02	2.51E-01	2.30E-02	1.41E+00	5.46E-01	1.41E+00	7.97E-01
Benzene	71-43-2	Yes	Yes	3.88E-04	2.39E-02	8.30E-02	7.60E-03	4.67E-01	1.81E-01	4.67E-01	2.63E-01
Chloroform	67-66-3	Yes	Yes	5.11E-06	3.14E-04	1.09E-03	1.00E-04	6.15E-03	2.38E-03	6.15E-03	3.47E-03
Cumene	98-82-8	Yes	No	1.02E-04	6.28E-03	2.18E-02	2.00E-03	1.23E-01	4.75E-02	1.23E-01	6.93E-02
Formaldehyde	50-00-0	Yes	Yes	7.15E-03	4.40E-01	1.53E+00	1.40E-01	8.61E+00	3.33E+00	8.61E+00	4.85E+00
m-,p-Xylene	1330-20-7	Yes	Yes	2.45E-04	1.51E-02	5.24E-02	4.80E-03	2.95E-01	1.14E-01	2.95E-01	1.66E-01
Methanol	67-56-1	Yes	No	5.62E-03	3.45E-01	1.20E+00	1.10E-01	6.77E+00	2.61E+00	6.77E+00	3.81E+00
Methyl isobutyl ketone	108-10-1	Yes	Yes	3.52E-04	2.17E-02	7.53E-02	6.90E-03	4.24E-01	1.64E-01	4.24E-01	2.39E-01
Methylene chloride	75-09-2	Yes	Yes	9.19E-05	5.65E-03	1.96E-02	1.80E-03	1.11E-01	4.28E-02	1.11E-01	6.24E-02
o-Xylene	95-47-6	Yes	No	2.30E-05	1.41E-03	4.91E-03	4.50E-04	2.77E-02	1.07E-02	2.77E-02	1.56E-02
Phenol	108-95-2	Yes	Yes	1.43E-03	8.79E-02	3.06E-01	2.80E-02	1.72E+00	6.65E-01	1.72E+00	9.71E-01
Propionaldehyde	123-38-6	Yes	No	6.64E-04	4.08E-02	1.42E-01	1.30E-02	8.00E-01	3.09E-01	8.00E-01	4.51E-01
Styrene	100-42-5	Yes	Yes	1.84E-05	1.13E-03	3.93E-03	3.60E-04	2.21E-02	8.55E-03	2.21E-02	1.25E-02
Toluene	108-88-3	Yes	Yes	6.64E-04	4.08E-02	1.42E-01	1.30E-02	8.00E-01	3.09E-01	8.00E-01	4.51E-01
									Total HAP	**2.62E+01**	**1.48E+01**

Note:

[1] HAP & TAP emission factors for "green, direct wood-fired (inlet moisture content >50%, dry basis" softwood were obtained from AP-42, Section 10.6.2, Table 10.6.2-3.

[2] To account for hardwood HAP & TAP emissions, factors were conservatively calculated by taking the AP-42 HAP factors for 100% softwood (green) and multiplying by the ratio of the total listed VOC emission factors for hardwood and softwood (0.24 / 4.7).

[3] Short-term HAP & TAP emissions were calculated based upon a worst-case scenario of 100% hardwood or softwood firing (in which case, softwood is always the overall worst case).

Emergency Generator Emissions (ES-EG)

Equipment and Fuel Characteristics

Engine Output	0.26	MW
Engine Power	350	hp (brake)
Hours of Operation	500	hr/yr[1]
Heating Value of Diesel	19,300	Btu/lb
Power Conversion	2,545	Btu/hr/hp

Criteria Pollutant Emissions

Pollutant	Category	Emission Factor	Units	Potential Emissions	
				lb/hr	tpy
TSP	PSD	4.41E-04	lb/kW-hr (2)	0.12	2.88E-02
PM$_{10}$	PSD	4.41E-04	lb/kW-hr (2)	0.12	2.88E-02
PM$_{2.5}$	PSD	4.41E-04	lb/kW-hr (2)	0.12	2.88E-02
NO$_x$	PSD	8.82E-03	lb/kW-hr (5)	2.30	5.75E-01
SO$_2$	PSD	15	ppmw (3)	1.38E-03	3.46E-04
CO	PSD	7.72E-03	lb/kW-hr (2)	2.01	5.03E-01
VOC (NMHC)	PSD	2.51E-03	lb/MMBtu (4)	2.24E-03	5.59E-04
Toxic/Hazardous Air Pollutant Emissions					
Acetaldehyde	HAP/TAP	5.37E-06	lb/hp-hr (4)	1.88E-03	4.70E-04
Acrolein	HAP/TAP	6.48E-07	lb/hp-hr (4)	2.27E-04	5.67E-05
Benzene	HAP/TAP	6.53E-06	lb/hp-hr (4)	2.29E-03	5.71E-04
Benzo(a)pyrene[6]	HAP/TAP	1.32E-09	lb/hp-hr (4)	4.61E-07	1.15E-07
1,3-Butadiene	HAP/TAP	2.74E-07	lb/hp-hr (4)	9.58E-05	2.39E-05
Formaldehyde	HAP/TAP	8.26E-06	lb/hp-hr (4)	2.89E-03	7.23E-04
Total PAH (POM)	HAP	1.18E-06	lb/hp-hr (4)	4.12E-04	1.03E-04
Toluene	HAP/TAP	2.86E-06	lb/hp-hr (4)	1.00E-03	2.51E-04
Xylene	HAP/TAP	2.00E-06	lb/hp-hr (4)	6.98E-04	1.75E-04
Highest HAP (Formaldehyde)		8.26E-06	lb/hp-hr (4)	2.89E-03	7.23E-04
Total HAPs				9.49E-03	2.37E-03

Note:

[1] NSPS allows for only 100 hrs/yr of non-emergency operation of these engines (not the 500 hours shown). The PTE for the emergency generator is based on 500 hr/yr, though, because the regs allow non-emergency operation and EPA guidance is 500 hr/yr for emergency generators.

[2] Emissions factors from NSPS Subpart IIII (or 40 CFR 89.112 where applicable) in compliance with post-2009 construction.

[3] Sulfur content in accordance with Year 2010 standards of 40 CFR 80.510(a) as required by NSPS Subpart IIII.

[4] Emission factor obtained from AP-42 Section 3.3, Tables 3.3-1 Table 3.3-2.

[5] Emission factor for NOx is listed as NOx and NMHC (Non-Methane Hydrocarbons or VOC) in Table 4 of NSPS Subpart IIII. Conservatively assumed entire limit attributable to NOx.

[6] Benzo(a)pyrene is included as a HAP in Total PAH.

Firewater Pump Emissions (ES-FWP)

Equipment and Fuel Characteristics

Engine Output	0.22	MW
Engine Power	300	hp
Hours of Operation	500	hr/yr[1]
Heating Value of Diesel	19,300	Btu/lb
Power Conversion	2,545	Btu/hr/hp

Criteria Pollutant Emissions

Pollutant	Category	Emission Factor	Units	Potential Emissions	
				lb/hr	**tpy**
TSP	PSD	4.41E-04	lb/kW-hr (2)	0.10	2.47E-02
PM$_{10}$	PSD	4.41E-04	lb/kW-hr (2)	0.10	2.47E-02
PM$_{2.5}$	PSD	4.41E-04	lb/kW-hr (2)	0.10	2.47E-02
NO$_x$	PSD	8.82E-03	lb/kW-hr (5)	1.97	4.93E-01
SO$_2$	PSD	15	ppmw (3)	1.19E-03	2.97E-04
CO	PSD	7.72E-03	lb/kW-hr (2)	1.73	4.32E-01
VOC (NMHC)	PSD	2.51E-03	lb/MMBtu (4)	1.92E-03	4.79E-04

Toxic/Hazardous Air Pollutant Emissions

Acetaldehyde	HAP/TAP	5.37E-06	lb/hp-hr (4)	1.61E-03	4.03E-04
Acrolein	HAP/TAP	6.48E-07	lb/hp-hr (4)	1.94E-04	4.86E-05
Benzene	HAP/TAP	6.53E-06	lb/hp-hr (4)	1.96E-03	4.90E-04
Benzo(a)pyrene[6]	HAP/TAP	1.32E-09	lb/hp-hr (4)	3.95E-07	9.87E-08
1,3-Butadiene	HAP/TAP	2.74E-07	lb/hp-hr (4)	8.21E-05	2.05E-05
Formaldehyde	HAP/TAP	8.26E-06	lb/hp-hr (4)	2.48E-03	6.20E-04
Total PAH (POM)	HAP	1.18E-06	lb/hp-hr (4)	3.53E-04	8.82E-05
Toluene	HAP/TAP	2.86E-06	lb/hp-hr (4)	8.59E-04	2.15E-04
Xylene	HAP/TAP	2.00E-06	lb/hp-hr (4)	5.99E-04	1.50E-04
Highest HAP (Formaldehyde)		8.26E-06	lb/hp-hr (4)	2.48E-03	6.20E-04
Total HAPs				8.13E-03	2.03E-03

Note:

[1] NSPS allows for only 100 hrs/yr of non-emergency operation of these engines (not the 500 hours shown). The PTE for the emergency generator is based on 500 hr/yr, though, because the regs allow non-emergency operation and EPA guidance is 500 hr/yr for emergency generators.

[2] Emissions factors from NSPS Subpart IIII (or 40 CFR 89.112 where applicable) in compliance with post-2009 construction.

[3] Sulfur content in accordance with Year 2010 standards of 40 CFR 80.510(a) as required by NSPS Subpart IIII.

[4] Emission factor obtained from AP-42 Section 3.3, Tables 3.3-1 Table 3.3-2.

[5] Emission factor for NOx is listed as NOx and NMHC (Non-Methane Hydrocarbons or VOC) in Table 4 of NSPS Subpart IIII. Conservatively assumed entire limit attributable to NOx.

[6] Benzo(a)pyrene is included as a HAP in Total PAH.

Dust Control Systems PM Emissions

Emission Unit	Emission Source ID	Filter. Vent -or- Cyclone ID	Flowrate[1] (cfm)	Pollutant Loading[2] (gr/cf)	Annual Operation (hours)	% PM that is		Potential Emissions					
								PM		PM_{10}[3]		$PM_{2.5}$[3]	
						PM_{10}	$PM_{2.5}$	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Hammermills Bagfilter 1	ES-HM-1, -2, -3, -4	CD-HM-BF1	40,000	0.005	8,760	100%	100%	1.71	7.51	1.71	7.51	1.71	7.51
Hammermills Bagfilter 2	ES-HM-1, -2, -3, -4	CD-HM-BF2	40,000	0.005	8,760	100%	100%	1.71	7.51	1.71	7.51	1.71	7.51
Hammermill Area Filter	ES-HMA	CD-HMA-BF	37,500	0.005	8,760	100%	100%	1.61	7.04	1.61	7.04	1.61	7.04
Pellet Mill Feed Silo Bin Vent Filter	ES-PMFS	CD-PMFS-BV	2,500	0.005	8,760	100%	100%	0.11	0.47	0.11	0.47	0.11	0.47
Pellet Coolers Cyclone 1	ES-CLR	CD-CLR-1	25,000	0.022	8,760	100%	100%	4.71	20.65	4.71	20.65	4.71	20.65
Pellet Coolers Cyclone 2	ES-CLR	CD-CLR-2	25,000	0.022	8,760	100%	100%	4.71	20.65	4.71	20.65	4.71	20.65
Pellet Coolers Cyclone 3	ES-CLR	CD-CLR-3	25,000	0.022	8,760	100%	100%	4.71	20.65	4.71	20.65	4.71	20.65
							TOTAL	**19.29**	**84.47**	**19.29**	**84.47**	**19.29**	**84.47**

Note:

[1] Filter, Vent, and Cyclone inlet flow rate (cfm) provided by design engineering firm (Mid-South Engineering Co.). The exit flowrate was conservatively assumed to be the same as the inlet flowrate.

[2] Unless otherwise specified, pollutant (PM) loading conservatively assumed to be 0.005 gr/dscf

[3] It was conservatively assumed that PM_{10} and $PM_{2.5}$ equal PM emissions.

Fugitive PM Emissions[1]

ID	Emission Source Group	Description	Control	Control Description	Throughput		Potential Uncontrolled Emissions for PM[3]		Potential Uncontrolled Emissions for PM_{10}[3]		Potential Uncontrolled Emissions for $PM_{2.5}$[3]	
					Max. Hourly[2]	Max. Annual	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
					(tph)	(tpy)						
DP1	ES-DWH	Dryer Discharger to Dryer Collection Conveyor Belt	Enclosed	Reduction to 2 mph mean wind speed	68.29	527,778	5.2E-03	2.0E-02	2.4E-03	9.4E-03	3.7E-04	1.4E-03
DP2	ES-DWH	Pre-screen Feeder Fines Overs to Hammermills Infeed and Distribution	Enclosed	Reduction to 2 mph mean wind speed	6.46	49,928	4.9E-04	1.9E-03	2.3E-04	8.9E-04	3.5E-05	1.4E-04
DP3	ES-DWH	Hammermills Cyclone Diverter Gates to Hammermills System Discharge Collection Conveyor Belt	Enclosed	Reduction to 2 mph mean wind speed	61.83	477,850	4.7E-03	1.8E-02	2.2E-03	8.5E-03	3.3E-04	1.3E-03
DP4	ES-DWH	Hammermills System Discharge Collection Conveyor Belt to Pellet Mill Feed Silo Infeed Screw	Enclosed	Reduction to 2 mph mean wind speed	68.29	527,778	5.2E-03	2.0E-02	2.4E-03	9.4E-03	3.7E-04	1.4E-03
						TOTAL	**1.5E-02**	**6.0E-02**	**7.3E-03**	**2.8E-02**	**1.1E-03**	**4.3E-03**

Note:

[1] Fugitive emissions are not included in facility-wide PTE because the Northampton Pellet Mill does not belong to one of the listed 28 source categories.

[2] Max hourly rates based upon maximum calculated throughput rates and moistures contents provided in mass balance provided by Mid-South Engineering Company, June 17, 2011.

[3] Based emission factors calculated per AP-42 Section 13.2.4, September 2006.

where: E = emission factor (lb/ton)
k = particle size multiplier (dimensionless) for PM 0.74
k = particle size multiplier (dimensionless) for PM_{10} 0.35
k = particle size multiplier (dimensionless) for $PM_{2.5}$ 0.053
U = mean wind speed (mph) 2.00
M = material moisture content (%) 10
E for PM (lb/ton) = 7.6E-05
E for PM_{10} (lb/ton) = 3.6E-05
E for $PM_{2.5}$ (lb/ton) = 5.4E-06

Tank VOC Emissions

Tank ID	Tank Description	Volume[1] (gal)	Tank Dimensions		Orientation	Throughput (gal/yr)	Turnovers	TANKS 4.0 VOC Emissions	
			Diameter (ft)	Height/Length (ft)				(lb/yr)	(tpy)
TK01	Emergency Generator Fuel Oil Tank[2]	2,500	6	12	Vertical	12,000	4.80	0.37	3.57E-03
TK02	Fire Water Pump Fuel Oil Tank[2]	500	3	10	Horizontal	10,300	20.60	0.43	2.15E-04
							TOTAL	**0.80**	**3.79E-03**

Note:

[1] Conservative design specifications.

[2] Throughput based on fuel consumption and 500 hours of operation per year. Fuel consumption data provided by pump engine vendors.

Electric Powered Chipper (ES-CHIP-1) Emissions

Annual Throughput of Chipper	475,000	tons/year (dry wood)[1]
Short-term Throughput of Chipper	61.50	tons/hr (dry wood)[1]
Maximum Annual Operation	8,760	hours

Pollutant	Emission Factors (lb/dry wood tons)	Emissions[6]	
		(lb/hr)	(tpy)
THC as Carbon[2]	0.0041	2.522E-01	1.10
THC as alpha-Pinene[3]	0.0047	**2.862E-01**	**1.25**
PM[4]	N/A	**N/A**	**N/A**
Methanol[2]	0.0010	**6.150E-02**	**0.24**

[1] It is assumed that the wood received at the facility has a nominal water content of 50%. The annual throughput used for the chipper is the same as the annual throughput of the dryer; while the short-term throughput is based upon the maximum hourly throughput of the dryer.

[2] Emission factor obtained from available emissions factors for chippers in AP-42 Section 10.6.3, Table 7 and Section 10.6.4, Tables 7 and 9. Emission factors for THC and Methanol are the same across all three tables.

[3] The THC/VOC makeup of wood is primarily composed of terpenes $(C_5H_8)_n$ [where n = 2, 3, or 4 typically] but to convert from carbon to the equivalent weight in THC/VOC, the assumption was that alpha-pinene (AP) would be the representative THC/VOC (molecular weight = 136.2 lb/lb-mol).
The following equation shows the conversion:
*lb VOC/ODT = lb C/ODT * (136.2 lb/mol AP / 12 lb/mol C) * (1 mol AP / 10 mol C)*

[4] PM emission factor is not applicable as the chipper emissions are routed downward to the ground.

[5] Short term emissions were based upon the annual throughput of the chipper (dry wood) divided by the total hours of operation.

Potential GHG Emissions

Operating Data:

Dryer Heat Input	175.00 MMBtu/hr
Operating Schedule	8,760 hrs/yr
Emergency Generator Output	350 bhp
Operating Schedule	500 hrs/yr
No. 2 Fuel Input	16.7 gal/hr[1]
Energy Input	2.282 MMBtu/hr[2]
Fire Water Pump Output	300 bhp
Operating Schedule	500 hrs/yr
No. 2 Fuel Input	14.3 gal/hr[1]
Energy Input	1.956 MMBtu/hr[2]

Emission Unit ID	Fuel Type	Emission Factors from Table C-1 (kg/MMBtu)[3]			Tier 1 Emissions (metric tons)			
		CO2	CH4	N2O	CO2	CH4	N2O	Total CO2e
ES-DRYER	Wood and Wood Residuals	9.38E+01	3.20E-02	4.20E-03	158,506	54	7	158,567
ES-GN	No. 2 Fuel Oil (Distillate)	7.40E+01	3.00E-03	6.00E-04	93	3.77E-03	7.55E-04	93
ES-FWP	No. 2 Fuel Oil (Distillate)	7.40E+01	3.00E-03	6.00E-04	80	3.23E-03	6.47E-04	80

[1] Fuel consumption calculated using a factor of 0.0476 gal/hr-hp. Advanced Environmental Interface, Inc. (1998). General Permits for Emergency Engines. INSIGHTS, 98-2, 3.

[2] Energy calculated on a fuel consumption basis, using an energy factor of 0.137 MMBtu/gal.

[3] Emission factors from Table C-1 and C-2 of GHG Reporting Rule. Emission factors for methane and N2O already multiplied by their respective GWPs of 21 and 310.

APPENDIX C – LOCAL ZONING CONSISTENCY DETERMINATION

Trinity Consultants
One Copley Parkway, Suite 310, Morrisville, North Carolina 27560 U.S.A. ■ (919) 462-9693 ■ Fax (919) 462-9694

August X, 2011

William Flynn
Planning and Zoning Director
Northampton County Planning and Zoning
102 West Jefferson Street
Jackson, NC 27845

Subject: **Air Permit Application Zoning Consistency Determination Request**
Enviva Pellets Northampton, LLC

Dear Mr. William Flynn,

This letter is a request for a determination of whether planned construction project of a wood pellet manufacturing facility located at Lebanon Church Road in Gaston, NC is consistent with current local zoning requirements. A copy of the air permit application being submitted to the North Carolina Division of Air Quality (NCDAQ) is attached.

Your confirmation of zoning consistency is needed by the NCDAQ prior to issuance of the air quality construction permit. Please complete the attached form and send to the address shown on the form as soon as possible. In the interim, we would appreciate it if you would stamp this cover letter with your department's seal, sign and date next to your seal and return the sealed cover letter via FAX to my attention at (919) 462-9694. This stamp is needed to be considered administratively complete by the NC Division of Air Quality. Should you require additional information to complete your review, please do not hesitate to contact me at (919) 462-9693.

Sincerely,

Joe W. Sullivan

Joe Sullivan, PE, CM
Managing Consultant

Attachment

Zoning Consistency Determination

Facility Name Enviva Pellets Northampton, LLC

Facility Street Address Lebanon Church Road (Street Number TBD)

Facility City Gaston

Description of Process Wood pellet manufacturing facility

SIC Code/NAICS SIC – 2499 ; NAICS - 321999

Facility Contact Glenn Gray

Phone Number (804) 412-0227

Mailing Address 1309 East Cary Street, Suite 200

Mailing City, State Zip Richmond, Virginia 23219

Based on the information given above:

☐ I have received a copy of the air permit application (draft or final) AND...

☐ There are no applicable zoning and subdivision ordinances for this facility at this time

☐ The proposed operation IS consistent with applicable zoning and subdivision ordinances

☐ The proposed operation IS NOT consistent with applicable zoning and subdivision ordinances (please include a copy of the rules in the package sent to the air quality office)

☐ The determination is pending further information and can not be made at this time

☐ Other:

Agency

Name of Designated Official

Title of Designated Official

Signature

Date

Please forward to the mailing address listed above and the air quality office at the appropriate address as checked on the back of this form.

Courtesy of the Small Business Assistance Program
toll free at 1-877-623-6748 or on the web at www.envhelp.org/sb

All PSD and Title V Applications

X Attn: Dr. Donald van der Vaart, PE
DAQ – Permitting Section
1641 Mail Service Center
Raleigh, NC 27699-1641

Local Programs

☐ Attn: David Brigman
Western NC Regional Air Quality Agency
49 Mount Carmel Road
Asheville, NC 28806
(828) 250-6777

☐ Attn: Donald R. Willard
Mecklenburg County Air Quality
700 N. Tryon Street, Suite 205
Charlotte, NC 28202-2236
(704) 336-5500

☐ Attn: Robert R. Fulp
Forsyth County
Environmental Affairs Department
537 N. Spruce Street
Winston-Salem, NC 27101-1362
(336) 703-2440

Division of Air Quality Regional Offices

☐ Attn: Paul Muller
Asheville Regional Office
2090 U.S. Highway 70
Swannanoa, NC 28778
(828) 296-4500

☐ Attn: Steven Vozzo
Fayetteville Regional Office
225 Green Street Suite 714
Fayetteville, NC 28301
(910) 433-3300

☐ Attn: Ron Slack
Mooresville Regional Office
610 East Center Avenue, Suite 301
Mooresville, NC 28115
(704) 663-1699

☐ Attn: Patrick Butler, PE
Raleigh Regional Office
1628 Mail Service Center
Raleigh, NC 27699-1628
(919) 791-4200

☐ Attn: Robert Fisher
Washington Regional Office
943 Washington Square Mall
Washington, NC 27889
(252) 946-6481

☐ Attn: Wayne Cook
Wilmington Regional Office
127 Cardinal Drive Extension
Wilmington, NC 28405
(910) 796-7215

☐ Attn: Margaret Love, PE
Winston-Salem Regional Office
585 Waughtown Street
Winston-Salem, NC 27107
(336) 771-5000

Courtesy of the Small Business Assistance Program
toll free at 1-877-623-6748 or on the web at www.envhelp.org/sb