Ms. Jo Anna Cunningham
Air Permitting Division
Bureau of Air Quality
South Carolina Department of Health & Environmental Control
2600 Bull Street
Columbia, South Carolina

Re: **Update to Application for Construction Permit Modification**
Enviva Pellets Greenwood, LLC
Greenwood County, South Carolina
Construction Permit Number 1240-0133-CBr2

Dear Ms. Cunningham:

Date June 29, 2020

Ramboll
8235 YMCA Plaza Drive
Suite 300
Baton Rouge, LA 70810
USA

T +1 225-408-2691
www.ramboll.com

Enclosed please find an updated South Carolina Department of Health and Environmental Control (SC DHEC) permit application package for a permit modification to incorporate proposed facility changes at the Enviva Pellets Greenwood, LLC (Enviva) facility located in Greenwood County (referred to herein as "the Greenwood plant" or "the facility"). As requested Enviva is updating information provided in the application submitted in February 2020. Specifically, Enviva is updating the application to reflect the following minor changes:

- Increase in the amount of diesel assumed to quantify fuel combustion emissions during Furnace (E11) cold start-ups from 10 gallons per start-up and 50 gallons per year to 30 gallons per start-up and 200 gallons per year;
- Reduction in the allowable duration of cold start-ups from 12 hours per event to 8 hours per event;
- Additional discussion of potential emissions previously quantified by Colombo Energy Inc. (Colombo), the previous owner of the facility, and emissions quantified by Enviva;
- Quantification of particulate matter emissions from the Chipper (E2); and
- Removal of the Dry Hammermill modification option designated as "Option 1" in the February 2020 application (i.e., combination of existing horizontal and new vertical Dry Hammermills) to retain only "Option 2" (i.e., only new vertical Dry Hammermills).

The updates described above result in insignificant changes to the emission rates modeled as part of the February 2020 application. Specifically, the above discussed changes to furnace cold start-up bypass emissions (decrease in hours vented and increase in diesel usage) have an overall reduction in modeled emissions for PM_{10} and $PM_{2.5}$ and negligible increases for CO, NO_X, and SO_2 (0.1 lb/hr, 0.40 lb/hr, and 0.004 lb/hr, respectively). Furthermore, the Chipper

emissions are below the modeling exemption thresholds and do not require modeling. Therefore, additional air dispersion modeling was not conducted as part of these updates.

As required, two (2) complete permit application packages, including one package with original signatures, and one complete electronic copy are enclosed.

Thank you for your prompt attention to this matter. If you have any questions, please contact me at (225) 408-2691 or Kai Simonsen, Senior Environmental Engineer and Manager at Enviva, at (919) 428-0289.

Sincerely,

Michael Carbon
Managing Principal

D 225-408-2691
M 225-907-3822
mcarbon@ramboll.com

Enclosures: Permit Application including Appendices

Cc: Yana Kravtsova (Enviva)
Kai Simonsen (Enviva)
Stephen Stroud (Enviva)

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APPENDIX

ACRONYMS AND ABBREVIATIONS

AAQS	Ambient Air Quality Standard
AP-42	Compilation of Air Pollutant Emission Factors
BMP	Best Management Practice
CAA	Clean Air Act
CAM	Compliance Assurance Monitoring
CFR	Code of Federal Regulations
CI	Compression Ignition
CO	Carbon Monoxide
CO_2	Carbon Dioxide
DHM	Dry Hammermill
EPA	US Environmental Protection Agency
FSC	Forest Stewardship Council
GEP	Good Engineering Practice
GHG	Greenhouse gases
GHM	Green Hammermill
HAP	Hazardous Air Pollutant
hp	horsepower
ICE	Internal Combustion Engine
lb	Pound
MAAC	Maximum Allowable Ambient Concentrations
MACT	Maximum Achievable Control Technology
MMBtu	Million British thermal units
NAAQS	National Ambient Air Quality Standards
NCASI	National Council for Air and Stream Improvement
NC DAQ	North Carolina Division of Air Quality
NED	National Elevation Dataset
NESHAP	National Emission Standards for Hazardous Air Pollutants
NNSR	Nonattainment New Source Review
NO_X	Nitrogen Oxides ($NO + NO_2$)
NSPS	New Source Performance Standards
NSR	New Source Review

ODT	Oven Dried Short Tons
PEFC	Programme for the Endorsement of Forest Certifications
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter Less Than 2.5 Micrometers in Aerodynamic Diameter
PM_{10}	Particulate Matter Less Than 10 Micrometers in Aerodynamic Diameter
PSD	Prevention of Significant Deterioration
PSEU	Pollutant Specific Emission Unit
RICE	Reciprocating Internal Combustion Engine
RCO	Regenerative Catalytic Oxidizer
RMP	Risk Management Plan
RTO	Regenerative Thermal Oxidizer
SC DHEC	South Carolina Department of Health and Environmental Control
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SFI	Sustainable Forestry Initiative
TAP	Toxic Air Pollutant
tpy	tons per year
USGS	U.S. Geological Survey
VOC	Volatile Organic Compounds
WESP	Wet Electrostatic Precipitator

1. INTRODUCTION

Enviva Pellets Greenwood, LLC (Enviva) owns and operates a wood pellet manufacturing plant (referred to herein as "the Greenwood plant" or "the facility") located in Greenwood County, South Carolina. The Greenwood plant currently operates under Construction Permit Number 1240-0133-CBr2, originally issued by the South Carolina Department of Health and Environmental Control (SC DHEC) on January 12, 2018 and last revised on October 2, 2018. The facility is currently permitted to produce up to 500,000 wet metric tons per year of wood pellets utilizing up to 90% softwood on a 12-month rolling basis, which is equivalent to approximately 521,000 oven-dried short tons (ODT). The Greenwood plant consists of the following processes: Log chipper, Debarker, Green Wood Screener, Green Hammermills (GHMs), Rotary Dryer, Dry Hammermills (DHMs), Pelletizers and Coolers, product loadout operations, and other ancillary activities.

The Greenwood plant is a major source with respect to the Title V permitting program because potential facility-wide emissions of one or more criteria pollutants are above the major source threshold of 100 tons per year (tpy). The facility is classified as an area source of hazardous air pollutants (HAP) because potential total HAP emissions and maximum individual HAP emissions are below the major source thresholds of 25 tpy total HAP and 10 tpy individual HAP. The facility is minor with respect to the New Source Review (NSR) permitting programs because criteria pollutant emissions are below the 250 tpy threshold.

Enviva is submitting this permit modification application to request planned changes for the Greenwood plant to increase pellet production rate and reduce emissions from the DHMs. These changes are being implemented to meet new customer production rate demands, and to incorporate emission reduction efforts to minimize emissions impacts associated with the production rate increase.

The following summarizes the proposed physical changes and changes in the method of operation associated with this production increase, and other changes requested in this application:

- Increase pellet production rate from 521,000 ODT per year to 660,000 ODT per year;
- Increase woodyard throughput rate from 541,500 ODT per year to 876,000 ODT per year for the Debarker (E1) and 766,500 ODT per year for other woodyard operations;
- Increase the amount of softwood processed from a maximum of 90% to 100%;
- Add three (3) new pelletizers [Pelletizers 16 through 18 (E49 through 51)] and one (1) new pellet cooler [Pellet Cooler 6 (E52)], which will be controlled by one (1) new baghouse (CD-18c) and the existing Regenerative Thermal Oxidizer (RTO)/Regenerative Catalytic Oxidizer (RCO) RTO3/RCO2 (CD19);
- Update the number and firing rate capacity of the RTO1 (CD3) burners from one (1) burner at five million British thermal units per hour (MMBtu/hr) to four (4) burners at 8 MMBtu/hr per burner;
- Update the firing rate capacity of the RTO2/RCO1 (CD15) burner from 5 MMBtu/hr to 5.2 MMBtu/hr;

- Update the number and firing rate capacity of the RTO3/RCO2 (CD19) burners from one (1) burner at 5 MMBtu/hr to two (2) burners at 5.2 MMBtu/hr per burner;
- Add one (1) new GHM [Green Hammermill 5 (E58)] which will be controlled by the existing Wet Electrostatic Precipitator [WESP (CD2)] and RTO [RTO1 (CD3)];
- Add one (1) new truck dump [Truck Dump 2 (E47)] and revise the permit to include an existing truck dump [Truck Dump 1 (E46)];
- Add an electric powered radial log crane, which will only be used to move logs and, therefore, will not be a source of air emissions;
- Include the existing furnace bypass stack (S15) in the permit and quantify associated emissions [Furnace (E11)];
- Quantify emissions from the existing Dryer Duct Burner (E48);
- Add an air-to-air chiller to cool incoming air to the pellet coolers to improve product quality;
- Quantify fugitive emissions from vehicle traffic on unpaved and paved roads [Unpaved Roads (E56) and Paved Roads (E57)];
- Update the permit to reflect the as-built control configuration for the Dust Silo (E43) (i.e., one cyclofilter (CD23) instead of four);
- Make other updates to emissions calculation methodologies described in Section 3 to incorporate additional plant-specific test data, data from comparable Enviva facilities, and to be consistent with methodologies employed by Enviva for its other plants; and
- Replace the existing five (5) DHMs (E14 through E18) with thirty-six (36) new vertical DHMs (E59 through E94). Exhaust from the new vertical DHMs will be routed to either:
    a) a new bin vent filter [Bin Vent Filter 3 (CD24)] followed by a safety water quench duct and then to the dryer furnace (E11) followed by the existing WESP (CD2) and RTO1 (CD3);
    b) a safety water quench duct and then the existing WESP (CD2) followed by the existing RTO1 (CD3); or
    c) a combination of the two options.

Incorporation of these changes will allow the facility to increase total production while remaining under the Prevention of Significant Deterioration (PSD) major source threshold of 250 tpy for all criteria pollutants and the major source thresholds for HAPs. The facility will, however, continue to be classified as a major source under the Title V program due to potential criteria pollutant emissions above the 100 tpy threshold.

A description of the process is provided in Section 2 and methodologies used to quantify potential emissions are summarized in Section 3. Section 4 describes the applicability of federal and state permitting programs. Section 5 includes a detailed applicability analysis of both federal and state regulations. Additionally, Section 6 discusses the ambient air quality impact analysis for the facility. The completed air permit application forms are included in Appendix D.

2. PROCESS DESCRIPTION

Enviva manufactures wood pellets for use as a renewable fuel for energy generation and industrial customers. Enviva's customers use wood pellets in place of coal, significantly reducing emissions of pollutants such as lifecycle carbon dioxide (CO_2)/greenhouse gases (GHG), mercury, arsenic and lead. The company is dedicated to improving the environmental profile of energy generation while promoting sustainable forestry in the Southeastern United States. Enviva holds certifications from the Forest Stewardship Council (FSC), Sustainable Forestry Initiative (SFI), Programme for the Endorsement of Forest Certification (PEFC), and Sustainable Biomass Program (SBP). Enviva requires that all suppliers adhere to state-developed "Best Management Practices" (BMPs) in their activities to protect water quality and sensitive ecosystems. In addition, Enviva is implementing an industry leading "track and trace" system to further ensure that all fiber resources come from responsible harvests. Enviva pays attention to: land use change, use and effectiveness of BMPs, wetlands, biodiversity, and certification status. All of this combined ensures that Enviva's forestry activities contribute to healthy forests both today and in the future. A detailed description of Enviva's Responsible Wood Supply Program can be found at: http://www.envivabiomass.com/sustainability/wood-sourcing/responsible-wood-supply-program/

The following sections provide a description of the process and proposed changes to the Greenwood plant. An area map and facility layout are provided in Appendix A and a process flow diagram is provided in Appendix B.

2.1 Debarking, Chipping, Screening, Pile Drop, Pile Erosion, and Truck Dumps (E1 through E5, E46, E47)

In the woodyard, logs are debarked by the electric-powered Debarker (E1) and then sent to the Chipper (E2) to chip the wood. Bark from the Debarker is stored in outdoor piles (E4 and E5) prior to being sent to the furnace. The chips from the chipper are stored in outdoor piles (E5) prior to further processing in the GHMs. Purchased chips received by an existing truck dump (E46) are sent through a Green Wood Screener (E3) and then transferred to the storage piles.

As noted above, Enviva is proposing to install an additional truck dump (E47) as part of the proposed project. Enviva is also proposing to increase the woodyard throughput rate from 541,500 ODT per year to 876,000 ODT per year for the Debarker (E1) and 766,500 ODT per year for other woodyard operations.

2.2 Green Hammermills 1 through 5 (E6 through E9, E58) and Green Chip Silo (E10)

Prior to drying, chips from the woodyard are processed in four (4) GHMs (E6 through E9). From the GHMs, chips are sent to the Green Chip Silo (E10). Emissions from the GHMs and Green Chip Silo are routed to the WESP (CD2) and RTO-1 (CD3) to control particulate matter (PM), volatile organic compound (VOC), HAP, and toxic air pollutant (TAP) emissions.

In this application, Enviva is requesting the installation of one (1) new GHM (E58). The new GHM would also be controlled by the WESP (CD2) and RTO-1 (CD3).

2.3 Dryer Furnace, Dryer, Dryer Duct Burner, and Dry Chip Silo (E11 through E13, E48)

The rotary drum Dryer (E12) uses direct contact heat provided to the system via a 200 MMBtu/hr Furnace (E11) that uses bark and wood chips as fuel. Green wood is fed into the Dryer (E12) where the moisture content is reduced to the desired level and routed to a material recovery cyclone (CD1) in series with a WESP (CD2) and RTO (CD3) for PM, VOC, HAP, and TAP control. Dried chips are stored in the Dry Chip Silo (E13). Particulate emissions from the Dry Chip Silo are controlled by a bin vent [Bin Vent Filter 1 (CD4)].

As the flue gas exits the dryer and begins to cool, wood tar can condense and coat the inner walls of the dryer ducts creating a fire risk. To prevent condensation from occurring and thus reduce the fire risk, ductwork associated with the cyclone outlet is heated by an existing duct burner with a maximum heat input rating of 5 MMBtu/hr [Dryer Duct Burner (E48)]. The duct burner combusts natural gas and exhausts directly to atmosphere.

As noted above, with this application, Enviva proposes to update the number and firing rate capacity of the RTO1 (CD3) burners from one (1) burner at 5 MMBtu/hr to four (4) burners at 8 MMBtu/hr per burner.

2.3.1 Furnace and Dryer Bypass Stacks (E11, E12)

Bypass stacks for the furnace and rotary drum dryer are used as an inlet for makeup air or to exhaust hot gases during start-ups (for temperature control), shutdowns, and malfunctions.

Specifically, the furnace bypass stack will be used in the following situations:

- Cold Start-ups: The furnace bypass stack will be used when the furnace is started up from a cold shutdown until the secondary combustion zone temperature approaches 600 degrees Fahrenheit (° F). Diesel fuel may be used as an accelerant for cold start-ups. The amount of fuel used per event is typically 15 to 30 gallons and the annual usage is typically 100 to 200 gallons. Emissions resulting from diesel usage during cold start-ups are insignificant. The heat input rate of the furnace during this initial stage of the start-up is not expected to exceed 15% of the maximum heat input rate of the unit. Once the secondary combustion zone temperature reaches 600 °F, the unit's induced draft fan is started and, although the bypass stack remains open, it is no longer exhausting emissions from the furnace. Instead, the bypass stack remains open to allow ambient air to be pulled through the dryer and during this time emissions are routed to the control devices for the furnace and dryer. Once the secondary combustion zone temperature reaches approximately 900 °F, the furnace bypass stack is closed. Use of the furnace bypass stack for cold start-ups will not exceed 8 hours per start-up and 50 hours per year. Emissions from cold start-up operations are quantified and included in the facility-wide potential emissions presented in this permit application.
- Idle Mode: The purpose of operation in idle mode is to maintain the temperature of the fire brick lining the furnace, which may be damaged if it cools too rapidly. Operation in idle mode also significantly reduces the amount of time required to restart the dryer. During idle mode, the furnace may operate up to a maximum heat input of 12 MMBtu/hr. Note that the furnace emissions are only vented through the bypass stack in idle mode when the facility is either conducting maintenance and cleaning of the WESP and RTO, or during dryer system repairs including repairs to

raw material input and product discharge. During other periods of idle mode operation, fan speeds are lowered and emissions from the furnace continue to be routed to the control devices. Use of the furnace bypass stack in idle mode will not exceed 500 hours per year. Emissions from furnace idle mode operation are quantified and included in the facility-wide potential emissions presented in this permit application.

- Malfunction: The furnace itself can abort and open the bypass stack in the event of a malfunction. This may be caused by failsafe interlocks associated with the furnace or dryer and emissions control systems as well as utility supply systems (i.e., electricity, compressed air, water/fire protection). As soon as the furnace aborts, it will automatically switch to idle mode (defined as operation up to a maximum heat input rate of 12 MMBtu/hr). The fuel feed will automatically stop, resulting in a rapid drop in heat input.
- Planned Shutdown: In the event of a planned shutdown, the furnace heat input will be decreased, and all remaining fuel will be moved through the system to prevent a fire. The remaining fuel will be combusted prior to opening the furnace bypass stack. The furnace bypass stack is not utilized until after the furnace achieves an idle state (12 MMBtu/hr or less) or the furnace is shut down completely. Until this time, emissions continue to be controlled by the WESP and RTO.

Conditions under which the dryer bypass stack will be used are as follows:

- Malfunction: The dryer system can abort due to power failure, equipment failure, or furnace abort. If the RTO goes offline because of an interlock failure, the dryer will immediately abort. This may occur if the dryer temperature is out of range or due to equipment or power failure. Dryer abort will also be triggered if a spark is detected.
- Planned Shutdown: During planned shutdowns, as the remaining fuel is combusted by the furnace, the chip input to the dryer is reduced. When only a small amount of chips remains, the dryer drum will be emptied. The dryer bypass stack will then be opened, and a purge air fan used to ensure no explosive build-up of flammable gas occurs in the drum. Emissions during this time will be negligible and are not quantified, as the furnace and dryer are no longer operating.

Malfunctions are infrequent, unpredictable, and minimized to the maximum extent possible. Furnace and dryer bypass stack malfunction emissions cannot reasonably be quantified and are not included in the facility-wide potential emissions.

2.4 Dry Hammermills (E59 – E94)

Dried materials from the dry chip silo (E13) are currently conveyed to the five (5) existing horizontal DHMs (E14 through E18) for further size reduction prior to pelletization. Reduced wood chips and dust are then routed to the pelletizer feed silo (E19). Each DHM is currently controlled by a cyclofilter (CD5 through CD9).

With this application, Enviva is proposing to replace the five (5) existing horizontal DHMs (E14 through E18) with thirty-six (36) new vertical DHMs (E59 through E94). Exhaust from the new DHMs would be routed to either:

a) new bin vent filter (CD24) followed by a safety water quench duct and then to the dryer furnace (E11) followed by the existing WESP (CD2) and RTO1 (CD3);

b) a safety water quench duct and then to the existing WESP (CD2) followed by the existing RTO1 (CD3);

c) a combination of the two options.

All exhaust ultimately exiting the DHMs would be controlled by WESP (CD2) and RTO-1 (CD3). Recovered dust collected from the bin vent filter would be transferred to the milled wood conveyor belt.

2.5 Pelletizer Feed Silo (E19)

Milled wood from the DHMs and smaller wood particles that bypass the DHMs are conveyed to the Pelletizer Feed Silo (E19) for storage prior to pelletization. Particulate emissions from the Pelletizer Feed Silo are controlled by a bin vent (CD10).

2.6 Pelletizers 1 through 15 and new Pelletizers 16 through 18, Pellet Coolers 1 through 5 and new Pellet Cooler 6 (E20 through E39, E49 through E52)

Dried processed wood is mechanically compacted through fifteen (15) presses in the Pelletizers (E20 - E22, E24 - E26, E28 - E30, E32 - E34, and E36 - E38). Formed pellets are discharged into one of five (5) Pellet Coolers (E23, E27, E31, E35, and E39). Chilled cooling air is passed through the pellets when needed during high ambient air temperature conditions. At this point, the pellets contain a small amount of wood fines, which are swept out with the cooling air and are recovered utilizing five (5) existing baghouses (CD14a-c and CD18a and b).

As part of this application, Enviva proposes to install three (3) new Pelletizers (E49 - E51), one (1) new Pellet Cooler (E52). Emissions from the new equipment will be controlled by a new baghouse (CD18c) and by the existing RTO3/RCO2 (CD19). In addition, Enviva proposes to update the firing rate capacity of the RTO2/RCO1 (CD15) burner from 5 MMBtu/hr to 5.2 MMBtu/hr, and update the number and firing rate capacity of the RTO-3/RCO-2 (CD19) from one (1) burner at 5 MMBtu/hr to two (2) burners at 5.2 MMBtu/hr per burner. Finally, as discussed previously Enviva is proposing to add an air-to-air chiller to cool incoming air to the pellet coolers to improve product quality.

2.7 Pellet Silos (E40 and E41) and Loadout (E42)

Final product is conveyed to two (2) Pellet Silos (E40 and E41) controlled by a single cyclofilter (CD20). Final product from the silos is fed to the rail loadout station (E42). Pellet loadout is accomplished by gravity feed of the pellets through four (4) product chutes. Rail Loadout (E42) emissions are controlled by a product recovery cyclone (CD21) and baghouse (CD22).

2.8 Dust Silos (E43)

Dust and fines are collected and reclaimed from the milling, pelletizing, and loadout processes and conveyed to one (1) Dust Silo (E43), where they are stored until they are transferred to the dry chip silo and reintroduced into the process. Dust and fines are conveyed to the Dust Silo from the following equipment:

- DHM cyclofilters (CD5 – CD9);
- Wood fines that bypass the DHMs;
- Pelletizers [E20 - E22, E24 - E26, E28 - E30, E32 - E34, E36 - E38, and E49 - E51 (future)];

- Pellet screens located under each pellet cooler;
- Pellet cooler baghouses (CD14a-c and CD18a-c); and
- Loadout cyclone (CD21).

With this application, Enviva is requesting that the permit be updated to reflect the as-built configuration of the Dust Silo (E43) emissions control. The dust silo is controlled by a single cyclofilter (CD23) rather than multiple filters.

2.9 Engine 1 (Emergency Generator), Engine 2 (Fire Pump) (E44, E45), and Diesel Storage Tanks (E53 – E55)

The facility has an 865-brake horsepower (bhp) diesel-fired emergency generator engine (E44) and a 305 hp diesel-fired fire pump engine (E45). Aside from maintenance and readiness testing, the generator and fire water pump engines are only utilized for emergency operations.

Diesel for the emergency generator is stored in a 660-gallon tank [AST-4 (E55)] and diesel for the fire pump engine is stored in a 359-gallon storage tank [AST-2 (E54)]. Diesel fuel for woodyard operations is stored in a 2,000-gallon tank [AST-1 (E53)].

3. POTENTIAL EMISSIONS QUANTIFICATION

The following summarizes the data sources and calculation methodologies used in quantifying potential emissions from the Greenwood plant. Detailed potential emissions calculations are provided in Appendix C. Note that Enviva has quantified potential GHG emissions from all applicable emissions sources; however, GHG emissions are not discussed in detail below. As noted below, emissions have been updated to reflect recent stack testing at the Greenwood plant and other Enviva facilities. Please refer to the detailed emission calculations provided in Appendix C for GHG emission estimates.

3.1 Currently Permitted Emission Rates

The currently permitted emission rates for the Greenwood plant are largely based on previous applications submitted by Colombo Energy Inc. (Colombo), the previous owner of the facility. However, Colombo did not quantify emissions from all sources at the facility, which are now quantified by Enviva in this application. Specifically, emissions from the following sources were not previously quantified by Colombo:

- Furnace bypass during cold start-ups and idle mode, which result in additional emissions of PM, PM less than 10 microns in diameter (PM_{10}), PM less than 2.5 microns in diameter ($PM_{2.5}$), sulfur dioxide (SO_2), nitrogen oxides (NO_X), carbon monoxide (CO), VOC, and HAP;
- Natural gas-fired duct burner, which result in additional emissions of PM, PM_{10}, $PM_{2.5}$, SO_2, NO_X, CO, VOC, and HAP; and
- Vehicle travel on paved and unpaved roads, which result in additional emissions of PM, PM_{10}, and $PM_{2.5}$.

The following table provides a comparison of currently-permitted facility-wide potential emissions ("Emission Rates Prior to Construction (tons/year) Colombo Basis"), currently-permitted facility-wide potential emissions with previously unquantified sources added ("Emission Rates Prior to Construction (tons/year) Colombo Permitted Emissions Plus Existing Unpermitted Emissions"), and Enviva's proposed emission rates ("Emission Rates After Construction / Modification (tons/year) Enviva Basis").

Pollutants	Emission Rates Prior to Construction / Modification (tons/year) Colombo Basis			Emission Rates Prior to Construction / Modification (tons/year) Colombo Permitted Emissions Plus Existing Unpermitted Emissions			Emission Rates After Construction / Modification (tons/year) Enviva Basis		
	Uncontrol.	Control.	Limited	Uncontrol.	Control.	Limited	Uncontrol.	Control.	Limited
PM	13,948	151	148	14,289	281	174	12,684	283	168
PM10	13,948	151	148	14,109	253	157	9,667	206	103
PM2.5	11,958	132	128	12,047	215	131	9,102	179	89
SO_2	22.5			27.1	27.1	22.6	27	27	22.1
NO_X	249			292	292	252	158	166	125
CO	249			361	361	253	173	216	100

Pollutants	Emission Rates Prior to Construction / Modification (tons/year) Colombo Basis			Emission Rates Prior to Construction / Modification (tons/year) Colombo Permitted Emissions Plus Existing Unpermitted Emissions			Emission Rates After Construction / Modification (tons/year) Enviva Basis		
	Uncontrol.	Control.	Limited	Uncontrol.	Control.	Limited	Uncontrol.	Control.	Limited
VOC	2,906	305	247	2,909	308	247	2,491	138	120
Pb	0	0	0	5.10E-02	1.20E-02	3.34E-03	5.10E-02	1.20E-02	3.34E-03
Formaldehyde	17.2	1.60	1.33	18.0	2.41	1.35	91.39	5.67	4.40
Total HAP Emissions	52.1	5.10	4.22	57.9	10.9	4.38	416.35	29.18	22.40

In addition to quantifying emissions from the existing sources discussed above, with this application Enviva is making updates to emission calculation methodologies to incorporate proposed project changes, incorporate additional test data, and for consistency with methodologies employed by Enviva for its other plants. These additional updates are discussed further in the subsequent sections of this application.

3.2 Pile Drop, Pile Erosion, and Truck Dumps (E4, E5, E46, E47)

Fugitive PM emissions result from unloading purchased chips and bark from trucks and transfer of these materials to storage piles and the fuel storage bin via conveyors, as well as from erosion of, and volatilization from, storage piles. With this application, Enviva is updating the emissions calculation methodology for these sources relative to previous applications submitted by Colombo, the previous owner of the Greenwood plant. The updates were made to incorporate proposed changes and to be consistent with methodologies employed by Enviva for its other plants. Specifically, Colombo previously quantified pile drop emissions by calculating an AP-42-based pound per ton (lb/ton) factor and applying it to the facility-wide throughput. Pile erosion emissions were quantified by calculating an AP-42-based ton per acre per year emission factor and applying it to an assumed total pile area of 2 acres. Enviva is quantifying emissions from these sources based on more accurate AP-42 methodologies for each type of pile, with updated pile sizes, and each type of drop point.

Fugitive PM emissions from chip and bark transfer operations were calculated based on AP-42 Section 13.2.4, *Aggregate Handling and Storage Piles*. Emissions were only quantified for the final drop points (e.g., from conveyor to pile). Green wood and bark contain a high moisture content approaching 50 percent water by weight. Therefore, chip and bark transfer operations have insignificant PM emissions.

Particulate emission factors used to quantify emissions from storage pile wind erosion were calculated based on EPA's *Control of Open Fugitive Dust Sources*.[1] The number of days with rainfall greater than 0.01 inches was obtained from AP-42 Section 13.2.2, *Unpaved Roads*,[2] and the percentage of time that wind speed exceeds 12 miles per hour (mph) was determined based on the AERMOD-ready meteorological dataset for the Greenwood Airport

[1] USEPA *Control of Open Fugitive Dust Sources: Final Report* (EPA-450/3-88-008, 09/88).

[2] USEPA AP-42 Section 13.2.2, *Unpaved Roads* (11/06).

National Weather Service (KGRD) Station provided by SC DHEC. The mean silt content of 8.4% for unpaved roads at lumber mills from AP-42 Section 13.2.2 was conservatively applied in the absence of site-specific data. The exposed surface area of the piles was calculated based on worst-case pile dimensions.

VOC emissions from storage piles were quantified based on the exposed surface area of the pile and emission factors from the National Council for Air and Stream Improvement (NCASI). NCASI emission factors range from 1.6 to 3.6 pounds (lb) VOC as carbon/acre-day; however, emissions were conservatively based on the maximum emission factor.

The pile drop points, pile erosion, and truck dump sources are exempt from construction permitting requirements per SC Regulation 61-62.1, Section II.B.2.h as total uncontrolled potential emissions are less than 5 tpy each of PM, SO_2, NO_X, CO, and total uncontrolled VOC emissions are less than 1,000 lb/month.

3.3 Debarker (E1)

PM emissions occur as a result of log debarking and processing. With this application, Enviva is updating the emissions calculation methodology for this source relative to previous applications submitted by Colombo. The updates were made to incorporate data from recent measurements conducted by NCASI, which more accurately reflect emissions from debarking relative to the lb/ton emission factor used by Colombo and obtained from a 1978 EPA document entitled "Assessment of Fugitive Particulate Emission Factor for Industrial Processes" (the "1978 PM factor").[3]

Potential emissions of PM, PM_{10}, and $PM_{2.5}$ from debarking were quantified based on emissions measurements conducted by NCASI and $PM_{2.5}$ and PM_{10} fractions for fresh bark.[4]

3.4 Chipper (E2)

The chipping process generates VOC and methanol air emissions. With this application, Enviva is updating the emissions calculation methodology for this source relative to previous applications submitted by Colombo. The updates were made to be consistent with methodologies employed by Enviva for its other plants, including speciating PM_{10} and $PM_{2.5}$ emissions from PM emissions, and quantifying previously unaddressed emissions of VOC and HAP.

PM emissions were quantified based on the 1978 PM factor reduced by 60% to account for the enclosed nature of the operation. PM_{10} and $PM_{2.5}$ emissions were conservatively assumed to be 50% of total PM emissions.

VOC and methanol emissions were quantified based on emission factors for log chipping from AP-42 Section 10.6.3, *Medium Density Fiberboard* and AP-42 Section 10.6.4, *Hardboard and Fiberboard*.[5]

The Chipper is exempt from construction permitting requirements per SC Regulation 61-62.1, Section II.B.2.h as total uncontrolled potential emissions are less than 5 tpy each of PM, SO_2, NO_X, CO, and total uncontrolled VOC emissions are less than 1,000 lb/month.

[3] Table 2-47 from Assessment of Fugitive Particulate Emission Factor for Industrial Processes (EPA-450/3-78-107). September 1978.

[4] NCASI. Untitled Draft White Paper. November 2019.

[5] USEPA AP-42 Section 10.6.3, *Medium Density Fiberboard* (08/02).

3.5 Green Wood Screener (E3)

The green wood screening process results in emissions of PM. With this application, Enviva is updating the emissions calculation methodology for this source relative to previous applications submitted by Colombo. The updates were made to incorporate NCASI factors, which more accurately reflect emissions from screening relative to the 1978 PM factor used by Colombo to previously quantify emissions from this source.

Potential PM emissions from screening were quantified based on emission factors from NCASI Technical Bulletin No. 1020 for chip screening.[6]

The Green Wood Screener is exempt from construction permitting requirements per SC Regulation 61-62.1, Section II.B.2.h as total uncontrolled potential emissions are less than 5 tpy each of PM, SO_2, NO_X, CO, and total uncontrolled VOC emissions are less than 1,000 lb/month.

3.6 Dryer (E11, E12), Green Hammermills (E6 - E9, E58), and Green Chip Silo (E10)

As described in Section 2, in addition to normal operation there are several other potential operating conditions for the Dryer line. Emissions for the different operating conditions were quantified as described in the following subsections. With this application, Enviva is updating the emissions calculation methodology for these sources relative to previous applications submitted by Colombo. The updates were made to incorporate additional plant-specific test data for CO, NO_X, PM, PM_{10}, $PM_{2.5}$, VOC, acetaldehyde, acrolein, formaldehyde, methanol, phenol, and propionaldehyde, and to apply Enviva's methodology for scaling VOC emissions to the proposed maximum softwood content of 100%. Furthermore, these updates include quantifying HAP emissions resulting from combustion of wood waste in the furnace and from combustion of natural gas in the RTO, and criteria and HAP emissions from bypass stacks during cold start-ups and idle mode operations, which were not previously quantified by Colombo.

3.6.1 Normal Operation

During normal operation, exhaust from the Furnace and Dryer (E11 and E12) are routed to a product recovery cyclone separator followed by a WESP and RTO for control of PM, VOC, HAP, and TAP. The GHMs (E6 – E9, E58) and the Green Chip Silo (E10) share the Dryer's existing WESP/RTO control system. Potential emissions of PM, PM_{10}, $PM_{2.5}$, CO, NO_x, and VOC are based on Greenwood stack testing data with included contingency factors. The VOC emissions factor was scaled up to account for the proposed increase in the amount of softwood processed from a maximum of 90% to a maximum of up to 100%. Potential emissions of SO_2 are based on AP-42 Section 1.6, *Wood Residue Combustion in Boilers, 09/03*.

HAP and TAP emissions were calculated based on emission factors from several data sources including stack testing data from the Greenwood plant and comparable Enviva facilities (with contingency factors), emission factors from AP-42 Section 1.6, *Wood Residue Combustion in*

[6] National Council for Air and Stream Improvement, Inc. (NCASI). 2013. Compilation of criteria air pollutant emissions data for sources at pulp and paper mills including boilers – an update to Technical Bulletin No. 884. Technical Bulletin No. 1020. Research Triangle Park, NC: National Council for Air and Stream Improvement, Inc.

Boilers[7], and NC DAQ's Wood Waste Combustion Spreadsheet[8]. HAP and TAP emissions from natural gas combustion by the RTO burners were calculated based on AP-42 Section 1.4, *Natural Gas Combustion* and USEPA's WebFIRE database.[9]

3.6.2 Furnace Bypass (Cold Start-ups)

The furnace bypass stack may be used to exhaust emissions during cold start-ups for up to 8 hours per start-up and 50 hours per year, during which the furnace will be operating at a heat input rate of up to 15% of the maximum heat input rate of the unit. The amount of fuel used per event is typically 15 to 30 gallons and the annual usage is typically 100 to 200 gallons. Potential emissions of PM, CO, NO_x, SO_2, VOC, HAP, and TAP during cold start-ups were calculated based on emission factors from AP-42 Section 1.6, *Wood Residue Combustion in Boilers*[10] and Section 1.3, *Fuel Oil Combustion*.[11]

3.6.3 Furnace Bypass (Idle Mode/Planned Shutdown)

The furnace may operate up to 500 hours per year in "idle mode", which is defined as operation up to a maximum heat input rate of 12 MMBtu/hr when the WESP and RTO are undergoing maintenance or cleaning or when the dryer system is being repaired. During this time, emissions may exhaust out of the furnace bypass stack. Potential emissions of PM, CO, NO_x, SO_2, VOC, HAP, and TAP were calculated based on emission factors from AP-42 Section 1.6, *Wood Residue Combustion in Boilers*.

3.7 Dry Hammermills (E59 – E94)

The DHMs generate PM, VOC, HAP, and TAP emissions during the process of reducing wood chips to the required size for pelletization. As described in Section 2, all exhaust from the DHMs will be routed to control devices to reduce these emissions as follows:

- PM emissions from the new DHMs (E59 – E94) will be controlled by a new bin vent filter (CD24) and/or WESP (CD2); and
- VOC, HAP, and TAP emissions controlled by the RTO (CD3).

All exhaust from the DHMs will ultimately be controlled by WESP (CD2) and RTO-1 (CD3). With this application, Enviva is updating the emissions calculation methodology for these sources relative to previous applications submitted by Colombo. The updates were made to reflect the proposed changes, incorporate additional plant-specific test data as well as data from other Enviva plants for VOC, PM, PM_{10}, $PM_{2.5}$, acetaldehyde, acrolein, formaldehyde, methanol phenol, and propionaldehyde, and to apply Enviva's methodology for scaling VOC emissions to the proposed maximum softwood content of 100%.

DHM emissions were calculated based on stack testing data from the Greenwood plant, assumed control efficiencies, and typical emission factors developed for other facilities and include a contingency factor. The VOC emissions factor was scaled up to account for the

[7] USEPA AP-42 Section 1.6, *Wood Residue Combustion in Boilers* (09/03).

[8] NCDAQ Wood Waste Combustion Spreadsheet for a wood stoker boiler. Available online at: https://files.nc.gov/ncdeq/Air%20Quality/permits/files/WWC_rev_K_20170308.xlsx.

[9] USEPA AP-42 Section 1.4, *Natural Gas Combustion* (07/98). WebFIRE factors are referenced in the NCDAQ spreadsheet in footnote above.

[10] USEPA AP-42 Section 1.6, *Wood Residue Combustion in Boilers* (09/03).

[11] USEPA AP-42 Section 1.3, *Fuel Oil Combustion* (05/10).

proposed increase in the amount of softwood processed from a maximum of 90% to a maximum of up to 100%.

Emissions of criteria pollutants, HAP, and TAP from natural gas combustion by the RTO burners were calculated based on AP-42 Section 1.4, *Natural Gas Combustion* and USEPA's WebFIRE database.[12]

NO_X and CO emissions resulting from thermal oxidation of VOC in the exhaust were calculated using AP-42 Section 1.4, *Natural Gas Combustion*[13], and the maximum high heating value of the anticipated VOC constituents.

3.8 Dry Chip Silo (E13) and Pelletizer Feed Silo (E19)

The Dry Chip Silo (E13) and Pelletizer Feed Silo (E19) are each equipped with bin vent filters (CD4 and CD10, respectively) to control PM emissions associated with silo loading and unloading operations. With this application, Enviva is updating the VOC and HAP emissions calculation methodology for these sources relative to previous applications submitted by Colombo. Specifically, VOC and HAP emissions for these sources were previously assumed to equal emissions from the Green Hammermills and Green Chip Silo. Enviva's updates were made to incorporate plant-specific VOC test data for the Dry Chip Silo and Pelletizer Feed Silo, estimate HAP emissions based on NCASI factors, and to apply Enviva's methodology for scaling VOC emissions to the proposed maximum softwood content of 100%. PM emissions are calculated based on the exit grain loading rate and the maximum nominal exhaust flow rate of the baghouse. VOC emissions were estimated based on testing data from the Greenwood plant and include a contingency factor. HAP, and TAP emissions were calculated based on dry wood handling emission factors from the NCASI Wood Products Database.[14]

3.9 Pelletizers and Pellet Coolers (E20 - E39, E49 - E52)

Pelletizers and Pellet Cooler (E20 - E39 and E49 - E52) operations generate PM, VOC, HAP, and TAP emissions during the forming and cooling of wood pellets. The Pelletizers and Pellet Coolers will be equipped with five existing baghouses (CD14a-c and CD18a and b) and one new baghouse (CD18c) and routed to two existing RTO/RCOs (CD15 and CD19) for emission control. With this application, Enviva is updating the VOC, CO, NO_X, PM_{10}, $PM_{2.5}$, and HAP emissions calculation methodology for these sources relative to previous applications submitted by Colombo. Specifically, the updates were made to:

- Reflect the proposed project changes;
- Incorporate additional plant-specific test data as well as data from other Enviva plants for VOC, CO, NO_X, $PM_{2.5}$, acetaldehyde, acrolein, formaldehyde, methanol, phenol, and propionaldehyde;
- Incorporate PM_{10} speciation data from comparable Enviva facilities;
- Apply Enviva's methodology for scaling VOC emissions to the proposed maximum softwood content of 100%; and
- Quantify HAP emissions resulting from combustion of natural gas in the RTO/RCOs.

[12] USEPA AP-42 Section 1.4, *Natural Gas Combustion* (07/98).

[13] Ibid.

[14] NCASI VOC Dry Wood handling factor based on oriented-strand board operations.

Emissions of PM from the Pelletizers and Pellet Coolers were calculated based on a maximum exit grain loading rate and the maximum nominal exhaust flow rate of the baghouses. Emissions of PM_{10} were calculated based on PM emissions and speciation based on data from a similar Enviva facility. Emissions of $PM_{2.5}$ were quantified based on stack testing data from the Greenwood plant and include a contingency factor.

Emissions of VOC, HAP, TAP, CO and NO_X from the Pelletizers and Pellet Coolers were quantified based on stack testing data from the Greenwood plant and comparable Enviva facilities and include a contingency factor. The VOC emissions factor was scaled up to account for the proposed increase in the amount of softwood processed from a maximum of 90% to a maximum of up to 100%. Note that emissions of CO and NO_X result only from combustion of fuel in the oxidizers. The pelletization process does not generate emissions of these pollutants. Emissions of SO_2, PM, HAP, and TAP from natural gas combustion by the RTO burner were calculated based on AP-42 Section 1.4, *Natural Gas Combustion* and USEPA's WebFIRE database..[15]

3.10 Pellet Silos 1 and 2 (E40 and E41) and Dust Silo (E43)

The Pellet Silos (E40 and E41) are controlled by Cyclofilter 6 (CD20) and the Dust Silo (E43) is controlled by Cyclofilter 7 (CD23). PM emissions are calculated based on the exit grain loading rate and the maximum nominal exhaust flow rate of the baghouses. Although emission calculation methodologies are not changing with this application relative to previous applications submitted by Colombo, Enviva's emission rates reflect the as-built control configuration for the Dust Silo (E43) (i.e., only one cyclofilter serves this silo instead of four).

Emissions of VOC from the Pelletizer Feed Silo (E19), which receives milled wood after it has been dried and processed by the DHMs, are estimated at only 0.02 pounds per hour. By the time the pellets are transferred from the pellet coolers to the pellet storage silos and dust and wood fines are transferred to the dust silo, this material has already cooled substantially and, therefore, VOC emissions from the Pellet Silos 1 and 2 (E40 and E41) and Dust Silo (E43) are negligible.

3.11 Pellet Loadout (E42)

PM emissions result from the transfer of finished product to the pellet loadout (E42). PM emissions from pellet loadout bins will be controlled by a baghouse (CD22) downstream of the product recovery cyclone (CD21). Pellet loadout is accomplished by gravity feed of the pellets through four (4) product hoppers equipped with sleeves with emissions controlled by the baghouse. Potential PM emissions from the baghouse were calculated based on a maximum exit grain loading rate and the maximum nominal exhaust flow rate of the baghouse. Emissions of PM_{10} and $PM_{2.5}$ were conservatively assumed to equal PM emissions.

Similar to the Pellet Storage Silos (E40 and E41), by the time the pellets are being loaded out, this material has already cooled substantially and, therefore, VOC emissions from the Pellet Loadout (E42) are negligible.

3.12 Emergency Generator (E44) and Fire Pump Engine (E45)

Operation of the Emergency Generator and Fire Water Pump engines generates emissions of criteria pollutants, HAP, and TAP. Criteria pollutant emissions (except VOC and SO_2) were estimated based on factors from the technical data sheet for the Emergency Generator

[15] USEPA AP-42 Section 1.4, *Natural Gas Combustion* (07/98).

engine and emission standards in Table 4 of NSPS Subpart IIII for the Fire Water Pump engine. Potential SO_2 emissions were calculated based on the fuel sulfur restriction in NSPS Subpart IIII, and by assuming that all of the sulfur present in the diesel fuel is emitted as SO_2.[16] Potential VOC, HAP, and TAP emissions were quantified based on emission factors from AP-42 Section 3.3, *Stationary Internal Combustion Engines*.[17] Annual potential emissions were conservatively calculated based on 500 hours per year. With this application, Enviva is updating emissions estimates previously submitted by Colombo for the Firewater Pump Engine (E45) to use NSPS Subpart IIII limits applicable specifically to stationary fire pump engines rather than limits applicable to other types of emergency engines.

The Emergency Generator and Fire Water Pump engines are not impacted by the proposed project and are exempt from construction permitting requirements per SC Regulation 61.62.1, Section II.B.2.f.ii and Section II.B.2.h, respectively.

3.13 Diesel Storage Tanks (E53 – E55)

The storage of diesel in on-site Storage Tanks generates emissions of VOC. With this application, Enviva is providing estimates of these emissions, which were not quantified in previous applications submitted by Colombo. Emissions of VOC from the three (3) Diesel Storage Tanks were calculated using equations and inputs from AP-42 Section 7.1, *Organic Liquid Storage Tanks*.[18] Emissions were based on actual tank characteristics (e.g., orientation, dimensions, etc.) and potential annual throughput.

The diesel storage tanks are exempt from construction permitting requirements per SC Regulation 61-62.1, Section II.B.2.h as total uncontrolled potential emissions are less than 5 tpy each of PM, SO_2, NO_X, CO, and total uncontrolled VOC emissions are less than 1,000 lb/month.

3.14 Unpaved and Paved Roads (E56 and E57)

Fugitive PM emissions occur as a result of trucks and employee vehicles traveling on Paved and Unpaved Roads on the Greenwood plant property. With this application, Enviva is providing estimates of these emissions, which were not quantified in previous applications submitted by Colombo. Emission factors for Unpaved Road emissions were calculated based on Equation 1a from AP-42 Section 13.2.2, *Unpaved Roads*[19] using a surface material silt content of 8.4% and 120 days with rainfall greater than 0.01 inches based on Figure 13.2.1-2. Emissions factors for Paved Road emissions were calculated based on Equation 2 from AP-42 Section 13.2.1, *Paved Roads*[20] using a surface material silt content of 8.2% and 120 days with rainfall greater than 0.01 inch based on Figure 13.2.1-2. A 90% control efficiency was applied to Unpaved and Paved Road emissions for water/dust suppression activities. This control efficiency is based on data from the *Air Pollution Engineering Manual* of the Air and Waste Management Association.

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

[17] USEPA AP-42 Section 3.3, *Stationary Internal Combustion Engines* (10/96).

[18] USEPA AP-42 Section 7.1, *Organic Liquid Storage Tanks* (11/06).

[19] USEPA AP-42 Section 13.2.2, *Unpaved Roads* (11/06).

[20] USEPA AP-42 Section 13.2.1, *Paved Roads* (01/11).

3.15 Dryer Duct Burner (E48)

With this application, Enviva is providing estimates of emissions from the Dryer Duct Burner (E48), which were not quantified in previous applications submitted by Colombo. Emissions from natural gas combustion by the Dryer Duct Burner (E48) were calculated based on AP-42 Section 1.4, *Natural Gas Combustion*.[21]

The Duct Burner is exempt from construction permitting requirements per SC Regulation 61-62.1, Section II.B.2.h as total uncontrolled potential emissions are less than 5 tpy each of PM, SO_2, NO_x, CO, and total uncontrolled VOC emissions are less than 1,000 lb/month.

[21] USEPA AP-42 Section 1.4, *Natural Gas Combustion* (07/98).

4. STATE AND FEDERAL PERMITTING APPLICABILITY

The Enviva Greenwood plant is subject to federal and state air quality permitting requirements. The following sections summarize the applicability of federal and state permitting programs.

4.1 Federal Permitting Programs

The federal NSR permitting program includes requirements for construction of new major sources, and modifications to existing major sources, while the Title V Operating Permit Program includes requirements for operation of Title V major sources. The following sections discuss the applicability of these requirements to the Greenwood plant.

4.1.1 New Source Review

NSR is a federal pre-construction permitting program that applies to certain major stationary sources. The federal NSR permitting program is implemented in South Carolina pursuant to SC Regulation 61-62.5, Standard No. 7 and Standard No. 7.1. The primary purpose of NSR is to support the attainment and maintenance of ambient air quality standards across the country. There are two distinct permitting programs under NSR. The specific program that applies to a facility depends on the ambient air quality designation in the geographic area in which the source is located. The two programs are nonattainment NSR (NNSR) and PSD. Because NNSR and PSD requirements are pollutant-specific, a stationary source can be subject to NNSR requirements for one or more regulated NSR pollutants and to PSD requirements for the remaining regulated NSR pollutants.

NNSR permitting requirements apply to an existing stationary source located in an area where concentrations of a "criteria pollutant".[22] exceed the National Ambient Air Quality Standard (NAAQS) for that pollutant. PSD permitting requirements apply to major stationary sources for each criteria pollutant for which the geographic area in which the source is located has been designated as unclassifiable or in attainment with the NAAQS. PSD permitting requirements may also apply to certain stationary sources regardless of location for each regulated NSR pollutant that is not a criteria pollutant (e.g., fluorides, hydrogen sulfide, and sulfuric acid mist).

The Greenwood plant is located in Greenwood County which is designated as attainment or unclassifiable for all criteria pollutants..[23] The Greenwood plant is classified as a PSD minor source because facility-wide potential emissions of each individual criteria pollutant are below the major source threshold of 250 tpy. As shown in the potential emissions calculations provided in **Appendix C**, following the proposed project, the facility-wide potential emissions will remain under the PSD major source threshold.

4.1.2 Title V Operating Permit Program

The Federal Title V Operating Permit program is codified in 40 CFR Part 70 and is implemented in South Carolina via SC Regulation 61-62.70. The Greenwood plant is a major source with respect to the Title V Operating Permit Program because facility-wide emissions of one or more criteria pollutants exceed the major source threshold of 100 tpy. The facility is considered an area source of HAP due to total HAP emissions and maximum individual HAP

[22] The following are "criteria pollutants" under current NSR regulations: CO, nitrogen dioxide, SO_2, PM_{10}, $PM_{2.5}$, ozone (VOCs and NO_x), and lead.

[23] 40 CFR 81.341

emissions being below the major source thresholds of 25 tpy and 10 tpy, respectively. The proposed project will not change the facility's Title V or HAP source status.

4.2 State Permitting Programs

South Carolina's state construction permitting requirements are codified under SC Regulation 61-62.1, Section II. In accordance with SC Regulation 61-62.1, Section II.A.1.a., and unless otherwise exempt, facilities must obtain a permit prior to beginning construction of new or modified emissions units. The required application forms are included in Appendix D.

5. REGULATORY APPLICABILITY

The Greenwood plant is subject to federal and state air quality regulations. The following addresses all potentially applicable regulations.

5.1 New Source Performance Standards

New Source Performance Standards (NSPS) apply to new and modified sources and require sources to control emissions in accordance with standards set forth at 40 CFR Part 60. NSPS standards in 40 CFR Part 60 have been incorporated by reference in SC Regulation 61-62.60, Subpart A.

5.1.1 40 CFR 60 Subpart A – General Provisions

All sources subject to a NSPS are subject to the general requirements under Subpart A unless excluded by the source-specific subpart. Subpart A includes requirements for initial notification, performance testing, recordkeeping, monitoring, and reporting. Subpart A is applicable because the Emergency Generator and Fire Water Pump Engine are subject to NSPS Subpart IIII.

5.1.2 40 CFR 60 Subpart Db – Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units

NSPS Subpart Db applies to owners and operators of steam generating units for which construction, modification, or reconstruction commenced after June 19, 1984 and that have a maximum design heat input of greater than 100 MMBtu/hr. The Greenwood plant Furnace (E11) is not a steam generating unit; therefore, NSPS Subpart Db does not apply.

5.1.3 40 CFR 60 Subpart Dc – Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units

NSPS Subpart Dc applies to owners or operators of steam generating units for which construction, modification, or reconstruction is commenced after June 9, 1989 and that have a maximum design heat input of 100 MMBtu/hr or less but greater than or equal to 10 MMBtu/hr. The Greenwood plant Double Duct Burner has a maximum heat input of 5 MMBtu/hr and is not a steam generating unit; therefore, NSPS Subpart Dc does not apply.

5.1.4 40 CFR 60 Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

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. The existing 865 bhp emergency Generator and 305 hp Fire Pump engines at the Greenwood plant are subject to NSPS Subpart IIII and the proposed changes included in this application do not impact the applicability of NSPS Subpart IIII requirements for the engines.

5.2 National Emission Standards for Hazardous Air Pollutants

National Emission Standards for Hazardous Air Pollutants (NESHAP) regulate HAP emissions and are applicable to certain major and area sources of HAP. NESHAP can be found in 40 CFR Part 63. NESHAP standards in 40 CFR Part 63 have been incorporated by reference in SC Regulation 61-62.63, Subpart A. As previously discussed, the Greenwood plant will remain a minor source of HAP due to facility-wide total HAP emissions being below 25 tpy and maximum individual HAP emissions below 10 tpy (refer to emissions calculations in Appendix C).

5.2.1 40 CFR 63 Subpart A – General Provisions

All sources subject to a NESHAP are subject to the general requirements under Subpart A unless excluded by the source-specific subpart. Subpart A includes requirements for initial notification, performance testing, recordkeeping, monitoring, and reporting. The Emergency Generator and Fire Water Pump Engine are subject to Subpart ZZZZ of this part and thus, Subpart A is also applicable to these sources.

5.2.2 40 CFR 63 Subpart B – Requirements for Control Technology Determinations for Major Sources in Accordance with Clean Air Act Section 112(g)

Section 112(g)(2)(B) of the Clean Air Act (CAA) requires that a new or reconstructed stationary source that does not belong to a regulated "source category" for which a NESHAP has been promulgated control emissions to levels that reflect "maximum achievable control technology" (MACT). As provided in §63.40(b), a case-by-case MACT evaluation is only required prior to the construction or reconstruction of a major source of HAP emissions. The Greenwood plant will not be subject to 112(g) since it is currently, and will remain, an area source of HAP emissions.

5.2.3 40 CFR 63 Subpart DDDD – NESHAP for Plywood and Composite Wood Products

Subpart DDDD regulates HAP emissions from plywood and composite wood products (PCWP) manufacturing facilities located at major sources of HAPs. The facility is not a major source of HAP emissions and, further, the wood pellets manufactured at the facility do not meet the definition of any of the PCWP products under §63.2292 that are subject to Subpart DDDD. Specifically, the wood pellets are not an engineered wood product, as they are not bound together with resin or other chemical agents. Therefore, this regulation is not applicable.

5.2.4 40 CFR 63 Subpart ZZZZ – NESHAP for Stationary Reciprocating Internal Combustion Engines

Subpart ZZZZ applies to reciprocating internal combustion engines (RICE) located at a major or area source of HAP emissions. Emergency stationary RICE are defined in §63.6675 as any stationary RICE that operates in an emergency situation. These situations include engines used for power generation when a normal power source is interrupted, or when engines are used to pump water in the case of fire or flood. The Greenwood plant's emergency Generator and emergency Fire Water Pump are both classified as emergency RICE under Subpart ZZZZ. New or reconstructed CI engines located at an area source of HAP, such as the facility's Emergency Generator and Fire Water Pump engine, are only required to comply with the applicable provisions of NSPS Subpart IIII, per §63.6590(c)(1), and no further requirements apply under Subpart ZZZZ. The applicable requirements of this regulation have previously been incorporated into the facility's current permit and will not be impacted by the proposed permit changes.

5.2.5 40 CFR 63 Subpart DDDDD – NESHAP for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters

Subpart DDDDD, also referred to as the Boiler MACT, provides emission standards for boilers and process heaters located at major sources of HAP emissions. The facility is not a major source of HAP emissions. As such, Subpart DDDDD does not apply.

5.2.6 40 CFR 63 Subpart JJJJJJ – NESHAP for Area Sources: Industrial, Commercial, and Institutional Boilers

Subpart JJJJJJ provides emission standards for boilers located at area sources of HAP emissions. The rule defines a boiler in §63.11237 as an "enclosed device using controlled flame combustion in which water is heated to recover thermal energy in the form of steam and/or hot water [...]." The facility does not currently operate any units that meet the Subpart JJJJJJ definition of a boiler and Enviva is not proposing to add boilers to the facility as part of the proposed project. Therefore, Subpart JJJJJJ is not applicable.

5.3 Compliance Assurance Monitoring

Compliance Assurance Monitoring (CAM) under 40 CFR Part 64 applies to emission units located at a Title V major source that use a control device to achieve compliance with an emission limit and whose pre-controlled emissions exceed the major source thresholds. A CAM plan is required to be submitted with the initial Title V operating permit application for emission units whose post-controlled emissions exceed the major source thresholds (i.e., large pollutant-specific emission units [PSEU]). For emission units with post-controlled emissions below the major source thresholds, a CAM plan must be submitted with the first Title V permit renewal application.

CAM will potentially be applicable to sources at the Greenwood plant. However, no emissions units have post-controlled emissions above major source thresholds and, therefore, any CAM plans that may be required will not be due until submittal of the facility's first Title V renewal application. Applicability of 40 CFR Part 64 requirements will be fully assessed at that time.

5.4 Chemical Accident Prevention Provisions

The Chemical Accident Prevention Provisions, codified in 40 CFR Part 68 and implemented in SC Regulation 61-62.68, provide requirements for the development of risk management plans (RMP) for regulated substances. Applicability of RMP requirements is based on the types and amounts of chemicals stored at a facility. No regulated substances under Subpart F of this rule will be stored at the Greenwood plant; therefore, an RMP is not required for the Greenwood plant.

5.5 South Carolina Administrative Code

In addition to federal regulations, SC Regulation 61-62 establishes regulations applicable at both the emission unit and facility level in South Carolina. The state regulations also include general requirements for facilities, such as the requirement to obtain construction and operating permits (discussed in Section 4.2 above). Source-specific standards in SC Regulation 61-62 that are potentially applicable to the facility as a result of this project are discussed in the following sections.

5.5.1 SC Regulation 61-62.5 Standard No. 1 Emissions from Fuel Burning Operations

This regulation establishes emissions standards for "fuel burning operations", which are defined as the "use of a furnace, boiler, device, or mechanism used principally, but not exclusively, to burn any fuel for the purpose of indirect heating in which the material being heated is not contacted by and adds no substance to the products of combustion." The facility's duct burner is used for indirect heating of exhaust gases and, therefore, is subject to this regulation and the following emission standards:

- Opacity may not exceed 20%;
- Emissions of PM may not exceed 0.6 lbs/MMBtu; and
- Emissions of SO_2 may not exceed 2.3 lb/MMBtu.

The duct burner is fired with pipeline quality natural gas and complies with the emission limitations above.

The facility's Furnace (E11) provides direct heating of the wood chips and, therefore, is not subject to this regulation.

5.5.2 SC Regulation 61-62.5 Standard No. 2 Ambient Air Quality Standards and SC Regulation 61-62.1, Section II.C.3.n. Modeling Analysis Requirement

Under this regulation, construction permit applications shall provide an air dispersion modeling analysis or other information to demonstrate that emissions from the facility will not interfere with the attainment or maintenance of any air quality standard under SC Regulation 61-62.5 Standard No. 2. The modeling analysis is discussed in detail in Section 6.

5.5.3 SC Regulation 61-62.5, Standard No. 3, Section III.I.1 Control of Visible Emissions for Industrial Incinerators

Under this regulation, visible emissions from industrial incinerators are limited to no more than 20% opacity. The Greenwood plant's existing thermal oxidizers demonstrate compliance with this opacity limit through weekly visual opacity observations.

5.5.4 SC Regulation 61-62.5, Standard No. 3, Section III.I.2 Control of PM Emissions for Industrial Incinerators

Under this regulation, PM emissions from industrial incinerators are limited to no more than 0.5 lb/MMBtu total heat input. The Greenwood plant's thermal oxidizers comply with this limit.

5.5.5 SC Regulation 61-62.5, Standard No. 4, Section VIII Control of PM Emissions

Under this regulation, PM emissions from all sources are limited to the rate specified in Table A of SC Regulation 61-62.5, Standard No. 4, Section VIII. For process weights greater than 5 tons per hour, the equations within this section must be used to determine the limit of PM emissions. All emissions from PM sources at the Greenwood plant will either be negligible or controlled by particulate matter control devices, and thus, will comply with this requirement. The emissions rates and corresponding process weight limits for the Greenwood plant are provided in Appendix C.

5.5.6 SC Regulation 61-62.5, Standard No. 4, Section IX Control of Visible Emissions (Where Not Specified Elsewhere)

Under this regulation, visible emissions from all sources are limited to no more than 20% opacity. This rule applies to all processes at the facility that may have visible emissions. The Greenwood plant complies with this rule by operating PM control devices and using best operating practices for uncontrolled sources at the facility.

5.5.7 SC Regulation 61-62.5, Standard No. 4, Section X Control of PM Emissions

Under this regulation, PM emissions from all non-enclosed operations are required to be minimized. This rule applies to all non-enclosed processes at the facility that may have PM

emissions. The Greenwood plant complies with this rule by using proper operating practices to minimize emissions from non-enclosed sources at the facility [i.e., Debarking, Chipping, Screening, Pile Drop, and Pile Erosion (E1 through E5)] and by limiting vehicle speed to minimize roadway fugitive dust emissions.

5.5.8 SC Regulation 61-62.5, Standard No. 5 Volatile Organic Compounds

This regulation establishes VOC emission standards for activities listed in Section II of the regulation. With the exception of fixed roof diesel storage tanks, the Greenwood plant does not maintain any of the regulated activities. Furthermore, this regulation applies only to petroleum liquid storage in fixed roof tanks with a capacity of 40,000 gallons or larger and, therefore, is not applicable to the Greenwood diesel tanks (Part O).

5.5.9 SC Regulation 61-62.5, Standard No. 5.2, Section III Control of NO_x Emissions

Under this regulation, NO_x emissions from the 200 MMBtu/hr furnace (E11) must comply with the limitations set forth in Table 1 of SC Regulation 61-62.5, Standard 5.2, Section III. The Greenwood plant complies with this regulation by using a modern furnace design that results in emissions of NO_x that are 30% lower relative to furnaces that do not employ this design, as documented in the vendor statement provided in the December 2017 permit application for the facility. In addition, and in accordance with current permit conditions, the Greenwood plant conducts tune-ups on the furnace every 24 months in accordance with manufacturer specifications or good engineering practices.

5.5.10 SC Regulation 61-62.5, Standard No. 8, Section II Toxic Air Emissions

Under this regulation, any person who constructs, alters, or adds to a source of TAP must demonstrate compliance with each toxic's maximum allowable 24-hour average concentration. This standard is applicable to all sources of TAP unless specifically exempt by the regulation or by SC DHEC's Modeling Guidelines for Air Quality Permits (October 2018, revised April 2019). There are several bases on which sources may be exempt from the requirement to demonstrate compliance with Standard No. 8, including:

- Fuel burning sources which burn only virgin fuel or specification used oil; and
- Facility-wide emissions of a toxic is below the de minimis emission rate in lb/day.

The Greenwood plant conducted a modeling analysis in order to demonstrate compliance with Standard No. 8 for subject sources. The modeling analysis and results are discussed further in Section 6.

5.5.11 SC Regulation 61-62.6, Section III Control of PM Emissions Statewide

Under this regulation, fugitive PM emissions are required to be controlled in such a manner and to the degree that it does not create an undesirable level of air pollution. This rule applies to all fugitive sources at the facility that may have PM emissions. The Greenwood plant complies with this rule by conducting modeling analyses to indicate compliance with the PM NAAQS (see Section 6) and by using proper operating practices to minimize emissions from non-enclosed sources at the facility [i.e., Debarking, Chipping, Screening, Pile Drop, and Pile Erosion (E1 through E5)] and by limiting vehicle speed to minimize roadway fugitive dust emissions.

6. AIR QUALITY MODELING ANALYSES

As discussed previously, SC Regulations 61-62.5 Standard No. 2 establishes ambient air quality standards (AAQS) for South Carolina and SC Regulation 61-62.5 Standard No. 8 establishes Toxic Air Emissions requirements for new or modified sources. Pursuant to SC Regulation 61-62.1 Section II.C.3.n, SC Regulation 61-62.5 Standard No. 8, and the April 2019 South Carolina *Modeling Guidelines for Air Quality Permits* (SC Modeling Guidelines), air dispersion modeling must be conducted as part of a construction permit application to demonstrate compliance with the AAQS and maximum allowable ambient concentrations (MAAC) for TAP.

6.1 State Requirements

Dispersion modeling for TAP and criteria pollutant emissions was conducted consistent with the following state and federal guidance documents:

- South Carolina *Modeling Guidelines for Air Quality Permits* (Revised April 15, 2019);
- USEPA's Guideline on Air Quality Models 40 CFR 51, Appendix W (Revised, January 17, 2017), herein referred to as Appendix W;[24] and
- USEPA's *AERMOD Implementation Guide* (Revised August 28, 2019).

In accordance with SC Modeling Guidelines, emission units with emissions of less than 5 tpy each of PM_{10}, $PM_{2.5}$, SO_2, NO_X, and CO are exempt from modeling requirements for those pollutants that are under the threshold. Additionally, modeling of lead emissions is required only if facility-wide lead emissions exceed the 0.5 tpy exemption threshold. Potential emissions of PM_{10}, $PM_{2.5}$, SO_2, NO_X, CO, and lead were compared to the exemption thresholds in Table 2.1 of the SC Modeling Guidelines to identify the source-pollutant combinations subject to modeling requirements. Additionally, facility-wide potential emissions for each Standard No. 8 TAP were compared to their respective de minimis threshold in Table B.1 of the SC Modeling Guidelines to determine which TAP were subject to modeling (see Table 6-1). Finally, additional exemptions specified in the SC Modeling Guidelines were determined to apply to certain Greenwood plant emission units. Specifically:

- The Duct Burner (E48) emissions are below the criteria pollutant exemption thresholds and therefore not subject to Standard No. 2 modeling. Furthermore, this unit only burns "virgin fuel" and therefore, is exempt from Standard No. 8 modeling.
- The Emergency Generator and Fire Pump Engines (E44, E45) are also exempt from Standard No. 2 and Standard No. 8 modeling requirements because of uncontrolled criteria pollutant emissions below exemption thresholds and the fact that they burn "virgin fuel" only.
- Storage Piles and Roadways (E4, E5, E56, E57) are exempt from Standard No. 2 modeling requirements because the facility maintains a fugitive dust control plan.

[24] Appendix W was revised on December 17, 2016 (Federal Register Vol. 82, No. 10); however, on January 26, 2017 the effective date of the final rule was delayed until March 21, 2017 (Federal Register Vol. 82, No. 16). On March 20, 2017 the effective date of the final rule was further delayed to May 22, 2017 (Federal Register Vol. 82, No. 52), upon which it became effective.

- Other sources not specifically discussed above were exempt from modeling due to uncontrolled criteria pollutant emissions being below exemption thresholds or due to facility-wide TAP emissions being below the de minimis thresholds.

Table 6-1. Comparison to Standard No. 8 Air Toxic De Minimis Exemption Thresholds

Pollutant	Potential Emissions (lb/day)	De Minimis Threshold (lb/day)	Modeling Required?
Acetaldehyde	22.267	21.600	**Yes**
Acrolein	21.563	0.015	**Yes**
Formaldehyde	31.214	0.180	**Yes**
Methanol	20.852	15.720	**Yes**
Phenol	16.640	2.280	**Yes**
Propionaldehyde	8.043	+	No
Acetophenone	0.000	+	No
Antimony and compounds	0.011	0.030	No
Arsenic	0.030	0.012	**Yes**
Benzene	1.192	1.800	No
Beryllium	0.002	0.000	**Yes**
1,3-Butadiene	0.008	1.326	No
Cadmium	0.006	0.003	**Yes**
Carbon tetrachloride	0.056	1.800	No
Chlorine	4.588	0.900	**Yes**
Chlorobenzene	0.041	20.700	No
Chloroform	0.007	3.000	No
Chromium VI	0.002	0.030	No
Cobalt compounds	0.009	0.003	**Yes**
Dichlorobenzene	0.001	54.000	No
Dichloroethane, 1,2-	0.036	2.400	No
Dichloropropane, 1,2-	0.041	21.000	No
Dinitrophenol, 2,4-	0.000	+	No
Di(2-ethylhexyl)phthalate	0.000	0.300	No
Ethyl benzene	0.039	52.200	No
Hexane	0.872	10.800	No
Hydrochloric acid	28.272	2.100	**Yes**
Manganese	2.170	0.300	**Yes**
Mercury	0.005	0.003	**Yes**
Methyl bromide	0.019	1.200	No
Methyl chloride	0.029	6.180	No
Methylene chloride	0.070	105.000	No
Naphthalene	0.122	15.000	No
Nickel	0.046	0.006	**Yes**
Pentachlorophenol	0.000	0.060	No
Perchloroethylene	0.047	40.200	No
Phosphorus metal, yellow or white	0.037	0.006	**Yes**

Pollutant	Potential Emissions (lb/day)	De Minimis Threshold (lb/day)	Modeling Required?
Polychlorinated biphenyls	0.000	0.030	No
Polycyclic Organic Matter	0.189	1.920	No
Selenium compounds	0.004	0.012	No
Styrene	0.456	63.900	No
Tetrachlorodibenzo-p-dioxin, 2,3,7,8-	0.000	0.000	No
Toluene	0.091	24.000	No
Trichloroethane, 1,1,1-	0.039	114.600	No
Trichloroethylene	0.037	81.000	No
Trichlorophenol, 2,4,6-	0.000	+	No
Vinyl chloride	0.022	0.600	No
Xylene	0.062	52.200	No

1) The "+" symbol represents that a de minimis value is not determined by SC Guidelines; any level of emissions qualifies as de minimis for this pollutant.

Based on the comparison with exemption thresholds and the eligibility of other modeling exemptions, Enviva identified the following sources and pollutants as being subject to modeling requirements:

- Emissions of PM_{10}, $PM_{2.5}$, SO_2, NO_x, CO, and TAP from RTO-1 (CD3) (Model ID RTO1), which includes the following sources:
  - GHMs (E6 – E9, E58);
  - Green Chip Silo (E10);
  - Normal Dryer line operations (E11, E12); and
  - DHMs (E59 – E94).
- Emissions of PM_{10}, $PM_{2.5}$, SO_2, NO_x, CO, and TAP from the Furnace Bypass Stack (E11) for idle mode (Model ID FBYP1_I) and cold start-up (Model ID FBYP1_F) operations.
- Dry Chip Silo (E13) emissions of TAP (model ID DCS);
- Pelletizer Feed Silo (E19) emissions of TAP (model ID PFS);
- Pelletizer and Pellet Cooler (E20 – E39, E49 – E52) emissions of PM_{10}, CO, and TAP (Model ID RTO2 and Model ID RTO3); and
- Electric Powered Chipper (E2) emissions of TAP (Model ID CHIP).

6.1.1 AAQS

Enviva conducted dispersion modeling to demonstrate compliance with the AAQS using the "Conservative Option" listed in Table A.1 of the SC Modeling Guidelines for each criteria pollutant and averaging period, with the exception of the NO_2 annual standard for which there is no conservative option provided in the SC Modeling Guidelines (see Table 6-2). For all pollutants (PM_{10}, $PM_{2.5}$, SO_2, NO_2, CO), the AAQS was compared to the "AERMOD Rank" for that specific pollutant over 5 separate years of modeling data plus the appropriate

background concentration obtained from SC DHEC's website.[25] The closest available background monitor was used for each pollutant. The selection of background concentration locations is consistent with previous modeling conducted for the facility.

Table 6-2. SC Standard No. 2 AAQS Analyses Model Output and Meteorological Data File Options

Pollutant	Averaging Time	AAQS ($\mu g/m^3$)	AERMOD Rank	AERMOD Met File
PM_{10}	24 Hour	150	2nd High	5 Separate Years
$PM_{2.5}$	24 Hour	35	8th High	5 Separate Years
	Annual	12	1st High	5 Separate Years
SO_2	1 Hour	196	4th High	5 Separate Years
	3 Hour	1,300	1st High	5 Separate Years
NO_2	1 Hour	188	8th High	5 Separate Years
	Annual	100	1st High	5 Separate Years
CO	1 Hour	40,000	1st High	5 Separate Years
	8 Hour	10,000	1st High	5 Separate Years

6.1.2 MAAC

Enviva conducted air dispersion modeling for fifteen TAPs with emissions in excess of the SC exemption thresholds. The maximum 24-hour concentration across five years of meteorological data was compared to the 24-hour average MAAC.

6.2 Model Selection

Enviva utilized the latest version of the AERMOD model (Version 19191). AERMOD is the EPA-approved air dispersion model for near-field (within 50 km) modeling analyses. AERMOD was run using default regulatory options.

6.3 Receptor Grid and Elevation Data

Consistent with the SC Modeling Guidelines, a resolution of 50 meters was used for receptors along the ambient boundary and a resolution of 100 meters was used for a Cartesian receptor grid extending approximately 1.5 km from the property line. Modeled concentrations were reviewed to ensure that the maximum concentration was captured for all pollutants and averaging periods within the 1.5 km grid.

Receptor, source, and building elevations were determined using the AERMAP terrain pre-processor (Version 18081). Hill height parameters required by AERMOD were also calculated by AERMAP. Elevations were based on 1/3 arc-second National Elevation Dataset (NED) from the U.S. Geological Survey (USGS). AERMAP input and output files, and a copy of the NED file are provided in Appendix E.

6.4 Meteorological Data

Enviva utilized AERMOD-ready meteorological data processed by SC DHEC for the Greenwood County Airport (KGRD) surface station (ID: 53874) and upper air data from the Greensboro Piedmont Triad International Airport (KGSO) National Weather Service (NWS) station (ID:

[25] BAQ_BackgroundDataforModeling_2019_23_04.xlsx. Available online at: https://scdhec.gov/environment/air-quality/air-dispersion-modeling-data

13723) for the period 2012-2016, consistent with SC DHEC's selection of the most representative meteorological station/data for each county in the state..[26] The selection of meteorological stations is also consistent with previous modeling conducted for the Greenwood plant in December 2017.

The meteorological data were processed by SC DHEC using version 18081 of AERMET and are based on 2012-2016 surface and upper air observations. SC DHEC provides the meteorological data processed with and without the ADJ U* option. Enviva has utilized the meteorological data processed using the ADJ U* option consistent with current SC DHEC and EPA modeling guidance. The base elevation for the Greenwood surface station was set to 192.3 m..[27] The meteorological data files are provided in Appendix E for reference.

6.5 Modeled Sources and Release Parameters

As previously described in Section 2, there are several different operating scenarios for the Greenwood plant dryer and furnace. Each operating scenario was modeled to assess compliance with the AAQS and MAAC. The following source groups were included to reflect the three operating modes:

- NORM1: All sources operating under normal conditions;
- BYPI: Dryer line in furnace bypass "idle mode" with all other sources operating under normal conditions; and
- BYPF: Dryer line in furnace bypass "cold start-up" will all other sources operating under normal conditions.

Tables 6-3 and 6-4 present a summary of the modeled sources and associated release parameters. Modeled emission rates are consistent with the maximum emission rates provided in the potential emissions calculations in Appendix C. For the Furnace (E11) Bypass Stack during cold start-up (Model ID FBYP1_F), the modeled short-term emission rates for $PM_{2.5}$ and PM_{10} are equal to the daily average emission rate and were conservatively determined assuming use of the furnace bypass stack for cold start-ups will not exceed 12 hours per start-up event. However, based on permit conditions, use of the furnace bypass stack will be limited to 8 hours per start-up event. Therefore, modeled emission rates for the furnace bypass stack are conservative and overestimate potential emissions emitted to the atmosphere. The modeled annual $PM_{2.5}$ emission rate is based on 50 hours of cold start-up per year.

A figure showing the modeled layout is provided in Appendix F.

6.5.1 Point Sources

Each modeled source with a defined vertical, unobstructed stack was represented as a POINT source and each source with a defined horizontal stack was represented as a POINTHOR source. None of the modeled stacks at the Greenwood plant have a rain cap. Modeled stack parameters for point sources are summarized in Table 6-3 below.

[26] https://scdhec.gov/environment/air-quality/air-dispersion-modeling-data

[27] https://scdhec.gov/sites/default/files/media/document/NWS-Meteorological-Data-Pairs-AERMOD-BAQ-2012-16.pdf

Table 6-3. Summary of Modeled Point Source Parameters

Model ID	Emission Point Description	Source Type	UTM Easting[1] (m)	UTM Northing[1] (m)	Stack Height (m)	Exhaust Temperature (K)	Exit Veloc. (m/s)	Stack Diam. (m)
RTO1	RTO-1 (CD3)	POINT	401937.00	3788078.00	23.00	395.37	17.70	2.54
FBYP1_I	Furnace (E11) Bypass Stack "Idle Mode"	POINT	401883.00	3788057.00	24.31	560.93	0.70	1.83
FBYP1_F	Furnace (E11) Bypass Stack Cold Start-Up	POINT	401883.00	3788057.00	24.31	505.37	1.88	1.83
DCS	Dry Chip Silo (E13)	POINTHOR	401922.17	3788115.91	25.90	Ambient	13.35	0.30
PFS	Pelletizer Feed Silo (E19)	POINTHOR	402010.00	3788191.00	25.90	Ambient	13.35	0.30
RTO2	RTO2/RCO1 (CD15)	POINT	401976.00	3788211.00	34.30	400.00	16.01	1.37
RTO3	RTO3/RCO2 (CD19)	POINT	401992.00	3788227.00	34.30	400.00	16.01	1.37

1. Coordinates reflect NAD83, UTM Zone 17.

6.5.2 Volume Sources

Fugitive TAP emissions associated with the chipper were modeled using a volume source. Initial lateral and vertical dimensions were determined in accordance with the AERMOD User's Guide.[28] Modeled volume source parameters are summarized in Table 6-4 below.

Table 6-4. Summary of Modeled Volume Source Parameters

Model ID	UTM Easting[1] (m)	UTM Northing[1] (m)	Release Height (m)	Initial Lateral Dimension (m)	Initial Vertical Dimension (m)
CHIP	401639.00	3787901.00	1.97	0.97	3.67

1. Coordinates reflect NAD83, UTM Zone 17.

6.6 GEP Stack Height Analysis

EPA has promulgated regulations that limit the maximum stack height that may be used in a modeling analysis to no more than Good Engineering Practice (GEP) stack height. The purpose of this requirement is to prevent the use of excessively tall stacks to reduce the

[28] USEPA. User's Guide for the AMS/EPA Regulatory Model (AERMOD). EPA-454/B-19-027. August 2019.

modeled concentrations of a pollutant. GEP stack height is impacted by the heights of nearby structures. In general, the minimum value for GEP stack height is 65 meters. The stack heights for all sources at the Greenwood plant are less than 65 meters and were thus modeled using actual stack heights.

6.7 Building Downwash

The AERMOD model incorporates Plume Rise Modeling Enhancements (PRIME) to account for downwash. The direction-specific building downwash dimensions used as inputs were determined by the latest version (04274) of the Building Profile Input Program, PRIME (BPIP PRIME). Per USEPA instruction, the draft version of BPIP PRIME (19191_DRFT) was not used. BPIP PRIME uses building downwash algorithms incorporated into AERMOD to account for the plume dispersion effects of the aerodynamic wakes and eddies produced by buildings and structures. On-site structures at the Greenwood plant were evaluated for downwash effects on each modeled point source. BPIP input and output files are included in Appendix E.

6.8 MAAC Modeling Results

As shown in Table 6-5 below, modeled concentrations for each of the fifteen TAPs are below their respective MAAC. As such, the Greenwood plant will not cause an exceedance of the MAAC for any of the modeled TAP. Modeled concentrations are shown to two decimal places for comparison to the MAAC per SC Modeling Guidance. AERMOD input and output files are provided in Appendix E.

6.9 AAQS Modeling Results

As shown in Table 6-6 below, modeled concentrations for criteria pollutants are below the respective AAQS thresholds. Therefore, the Greenwood plant will not cause an exceedance of the AAQS. AERMOD input and output files are provided in Appendix E.

Table 6-5. Comparison of Maximum Modeled Concentrations to the MAAC

Pollutant	Averaging Period	Source Group	UTM Easting[1] (m)	UTM Northing[1] (m)	Modeled Concentration (µg/m³)[2]	MAAC (µg/m³)	Exceeds MAAC?
Acetaldehyde	24-Hour	NORM1	401,963.81	3,788,362.21	0.54	1,800	No
		BYPI	402,034.65	3,788,430.88	0.28		No
		BYPF	402,034.65	3,788,430.88	0.29		No
Acrolein	24-Hour	NORM1	401,999.23	3,788,396.55	0.56	1.25	No
		BYPI	402,034.65	3,788,430.88	0.46		No
		BYPF	401,786.70	3,788,190.52	0.58		No
Arsenic	24-Hour	NORM1	401,963.81	3,788,362.21	0.00	1.00	No
		BYPI	401,786.70	3,788,190.52	0.00		No
		BYPF	401,786.70	3,788,190.52	0.00		No
Beryllium	24-Hour	NORM1	401,963.81	3,788,362.21	0.00	0.01	No
		BYPI	401,786.70	3,788,190.52	0.00		No
		BYPF	401,786.70	3,788,190.52	0.00		No
Cadmium	24-Hour	NORM1	401,963.81	3,788,362.21	0.00	0.25	No
		BYPI	401,786.70	3,788,190.52	0.00		No
		BYPF	401,786.70	3,788,190.52	0.00		No
Chlorine	24-Hour	NORM1	401,963.81	3,788,362.21	0.07	75.00	No
		BYPI	401,786.70	3,788,190.52	0.07		No
		BYPF	401,786.70	3,788,190.52	0.11		No
Cobalt	24-Hour	NORM1	401,963.81	3,788,362.21	0.00	0.25	No
		BYPI	401,786.70	3,788,190.52	0.00		No
		BYPF	401,786.70	3,788,190.52	0.00		No
Formaldehyde	24-Hour	NORM1	401,999.23	3,788,396.55	1.34	15.00	No
		BYPI	401,999.23	3,788,396.55	1.32		No
		BYPF	401,999.23	3,788,396.55	1.39		No
Hydrochloric acid	24-Hour	NORM1	401,963.81	3,788,362.21	0.17	175.00	No
		BYPI	401,786.70	3,788,190.52	1.68		No
		BYPF	401,786.70	3,788,190.52	2.74		No
Manganese	24-Hour	NORM1	401,963.81	3,788,362.21	0.01	25.00	No
		BYPI	401,786.70	3,788,190.52	0.14		No
		BYPF	401,786.70	3,788,190.52	0.23		No

Pollutant	Averaging Period	Source Group	UTM Easting[1] (m)	UTM Northing[1] (m)	Modeled Concentration (µg/m³)[2]	MAAC (µg/m³)	Exceeds MAAC?
Mercury	24-Hour	NORM1	401,963.81	3,788,362.21	0.00	0.25	No
		BYPI	401,786.70	3,788,190.52	0.00		No
		BYPF	401,786.70	3,788,190.52	0.00		No
Methanol	24-Hour	NORM1	401,589.56	3,787,999.16	9.94	1,310	No
		BYPI	401,589.56	3,787,999.16	9.94		No
		BYPF	401,589.56	3,787,999.16	9.94		No
Nickel	24-Hour	NORM1	401,963.81	3,788,362.21	0.00	0.50	No
		BYPI	401,786.70	3,788,190.52	0.00		No
		BYPF	401,786.70	3,788,190.52	0.00		No
Phenol	24-Hour	NORM1	401,963.81	3,788,362.21	0.42	190.00	No
		BYPI	402,034.65	3,788,430.88	0.20		No
		BYPF	402,034.65	3,788,430.88	0.20		No
Phosphorous	24-Hour	NORM1	401,963.81	3,788,362.21	0.00	0.50	No
		BYPI	401,786.70	3,788,190.52	0.00		No
		BYPF	401,786.70	3,788,190.52	0.00		No

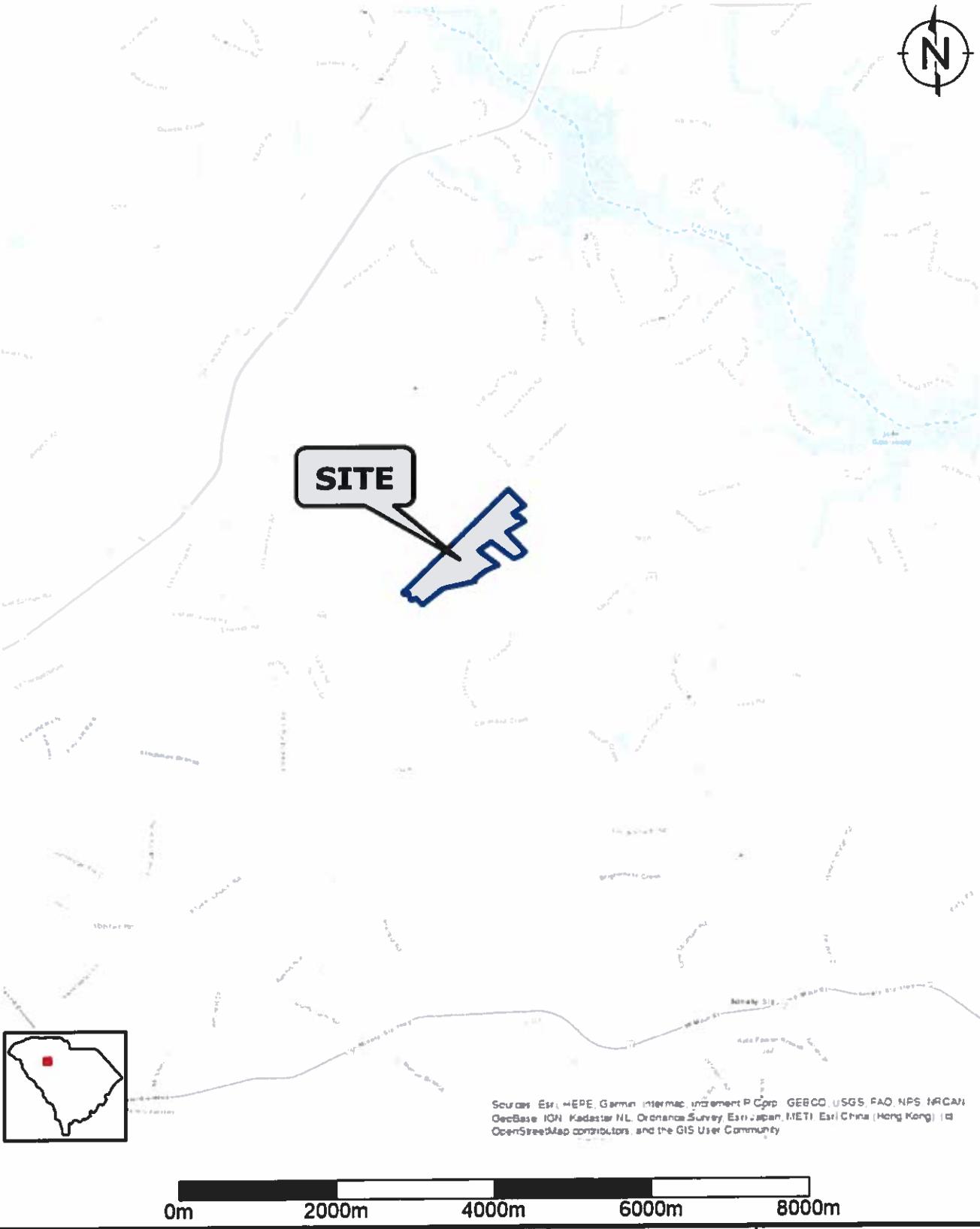
1. Coordinates reflect NAD83, UTM Zone 17.
2. Modeled concentrations are shown to two decimal places for comparison to the MAAC per SC Modeling Guidance. Concentrations for pollutants showing as 0.00 can be found in the individual AERMOD Output files.

Table 6-6. Comparison of Modeled Concentrations to the AAQS

Pollutant	Averaging Period	Source Group	UTM Easting[1] (m)	UTM Northing[1] (m)	Modeled Concentration (µg/m³)	Background Concentration (µg/m³)[2]	Total Concentration (µg/m³)	AAQS (µg/m³)	Exceeds AAQS?
PM_{10}	24 Hour	NORM1	402,034.65	3,788,430.88	6.5	60	66	150	No
		BYPI	401,786.70	3,788,190.52	33.2		93		No
		BYPF	401,786.70	3,788,190.52	27.1		87		No
$PM_{2.5}$	24 Hour	NORM1	402,265.86	3,788,292.59	2.3	16.4	19	35	No
		BYPI	401,822.12	3,788,224.86	16.0		32		No
		BYPF	401,822.12	3,788,224.86	13.0		29		No
	Annual	NORM1	402,269.28	3,788,288.63	0.5	8.3	9	12	No
		BYPI	402,265.86	3,788,292.59	2.5		11		No
		BYPF	402,265.86	3,788,292.59	0.0		8		No
SO_2	1 Hour	NORM1	401,963.81	3,788,362.21	6.4	7.9	14	196	No
		BYPI	401,742.50	3,788,281.75	5.2		13		No
		BYPF	401,742.50	3,788,281.75	8.2		16		No
	3 Hour	NORM1	401,963.81	3,788,362.21	6.3	4.5	11	1,300	No
		BYPI	401,742.50	3,788,181.75	4.7		9		No
		BYPF	401,742.50	3,788,181.75	6.4		11		No
NO_2	1 Hour	NORM1	401,999.23	3,788,396.55	19.2	79.0	98	188	No
		BYPI	401,742.50	3,788,281.75	37.7		117		No
		BYPF	401,742.50	3,788,281.75	63.6		143		No
	Annual	NORM1	402,269.28	3,788,288.63	0.6	14.9	15	100	No
		BYPI	402,265.86	3,788,292.59	1.1		16		No
		BYPF	402,265.86	3,788,292.59	2.2		17		No
CO	1 Hour	NORM1	402,034.65	3,788,430.88	41.6	1259.5	1,301	40,000	No
		BYPI	401,742.50	3,788,281.75	134.6		1,394		No
		BYPF	401,742.50	3,788,281.75	202.5		1,462		No
	8 Hour	NORM1	402,034.65	3,788,430.88	33.6	950.4	984	10,000	No
		BYPI	401,786.70	3,788,190.52	70.0		1,020		No
		BYPF	401,786.70	3,788,190.52	113.0		1,063		No

1. Coordinates reflect NAD83, UTM Zone 17.
2. Background concentration from closest county to Greenwood County, SC from SC DHEC's spreadsheet "BAQ_BackgroundDataforModeling_2019_23_04.xlsx".

APPENDIX A
AREA MAP AND FACILITY LAYOUT



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SITE LOCATION MAP
ENVIVA PELLETS GREENWOOD, LLC
Greenwood County, South Carolina

FIGURE 1

DRAFTED BY: FXP

DATE: 10/16/2019

1690009068

RAMBOLL

DRAFTED BY: FXP | DATE: 2/6/2020

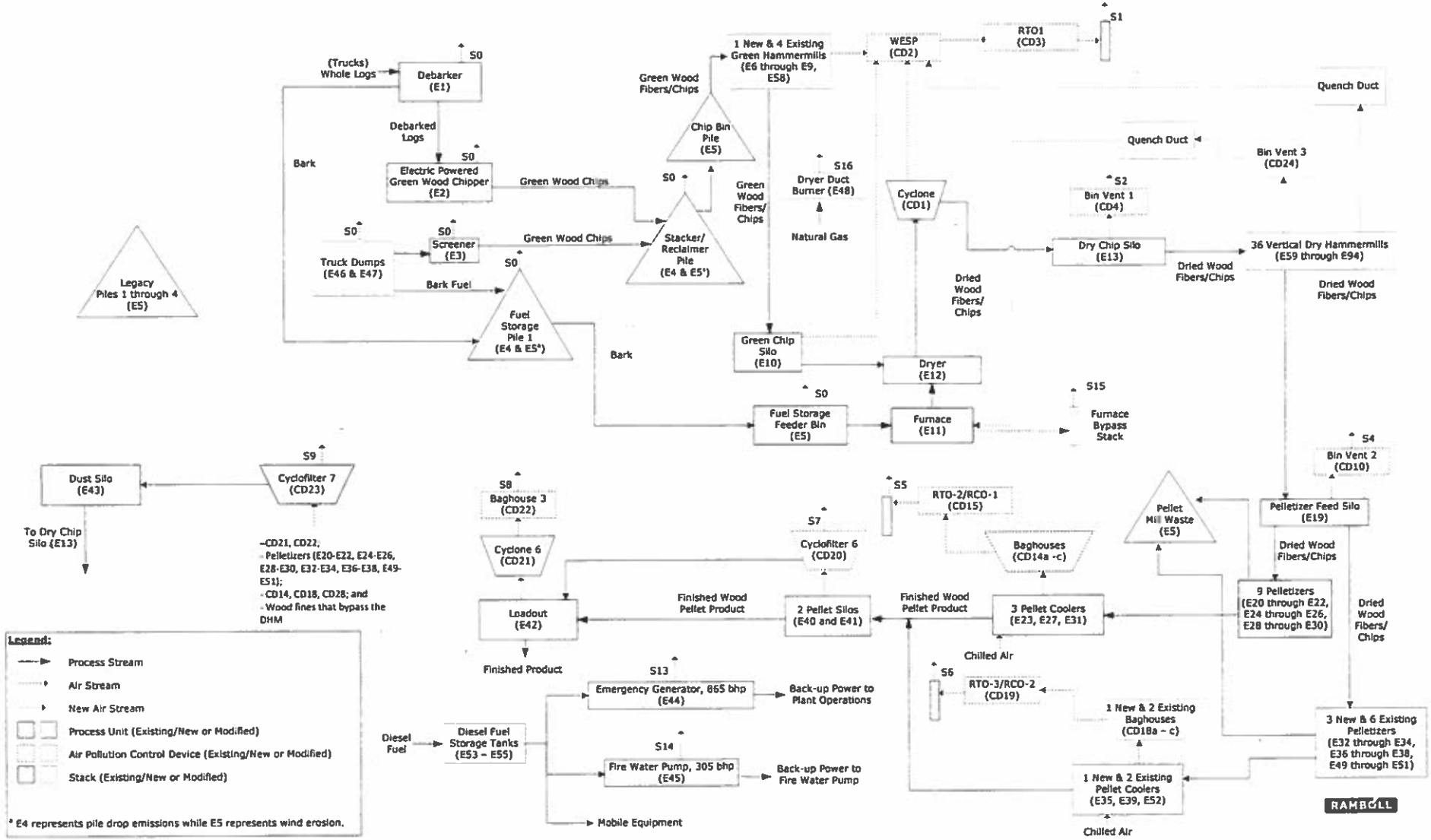
SITE LAYOUT
ENVIVA PELLETS GREENWOOD, LLC
Greenwood County, South Carolina

FIGURE
2

1690014763-007

APPENDIX B
PROCESS FLOW DIAGRAM

Appendix B - Process Flow Diagram
Enviva Pellets Greenwood, LLC – Greenwood County, SC
Option 2: All New Vertical DHM Scenario



APPENDIX C
POTENTIAL EMISSIONS CALCULATIONS

TABLE 1
FACILITY-WIDE CRITERIA & CO_2e POLLUTANT SUMMARY
ENVIVA PELLETS GREENWOOD, LLC

Process ID	Emission Unit ID	Source Description	Control Device ID	Control Device Description	CO (tpy)	NO_x (tpy)	TSP (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	SO_2 (tpy)	VOC (tpy)	CO_2e (tpy)
P0	E1	Debarker	--	--	--	--	10.28	0.28	0.05	--	--	--
	E2	Electric Powered Chipper	--	--	--	--	7.36	3.68	3.68	--	1.92	--
	E3	Green Wood Screening	--	--	--	--	1.46	1.46	1.46	--	--	--
	E4	Pile Drop	--	--	--	--	0.06	0.027	0.0041	--	--	--
	E5	Storage Pile Wind Erosion	--	--	--	--	2.83	1.41	0.21	--	3.03	--
	E46	Truck Dump 1	--	--	--	--	0.03	0.012	0.002	--	--	--
	E47	Truck Dump 2	--	--	--	--	0.03	0.012	0.002	--	--	--
P1	E6	Green Hammermill 1	CD2, CD3	WESP, RTO-1	59.80	112.07	11.25	11.25	11.25	21.90	41.02	204,251
	E7	Green Hammermill 2										
	E8	Green Hammermill 3										
	E9	Green Hammermill 4										
	E58	Green Hammermill 5										
	E10	Green Chip Silo										
P2	E11	Furnace	CD1 - 3	Cyclone, WESP, RTO-1								
	E12	Dryer										
	E11	Furnace Bypass	--	--	2.25	0.83	2.16	1.94	1.68	0.09	0.06	786
	E13	Dry Chip Silo	CD4	Bin Vent Filter 1	--	--	0.75	0.75	0.75	--	4.69	--
	E48	Dryer Duct Burner	--	--	1.80	2.15	0.16	0.16	0.16	0.01	0.12	3,232
P3	E59 - E94	Vertical Dry Hammermill 1 - 36	CD2/CD3 or CD24 then E11/CD2/CD2	WESP/RTO or Bin Vent Filter 3 then Furnace/WESP/RTO-1	0.62	0.74	56.27	56.27	56.27	--	20.33	1,110
	E19	Pelletizer Feed Silo	CD10	Bin Vent Filter 2	--	--	0.75	0.75	0.75	--	0.07	--
P4	E20	Pelletizer 1	CD14a - c, CD15	Baghouses 1a - c, RTO-2/RCO-1	17.62	2.97	18.94	5.07	2.51	0.01	24.51	4,699
	E21	Pelletizer 2										
	E22	Pelletizer 3										
	E24	Pelletizer 4										
	E25	Pelletizer 5										
	E26	Pelletizer 6										
	E28	Pelletizer 7										
	E29	Pelletizer 8										
	E30	Pelletizer 9										
	E23	Pellet Cooler 1										
	E27	Pellet Cooler 2										
	E31	Pellet Cooler 3										
	E32	Pelletizer 10	CD18a - c, CD19	Baghouses 2a - c, RTO-3/RCO-2	17.62	2.97	19.11	5.24	2.51	0.03	24.51	9,398
	E33	Pelletizer 11										
	E34	Pelletizer 12										
	E36	Pelletizer 13										
	E37	Pelletizer 14										
	E38	Pelletizer 15										
	E49	Pelletizer 16										
	E50	Pelletizer 17										
	E51	Pelletizer 18										
	E35	Pellet Cooler 4										
	E39	Pellet Cooler 5										
	E52	Pellet Cooler 6										

TABLE 1
FACILITY-WIDE CRITERIA & CO_2e POLLUTANT SUMMARY
ENVIVA PELLETS GREENWOOD, LLC

Process ID	Emission Unit ID	Source Description	Control Device ID	Control Device Description	CO (tpy)	NO_x (tpy)	TSP (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	SO_2 (tpy)	VOC (tpy)	CO_2e (tpy)
P5	E40	Pellet Silo 1	CD20	Cyclofilter 6	--	--	0.75	0.75	0.75	--	--	--
	E41	Pellet Silo 2										
	E42	Loadout	CD21, CD22	Cyclone 6, Baghouse 3	--	--	4.32	4.32	4.32	--	--	--
	E43	Dust Silo	CD23	Cyclofilter 7	--	--	1.24	1.24	1.24	--	--	--
P6	E44	Engine 1 (Generator)	--	--	0.19	2.74	8.58E-03	8.58E-03	8.58E-03	2.35E-03	4.77E-03	247.67
	E45	Engine 2 (Fire Pump)	--	--	0.44	0.50	0.025	0.025	0.025	8.30E-04	1.34E-03	87.33
	E53	Woodyard Fuel Storage Tank	--	--	--	--	--	--	--	--	8.65E-04	--
	E54	Fire Pump House Fuel Storage Tank	--	--	--	--	--	--	--	--	1.45E-04	--
	E55	Diesel Generator Fuel Storage Tank	--	--	--	--	--	--	--	--	2.88E-04	--
P7	E56	Unpaved Roads	--	--	--	--	27.61	7.87	0.79	--	--	--
	E57	Paved Roads	--	--	--	--	2.18	0.44	0.11	--	--	--
Total Emissions:					**100.3**	**125.0**	**167.6**	**103.0**	**88.5**	**22.1**	**120.3**	**223,810**
Total Excluding Fugitives[1]:					**100.3**	**125.0**	**134.8**	**93.2**	**87.4**	**22.1**	**117.2**	**223,810**
PSD Major Source Threshold:					**250**	**250**	**250**	**250**	**250**	**250**	**250**	--
Major Source?					**No**	**No**	**No**	**No**	**No**	**No**	**No**	--

Notes:

[1] Fugitive emissions are not included in comparison against the major source threshold because the facility is not on the list of 28 source categories in 40 CFR 52.21.

TABLE 2
FACILITY-WIDE HAP EMISSIONS SUMMARY
ENVIVA PELLETS GREENWOOD, LLC

Description	CAS No.	HAP	Dryer & GHM (RTO-1) (tpy)	Furnace Bypass (tpy)	Dryer Duct Burner (tpy)	DHM (RTO-1) (tpy)	Pellet Coolers (RTO-2/RCO-1) (tpy)	Pellet Coolers (RTO-3/RCO-2) (tpy)	Dry Chip & Pelletizer Feed Silos (tpy)	Chipper (tpy)	Engine 1 (Generator) (tpy)	Engine 2 (Fire Pump) (tpy)	Total (tpy)	Major Source?
Acetaldehyde	75-07-0	Y	3.08	3.11E-03	3.26E-07	0.12	0.28	0.28	-	-	1.16E-03	4.09E-04	3.75	No
Acrolein	107-02-8	Y	2.00	0.02	3.86E-07	0.18	0.41	0.41	-	-	1.40E-04	4.94E-05	3.01	No
Formaldehyde	50-00-0	Y	1.99	0.02	1.61E-03	3.96E-03	1.05	1.05	0.28	-	1.79E-03	6.30E-04	4.40	No
Methanol	67-56-1	Y	2.44	-	-	0.10	0.05	0.05	0.64	0.38	-	-	3.66	No
Phenol	108-95-2	Y	2.47	1.91E-04	-	0.05	0.21	0.21	-	-	-	-	2.93	No
Propionaldehyde	123-38-6	Y	0.93	2.29E-04	-	0.20	0.12	0.12	-	-	-	-	1.37	No
Acetophenone	98-86-2	Y	1.40E-07	1.20E-08	-	-	-	-	-	-	-	-	1.52E-07	No
Ammonia	7664-41-7	N	0.44	-	0.07	-	0.07	0.14	-	-	-	-	0.72	No
Antimony and compounds	--	Y	5.02E-04	2.96E-05	-	-	-	-	-	-	-	-	5.31E-04	No
Arsenic	7440-38-2	Y	1.42E-03	8.26E-05	4.29E-06	-	4.47E-06	8.93E-06	-	-	-	-	1.52E-03	No
Benzene	71-43-2	Y	0.18	2.14E-08	4.51E-05	-	4.69E-05	9.38E-05	-	-	1.41E-03	4.98E-04	0.19	No
Benzo(a)pyrene	50-32-8	Y	1.14E-04	9.75E-06	2.58E-08	-	2.68E-08	5.36E-08	-	-	2.85E-07	1.00E-07	1.24E-04	No
Beryllium	7440-41-7	Y	7.15E-05	4.17E-06	2.58E-07	-	2.68E-07	5.36E-07	-	-	-	-	7.67E-05	No
1,3-Butadiene	106-99-0	Y	-	-	-	-	-	-	-	-	5.92E-05	2.09E-05	8.01E-05	No
Cadmium	7440-43-9	Y	4.12E-04	1.54E-05	2.36E-05	-	2.46E-05	4.91E-05	-	-	-	-	5.24E-04	No
Carbon tetrachloride	56-23-5	Y	1.97E-03	1.69E-04	-	-	-	-	-	-	-	-	2.14E-03	No
Chlorine	7782-50-5	Y	0.69	2.96E-03	-	-	-	-	-	-	-	-	0.70	No
Chlorobenzene	108-90-7	Y	1.45E-03	1.24E-04	-	-	-	-	-	-	-	-	1.57E-03	No
Chloroform	67-66-3	Y	1.23E-03	-	-	-	-	-	-	-	-	-	1.23E-03	No
Chromium VI	18540-29-9	Y	4.15E-04	-	3.01E-05	-	3.13E-05	6.25E-05	-	-	-	-	5.39E-04	No
Chromium-Other compounds	--	Y	1.11E-03	7.88E-05	-	-	-	-	-	-	-	-	1.19E-03	No
Cobalt compounds	--	Y	4.24E-04	2.44E-05	1.80E-06	-	1.88E-06	3.75E-06	-	-	-	-	4.56E-04	No
Copper	7440-50-8	N	-	8.40E-08	-	-	-	-	-	-	-	-	8.40E-08	No
Dichlorobenzene	106-46-7	Y	1.65E-04	-	2.58E-05	-	2.68E-05	5.36E-05	-	-	-	-	2.71E-04	No
Dichloroethane, 1,2-	107-06-2	Y	1.27E-03	1.09E-04	-	-	-	-	-	-	-	-	1.38E-03	No
Dichloropropane, 1,2-	78-87-5	Y	1.45E-03	1.24E-04	-	-	-	-	-	-	-	-	1.57E-03	No
Dinitrophenol, 2,4-	51-28-5	Y	7.88E-06	6.75E-07	-	-	-	-	-	-	-	-	8.56E-06	No
Di(2-ethylhexyl)phthalate	117-81-7	Y	2.06E-06	1.76E-07	-	-	-	-	-	-	-	-	2.23E-06	No
Ethyl benzene	100-41-4	Y	1.36E-03	1.16E-04	-	-	-	-	-	-	-	-	1.47E-03	No
Hexachlorodibenzo-p-dioxin, 1,2,3,6,7,8-	57653-85-7	N	7.84E-10	-	-	-	-	-	-	-	-	-	7.84E-10	No
Hexane	110-54-3	Y	0.25	-	0.04	-	0.04	0.08	-	-	-	-	0.41	No
Indeno(1,2,3-cd)pyrene	193-39-5	Y	2.47E-07	2.14E-10	3.86E-08	-	4.02E-08	8.04E-08	-	-	-	-	4.07E-07	No
Hydrochloric acid	7647-01-0	Y	1.66	0.07	-	-	-	-	-	-	-	-	1.74	No
Lead	7439-92-1	Y	3.12E-03	1.80E-04	1.07E-05	-	1.12E-05	2.23E-05	-	-	-	-	3.34E-03	No
Manganese	7439-96-5	Y	0.10	6.00E-03	8.15E-06	-	8.49E-06	1.70E-05	-	-	-	-	0.11	No
Mercury	7439-97-6	Y	2.58E-04	1.32E-05	5.58E-06	-	5.81E-06	1.16E-05	-	-	-	-	2.94E-04	No
Methyl bromide	74-83-9	Y	6.57E-04	5.63E-05	-	-	-	-	-	-	-	-	7.13E-04	No
Methyl chloride	74-87-3	Y	1.01E-03	8.63E-05	-	-	-	-	-	-	-	-	1.09E-03	No
3-Methylchloranthrene	56-49-5	Y	2.47E-07	-	3.86E-08	-	4.02E-08	8.04E-08	-	-	-	-	4.07E-07	No
Methylene chloride	75-09-2	Y	0.01	-	-	-	-	-	-	-	-	-	0.01	No
Naphthalene	91-20-3	Y	4.33E-03	3.64E-04	1.31E-05	-	1.36E-05	2.72E-05	-	-	-	-	4.75E-03	No
Nickel	7440-02-0	Y	2.38E-03	1.24E-04	4.51E-05	-	4.69E-05	9.38E-05	-	-	-	-	2.69E-03	No
Nitrophenol, 4-	100-02-7	Y	4.82E-06	4.13E-07	-	-	-	-	-	-	-	-	5.23E-06	No
Octachlorodibenzodioxin	3268-87-9	N	-	3.10E-13	-	-	-	-	-	-	-	-	3.10E-13	No
Pentachlorophenol	87-86-5	Y	2.23E-06	1.91E-07	-	-	-	-	-	-	-	-	2.43E-06	No
Perchloroethylene	127-18-4	Y	1.66E-03	1.43E-04	-	-	-	-	-	-	-	-	1.81E-03	No
Phosphorus metal, yellow or white	7723-14-0	Y	1.71E-03	1.01E-04	-	-	-	-	-	-	-	-	1.82E-03	No
Polychlorinated biphenyls	1336-36-3	Y	3.57E-07	3.06E-08	-	-	-	-	-	-	-	-	3.88E-07	No
Polycyclic Organic Matter	--	Y	5.48E-03	4.69E-04	1.50E-05	-	1.56E-05	3.12E-05	-	-	2.54E-04	8.97E-05	6.35E-03	No
Selenium compounds	--	Y	1.81E-04	1.07E-05	5.15E-07	-	5.36E-07	1.07E-06	-	-	-	-	1.94E-04	No

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TABLE 2
FACILITY-WIDE HAP EMISSIONS SUMMARY
ENVIVA PELLETS GREENWOOD, LLC

Description	CAS No.	HAP	Dryer & GHM (RTO-1) (tpy)	Furnace Bypass (tpy)	Dryer Duct Burner (tpy)	DHM (RTO-1) (tpy)	Pellet Coolers (RTO-2/RCO-1) (tpy)	Pellet Coolers (RTO-3/RCO-2) (tpy)	Dry Chip & Pelletizer Feed Silos (tpy)	Chipper (tpy)	Engine 1 (Generator) (tpy)	Engine 2 (Fire Pump) (tpy)	Total (tpy)	Major Source?
Styrene	100-42-5	Y	0.08	-	-	-	-	-	-	-	-	-	0.08	No
Tetrachlorodibenzo-p-dioxin, 2,3,7,8-	1746-01-6	Y	3.77E-10	3.23E-11	-	-	-	-	-	-	-	-	4.09E-10	No
Toluene	108-88-3	Y	1.78E-03	6.20E-07	7.30E-05	-	7.59E-05	1.52E-04	-	-	6.19E-04	2.18E-04	2.92E-03	No
Trichloroethane, 1,1,1-	71-55-6	Y	1.36E-03	1.16E-04	-	-	-	-	-	-	-	-	1.47E-03	No
Trichloroethylene	79-01-6	Y	1.31E-03	1.13E-04	-	-	-	-	-	-	-	-	1.43E-03	No
Trichlorofluoromethane	75-69-4	N	1.80E-03	-	-	-	-	-	-	-	-	-	1.80E-03	No
Trichlorophenol, 2,4,6-	88-06-2	Y	9.64E-07	8.25E-08	-	-	-	-	-	-	-	-	1.05E-06	No
Vinyl chloride	75-01-4	Y	7.88E-04	6.75E-05	-	-	-	-	-	-	-	-	8.56E-04	No
Xylene	1330-20-7	Y	1.10E-03	1.09E-08	-	-	-	-	-	-	4.31E-04	1.52E-04	1.68E-03	No
Zinc	7440-66-6	N	-	5.60E-08	-	-	-	-	-	-	-	-	5.60E-08	No
		TOTAL HAP	15.92	0.12	0.04	0.65	2.16	2.20	0.92	0.38	5.86E-03	2.07E-03	22.40	No

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TABLE 3
POTENTIAL EMISSIONS AT OUTLET OF RTO-1 STACK
ROTARY DRYER, GHM, AND GREEN CHIP SILO - CRITERIA POLLUTANT EMISSIONS
ENVIVA PELLETS GREENWOOD, LLC

Dryer Inputs

Annual Dried Wood Throughput	**660,000**	ODT/year
Max. Hourly Dried Wood Throughput of Dryer	75.3	ODT/hr
Furnace Heat Input	200.0	MMBtu/hr
Percent Hardwood	0.0%	
Percent Softwood	100.0%	
Annual Operation	8,760	hr/yr
Annual Heat Input	**1,752,000**	**MMBtu/yr**
WESP Control Efficiency	99.0%	
Number of RTO Burners	**4**	
RTO Burner Rating	**8**	**MMBtu/hr**
RTO Control Efficiency	**95.00%**	

Criteria Pollutant Calculations at the RTO Outlet:

Pollutant	Uncontrolled Emission Factor	Units	Footnote	Uncontrolled & Unlimited Emissions[1]		Controlled & Unlimited Emissions[1]		Controlled & Limited Emissions (PTE)[1]	
				Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)
CO	0.18	lb/ODT	2	13.7	59.8	13.7	59.8	13.7	59.8
NO_x	0.34	lb/ODT	2	25.6	112	25.6	112	25.6	112
$PM/PM_{10}/PM_{2.5}$ (Filterable + Condensable)	3.41	lb/ODT	2	257	1,125	2.57	11.2	2.57	11.2
SO_2	0.025	lb/MMBtu	AP-42, Section 1.6[3]	5.00	21.9	5.00	21.9	5.00	21.9
Total VOC (as propane)	2.49	lb/ODT	2	187	820	9.36	41.0	9.36	41.0

Notes:

[1] Unlimited emissions assume maximum hourly throughput at 8,760 hours/year. Limited emissions are based on proposed annual throughput. Controlled emissions are based on proposed short-term and annual throughputs and application of control device efficiencies.

[2] Emission factors for all pollutants except for SO2 are based on stack testing data from the Greenwood plant and include contingency. The emission factors represent uncontrolled emissions.

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

TABLE 4
POTENTIAL EMISSIONS AT OUTLET OF RTO-1 STACK
ROTARY DRYER, GHM, AND GREEN CHIP SILO - HAP & TAP POLLUTANT EMISSIONS
ENVIVA PELLETS GREENWOOD, LLC

Dryer Inputs

Annual Dried Wood Throughput of Dryer	660,000	ODT/year
Max. Hourly Dried Wood Throughput of Dryer	75.3	ODT/hr
Furnace Heat Input (HHV)	200.0	MMBtu/hr
Percent Hardwood	0.0%	
Percent Softwood	100.0%	
Annual Operation	8,760	hr/yr
Annual Heat Input	1,752,000	MMBtu/yr
Number of RTO Burners	4	
RTO Burner Rating	8	MMBtu/hr
RTO Control Efficiency	95.00%	

Potential HAP and TAP Emissions

Pollutant	HAP	VOC	Uncontrolled Emission Factor	Units	Footnote	Uncontrolled & Unlimited Emissions[a]		Controlled & Unlimited Emissions[a]		Controlled & Limited Emissions (PTE)[a]	
						Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)
Furnace/Dryer - Biomass Source											
Acetaldehyde	Y	Y	1.9E-01	lb/ODT	1	14.0	61.5	0.70	3.08	0.70	3.08
Acrolein	Y	Y	1.2E-01	lb/ODT	1	9.11	39.9	0.46	2.00	0.46	2.00
Formaldehyde	Y	Y	1.2E-01	lb/ODT	1	9.04	39.6	0.45	1.98	0.45	1.98
Methanol	Y	Y	1.5E-01	lb/ODT	1	11.1	48.7	0.56	2.44	0.56	2.44
Phenol	Y	Y	1.5E-01	lb/ODT	1	11.3	49.5	0.56	2.47	0.56	2.47
Propionaldehyde	Y	Y	5.6E-02	lb/ODT	1	4.23	18.54	0.21	0.93	0.21	0.93
Acetophenone	Y	Y	3.2E-09	lb/MMBtu	2,3	6.40E-07	2.80E-06	3.20E-08	1.40E-07	3.2E-08	1.4E-07
Antimony and compounds	Y	N	7.9E-06	lb/MMBtu	2,4	1.58E-03	6.92E-03	1.15E-04	5.02E-04	1.1E-04	5.0E-04
Arsenic	Y	N	2.2E-05	lb/MMBtu	2,4	4.40E-03	1.93E-02	3.19E-04	1.40E-03	3.2E-04	1.4E-03
Benzene	Y	Y	4.2E-03	lb/MMBtu	2,3	8.40E-01	3.68E+00	4.20E-02	1.84E-01	4.2E-02	1.8E-01
Benzo(a)pyrene	Y	Y	2.6E-06	lb/MMBtu	2,3	5.20E-04	2.28E-03	2.60E-05	1.14E-04	2.6E-05	1.1E-04
Beryllium	Y	N	1.1E-06	lb/MMBtu	2,4	2.20E-04	9.64E-04	1.60E-05	6.99E-05	1.6E-05	7.0E-05
Cadmium	Y	N	4.1E-06	lb/MMBtu	2,4	8.20E-04	3.59E-03	5.95E-05	2.60E-04	5.9E-05	2.6E-04
Carbon tetrachloride	Y	Y	4.5E-05	lb/MMBtu	2,3	9.00E-03	3.94E-02	4.50E-04	1.97E-03	4.5E-04	2.0E-03
Chlorine	Y	N	7.9E-04	lb/MMBtu	2,8	2.18E+00	9.55E+00	1.58E-01	6.92E-01	1.6E-01	6.9E-01
Chlorobenzene	Y	Y	3.3E-05	lb/MMBtu	2,3	6.60E-03	2.89E-02	3.30E-04	1.45E-03	3.3E-04	1.4E-03
Chloroform	Y	Y	2.8E-05	lb/MMBtu	2,3	5.60E-03	2.45E-02	2.80E-04	1.23E-03	2.8E-04	1.2E-03
Chromium VI	-[5]	N	3.5E-06	lb/MMBtu	2,4,5	7.00E-04	3.07E-03	5.08E-05	2.22E-04	5.1E-05	2.2E-04
Chromium–Other compounds	Y	N	1.8E-05	lb/MMBtu	2,4	3.50E-03	1.53E-02	2.54E-04	1.11E-03	2.5E-04	1.1E-03
Cobalt compounds	Y	N	6.5E-06	lb/MMBtu	2,4	1.30E-03	5.69E-03	9.43E-05	4.13E-04	9.4E-05	4.1E-04
Dichloroethane, 1,2-	Y	Y	2.9E-05	lb/MMBtu	2,3	5.80E-03	2.54E-02	2.90E-04	1.27E-03	2.9E-04	1.3E-03
Dichloropropane, 1,2-	Y	Y	3.3E-05	lb/MMBtu	2,3	6.60E-03	2.89E-02	3.30E-04	1.45E-03	3.3E-04	1.4E-03
Dinitrophenol, 2,4-	Y	Y	1.8E-07	lb/MMBtu	2,3	3.60E-05	1.58E-04	1.80E-06	7.88E-06	1.8E-06	7.9E-06
Di(2-ethylhexyl)phthalate	Y	Y	4.7E-08	lb/MMBtu	2,3	9.40E-06	4.12E-05	4.70E-07	2.06E-06	4.7E-07	2.1E-06
Ethyl benzene	Y	Y	3.1E-05	lb/MMBtu	2,3	6.20E-03	2.72E-02	3.10E-04	1.36E-03	3.1E-04	1.4E-03

TABLE 4
POTENTIAL EMISSIONS AT OUTLET OF RTO-1 STACK
ROTARY DRYER, GHM, AND GREEN CHIP SILO - HAP & TAP POLLUTANT EMISSIONS
ENVIVA PELLETS GREENWOOD, LLC

Hexachlorodibenzo-p-dioxin, 1,2,3,6,7,8-	N	Y	1.8E-11	lb/MMBtu	2,3	3.58E-09	1.57E-08	1.79E-10	7.84E-10	1.8E-10	7.8E-10
Hydrochloric acid	Y	N	1.9E-02	lb/MMBtu	2,6	3.80E+00	1.66E+01	3.80E-01	1.66E+00	3.8E-01	1.7E+00
Lead	Y	N	4.8E-05	lb/MMBtu	2,4	9.60E-03	4.20E-02	6.96E-04	3.05E-03	7.0E-04	3.0E-03
Manganese	Y	N	1.6E-03	lb/MMBtu	2,4	3.20E-01	1.40E+00	2.32E-02	1.02E-01	2.3E-02	1.0E-01
Mercury	Y	N	3.5E-06	lb/MMBtu	2,4	7.00E-04	3.07E-03	5.08E-05	2.22E-04	5.1E-05	2.2E-04
Methyl bromide	Y	Y	1.5E-05	lb/MMBtu	2,3	3.00E-03	1.31E-02	1.50E-04	6.57E-04	1.5E-04	6.6E-04
Methyl chloride	Y	Y	2.3E-05	lb/MMBtu	2,3	4.60E-03	2.01E-02	2.30E-04	1.01E-03	2.3E-04	1.0E-03
Methyl ethyl ketone	N	Y	5.4E-06	lb/MMBtu	2,3	1.08E-03	4.73E-03	5.40E-05	2.37E-04	5.4E-05	2.4E-04
Methylene chloride	Y	Y	2.9E-04	lb/MMBtu	2,3	5.80E-02	2.54E-01	2.90E-03	1.27E-02	2.9E-03	1.3E-02
Naphthalene	Y	Y	9.7E-05	lb/MMBtu	2,3	1.94E-02	8.50E-02	9.70E-04	4.25E-03	9.7E-04	4.2E-03
Nickel	Y	N	3.3E-05	lb/MMBtu	2,4	6.60E-03	2.89E-02	4.79E-04	2.10E-03	4.8E-04	2.1E-03
Nitrophenol, 4-	Y	Y	1.1E-07	lb/MMBtu	2,3	2.20E-05	9.64E-05	1.10E-06	4.82E-06	1.1E-06	4.8E-06
Pentachlorophenol	Y	N	5.1E-08	lb/MMBtu	2	1.02E-05	4.47E-05	5.10E-07	2.23E-06	5.1E-07	2.2E-06
Perchloroethylene	Y	N	3.8E-05	lb/MMBtu	2	7.60E-03	3.33E-02	3.80E-04	1.66E-03	3.8E-04	1.7E-03
Phosphorus metal, yellow or white	Y	N	2.7E-05	lb/MMBtu	2,4	5.40E-03	2.37E-02	3.92E-04	1.71E-03	3.9E-04	1.7E-03
Polychlorinated biphenyls	Y	Y	8.2E-09	lb/MMBtu	2,3	1.63E-06	7.14E-06	8.15E-08	3.57E-07	8.2E-08	3.6E-07
Polycyclic Organic Matter	Y	N	1.3E-04	lb/MMBtu	2	2.50E-02	1.10E-01	1.25E-03	5.48E-03	1.3E-03	5.5E-03
Selenium compounds	Y	N	2.8E-06	lb/MMBtu	2,4	5.60E-04	2.45E-03	4.06E-05	1.78E-04	4.1E-05	1.8E-04
Styrene	Y	Y	1.9E-03	lb/MMBtu	2,3	3.80E-01	1.66E+00	1.90E-02	8.32E-02	1.9E-02	8.3E-02
Tetrachlorodibenzo-p-dioxin, 2,3,7,8-	Y	Y	8.6E-12	lb/MMBtu	2,3	1.72E-09	7.53E-09	8.60E-11	3.77E-10	8.6E-11	3.8E-10
Toluene	Y	Y	3.0E-05	lb/MMBtu	2,3	6.00E-03	2.63E-02	3.00E-04	1.31E-03	3.0E-04	1.3E-03
Trichloroethane, 1,1,1-	Y	N	3.1E-05	lb/MMBtu	2	6.20E-03	2.72E-02	3.10E-04	1.36E-03	3.1E-04	1.4E-03
Trichloroethylene	Y	Y	3.0E-05	lb/MMBtu	2,3	6.00E-03	2.63E-02	3.00E-04	1.31E-03	3.0E-04	1.3E-03
Trichlorofluoromethane	N	Y	4.1E-05	lb/MMBtu	2,3	8.20E-03	3.59E-02	4.10E-04	1.80E-03	4.1E-04	1.8E-03
Trichlorophenol, 2,4,6-	Y	Y	2.2E-08	lb/MMBtu	2,3	4.40E-06	1.93E-05	2.20E-07	9.64E-07	2.2E-07	9.6E-07
Vinyl chloride	Y	Y	1.8E-05	lb/MMBtu	2,3	3.60E-03	1.58E-02	1.80E-04	7.88E-04	1.8E-04	7.9E-04
Xylene	Y	Y	2.5E-05	lb/MMBtu	2,3	5.00E-03	2.19E-02	2.50E-04	1.10E-03	2.5E-04	1.1E-03
			Total HAP Emissions (related to biomass)			**66.6**	**292**	**3.58**	**15.7**	**3.58**	**15.7**

TABLE 4
POTENTIAL EMISSIONS AT OUTLET OF RTO-1 STACK
ROTARY DRYER, GHM, AND GREEN CHIP SILO - HAP & TAP POLLUTANT EMISSIONS
ENVIVA PELLETS GREENWOOD, LLC

Pollutant	HAP	VOC	Emission Factor	Units	Footnote	Emissions (PTE)[10]	
						Max (lb/hr)	Annual (tpy)
RTO Burner - Natural Gas Source							
2-Methylnaphthalene	Y	Y	2.4E-05	lb/MMscf	7	7.5E-07	3.3E-06
3-Methylchloranthrene	Y	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
7,12-Dimethylbenz(a)anthracene	Y	Y	1.6E-05	lb/MMscf	7	5.0E-07	2.2E-06
Acenaphthene	Y	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
Acenaphthylene	Y	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
Acetaldehyde	Y	Y	1.5E-05	lb/MMscf	7	4.8E-07	2.1E-06
Acrolein	Y	Y	1.8E-05	lb/MMscf	7	5.6E-07	2.5E-06
Ammonia	N	N	3.2	lb/MMscf	7	1.0E-01	4.4E-01
Anthracene	Y	Y	2.4E-06	lb/MMscf	7	7.5E-08	3.3E-07
Arsenic	Y	N	2.0E-04	lb/MMscf	4,7	6.3E-06	2.7E-05
Benz(a)anthracene	Y	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
Benzene	Y	Y	2.1E-03	lb/MMscf	7	6.6E-05	2.9E-04
Benzo(a)pyrene	Y	Y	1.2E-06	lb/MMscf	7	3.8E-08	1.6E-07
Benzo(b)fluoranthene	Y	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
Benzo(g,h,i)perylene	Y	Y	1.2E-06	lb/MMscf	7	3.8E-08	1.6E-07
Benzo(k)fluoranthene	Y	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
Beryllium	Y	N	1.2E-05	lb/MMscf	4,7	3.8E-07	1.6E-06
Cadmium	Y	N	1.1E-03	lb/MMscf	4,7	3.5E-05	1.5E-04
Chromium VI	Y	N	1.4E-03	lb/MMscf	4,7	4.4E-05	1.9E-04
Chrysene	Y	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
Cobalt compounds	Y	N	8.4E-05	lb/MMscf	4,7	2.6E-06	1.2E-05
Dibenzo(a,h)anthracene	Y	Y	1.2E-06	lb/MMscf	7	3.8E-08	1.6E-07
Dichlorobenzene	Y	Y	1.2E-03	lb/MMscf	7	3.8E-05	1.6E-04
Fluoranthene	Y	Y	3.0E-06	lb/MMscf	7	9.4E-08	4.1E-07
Fluorene	Y	Y	2.8E-06	lb/MMscf	7	8.8E-08	3.8E-07
Formaldehyde	Y	Y	7.5E-02	lb/MMscf	7	2.4E-03	1.0E-02
Hexane	Y	Y	1.8	lb/MMscf	7	5.6E-02	2.5E-01
Indeno(1,2,3-cd)pyrene	Y	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
Lead	Y	N	5.0E-04	lb/MMscf	4,7	1.6E-05	6.9E-05
Manganese	Y	N	3.8E-04	lb/MMscf	4,7	1.2E-05	5.2E-05
Mercury	Y	N	2.6E-04	lb/MMscf	4,7	8.2E-06	3.6E-05
Naphthalene	Y	Y	6.1E-04	lb/MMscf	7	1.9E-05	8.4E-05
Nickel	Y	N	2.1E-03	lb/MMscf	4,7	6.6E-05	2.9E-04
Phenanthrene	Y	Y	1.7E-05	lb/MMscf	7	5.3E-07	2.3E-06
Pyrene	Y	Y	5.0E-06	lb/MMscf	7	1.6E-07	6.9E-07
Selenium compounds	Y	N	2.4E-05	lb/MMscf	4,7	7.5E-07	3.3E-06
Toluene	Y	Y	3.4E-03	lb/MMscf	7	1.1E-04	4.7E-04
Total HAP Emissions (related to natural gas)						**0.059**	**0.26**

TABLE 4

POTENTIAL EMISSIONS AT OUTLET OF RTO-1 STACK

ROTARY DRYER, GHM, AND GREEN CHIP SILO - HAP & TAP POLLUTANT EMISSIONS

ENVIVA PELLETS GREENWOOD, LLC

Notes:

[1] Emission factors were derived based on stack testing data for the Greenwood plant and comparable Enviva facilities and include contingency. The emission factors represent uncontrolled emissions.

[2] Emission factors (criteria and HAP/TAP) for wood combustion in a stoker boiler from NCDAQ Wood Waste Combustion Spreadsheet/AP-42, Fifth Edition, Volume 1, Chapter 1.6 - Wood Residue Combustion in Boilers, 09/03.

[3] The control efficiency of 95.0% for the RTO is applied to all VOC hazardous and toxic pollutants.

[4] The control efficiency of the wet electrostatic precipitator (WESP) for filterable particulate matter is applied to all metal hazardous and toxic pollutants from the dryer and duct burners. Actual design filterable efficiency is estimated to 96.4%, but 92.75% is assumed for toxics permitting.

[5] Chromium VI is a subset of chromium compounds, which is accounted for separately as a HAP. As such, Chromium VI is only calculated as a TAP.

[6] 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 October 18, 2011 with Steven A. Jaasund, P.E. of Lundberg Associates, a manufacturer of WESPs.

[7] Emission factors for natural gas combustion are from NCDAQ Natural Gas Combustion Spreadsheet and AP-42, Fifth Edition, Volume 1, Chapter 1.4 - Natural Gas Combustion, 07/98. The emission factors for acetaldehyde, acrolein, and ammonia are cited in the NCDAQ spreadsheet as being sourced from the USEPA's WebFIRE database.

[8] It was assumed that chlorine is not oxidized in the RTO.

[9] Unlimited emissions assume maximum hourly throughput at 8,760 hours/year. Limited emissions are based on proposed annual throughput. Controlled emissions are based on proposed short-term and annual throughputs and application of control device efficiencies.

[10] No control devices or limitations proposed for this unit.

Abbreviations:

CAS - chemical abstract service

CH_4 - methane

CO - carbon monoxide

CO2 - carbon dioxide

CO_2e - carbon dioxide equivalent

HAP - hazardous air pollutant

hr - hour

kg - kilogram

lb - pound

MMBtu - Million British thermal units

NO_x - nitrogen oxides

N_2O - nitrous oxide

ODT - oven dried tons

PM - particulate matter

PM_{10} - particulate matter with an aerodynamic diameter less than 10 microns

$PM_{2.5}$ - particulate matter with an aerodynamic diameter of 2.5 microns or less

RTO - regenerative thermal oxidizer

SO_2 - sulfur dioxide

TAP - toxic air pollutant

tpy - tons per year

VOC - volatile organic compound

WESP - wet electrostatic precipitator

yr - year

TABLE 5
POTENTIAL EMISSIONS - FURNACE BYPASS (COLD START-UP)[1]
ENVIVA PELLETS GREENWOOD, LLC

Calculation Basis

Hourly Heat Input Capacity (HHV)[1]	30	MMBtu/hr
Annual Heat Input Capacity	1,500	MMBtu/yr
Hours of Operation[1]	50	hr/yr
Annual Diesel Usage[2]	200	gal/yr
Hourly Diesel Usage[2]	30	gal/hr

Notes:

[1] The furnace bypass stack will be used when the furnace is started up from a cold shutdown until the secondary combustion zone temperature approaches 600 °F. The heat input rate of the furnace during this initial stage of the start-up is not expected to exceed 15% of the maximum heat input rate of the unit. Once the secondary combustion zone temperature reaches 600 °F, the unit's induced draft fan is started and, although the bypass stack remains open, it is no longer exhausting emissions from the furnace. Instead, the bypass stack remains open to allow ambient air to be pulled through the dryer and during this time emissions are routed to the control devices for the furnace and dryer. Once the secondary combustion zone temperature reaches approximately 900 °F, the furnace bypass stack is closed. Use of the furnace bypass stack for cold start-ups will not exceed 8 hours per start-up and 50 hours per year.

[2] The amount of fuel used per event is typically 15 to 30 gallons and the annual usage is typically 100 to 200 gallons. The 30 gallons per start-up are conservatively assumed to be used in one hour or less for purposes of estimating maximum hourly emissions.

Potential Criteria Pollutant Emissions - Biomass Combustion

Pollutant	Uncontrolled Emission Factor	Units	Uncontrolled & Unlimited Emissions[2]		Controlled & Unlimited Emissions[2]		Controlled & Limited Emissions (PTE)[2]	
			Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)
CO	0.60	lb/MMBtu[1]	18.0	78.8	18.0	78.8	18.0	0.45
NO_x	0.22	lb/MMBtu[1]	6.60	28.9	6.60	28.9	6.60	0.17
SO_2	0.025	lb/MMBtu[1]	0.75	3.29	0.75	3.29	0.75	0.019
VOC	0.017	lb/MMBtu[1]	0.51	2.23	0.51	2.23	0.51	0.013
Total PM	0.58	lb/MMBtu[1]	17.3	75.8	17.3	75.8	17.3	0.43
Total PM_{10}	0.52	lb/MMBtu[1]	15.5	67.9	15.5	67.9	15.5	0.39
Total $PM_{2.5}$	0.45	lb/MMBtu[1]	13.4	58.7	13.4	58.7	13.4	0.34

Notes:

[1] CO, NO_x, SO_2, PM, PM_{10}, $PM_{2.5}$ and VOC emission rates based on AP-42, Chapter 1.6 - Wood Residue Combustion in Boilers, 09/03 for bark/bark and wet wood/wet wood-fired boilers. PM, PM_{10}, and $PM_{2.5}$ factors equal to the sum of the filterable and condensable factors from Table 1.6-1. VOC emission factor excludes formaldehyde.

[2] Unlimited emissions are based on the maximum hourly heat input for this operating mode at 8,760 hours/year. Limited emissions are based on the proposed annual operating hour limit.

Potential HAP Emissions - Biomass Combustion

Pollutant	Uncontrolled Emission Factor	Units	Footnote	Uncontrolled & Unlimited Emissions[2]		Controlled & Unlimited Emissions[2]		Controlled & Limited Emissions (PTE)[2]	
				Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)
Acetaldehyde	8.30E-04	lb/MMBtu	1	2.49E-02	1.09E-01	2.49E-02	1.09E-01	2.49E-02	6.23E-04
Acrolein	4.00E-03	lb/MMBtu	1	1.20E-01	5.26E-01	1.20E-01	5.26E-01	1.20E-01	3.00E-03
Formaldehyde	4.40E-03	lb/MMBtu	1	1.32E-01	5.78E-01	1.32E-01	5.78E-01	1.32E-01	3.30E-03
Phenol	5.10E-05	lb/MMBtu	1	1.53E-03	6.70E-03	1.53E-03	6.70E-03	1.53E-03	3.83E-05
Propionaldehyde	6.10E-05	lb/MMBtu	1	1.83E-03	8.02E-03	1.83E-03	8.02E-03	1.83E-03	4.58E-05
Acetophenone	3.2E-09	lb/MMBtu	1	9.60E-08	4.20E-07	9.60E-08	4.20E-07	9.60E-08	2.40E-09
Antimony and compounds	7.9E-06	lb/MMBtu	1	2.37E-04	1.04E-03	2.37E-04	1.04E-03	2.37E-04	5.93E-06
Arsenic	2.2E-05	lb/MMBtu	1	6.60E-04	2.89E-03	6.60E-04	2.89E-03	6.60E-04	1.65E-05
Benzo(a)pyrene	2.6E-06	lb/MMBtu	1	7.80E-05	3.42E-04	7.80E-05	3.42E-04	7.80E-05	1.95E-06
Beryllium	1.1E-06	lb/MMBtu	1	3.30E-05	1.45E-04	3.30E-05	1.45E-04	3.30E-05	8.25E-07
Cadmium	4.1E-06	lb/MMBtu	1	1.23E-04	5.39E-04	1.23E-04	5.39E-04	1.23E-04	3.08E-06
Carbon tetrachloride	4.5E-05	lb/MMBtu	1	1.35E-03	5.91E-03	1.35E-03	5.91E-03	1.35E-03	3.38E-05
Chlorine	7.9E-04	lb/MMBtu	1	2.37E-02	1.04E-01	2.37E-02	1.04E-01	2.37E-02	5.93E-04
Chlorobenzene	3.3E-05	lb/MMBtu	1	9.90E-04	4.34E-03	9.90E-04	4.34E-03	9.90E-04	2.48E-05
Chromium-Other compounds	2.1E-05	lb/MMBtu	1	6.30E-04	2.76E-03	6.30E-04	2.76E-03	6.30E-04	1.58E-05
Cobalt compounds	6.5E-06	lb/MMBtu	1	1.95E-04	8.54E-04	1.95E-04	8.54E-04	1.95E-04	4.88E-06
Dinitrophenol, 2,4-	1.8E-07	lb/MMBtu	1	5.40E-06	2.37E-05	5.40E-06	2.37E-05	5.40E-06	1.35E-07
Di(2-ethylhexyl)phthalate	4.7E-08	lb/MMBtu	1	1.41E-06	6.18E-06	1.41E-06	6.18E-06	1.41E-06	3.53E-08
Ethyl benzene	3.1E-05	lb/MMBtu	1	9.30E-04	4.07E-03	9.30E-04	4.07E-03	9.30E-04	2.33E-05
Dichloroethane, 1,2-	2.9E-05	lb/MMBtu	1	8.70E-04	3.81E-03	8.70E-04	3.81E-03	8.70E-04	2.18E-05
Hydrochloric acid	1.9E-02	lb/MMBtu	1	5.70E-01	2.50E+00	5.70E-01	2.50E+00	5.70E-01	1.43E-02
Lead	4.8E-05	lb/MMBtu	1	1.44E-03	6.31E-03	1.44E-03	6.31E-03	1.44E-03	3.60E-05
Manganese	1.6E-03	lb/MMBtu	1	4.80E-02	2.10E-01	4.80E-02	2.10E-01	4.80E-02	1.20E-03
Mercury	3.5E-06	lb/MMBtu	1	1.05E-04	4.60E-04	1.05E-04	4.60E-04	1.05E-04	2.63E-06
Methyl bromide	1.5E-05	lb/MMBtu	1	4.50E-04	1.97E-03	4.50E-04	1.97E-03	4.50E-04	1.13E-05
Methyl chloride	2.3E-05	lb/MMBtu	1	6.90E-04	3.02E-03	6.90E-04	3.02E-03	6.90E-04	1.73E-05
Trichloroethane, 1,1,1-	3.1E-05	lb/MMBtu	1	9.30E-04	4.07E-03	9.30E-04	4.07E-03	9.30E-04	2.33E-05
Naphthalene	9.7E-05	lb/MMBtu	1	2.91E-03	1.27E-02	2.91E-03	1.27E-02	2.91E-03	7.28E-05
Nickel	3.3E-05	lb/MMBtu	1	9.90E-04	4.34E-03	9.90E-04	4.34E-03	9.90E-04	2.48E-05

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TABLE 5
POTENTIAL EMISSIONS - FURNACE BYPASS (COLD START-UP)[1]
ENVIVA PELLETS GREENWOOD, LLC

Nitrophenol, 4-	1.1E-07	lb/MMBtu	1	3.30E-06	1.45E-05	3.30E-06	1.45E-05	3.30E-06	8.25E-08
Pentachlorophenol	5.1E-08	lb/MMBtu	1	1.53E-06	6.70E-06	1.53E-06	6.70E-06	1.53E-06	3.83E-08
Perchloroethylene	3.8E-05	lb/MMBtu	1	1.14E-03	4.99E-03	1.14E-03	4.99E-03	1.14E-03	2.85E-05
Phosphorus metal, yellow or white	2.7E-05	lb/MMBtu	1	8.10E-04	3.55E-03	8.10E-04	3.55E-03	8.10E-04	2.03E-05
Polychlorinated biphenyls	8.2E-09	lb/MMBtu	1	2.45E-07	1.07E-06	2.45E-07	1.07E-06	2.45E-07	6.11E-09
Polycyclic Organic Matter	1.3E-04	lb/MMBtu	1	3.75E-03	1.64E-02	3.75E-03	1.64E-02	3.75E-03	9.38E-05
Dichloropropane, 1,2-	3.3E-05	lb/MMBtu	1	9.90E-04	4.34E-03	9.90E-04	4.34E-03	9.90E-04	2.48E-05
Selenium compounds	2.8E-06	lb/MMBtu	1	8.40E-05	3.68E-04	8.40E-05	3.68E-04	8.40E-05	2.10E-06
Tetrachlorodibenzo-p-dioxin, 2,3,7,8-	6.6E-12	lb/MMBtu	1	2.58E-10	1.13E-09	2.58E-10	1.13E-09	2.58E-10	6.45E-12
Trichloroethylene	3.0E-05	lb/MMBtu	1	9.00E-04	3.94E-03	9.00E-04	3.94E-03	9.00E-04	2.25E-05
Trichlorophenol, 2,4,6-	2.2E-08	lb/MMBtu	1	6.60E-07	2.89E-06	6.60E-07	2.89E-06	6.60E-07	1.65E-08
Vinyl chloride	1.8E-05	lb/MMBtu	1	5.40E-04	2.37E-03	5.40E-04	2.37E-03	5.40E-04	1.35E-05
Total HAP Emissions (Biomass Combustion)				**0.94**	**4.12**	**0.94**	**4.12**	**0.94**	**0.024**

Notes:
[1] Emission factors for wood combustion in a stoker boiler from AP-42, Section 1.6 - Wood Residue Combustion in Boilers, 09/03
[2] Unlimited emissions are based on the maximum hourly heat input for this operating mode at 8,760 hours/year. Limited emissions are based on the proposed annual operating hour limit.

Potential Criteria Pollutant Emissions - Diesel Fuel Combustion

Pollutant	Uncontrolled Emission Factor	Units	Uncontrolled & Unlimited Emissions		Controlled & Unlimited Emissions		Controlled & Limited Emissions (PTE)	
			Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)
CO	5	lb/Mgal[1]	1.50E-01	5.00E-04	1.50E-01	5.00E-04	1.50E-01	5.00E-04
NO_x	20	lb/Mgal[1]	6.00E-01	2.00E-03	6.00E-01	2.00E-03	6.00E-01	2.00E-03
SO_2	0.2	lb/Mgal[1]	6.39E-03	2.13E-05	6.39E-03	2.13E-05	6.39E-03	2.13E-05
VOC	0.2	lb/Mgal[1]	6.00E-03	2.00E-05	6.00E-03	2.00E-05	6.00E-03	2.00E-05
Total $PM/PM_{10}/PM_{2.5}$	3.3	lb/Mgal[1]	9.90E-02	3.30E-04	9.90E-02	3.30E-04	9.90E-02	3.30E-04

Notes:
[1] CO, NO_x, SO_2, PM, and VOC emission rates based on AP-42, Chapter 1.3 - Fuel Oil Combustion, 5/10 for distillate fuel oil combustion. Emissions of SO_2 assume a 15 ppm sulfur content in diesel fuel.

Potential HAP Emissions - Diesel Fuel Combustion

Pollutant	Uncontrolled Emission Factor	Units	Footnote	Uncontrolled & Unlimited Emissions		Controlled & Unlimited Emissions		Controlled & Limited Emissions (PTE)	
				Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)
Formaldehyde	3.30E-02	lb/Mgal	1	9.90E-04	3.30E-06	9.90E-04	3.30E-06	9.90E-04	3.30E-06
Acenaphthene	2.11E-05	lb/Mgal	1	6.33E-07	2.11E-09	6.33E-07	2.11E-09	6.33E-07	2.11E-09
Acenaphthylene	2.53E-07	lb/Mgal	1	7.59E-09	2.53E-11	7.59E-09	2.53E-11	7.59E-09	2.53E-11
Anthracene	1.2E-06	lb/Mgal	1	3.66E-08	1.22E-10	3.66E-08	1.22E-10	3.66E-08	1.22E-10
Arsenic	4.0E-06	lb/MMBtu	1	1.68E-05	5.60E-08	1.68E-05	5.60E-08	1.68E-05	5.60E-08
Benzene	2.1E-04	lb/Mgal	1	6.42E-06	2.14E-08	6.42E-06	2.14E-08	6.42E-06	2.14E-08
Benz(a)anthracene	4.0E-06	lb/Mgal	1	1.20E-07	4.01E-10	1.20E-07	4.01E-10	1.20E-07	4.01E-10
Benzo(b,k)fluoranthene	1.5E-06	lb/Mgal	1	4.44E-08	1.48E-10	4.44E-08	1.48E-10	4.44E-08	1.48E-10
Benzo(g,h,i)perylene	2.3E-06	lb/Mgal	1	6.78E-08	2.26E-10	6.78E-08	2.26E-10	6.78E-08	2.26E-10
Beryllium	3.0E-06	lb/MMBtu	1	1.26E-05	4.20E-08	1.26E-05	4.20E-08	1.26E-05	4.20E-08
Cadmium	3.0E-06	lb/MMBtu	1	1.26E-05	4.20E-08	1.26E-05	4.20E-08	1.26E-05	4.20E-08
Chromium-Other compounds	3.0E-06	lb/MMBtu	1	1.26E-05	4.20E-08	1.26E-05	4.20E-08	1.26E-05	4.20E-08
Chrysene	2.4E-06	lb/Mgal	1	7.14E-08	2.38E-10	7.14E-08	2.38E-10	7.14E-08	2.38E-10
Copper	6.0E-06	lb/MMBtu	1	2.52E-05	8.40E-08	2.52E-05	8.40E-08	2.52E-05	8.40E-08
Dibenzo(a,h) anthracene	1.7E-06	lb/Mgal	1	5.01E-08	1.67E-10	5.01E-08	1.67E-10	5.01E-08	1.67E-10
Ethyl benzene	6.4E-05	lb/Mgal	1	1.91E-06	6.36E-09	1.91E-06	6.36E-09	1.91E-06	6.36E-09
Fluoranthene	4.8E-06	lb/Mgal	1	1.45E-07	4.84E-10	1.45E-07	4.84E-10	1.45E-07	4.84E-10
Fluorene	4.5E-06	lb/Mgal	1	1.34E-07	4.47E-10	1.34E-07	4.47E-10	1.34E-07	4.47E-10
Indeno(1,2,3-cd)pyrene	2.1E-06	lb/Mgal	1	6.42E-08	2.14E-10	6.42E-08	2.14E-10	6.42E-08	2.14E-10
Lead	9.0E-06	lb/MMBtu	1	3.78E-05	1.26E-07	3.78E-05	1.26E-07	3.78E-05	1.26E-07
Manganese	6.0E-06	lb/MMBtu	1	2.52E-05	8.40E-08	2.52E-05	8.40E-08	2.52E-05	8.40E-08
Mercury	3.0E-06	lb/MMBtu	1	1.26E-05	4.20E-08	1.26E-05	4.20E-08	1.26E-05	4.20E-08
Trichloroethane, 1,1,1-	2.4E-04	lb/Mgal	1	7.08E-06	2.36E-08	7.08E-06	2.36E-08	7.08E-06	2.36E-08
Naphthalene	1.1E-03	lb/Mgal	1	3.39E-05	1.13E-07	3.39E-05	1.13E-07	3.39E-05	1.13E-07
Nickel	3.0E-06	lb/MMBtu	1	1.26E-05	4.20E-08	1.26E-05	4.20E-08	1.26E-05	4.20E-08
Octachlorodibenzodioxin	3.1E-09	lb/Mgal	1	9.30E-11	3.10E-13	9.30E-11	3.10E-13	9.30E-11	3.10E-13
Phenanthrene	1.1E-05	lb/Mgal	1	3.15E-07	1.05E-09	3.15E-07	1.05E-09	3.15E-07	1.05E-09
Pyrene	4.3E-06	lb/Mgal	1	1.28E-07	4.25E-10	1.28E-07	4.25E-10	1.28E-07	4.25E-10
Selenium compounds	1.5E-05	lb/MMBtu	1	6.30E-05	2.10E-07	6.30E-05	2.10E-07	6.30E-05	2.10E-07
Toluene	6.2E-03	lb/Mgal	1	1.86E-04	6.20E-07	1.86E-04	6.20E-07	1.86E-04	6.20E-07
Xylene	1.1E-04	lb/Mgal	1	3.27E-06	1.09E-08	3.27E-06	1.09E-08	3.27E-06	1.09E-08
Zinc	4.0E-06	lb/MMBtu	1	1.68E-05	5.60E-08	1.68E-05	5.60E-08	1.68E-05	5.60E-08
Total HAP Emissions (Diesel Fuel Combustion)				**1.48E-03**	**4.93E-06**	**1.48E-03**	**4.93E-06**	**1.48E-03**	**4.93E-06**

Notes:
[1] CO, NO_x, SO_2, PM, and VOC emission rates based on AP-42, Chapter 1.3 - Fuel Oil Combustion, 5/10 for distillate fuel oil combustion.

TABLE 5
POTENTIAL EMISSIONS - FURNACE BYPASS (COLD START-UP)[1]
ENVIVA PELLETS GREENWOOD, LLC

Abbreviations:

CH_4 - methane
CO - carbon monoxide
CO2 - carbon dioxide
CO_2e - carbon dioxide equivalent
HAP - hazardous air pollutant
hr - hour
lb - pound
MMBtu - Million British thermal units
NO_x - nitrogen oxides
N_2O - nitrous oxide
ODT - oven dried tons
PM - particulate matter
PM_{10} - particulate matter with an aerodynamic diameter less than 10 microns
$PM_{2.5}$ - particulate matter with an aerodynamic diameter of 2.5 microns or less
SO_2 - sulfur dioxide
tpy - tons per year
VOC - volatile organic compound
yr - year

TABLE 6
POTENTIAL EMISSIONS - FURNACE BYPASS (IDLE MODE)[1]
ENVIVA PELLETS GREENWOOD, LLC

Calculation Basis

Hourly Heat Input Capacity	12 MMBtu/hr
Annual Heat Input Capacity	6,000 MMBtu/yr
Hours of Operation[1]	500 hr/yr

Potential Criteria Pollutant Emissions

Pollutant	Uncontrolled Emission Factor	Units	Uncontrolled & Unlimited Emissions[3]		Controlled & Unlimited Emissions[3]		Controlled & Limited Emissions (PTE)[3]	
			Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)
CO	0.60	lb/MMBtu[2]	7.20	31.5	7.20	31.5	7.20	1.80
NO_x	0.22	lb/MMBtu[2]	2.64	11.6	2.64	11.6	2.64	0.66
SO_2	0.025	lb/MMBtu[2]	0.30	1.31	0.30	1.314	0.30	0.075
VOC	0.017	lb/MMBtu[2]	0.20	0.89	0.20	0.89	0.20	0.051
Total PM	0.58	lb/MMBtu[2]	6.92	30.3	6.92	30.33	6.92	1.73
Total PM_{10}	0.52	lb/MMBtu[2]	6.20	27.2	6.20	27.17	6.20	1.55
Total $PM_{2.5}$	0.45	lb/MMBtu[2]	5.36	23.5	5.36	23.49	5.36	1.34

Notes:

[1] Idle mode is defined as operation at up to a maximum heat input rate of 12 MMBtu/hr. The furnace may operate in idle mode for up to 500 hr/yr.

[2] CO, NO_x, SO_2, PM, PM_{10}, $PM_{2.5}$, and VOC emission rates based on AP-42, Section 1.6 - Wood Residue Combustion in Boilers, 09/03 for bark/bark and wet wood/wet wood-fired boilers. PM_{10} and $PM_{2.5}$ factors equal to the sum of the filterable and condensable factors from Table 1.6-1. VOC emission factor excludes formaldehyde.

[3] Unlimited emissions are based on the maximum hourly heat input for this operating mode at 8,760 hours/year. Limited emissions are based on the proposed annual operating hour limit.

TABLE 6
POTENTIAL EMISSIONS - FURNACE BYPASS (IDLE MODE)[1]
ENVIVA PELLETS GREENWOOD, LLC

Potential HAP Emissions

Pollutant	Uncontrolled Emission Factor	Units	Footnote	Uncontrolled & Unlimited Emissions[2]		Controlled & Unlimited Emissions[2]		Controlled & Limited Emissions (PTE)[2]	
				Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)
Acetaldehyde	8.30E-04	lb/MMBtu	1	9.96E-03	4.36E-02	9.96E-03	4.36E-02	9.96E-03	2.49E-03
Acrolein	4.00E-03	lb/MMBtu	1	4.80E-02	2.10E-01	4.80E-02	2.10E-01	4.80E-02	1.20E-02
Formaldehyde	4.40E-03	lb/MMBtu	1	5.28E-02	2.31E-01	5.28E-02	2.31E-01	5.28E-02	1.32E-02
Phenol	5.10E-05	lb/MMBtu	1	6.12E-04	2.68E-03	6.12E-04	2.68E-03	6.12E-04	1.53E-04
Propionaldehyde	6.10E-05	lb/MMBtu	1	7.32E-04	3.21E-03	7.32E-04	3.21E-03	7.32E-04	1.83E-04
Acetophenone	3.2E-09	lb/MMBtu	1	3.84E-08	1.68E-07	3.84E-08	1.68E-07	3.84E-08	9.60E-09
Antimony and compounds	7.9E-06	lb/MMBtu	1	9.48E-05	4.15E-04	9.48E-05	4.15E-04	9.48E-05	2.37E-05
Arsenic	2.2E-05	lb/MMBtu	1	2.64E-04	1.16E-03	2.64E-04	1.16E-03	2.64E-04	6.60E-05
Benzo(a)pyrene	2.6E-06	lb/MMBtu	1	3.12E-05	1.37E-04	3.12E-05	1.37E-04	3.12E-05	7.80E-06
Beryllium	1.1E-06	lb/MMBtu	1	1.32E-05	5.78E-05	1.32E-05	5.78E-05	1.32E-05	3.30E-06
Cadmium	4.1E-06	lb/MMBtu	1	4.92E-05	2.15E-04	4.92E-05	2.15E-04	4.92E-05	1.23E-05
Carbon tetrachloride	4.5E-05	lb/MMBtu	1	5.40E-04	2.37E-03	5.40E-04	2.37E-03	5.40E-04	1.35E-04
Chlorine	7.9E-04	lb/MMBtu	1	9.48E-03	4.15E-02	9.48E-03	4.15E-02	9.48E-03	2.37E-03
Chlorobenzene	3.3E-05	lb/MMBtu	1	3.96E-04	1.73E-03	3.96E-04	1.73E-03	3.96E-04	9.90E-05
Chromium–Other compounds	2.1E-05	lb/MMBtu	1	2.52E-04	1.10E-03	2.52E-04	1.10E-03	2.52E-04	6.30E-05
Cobalt compounds	6.5E-06	lb/MMBtu	1	7.80E-05	3.42E-04	7.80E-05	3.42E-04	7.80E-05	1.95E-05
Dinitrophenol, 2,4-	1.8E-07	lb/MMBtu	1	2.16E-06	9.46E-06	2.16E-06	9.46E-06	2.16E-06	5.40E-07
Di(2-ethylhexyl)phthalate	4.7E-08	lb/MMBtu	1	5.64E-07	2.47E-06	5.64E-07	2.47E-06	5.64E-07	1.41E-07
Ethyl benzene	3.1E-05	lb/MMBtu	1	3.72E-04	1.63E-03	3.72E-04	1.63E-03	3.72E-04	9.30E-05
Dichloroethane, 1,2-	2.9E-05	lb/MMBtu	1	3.48E-04	1.52E-03	3.48E-04	1.52E-03	3.48E-04	8.70E-05
Hydrochloric acid	1.9E-02	lb/MMBtu	1	2.28E-01	9.99E-01	2.28E-01	9.99E-01	2.28E-01	5.70E-02
Lead	4.8E-05	lb/MMBtu	1	5.76E-04	2.52E-03	5.76E-04	2.52E-03	5.76E-04	1.44E-04
Manganese	1.6E-03	lb/MMBtu	1	1.92E-02	8.41E-02	1.92E-02	8.41E-02	1.92E-02	4.80E-03
Mercury	3.5E-06	lb/MMBtu	1	4.20E-05	1.84E-04	4.20E-05	1.84E-04	4.20E-05	1.05E-05
Methyl bromide	1.5E-05	lb/MMBtu	1	1.80E-04	7.88E-04	1.80E-04	7.88E-04	1.80E-04	4.50E-05
Methyl chloride	2.3E-05	lb/MMBtu	1	2.76E-04	1.21E-03	2.76E-04	1.21E-03	2.76E-04	6.90E-05
Trichloroethane, 1,1,1-	3.1E-05	lb/MMBtu	1	3.72E-04	1.63E-03	3.72E-04	1.63E-03	3.72E-04	9.30E-05
Naphthalene	9.7E-05	lb/MMBtu	1	1.16E-03	5.10E-03	1.16E-03	5.10E-03	1.16E-03	2.91E-04
Nickel	3.3E-05	lb/MMBtu	1	3.96E-04	1.73E-03	3.96E-04	1.73E-03	3.96E-04	9.90E-05
Nitrophenol, 4-	1.1E-07	lb/MMBtu	1	1.32E-06	5.78E-06	1.32E-06	5.78E-06	1.32E-06	3.30E-07
Pentachlorophenol	5.1E-08	lb/MMBtu	1	6.12E-07	2.68E-06	6.12E-07	2.68E-06	6.12E-07	1.53E-07
Perchloroethylene	3.8E-05	lb/MMBtu	1	4.56E-04	2.00E-03	4.56E-04	2.00E-03	4.56E-04	1.14E-04
Phosphorus metal, yellow or white	2.7E-05	lb/MMBtu	1	3.24E-04	1.42E-03	3.24E-04	1.42E-03	3.24E-04	8.10E-05
Polychlorinated biphenyls	8.2E-09	lb/MMBtu	1	9.78E-08	4.28E-07	9.78E-08	4.28E-07	9.78E-08	2.45E-08
Polycyclic Organic Matter	1.3E-04	lb/MMBtu	1	1.50E-03	6.57E-03	1.50E-03	6.57E-03	1.50E-03	3.75E-04
Dichloropropane, 1,2-	3.3E-05	lb/MMBtu	1	3.96E-04	1.73E-03	3.96E-04	1.73E-03	3.96E-04	9.90E-05
Selenium compounds	2.8E-06	lb/MMBtu	1	3.36E-05	1.47E-04	3.36E-05	1.47E-04	3.36E-05	8.40E-06
Tetrachlorodibenzo-p-dioxin, 2,3,7,8-	8.6E-12	lb/MMBtu	1	1.03E-10	4.52E-10	1.03E-10	4.52E-10	1.03E-10	2.58E-11
Trichloroethylene	3.0E-05	lb/MMBtu	1	3.60E-04	1.58E-03	3.60E-04	1.58E-03	3.60E-04	9.00E-05
Trichlorophenol, 2,4,6-	2.2E-08	lb/MMBtu	1	2.64E-07	1.16E-06	2.64E-07	1.16E-06	2.64E-07	6.60E-08
Vinyl chloride	1.8E-05	lb/MMBtu	1	2.16E-04	9.46E-04	2.16E-04	9.46E-04	2.16E-04	5.40E-05
Total HAP Emissions (Biomass Combustion)				**0.38**	**1.65**	**0.38**	**1.65**	**0.38**	**0.094**

TABLE 6
POTENTIAL EMISSIONS - FURNACE BYPASS (IDLE MODE)[1]
ENVIVA PELLETS GREENWOOD, LLC

Notes:
[1] Emission factors for wood combustion in a stoker boiler from AP-42, Section 1.6 - Wood Residue Combustion in Boilers, 09/03.
[2] Unlimited emissions are based on the maximum hourly heat input for this operating mode at 8,760 hours/year. Limited emissions are based on the proposed annual operating hour limit.

Abbreviations:
CH_4 - methane
CO - carbon monoxide
CO2 - carbon dioxide
CO_2e - carbon dioxide equivalent
HAP - hazardous air pollutant
hr - hour
kg - kilogram
lb - pound
MMBtu - Million British thermal units
NO_x - nitrogen oxides
N_2O - nitrous oxide
ODT - oven dried tons
PM - particulate matter
PM_{10} - particulate matter with an aerodynamic diameter less than 10 microns
$PM_{2.5}$ - particulate matter with an aerodynamic diameter of 2.5 microns or less
SO_2 - sulfur dioxide
tpy - tons per year
VOC - volatile organic compound
yr - year

TABLE 7
DRYER DUCT BURNER POTENTIAL EMISSIONS
ENVIVA PELLETS GREENWOOD, LLC

Duct Burner Inputs

Duct Burner Rating	5 MMBtu/hr
Number of Duct Burners	1
Annual Operation	8,760 hr/yr

Potential Criteria Pollutant Emissions - Natural Gas Combustion

Pollutant	Emission Factor	Units	Footnote	Emissions (PTE)[2]	
				Max (lb/hr)	Annual (tpy)
CO	84.0	lb/MMscf	1	0.41	1.80
NO_x	100.0	lb/MMscf	1	0.49	2.15
SO_2	0.60	lb/MMscf	1	0.0029	0.013
VOC	5.50	lb/MMscf	1	0.027	0.12
$PM/PM_{10}/PM_{2.5}$ Condensable	5.70	lb/MMscf	1	0.028	0.12
$PM/PM_{10}/PM_{2.5}$ Filterable	1.90	lb/MMscf	1	0.0093	0.041
Total $PM/PM_{10}/PM_{2.5}$				0.037	0.16

Notes:

[1] Emission factors for natural gas combustion from AP-42 Section 1.4 - Natural Gas Combustion, 07/98. Natural gas heating value of 1,020 Btu/scf assumed per AP-42.

[2] No control devices or limitations are proposed for this unit.

TABLE 7
DRYER DUCT BURNER POTENTIAL EMISSIONS
ENVIVA PELLETS GREENWOOD, LLC

Potential HAP and TAP Emissions

Pollutant	HAP	VOC	Emission Factor	Units	Footnote	Emissions (PTE)[2]	
						Max (lb/hr)	Annual (tpy)
2-Methylnaphthalene	Y	Y	2.4E-05	lb/MMscf	1	1.2E-07	5.2E-07
3-Methylchloranthrene	Y	Y	1.8E-06	lb/MMscf	1	8.8E-09	3.9E-08
7,12-Dimethylbenz(a)anthracene	Y	Y	1.6E-05	lb/MMscf	1	7.8E-08	3.4E-07
Acenaphthene	Y	Y	1.8E-06	lb/MMscf	1	8.8E-09	3.9E-08
Acenaphthylene	Y	Y	1.8E-06	lb/MMscf	1	8.8E-09	3.9E-08
Acetaldehyde	Y	Y	1.5E-05	lb/MMscf	1	7.5E-08	3.3E-07
Acrolein	Y	Y	1.8E-05	lb/MMscf	1	8.8E-08	3.9E-07
Ammonia	N	N	3.2	lb/MMscf	1	1.6E-02	6.9E-02
Anthracene	Y	Y	2.4E-06	lb/MMscf	1	1.2E-08	5.2E-08
Arsenic	Y	N	2.0E-04	lb/MMscf	1	9.8E-07	4.3E-06
Benz(a)anthracene	Y	Y	1.8E-06	lb/MMscf	1	8.8E-09	3.9E-08
Benzene	Y	Y	2.1E-03	lb/MMscf	1	1.0E-05	4.5E-05
Benzo(a)pyrene	Y	Y	1.2E-06	lb/MMscf	1	5.9E-09	2.6E-08
Benzo(b)fluoranthene	Y	Y	1.8E-06	lb/MMscf	1	8.8E-09	3.9E-08
Benzo(g,h,i)perylene	Y	Y	1.2E-06	lb/MMscf	1	5.9E-09	2.6E-08
Benzo(k)fluoranthene	Y	Y	1.8E-06	lb/MMscf	1	8.8E-09	3.9E-08
Beryllium	Y	N	1.2E-05	lb/MMscf	1	5.9E-08	2.6E-07
Cadmium	Y	N	1.1E-03	lb/MMscf	1	5.4E-06	2.4E-05
Chromium VI	Y	N	1.4E-03	lb/MMscf	1	6.9E-06	3.0E-05
Chrysene	Y	Y	1.8E-06	lb/MMscf	1	8.8E-09	3.9E-08
Cobalt compounds	Y	N	8.4E-05	lb/MMscf	1	4.1E-07	1.8E-06
Dibenzo(a,h)anthracene	Y	Y	1.2E-06	lb/MMscf	1	5.9E-09	2.6E-08
Dichlorobenzene	Y	Y	1.2E-03	lb/MMscf	1	5.9E-06	2.6E-05
Fluoranthene	Y	Y	3.0E-06	lb/MMscf	1	1.5E-08	6.4E-08
Fluorene	Y	Y	2.8E-06	lb/MMscf	1	1.4E-08	6.0E-08
Formaldehyde	Y	Y	7.5E-02	lb/MMscf	1	3.7E-04	1.6E-03
Hexane	Y	Y	1.8	lb/MMscf	1	8.8E-03	3.9E-02
Indeno(1,2,3-cd)pyrene	Y	Y	1.8E-06	lb/MMscf	1	8.8E-09	3.9E-08
Lead	Y	N	5.0E-04	lb/MMscf	1	2.5E-06	1.1E-05
Manganese	Y	N	3.8E-04	lb/MMscf	1	1.9E-06	8.2E-06
Mercury	Y	N	2.6E-04	lb/MMscf	1	1.3E-06	5.6E-06
Naphthalene	Y	Y	6.1E-04	lb/MMscf	1	3.0E-06	1.3E-05
Nickel	Y	N	2.1E-03	lb/MMscf	1	1.0E-05	4.5E-05
Phenanthrene	Y	Y	1.7E-05	lb/MMscf	1	8.3E-08	3.7E-07
Pyrene	Y	Y	5.0E-06	lb/MMscf	1	2.5E-08	1.1E-07
Selenium compounds	Y	N	2.4E-05	lb/MMscf	1	1.2E-07	5.2E-07
Toluene	Y	Y	3.4E-03	lb/MMscf	1	1.7E-05	7.3E-05
					Total HAP Emissions	**0.0093**	**0.041**

Notes:

[1] Emission factors for natural gas combustion are from NCDAQ Natural Gas Combustion Spreadsheet and AP-42, Fifth Edition, Volume 1, Chapter 1.4 - Natural Gas Combustion, 07/98. The emission factors for acetaldehyde, acrolein, and ammonia are cited in the NCDAQ spreadsheet as being sourced from the USEPA's WebFIRE database.

[2] No control devices or limitations are proposed for this unit.

TABLE 7
DRYER DUCT BURNER POTENTIAL EMISSIONS
ENVIVA PELLETS GREENWOOD, LLC

Abbreviations:

CAS - chemical abstract service
CH_4 - methane
CO - carbon monoxide
CO2 - carbon dioxide
CO_2e - carbon dioxide equivalent
HAP - hazardous air pollutant
hr - hour
kg - kilogram
lb - pound
MMBtu - Million British thermal units
NC - North Carolina
NO_x - nitrogen oxides
N_2O - nitrous oxide
ODT - oven dried tons
PM - particulate matter
PM_{10} - particulate matter with an aerodynamic diameter less than 10 microns
$PM_{2.5}$ - particulate matter with an aerodynamic diameter of 2 5 microns or less
RTO - regenerative thermal oxidizer
SO_2 - sulfur dioxide
TAP - toxic air pollutant
tpy - tons per year
VOC - volatile organic compound
WESP - wet electrostatic precipitator
yr - year

TABLE 8
POTENTIAL DRY HAMMERMILL EMISSIONS AT OUTLET OF RTO-1 STACK
ENVIVA PELLETS GREENWOOD, LLC

Calculation Basis

Total Plant Throughput	660,000	ODT/yr
% of Total Throughput to the Hammermills	100%	
Hours of Operation	8,760	hr/yr
VOC/HAP Control Efficiency	95.0%	
Particulate Matter Control Efficiency	99.0%	
Hammermills Annual Throughput	660,000	ODT/yr
Hammermills Hourly Throughput	88	ODT/hr
Cyclofilter Control Efficiency	99%	

Potential PM, VOC and HAP Emissions

Pollutant	CAS No.	HAP	VOC	Emission Factor[1]	Uncontrolled & Unlimited Emissions[4]		Controlled & Unlimited Emissions[4]		Controlled & Limited Emissions (PTE)[2,4]	
				(lb/ODT)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)
Acetaldehyde	75-07-0	Y	Y	0.0072	0.64	2.79	0.032	0.14	0.032	0.12
Acrolein	107-02-8	Y	Y	0.011	0.96	4.19	0.048	0.21	0.048	0.18
Formaldehyde	50-00-0	Y	Y	0.00024	0.021	0.093	0.0011	0.0046	0.0011	0.0040
Methanol	67-56-1	Y	Y	0.0059	0.52	2.27	0.026	0.11	0.03	0.10
Phenol	108-95-2	Y	Y	0.0028	0.24	1.07	0.012	0.053	0.012	0.045
Propionaldehyde	123-38-6	Y	Y	0.012	1.09	4.79	0.055	0.24	0.055	0.20
			Total HAP Emissions:		3.47	15.2	0.17	0.76	0.17	0.65
Total VOC (as propane)	--	--	Y	1.23	109	477	5.44	23.8	5.44	20.3
$PM/PM_{10}/PM_{2.5}$ (Filterable + Condensable)	--	--	--	0.17	1,506	6,596	15.1	66.0	15.1	56.3

Thermal Generated Potential Criteria Pollutant Emissions

Maximum high heating value of VOC constituents	1.8E-02	MMBtu/lb
Uncontrolled VOC emissions	407	tons/yr
Uncontrolled VOC emissions	109	lb/hr
Heat input of uncontrolled VOC emissions	15,038	MMBtu/yr
Heat input of uncontrolled VOC emissions	2.0	MMBtu/hr

TABLE 8

POTENTIAL DRY HAMMERMILL EMISSIONS AT OUTLET OF RTO-1 STACK

ENVIVA PELLETS GREENWOOD, LLC

Pollutant	Emission Factor[3]	Units	Uncontrolled & Unlimited Emissions[4]		Controlled & Unlimited Emissions[4]		Controlled & Limited Emissions (PTE)[4]	
			Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)
CO	8.2E-02	lb/MMBtu	0.00	0.00	0.17	0.73	0.17	0.62
NO_x	9.8E-02	lb/MMBtu	0.00	0.00	0.20	0.86	0.20	0.74

Notes:

[1] Emission factors were derived based on stack testing data for the Greenwood plant and comparable Enviva facilities and include contingency. The emission factors represent uncontrolled emissions with the exception of the PM factor, which is controlled.

[2] VOC and HAP emissions controlled by furnace or RTO1 at 95%

[3] CO and NO_x emission factors are from AP-42, Fifth Edition, Volume 1, Chapter 1.4 - Natural Gas Combustion, 07/98 for small boilers.

[4] Unlimited emissions assume maximum hourly throughput at 8,760 hours/year. Limited emissions are based on proposed annual throughput. Controlled emissions are based on proposed short-term and annual throughputs and application of control device efficiencies.

Abbreviations:

CAS - chemical abstract service
HAP - hazardous air pollutant
hr - hour
lb - pound
ODT - oven dried tons
TAP - toxic air pollutant
tpy - tons per year
VOC - volatile organic compound
yr - year

TABLE 9
POTENTIAL PELLET PRESS AND COOLER EMISSIONS AT OUTLET OF RTO-2/RCO-1 STACK
ENVIVA PELLETS GREENWOOD, LLC

Calculation Basis

Annual Throughput	330,000	ODT/yr
Hourly Throughput	45	ODT/hr
Hours of Operation	8,760	hr/yr
Number of Burners	1	burners
RTO/RCO Burner Rating	5.2	MMBtu/hr
RTO/RCO Control Efficiency	95%	
Baghouse Control Efficiency	99%	

Pellet Mill and Cooler Potential CO, NO_x, VOC and HAP Emissions

Pollutant	CAS No.	HAP	VOC	Emission Factor[1]	Uncontrolled & Unlimited Emissions[4]		Controlled & Unlimited Emissions[4]		Controlled & Limited Emissions (PTE)[2,4]	
				(lb/ODT)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)
Acetaldehyde	75-07-0	Y	Y	0.034	1.52	6.68	0.076	0.33	0.076	0.28
Acrolein	107-02-8	Y	Y	0.050	2.26	9.91	0.11	0.50	0.11	0.41
Formaldehyde	50-00-0	Y	Y	0.13	5.77	25.3	0.29	1.26	0.29	1.05
Methanol	67-56-1	Y	Y	0.0060	0.27	1.19	0.014	0.059	0.014	0.049
Phenol	108-95-2	Y	Y	0.025	1.14	5.01	0.057	0.25	0.057	0.21
Propionaldehyde	123-38-6	Y	Y	0.015	0.66	2.90	0.033	0.14	0.033	0.12
Total HAP Emissions					**11.6**	**50.9**	**0.58**	**2.55**	**0.58**	**2.12**
Total VOC (as propane)	--	--	Y	2.97	135	590	6.74	29.5	6.74	24.5
CO	--	--	--	0.11	0.00	0.0	4.84	21.2	4.84	17.6
NO_x	--	--	--	0.018	0.00	0.00	0.82	3.58	0.82	2.97
Total PM	--	--	--	--[5]	428.57	1877.14	4.29	18.77	4.29	18.77
Total PM_{10}	--	--	--	--[5]	111.86	489.93	1.12	4.90	1.12	4.90
Total $PM_{2.5}$[6]	--	--	--	0.015	69.13	251.46	0.69	2.51	0.69	2.51

Notes:

[1] Emission factors were derived based on stack testing data from the Greenwood plant and comparable Enviva facilities, and include contingency. The emission factors represent uncontrolled emissions.

[2] A 95.0% control efficiency for the RCO is applied to VOC and organic HAP emissions.

[3] Emissions from the pellet mills and pellet coolers are controlled by an RCO that operates primarily in catalytic mode with thermal (RTO) mode as a backup. The RTO and RCO modes have the same control efficiency so there is no impact on emissions when operating in thermal mode.

[4] Unlimited emissions assume maximum hourly throughput at 8,760 hours/year. Limited emissions are based on proposed annual throughput. Controlled emissions are based on proposed short-term and annual throughputs and application of control device efficiencies.

[5] PM emissions based on an outlet grain loading of 0.010 gr/scf and an exhaust flow rate of 50,000 scfm. PM_{10} emissions based on PM emissions and speciation based on data for similar Enviva facility.

[6] $PM_{2.5}$ emissions factor represents post-control emissions and includes both process and combustion emissions with contingency.

TABLE 9

POTENTIAL PELLET PRESS AND COOLER EMISSIONS AT OUTLET OF RTO-2/RCO-1 STACK

ENVIVA PELLETS GREENWOOD, LLC

Natural Gas Combustion Potential Criteria Pollutant Emissions

Pollutant	Emission Factor[1]	Units	Emissions (PTE)[3]	
			Max (lb/hr)	Annual (tpy)
SO_2	5.9E-04	lb/MMBtu	0.0031	0.013
Total PM	7.5E-03	lb/MMBtu	0.039	0.17
Total PM_{10}	7.5E-03	lb/MMBtu	0.039	0.17

Natural Gas Combustion Potential HAP and TAP Emissions

Pollutant	HAP	VOC	Emission Factor	Units	Footnote	Emissions (PTE)[3]	
						Max (lb/hr)	Annual (tpy)
2-Methylnaphthalene	Y	Y	2.4E-05	lb/MMscf	2	1.2E-07	5.4E-07
3-Methylchloranthrene	Y	Y	1.8E-06	lb/MMscf	2	9.2E-09	4.0E-08
7,12-Dimethylbenz(a)anthracene	Y	Y	1.6E-05	lb/MMscf	2	8.2E-08	3.6E-07
Acenaphthene	Y	Y	1.8E-06	lb/MMscf	2	9.2E-09	4.0E-08
Acenaphthylene	Y	Y	1.8E-06	lb/MMscf	2	9.2E-09	4.0E-08
Acetaldehyde	Y	Y	1.5E-05	lb/MMscf	2	7.7E-08	3.4E-07
Acrolein	Y	Y	1.8E-05	lb/MMscf	2	9.2E-08	4.0E-07
Ammonia	N	N	3.2	lb/MMscf	2	0.016	0.071
Anthracene	Y	Y	2.4E-06	lb/MMscf	2	1.2E-08	5.4E-08
Arsenic	Y	N	2.0E-04	lb/MMscf	2	1.0E-06	4.5E-06
Benz(a)anthracene	Y	Y	1.8E-06	lb/MMscf	2	9.2E-09	4.0E-08
Benzene	Y	Y	2.1E-03	lb/MMscf	2	1.1E-05	4.7E-05
Benzo(a)pyrene	Y	Y	1.2E-06	lb/MMscf	2	6.1E-09	2.7E-08
Benzo(b)fluoranthene	Y	Y	1.8E-06	lb/MMscf	2	9.2E-09	4.0E-08
Benzo(g,h,i)perylene	Y	Y	1.2E-06	lb/MMscf	2	6.1E-09	2.7E-08
Benzo(k)fluoranthene	Y	Y	1.8E-06	lb/MMscf	2	9.2E-09	4.0E-08
Beryllium	Y	N	1.2E-05	lb/MMscf	2	6.1E-08	2.7E-07
Cadmium	Y	N	1.1E-03	lb/MMscf	2	5.6E-06	2.5E-05
Chromium VI	Y	N	1.4E-03	lb/MMscf	2	7.1E-06	3.1E-05
Chrysene	Y	Y	1.8E-06	lb/MMscf	2	9.2E-09	4.0E-08
Cobalt compounds	Y	N	8.4E-05	lb/MMscf	2	4.3E-07	1.9E-06
Dibenzo(a,h)anthracene	Y	Y	1.2E-06	lb/MMscf	2	6.1E-09	2.7E-08
Dichlorobenzene	Y	Y	1.2E-03	lb/MMscf	2	6.1E-06	2.7E-05
Fluoranthene	Y	Y	3.0E-06	lb/MMscf	2	1.5E-08	6.7E-08
Fluorene	Y	Y	2.8E-06	lb/MMscf	2	1.4E-08	6.3E-08
Formaldehyde	Y	Y	7.5E-02	lb/MMscf	2	3.8E-04	1.7E-03
Hexane	Y	Y	1.8	lb/MMscf	2	9.2E-03	0.040
Indeno(1,2,3-cd)pyrene	Y	Y	1.8E-06	lb/MMscf	2	9.2E-09	4.0E-08
Lead	Y	N	5.0E-04	lb/MMscf	2	2.5E-06	1.1E-05
Manganese	Y	N	3.8E-04	lb/MMscf	2	1.9E-06	8.5E-06
Mercury	Y	N	2.6E-04	lb/MMscf	2	1.3E-06	5.8E-06
Naphthalene	Y	Y	6.1E-04	lb/MMscf	2	3.1E-06	1.4E-05
Nickel	Y	N	2.1E-03	lb/MMscf	2	1.1E-05	4.7E-05
Phenanthrene	Y	Y	1.7E-05	lb/MMscf	2	8.7E-08	3.8E-07
Pyrene	Y	Y	5.0E-06	lb/MMscf	2	2.5E-08	1.1E-07
Selenium compounds	Y	N	2.4E-05	lb/MMscf	2	1.2E-07	5.4E-07
Toluene	Y	Y	3.4E-03	lb/MMscf	2	1.7E-05	7.6E-05
					Total HAP Emissions	**0.010**	**0.042**

TABLE 9

POTENTIAL PELLET PRESS AND COOLER EMISSIONS AT OUTLET OF RTO-2/RCO-1 STACK

ENVIVA PELLETS GREENWOOD, LLC

Notes:

[1] Emission factors from AP-42, Section 1.4 - Natural Gas Combustion, 07/98. Emission factors converted from lb/MMscf to lb/MMBtu based on assumed heating value of 1,020 Btu/scf for natural gas per AP-42 Section 1.4.

[2] Emission factors for natural gas combustion are from NCDAQ Natural Gas Combustion Spreadsheet and AP-42, Fifth Edition, Volume 1, Chapter 1.4 - Natural Gas Combustion, 07/98 for small boilers. The emission factors for acetaldehyde, acrolein, and ammonia are cited in the NCDAQ spreadsheet as being sourced from the USEPA's WebFIRE database.

[3] No control devices or limitations are proposed for this unit.

Abbreviations:

CAS - chemical abstract service
HAP - hazardous air pollutant
hr - hour
lb - pound
NC - North Carolina
ODT - oven dried tons
RCO - regenerative catalytic oxidizer
RTO - regenerative thermal oxidizer
TAP - toxic air pollutant
tpy - tons per year
VOC - volatile organic compound
yr - year

TABLE 10
POTENTIAL PELLET PRESS AND COOLER EMISSIONS AT OUTLET OF RTO-3/RCO-2 STACK
ENVIVA PELLETS GREENWOOD, LLC

Calculation Basis

Annual Throughput	330,000	ODT/yr
Hourly Throughput	45	ODT/hr
Hours of Operation	8,760	hr/yr
Number of Burners	2	burners
RTO/RCO Burner Rating	5.2	MMBtu/hr
RTO/RCO Control Efficiency	95%	
Baghouse Control Efficiency	99%	

Pellet Mill and Cooler Potential CO, NO_X, VOC and HAP Emissions

Pollutant	CAS No.	HAP	VOC	Emission Factor[1]	Uncontrolled & Unlimited Emissions[4]		Controlled & Unlimited Emissions[4]		Controlled & Limited Emissions (PTE)[2,4]	
				(lb/ODT)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)
Acetaldehyde	75-07-0	Y	Y	0.034	1.52	6.68	0.076	0.33	0.076	0.28
Acrolein	107-02-8	Y	Y	0.050	2.26	9.91	0.11	0.50	0.11	0.41
Formaldehyde	50-00-0	Y	Y	0.13	5.77	25.3	0.29	1.26	0.29	1.05
Methanol	67-56-1	Y	Y	0.0060	0.27	1.19	0.014	0.059	0.014	0.049
Phenol	108-95-2	Y	Y	0.025	1.14	5.01	0.057	0.25	0.057	0.21
Propionaldehyde	123-38-6	Y	Y	0.015	0.66	2.90	0.033	0.14	0.033	0.12
Total HAP Emissions					**11.6**	**50.9**	**0.58**	**2.55**	**0.58**	**2.12**
Total VOC (as propane)	--	--	Y	2.97	135	590	6.74	29.5	6.74	24.5
CO	--	--	--	0.11	0.00	0.0	4.84	21.2	4.84	17.6
NO_X	--	--	--	0.018	0.00	0.00	0.82	3.58	0.82	2.97
Total PM	--	--	--	--[5]	428.57	1877.14	4.29	18.77	4.29	18.77
Total PM_{10}	--	--	--	--[5]	111.86	489.93	1.12	4.90	1.12	4.90
Total $PM_{2.5}$[6]	--	--	--	0.015	69.13	251.46	0.69	2.51	0.69	2.51

Notes:

[1] Emission factors were derived based on stack testing data from the Greenwood plant and comparable Enviva facilities, and include contingency. The emission factors represent uncontrolled emissions.

[2] A 95.0% control efficiency for the RCO is applied to VOC and organic HAP emissions.

[3] Emissions from the pellet mills and pellet coolers are controlled by an RCO that operates primarily in catalytic mode with thermal (RTO) mode as a backup. The RTO and RCO modes have the same control efficiency so there is no impact on emissions when operating in thermal mode.

[4] Unlimited emissions assume maximum hourly throughput at 8,760 hours/year. Limited emissions are based on proposed annual throughput. Controlled emissions are based on proposed short-term and annual throughputs and application of control device efficiencies.

[5] PM emissions based on an outlet grain loading of 0.010 gr/scf and an exhaust flow rate of 50,000 scfm. PM_{10} emissions based on PM emissions and speciation based on data for similar Enviva facility.

[6] $PM_{2.5}$ emissions factor represents post-control emissions and includes both process and combustion emissions with contingency.

TABLE 10

POTENTIAL PELLET PRESS AND COOLER EMISSIONS AT OUTLET OF RTO-3/RCO-2 STACK

ENVIVA PELLETS GREENWOOD, LLC

Natural Gas Combustion Potential Criteria Pollutant Emissions

Pollutant	Emission Factor[1]	Units	Emissions (PTE)[3]	
			Max (lb/hr)	Annual (tpy)
SO_2	5.9E-04	lb/MMBtu	0.0061	0.027
Total PM	7.5E-03	lb/MMBtu	0.077	0.34
Total PM_{10}	7.5E-03	lb/MMBtu	0.077	0.34

Natural Gas Combustion Potential HAP and TAP Emissions

Pollutant	HAP	VOC	Emission Factor	Units	Footnote	Emissions (PTE)[3]	
						Max (lb/hr)	Annual (tpy)
2-Methylnaphthalene	Y	Y	2.4E-05	lb/MMscf	2	2.4E-07	1.1E-06
3-Methylchloranthrene	Y	Y	1.8E-06	lb/MMscf	2	1.8E-08	8.0E-08
7,12-Dimethylbenz(a)anthracene	Y	Y	1.6E-05	lb/MMscf	2	1.6E-07	7.1E-07
Acenaphthene	Y	Y	1.8E-06	lb/MMscf	2	1.8E-08	8.0E-08
Acenaphthylene	Y	Y	1.8E-06	lb/MMscf	2	1.8E-08	8.0E-08
Acetaldehyde	Y	Y	1.5E-05	lb/MMscf	2	1.5E-07	6.8E-07
Acrolein	Y	Y	1.8E-05	lb/MMscf	2	1.8E-07	8.0E-07
Ammonia	N	N	3.20	lb/MMscf	2	0.033	0.14
Anthracene	Y	Y	2.4E-06	lb/MMscf	2	2.4E-08	1.1E-07
Arsenic	Y	N	2.0E-04	lb/MMscf	2	2.0E-06	8.9E-06
Benz(a)anthracene	Y	Y	1.8E-06	lb/MMscf	2	1.8E-08	8.0E-08
Benzene	Y	Y	2.1E-03	lb/MMscf	2	2.1E-05	9.4E-05
Benzo(a)pyrene	Y	Y	1.2E-06	lb/MMscf	2	1.2E-08	5.4E-08
Benzo(b)fluoranthene	Y	Y	1.8E-06	lb/MMscf	2	1.8E-08	8.0E-08
Benzo(g,h,i)perylene	Y	Y	1.2E-06	lb/MMscf	2	1.2E-08	5.4E-08
Benzo(k)fluoranthene	Y	Y	1.8E-06	lb/MMscf	2	1.8E-08	8.0E-08
Beryllium	Y	N	1.2E-05	lb/MMscf	2	1.2E-07	5.4E-07
Cadmium	Y	N	1.1E-03	lb/MMscf	2	1.1E-05	4.9E-05
Chromium VI	Y	N	1.4E-03	lb/MMscf	2	1.4E-05	6.3E-05
Chrysene	Y	Y	1.8E-06	lb/MMscf	2	1.8E-08	8.0E-08
Cobalt compounds	Y	N	8.4E-05	lb/MMscf	2	8.6E-07	3.8E-06
Dibenzo(a,h)anthracene	Y	Y	1.2E-06	lb/MMscf	2	1.2E-08	5.4E-08
Dichlorobenzene	Y	Y	1.2E-03	lb/MMscf	2	1.2E-05	5.4E-05
Fluoranthene	Y	Y	3.0E-06	lb/MMscf	2	3.1E-08	1.3E-07
Fluorene	Y	Y	2.8E-06	lb/MMscf	2	2.9E-08	1.3E-07
Formaldehyde	Y	Y	7.5E-02	lb/MMscf	2	7.6E-04	3.3E-03
Hexane	Y	Y	1.8	lb/MMscf	2	1.8E-02	0.080
Indeno(1,2,3-cd)pyrene	Y	Y	1.8E-06	lb/MMscf	2	1.8E-08	8.0E-08
Lead	Y	N	5.0E-04	lb/MMscf	2	5.1E-06	2.2E-05
Manganese	Y	N	3.8E-04	lb/MMscf	2	3.9E-06	1.7E-05
Mercury	Y	N	2.6E-04	lb/MMscf	2	2.7E-06	1.2E-05
Naphthalene	Y	Y	6.1E-04	lb/MMscf	2	6.2E-06	2.7E-05
Nickel	Y	N	2.1E-03	lb/MMscf	2	2.1E-05	9.4E-05
Phenanthrene	Y	Y	1.7E-05	lb/MMscf	2	1.7E-07	7.6E-07
Pyrene	Y	Y	5.0E-06	lb/MMscf	2	5.1E-08	2.2E-07
Selenium compounds	Y	N	2.4E-05	lb/MMscf	2	2.4E-07	1.1E-06
Toluene	Y	Y	3.4E-03	lb/MMscf	2	3.5E-05	1.5E-04
					Total HAP Emissions	**0.019**	**0.084**

TABLE 10

POTENTIAL PELLET PRESS AND COOLER EMISSIONS AT OUTLET OF RTO-3/RCO-2 STACK

ENVIVA PELLETS GREENWOOD, LLC

Notes:

[1] Emission factors from AP-42, Section 1.4 - Natural Gas Combustion, 07/98. Emission factors converted from lb/MMscf to lb/MMBtu based on assumed heating value of 1,020 Btu/scf for natural gas per AP-42 Section 1.4.

[2] Emission factors for natural gas combustion are from NCDAQ Natural Gas Combustion Spreadsheet and AP-42, Fifth Edition, Volume 1, Chapter 1.4 - Natural Gas Combustion, 07/98 for small boilers. The emission factors for acetaldehyde, acrolein, and ammonia are cited in the NCDAQ spreadsheet as being sourced from the USEPA's WebFIRE database.

[3] No control devices or limitations are proposed for this unit.

Abbreviations:

CAS - chemical abstract service
HAP - hazardous air pollutant
hr - hour
lb - pound
NC - North Carolina
ODT - oven dried tons
RCO - regenerative catalytic oxidizer
RTO - regenerative thermal oxidizer
TAP - toxic air pollutant
tpy - tons per year
VOC - volatile organic compound
yr - year

TABLE 11

DRIED WOOD HANDLING POTENTIAL EMISSIONS
(DRY CHIP SILO AND PELLETIZER FEED SILO)
ENVIVA PELLETS GREENWOOD, LLC

Calculation Basis

Hourly Throughput[1]	88 ODT/hr
Annual Throughput[1]	660,000 ODT/yr

Potential VOC and HAP Pollutant Emissions

Pollutant	Emission Factor[2] (lb/ODT)	Unlimited Emissions[3]		Limited Emissions (PTE)[3]	
		Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)
Formaldehyde	8.4E-04	0.074	0.32	0.074	0.28
Methanol	2.0E-03	0.17	0.75	0.17	0.64
Total HAP Emissions		**0.25**	**1.08**	**0.25**	**0.92**
VOC as propane from Chip Silo	1.42E-02	1.25	5.50	1.25	4.69
VOC as propane from Pelletizer Feed Silo	2.19E-04	0.019	0.085	0.019	0.072
Total VOC Emissions		**1.27**	**5.58**	**1.27**	**4.76**

Notes:

1. Provided by Enviva
2. HAP/TAP emission factors derived from NCASI's Wood Products Database (February 2013) for dry wood handling operations at an OSB mill, mean emission factors. The emission factors were converted from lb/MSF (3/8") to lb/ODT using the typical density and moisture content of an OSB panel. The VOC emission factor was derived based on Greenwood bag sampling data and includes 20% contingency.
3. Unlimited emissions assume maximum hourly throughput at 8,760 hours/year. Limited emissions are based on the proposed annual throughput. No VOC/HAP/TAP control devices are proposed for these silos.

Abbreviations:

hr - hour
lb - pound
ODT - oven dried tons
tpy - tons per year
VOC - volatile organic compound
yr - year

TABLE 12
DEBARKER POTENTIAL EMISSIONS
ENVIVA PELLETS GREENWOOD, LLC

Calculation Basis

Annual Throughput	876,000	tons/year (dry wood)[1]
Short-term Throughput	115.0	tons/hr (dry wood)[1]
Approximate Moisture Content	50%	of total weight

Pollutant	Emission Factor		Unlimited Emissions[3]		Limited Emissions (PTE)[3]	
			Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)
PM[2]	1.17E-02	lb/ton	2.70	11.8	2.70	10.3
PM_{10}[2]	3.17E-04	lb/ton	0.073	0.32	0.073	0.28
$PM_{2.5}$[2]	5.40E-05	lb/ton	0.012	0.054	0.012	0.047

Notes:

[1] Annual throughput used for the debarker provided by Enviva. The short-term throughput is based upon the maximum capacity of the debarker.

[2] Emission factor for $PM_{2.5}$ from draft November 2019 NCASI White Paper based on measurements at a mill debarker, where logs are processed dry (i.e., without water spray). Emission factor for PM was back-calculated based on the $PM_{2.5}$ factor and the $PM_{2.5}$ fraction for fresh bark provided in the White Paper. Emission factor for PM_{10} was calculated based on the calculated PM factor and the PM_{10} fraction for fresh bark. Contingency was added to the factors.

[3] Unlimited emissions assume maximum hourly throughput at 8,760 hours/year. Limited emissions are based on the proposed annual throughput. No control devices are proposed for this unit.

TABLE 13
ELECTRIC POWERED CHIPPER EMISSIONS
ENVIVA PELLET GREENWOOD, LLC

Calculation Basis

Annual Throughput of Chipper	766,500	tons/year (dry wood)[1]
Short Term Throughput	87.5	tons/hr (dry wood)[1]
Approximate Moisture Content	50%	of total weight

Pollutant	Emission Factor		Unlimited Emissions[5]		Limited Emissions (PTE)[5]	
			Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)
THC as Carbon[2]	4.10E-03	lb/ODT	0.36	1.57	0.36	1.57
VOC as propane[3]	5.00E-03	lb/ODT	0.44	1.92	0.44	1.92
Methanol[2]	1.00E-03	lb/ODT	0.088	0.38	0.088	0.38
PM[4]	1.92E-02	lb/ODT	1.68	7.36	1.68	7.36
PM_{10}[4]	9.60E-03	lb/ODT	0.84	3.68	0.84	3.68
$PM_{2.5}$[4]	9.60E-03	lb/ODT	0.84	3.68	0.84	3.68

Notes:

[1] Chipper throughputs provided by Enviva.

[2] Emission factor obtained from available emissions factors for chippers in AP-42 Section 10.6.3, Medium Density Fiberboard, 08/02, Table 7 and Section 10.6.4, Hardboard and Fiberboard, 10/02, Tables 7 and 9. Emission factors for THC and Methanol are the same across all three tables.

[3] Emission factor for VOC as propane is from AP-42, Section 10.6.3., Medium Density Fiberboard, 08/02, Table 7.

[4] PM factor from Assessment of Fugitive Particulate Emission Factor for Industrial Processes, EPA-450/3-78-107 (September 1978), Table 2-47. Emission factor reduced by 60% to account for enclosed nature of operation. PM10/PM2.5 emissions assumed one-half of PM emissions.

[5] Unlimited emissions assume maximum hourly throughput at 8,760 hours/year. Limited emissions are based on the proposed annual throughput. No control devices are proposed for this unit.

TABLE 14
GREEN WOOD SCREENING EMISSIONS
ENVIVA PELLET GREENWOOD, LLC

Calculation Basis

Hourly Throughput	87.5	ODT/hr
Annual Throughput	766,500	ODT/yr

Potential Criteria Pollutant Emissions

Pollutant	Emission Factor[1]		Unlimited Emissions[2]		Limited Emissions (PTE)[2]	
			Max	Annual	Max	Annual
$PM/PM_{10}/PM_{2.5}$	0.0038	lb/ODT	0.33	1.46	0.33	1.46

Notes:

1. Emission factor from NCASI Technical Bulletin No. 1020 Table 9.1 for chip screening converted from units of bone dry tons (BDT) to ODT based on a moisture content of 50%.
2. Unlimited emissions assume maximum hourly throughput at 8,760 hours/year. Limited emissions are based on the proposed annual throughput. No control devices are proposed for this unit.

Abbreviations:

hr - hour
lb - pound
ODT - oven dried tons
THC - total hydrocarbon
tpy - tons per year
yr - year

TABLE 1S
SUMMARY OF POTENTIAL EMISSIONS FROM OTHER BAGHOUSES AND CYCLONES
ENVIVA PELLETS GREENWOOD, LLC

Emission Unit ID	Source Description	Control Device ID	Control Device Description	Exhaust Flow Rate[1]	Pollutant Loading[1]	Annual Operation	Particulate Speciation		Uncontrolled Emissions[3]						Controlled Emissions (PTE)[3]					
									PM		PM_{10}		$PM_{2.5}$		PM		PM_{10}		$PM_{2.5}$	
				(cfm)	(gr/cf)	(hours)	PM_{10} (% of PM)	$PM_{2.5}$ (% of PM)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)
E13	Dry Chip Silo	CD4	One (1) existing Bin Vent Filter[2]	2,000	0.010	8,760	100.0%	100.0%	17.1	75.1	17.1	75.1	17.1	75.1	0.17	0.75	0.17	0.75	0.17	0.75
E19	Pelletizer Feed Silo	CD10	One (1) existing Bin Vent Filter[2]	2,000	0.010	8,760	100.0%	100.0%	17.1	75.1	17.1	75.1	17.1	75.1	0.17	0.75	0.17	0.75	0.17	0.75
E40, E41	Pellet Silo 1 and Pellet Silo 2	CD20	One (1) existing Cyclofilter[2]	2,000	0.010	8,760	100.0%	100.0%	17.1	75.1	17.1	75.1	17.1	75.1	0.17	0.75	0.17	0.75	0.17	0.75
E42	Loadout	CD21	One (1) existing Cyclone[2]	23,000	0.005	8,760	100.0%	100.0%	98.6	432	98.6	432	98.57	431.74	0.99	4.32	0.99	4.32	0.99	4.32
		CD22	One (1) existing baghouse[2]																	
E43	Dust Silo	CD23	One (1) existing Cyclofilter[2]	3,300	0.010	8,760	100.0%	100.0%	28.3	124	28.3	124	28.3	124	0.28	1.24	0.28	1.24	0.28	1.24
								Total PM Emissions:	178	781	178	781	178	781	1.8	7.8	1.78	7.8	1.78	7.81

Notes:

[1] Provided by Enviva

[2] Conservatively assumes $PM_{10}/PM_{2.5}$ are equal to total PM.

[3] PM emissions for these sources are not based on annual throughput or operating hour limitations. Uncontrolled emissions are back-calculated from controlled emissions assuming a control efficiency of 99.0%.

Abbreviations:

cf - cubic feet
cfm - cubic feet per minute
ES - Emission Sources
IES - Insignificant Emission Source
gr - grain
hr - hour
lb - pound
PM - particulate matter
PM_{10} - particulate matter with an aerodynamic diameter less than 10 microns
$PM_{2.5}$ - particulate matter with an aerodynamic diameter of 2.5 microns or less
tpy - tons per year

TABLE 16
GREEN WOOD HANDLING
ENVIVA PELLETS GREENWOOD, LLC

Source	Transfer Activity[1]	Number of Drop Points	Material Moisture Content[1]	PM Emission Factor[2]	PM_{10} Emission Factor[2]	$PM_{2.5}$ Emission Factor[2]	Potential Throughput (wet basis)		Unlimited PM Emissions[3]		Unlimited PM_{10} Emissions[3]		Unlimited $PM_{2.5}$ Emissions[3]		Limited PM Emissions (PTE)[3]		Limited PM_{10} Emissions (PTE)[3]		Limited $PM_{2.5}$ Emissions (PTE)[3]	
			(%)	(lb/ton)	(lb/ton)	(lb/ton)	(tph)	(tpy)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)	Max (lb/hr)	Annual (tpy)
E4	Material feed conveyance to fuel storage piles (bark)	1	45%	3.89E-05	1.84E-05	2.79E-06	175	1,533,000	6.8E-03	3.0E-02	3.2E-03	1.4E-02	4.9E-04	2.1E-03	6.8E-03	3.0E-02	3.2E-03	1.4E-02	4.9E-04	2.1E-03
	Material feed conveyance to raw wood chip storage pile (stacker/reclaimer pile)	1	48%	3.55E-05	1.68E-05	2.55E-06	175	1,533,000	6.2E-03	2.7E-02	2.9E-03	1.3E-02	4.5E-04	2.0E-03	6.2E-03	2.7E-02	2.9E-03	1.3E-02	4.5E-04	2.0E-03
E46, E47	Truck Dump 1 and Truck Dump 2	2	50%	3.36E-05	1.59E-05	2.40E-06	175	1,533,000	1.2E-02	5.1E-02	5.6E-03	2.4E-02	8.4E-04	3.7E-03	1.2E-02	5.1E-02	5.6E-03	2.4E-02	8.4E-04	3.7E-03
								Total Emissions:	2.5E-02	1.1E-01	1.2E-02	5.1E-02	1.8E-03	7.8E-03	2.5E-02	1.1E-01	1.2E-02	5.1E-02	1.8E-03	7.8E-03

Notes:

[1] Moisture content provided by Enviva on 1/11/2019.

[2] Emission factor calculation based on formula from AP-42, Section 13.2.4 - Aggregate Handling and Storage Piles, Equation 1, (11/06)

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)	6.06

[3] Unlimited emissions assume maximum hourly throughput at 8,760 hours/year. Limited emissions are based on the proposed annual throughput. No control devices are proposed for these emission sources.

Abbreviations:

hr - hour
lb - pound
PM - particulate matter
PM_{10} - particulate matter with an aerodynamic diameter less than 10 microns
$PM_{2.5}$ - particulate matter with an aerodynamic diameter of 2.5 microns or less
tpy - tons per year
yr - year

TABLE 17
STORAGE PILE WIND EROSION
ENVIVA PELLETS GREENWOOD, LLC

Source	Description	PM Emission Factor[1]		VOC Emission Factor[2]		Pile Width/ Diameter	Pile Length	Pile Height	Outer Surface Area of Pile[3]	PM Emissions (PTE)[4]		PM_{10} Emissions (PTE)[4]		$PM_{2.5}$ Emissions (PTE)[4]		VOC Emissions as propane (PTE)[4,5]	
		(lb/day/acre)	(lb/hr/ft²)	(lb/day/acre)	(lb/hr/ft²)	(ft)	(ft)	(ft)	(ft²)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
PD, ES	Stacker/Reclaimer Pile	4.1	3.9E-06	3.6	3.4E-06	250	--	40	66,659	0.26	1.14	0.13	0.57	0.020	0.086	0.28	1.23
	Pellet Mill Waste	4.1	3.9E-06	3.6	3.4E-06	100	200	10	31,200	0.12	0.54	0.061	0.27	9.17E-03	0.040	0.13	0.57
	Legacy Piles 1 through 4	4.1	3.9E-06	3.6	3.4E-06	100	150	12	25,200	0.10	0.43	0.049	0.22	7.40E-03	0.032	0.11	0.46
	Chip Bin Pile	4.1	3.9E-06	3.6	3.4E-06	14	21	8	1,025	4.01E-03	0.018	2.01E-03	8.79E-03	3.01E-04	1.32E-03	4.31E-03	0.019
	Fuel Storage Pile 1	4.1	3.9E-06	3.6	3.4E-06	100	200	20	38,400	0.15	0.66	0.075	0.33	0.011	0.049	0.16	0.71
	Fuel Storage Feeder Bin	4.1	3.9E-06	3.6	3.4E-06	20	40	10	2,400	9.40E-03	0.041	4.70E-03	0.021	7.05E-04	3.09E-03	0.01	0.04
									Total Emissions:	0.65	2.83	0.32	1.41	0.048	0.21	0.69	3.03

Notes:

[1] TSP emission factor based on U.S. EPA Control of Open Fugitive Dust Sources. Research Triangle Park, North Carolina, EPA-450/3-88-008. September 1988, Page 4.1-7

$$E = 1.7\left(\frac{s}{1.5}\right)\left(\frac{(365-p)}{235}\right)\left(\frac{f}{15}\right) \text{ (lb/day/acre)}$$

where:			
	s, silt content of wood chips (%):	6.4	s = silt content (%) for lumber sawmills (mean) from AP-42, Section 13.2.2 - Unpaved Roads, 11/06, Table 13.2.2-1
	p, number of days with rainfall greater than 0.01 inch:	120	Per AP-42, Section 13.2.1, Figure 13.2.1-2 (Greenwood, SC)
	f (time that wind exceeds 5.36 m/s = 12 mph) (%):	6.2	Based on meteorological data averaged for 2012-2016 for Greenwood County Airport, SC National Weather Service (NWS) Station
	PM_{10}/TSP ratio:	50%	PM_{10} is assumed to equal 50% of TSP based on U.S. EPA Control of Open Fugitive Dust Sources, Research Triangle Park, North Carolina, EPA-450/3-88-008. September 1988.
	$PM_{2.5}$/TSP ratio:	7.5%	$PM_{2.5}$ is assumed to equal 7.5 % of TSP U.S. EPA Background Document for Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emission Factors. November 2006.

[2] Emission factors obtained from NCASI document provided by the South Carolina Department of Health and Environmental Control (DHEC) for the calculation of fugitive VOC emissions from Douglas Fir wood storage piles. Emission factors ranged from 1.6 to 3.6 lb C/acre-day. As Enviva has engineering data that shows VOC emissions from greenwood storage piles are less than the low end of the range of the factors listed; however, Enviva chose to employ the maximum emission factor from the NCASI document for purposes of conservatism.

[3] The surface area for rectangular piles is calculated as [2*H*L+2*W*H+L*W] + 20% to consider the sloping pile edges. Pile dimensions were provided by Enviva.
The surface area for circular piles is calculated as [Π*R*(R^2+H^2)$^{0.5}$] + 20% to consider the sloping pile edges. Diameter and height were provided by Enviva.

[4] Emissions are calculated in tons of carbon per year by the following formula:
tons C/year = 5 acres * 365 days * 3.6 lb C/acre day / 2000 lb/ton
Emission factor converted from as carbon to as propane by multiplying by 1.22.

[5] No operational restrictions or control devices are proposed for these sources.

Abbreviations:

EPA = Environmental Protection Agency
ft = feet
ft² = square feet
lb = pound
mph = miles per hour
NC = North Carolina
NCASI = National Council for Air and Stream Improvement, Inc.
NWS = National Weather Service
PM = particulate matter
PM_{10} = particulate matter with an aerodynamic diameter less than 10 microns
$PM_{2.5}$ = particulate matter with an aerodynamic diameter of 2.5 microns or less
tpy = tons per year
TSP = total suspended particulate
yr = year
VOC = volatile organic compound

TABLE 18
ENGINE 1 (GENERATOR) AND ENGINE 2 (FIRE PUMP) POTENTIAL EMISSIONS
ENVIVA PELLETS GREENWOOD, LLC

Engine 1 (Generator)

Equipment and Fuel Characteristics

Engine Power	865 hp (brake)
Hours of Operation	500 hr/yr[1]
Heating Value of Diesel	19,300 Btu/lb
Power Conversion	7,000 Btu/hr/hp

Criteria Pollutant Emissions

Pollutant	Category	Emission Factor	Units	Potential Emissions	
				Max (lb/hr)	Annual (tpy)
TSP	PSD	1.80E-02	g/hp-hr (2)	0.03	8.58E-03
PM_{10}	PSD	1.80E-02	g/hp-hr (2)	0.03	8.58E-03
$PM_{2.5}$	PSD	1.80E-02	g/hp-hr (2)	0.03	8.58E-03
NO_x	PSD	5.74	g/hp-hr (2)	10.95	2.74E+00
SO_2	PSD	15	ppmw (3)	9.41E-03	2.35E-03
CO	PSD	4.00E-01	g/hp-hr (2)	0.76	1.91E-01
VOC (NMHC)	PSD	1.00E-02	g/hp-hr (2)	1.91E-02	4.77E-03

Hazardous Air Pollutant Emissions

Pollutant[6]	Category	Emission Factor	Units	Potential Emissions	
				Max (lb/hr)	Annual (tpy)
Acetaldehyde	HAP	5.37E-06	lb/hp-hr (4)	4.64E-03	1.16E-03
Acrolein	HAP	6.48E-07	lb/hp-hr (4)	5.60E-04	1.40E-04
Benzene	HAP	6.53E-06	lb/hp-hr (4)	5.65E-03	1.41E-03
Benzo(a)pyrene	HAP	1.32E-09	lb/hp-hr (4,5)	1.14E-06	2.85E-07
1,3-Butadiene	HAP	2.74E-07	lb/hp-hr (4)	2.37E-04	5.92E-05
Formaldehyde	HAP	8.26E-06	lb/hp-hr (4)	7.14E-03	1.79E-03
Polycyclic Organic Matter	HAP	1.18E-06	lb/hp-hr (4)	1.02E-03	2.54E-04
Toluene	HAP	2.86E-06	lb/hp-hr (4)	2.48E-03	6.19E-04
Xylene	HAP	2.00E-06	lb/hp-hr (4)	1.73E-03	4.31E-04
			Highest HAP (Formaldehyde)	7.14E-03	1.79E-03
			Total HAPs	2.35E-02	5.86E-03

Notes:

[1] NSPS allows for only 100 hrs/yr of non-emergency operation. Potential emissions for the emergency generator are conservatively based on 500 hr/yr.
[2] Emissions factors from technical data sheet for engine.
[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] Benzo(a)pyrene is included as a HAP in Total PAH.

TABLE 18
ENGINE 1 (GENERATOR) AND ENGINE 2 (FIRE PUMP) POTENTIAL EMISSIONS
ENVIVA PELLETS GREENWOOD, LLC

Engine 2 (Fire Pump)

Equipment and Fuel Characteristics

Engine Power	305 hp
Hours of Operation	500 hr/yr[1]
Heating Value of Diesel	19,300 Btu/lb
Power Conversion	7,000 Btu/hr/hp

Criteria Pollutant Emissions

Pollutant	Category	Emission Factor	Units	Potential Emissions	
				Max lb/hr	Annual tpy
TSP	PSD	0.15	g/hp-hr (2)	0.10	2.52E-02
PM_{10}	PSD	0.15	g/hp-hr (2)	0.10	2.52E-02
$PM_{2.5}$	PSD	0.15	g/hp-hr (2)	0.10	2.52E-02
NO_x	PSD	3.00	g/hp-hr (2,5)	2.02	5.04E-01
SO_2	PSD	15	ppmw (3)	3.32E-03	8.30E-04
CO	PSD	2.60	g/hp-hr (2)	1.75	4.37E-01
VOC (NMHC)	PSD	2.51E-03	lb/MMBtu (4)	5.36E-03	1.34E-03

Hazardous Air Pollutant Emissions

Pollutant[6]	Category	Emission Factor	Units	Potential Emissions	
				Max lb/hr	Annual tpy
Acetaldehyde	HAP	5.37E-06	lb/hp-hr (4)	1.64E-03	4.09E-04
Acrolein	HAP	6.48E-07	lb/hp-hr (4)	1.97E-04	4.94E-05
Benzene	HAP	6.53E-06	lb/hp-hr (4)	1.99E-03	4.98E-04
Benzo(a)pyrene	HAP	1.32E-09	lb/hp-hr (4)	4.01E-07	1.00E-07
1,3-Butadiene	HAP	2.74E-07	lb/hp-hr (4)	8.35E-05	2.09E-05
Formaldehyde	HAP	8.26E-06	lb/hp-hr (4)	2.52E-03	6.30E-04
Polycyclic Organic Matter	HAP	1.18E-06	lb/hp-hr (4)	3.59E-04	8.97E-05
Toluene	HAP	2.86E-06	lb/hp-hr (4)	8.73E-04	2.18E-04
Xylene	HAP	2.00E-06	lb/hp-hr (4)	6.08E-04	1.52E-04
			Highest HAP (Formaldehyde)	2.52E-03	6.30E-04
			Total HAPs	8.27E-03	2.07E-03

Notes:

[1] NSPS allows for only 100 hrs/yr of non-emergency operation. Potential emissions for the emergency generator are conservatively based on 500 hr/yr.
[2] Emissions standards 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 standard for NO_x + NMHC (Non-Methane Hydrocarbons ~~or VOC~~) from Table 4 of NSPS Subpart IIII. Conservatively assumed entire standard is attributable to NO_x.

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

TABLE 19
DIESEL STORAGE TANKS
ENVIVA PELLETS GREENWOOD, LLC

Calculation Constants

Description	AST-1	AST-2	AST-4	Units	Notes
α - Tank Paint Solar Absorptance		0.17		dimensionless	AP-42, Chapter 7 - Table 7.1-6 for White Tank, Good Condition (default)
I - Annual Avg Total Solar Insolation Factor		1380		dimensionless	AP-42, Chapter 7 - Table 7.1-7 for Columbia, SC
T_{AX} - Annual Avg Maximum Ambient Temperature		534.97		R	AP-42, Chapter 7 - Table 7.1-7 for Columbia, SC
T_{AN} - Annual Avg Minimum Ambient Temperature		510.87		R	AP-42, Chapter 7 - Table 7.1-7 for Columbia, SC
R - Ideal Gas Constant		10.731		psia*ft^3/lb-mole R	AP-42, Chapter 7 - Page 7.1-16
Kp - Product Factor		1		dimensionless	Assume conservative value of 1
ΔP_V - Daily Vapor Pressure Range		0.008		psia	Calculated per Figure 7.1-14b
ΔP_b - Breather Vent Pressure Setting Range		0.06		psia	AP-42, Chapter 7 - Page 7.1-13 Note 3 (default)
P_a - Atmospheric Pressure		14.7		psia	AP-42, Chapter 7

Calculation Inputs

Description	AST-1	AST-2	AST-4	Units	Notes
Tank Diameter	5.3	3.3	3.7	ft	Dimensions were provided by Enviva
Tank Length	12.3	6.0	12.5	ft	Dimensions were provided by Enviva
Tank Design Volume	2,000	359.00	660.00	gal	Conservative design specifications
Tank Working Volume	1,000	179.5	330	gal	50% of tank design volume because tanks will not be full at all times
Tank Throughput	99,800	17,914	32,934	gal/yr	Max monthly site-wide throughput for 2018, scaled to an annual basis. Individual tank throughputs are scaled based on size the of each tank.
Equivalent Tank Diameter (D_E)	9.11	5.02	7.63	ft	AP-42, Chapter 7 - Equation 1-13 (SQRT(LD/(PI/4)))
Effective Height (H_E)	4.16	2.59	2.87	ft	AP-42, Chapter 7 - Equation 1-14 (PI/4*D)
V_v - Vapor Space Volume	135.68	25.66	65.63	ft^3	AP-42, Chapter 7 - Equation 1-3 ($PI/4*D^2*H_{VO}$), substitute D_E for D for horizontal tanks
H_{vo} - Vapor Space Outage	2.08	1.30	1.44	ft	AP-42, Chapter 7 - $H_{VO} = 0.5*H_E$ for horizontal tanks
P_{va} - Vapor Pressure	0.009	0.009	0.009	psia	Vapor pressure for distillate fuel oil no. 2 at 70F (daily average liquid surface temp is lower; therefore, this Pva is conservative)
M_v - Vapor Molecular Weight	130	130	130	lb/lb.mole	AP-42, Chapter 7 - Table 7.1-2 for diesel
Q - Throughput	2376.19	426.53	784.14	bbl/yr	

TABLE 19
DIESEL STORAGE TANKS
ENVIVA PELLETS GREENWOOD, LLC

Calculated Values

Description	AST-1	AST-2	AST-4	Units	Notes
K_e - Vapor Space Expansion Factor	0.04	0.03	0.03	dimensionless	AP-42, Chapter 7 - Equation 1-7 (ΔTv/Taa + ((ΔPv - ΔPb)/(Pa - ΔPva))
ΔT_v - Daily Vapor Temperature Range	23.92	17.35	17.35	R	AP-42, Chapter 7 - Equation 1-8 (0.72*ΔTa + 0.028*α*I)
ΔT_a - Daily Ambient Temperature Range	24.1	24.1	24.1	R	AP-42, Chapter 7 - Equation 1-12 (Tax - Tan)
K_s - Vented Vapor Saturation Factor	1.00	1.00	1.00	dimensionless	AP-42, Chapter 7 - Equation 1-20 (1/(1 + 0.53Pva*Hvo))
W_v - Stock Vapor Density	0.000208	0.000208	0.000208	lb/ft^3	AP-42, Chapter 7 - Equation 1-21 (Mv * Pva) / (R * Tla)
T_{la} - Daily Average Liquid Surface Temperature	524.78	522.93	522.93	R	AP-42, Chapter 7 - Equation 1-26 (0.44*Taa + 0.56Tb + 0.0079α*I)
T_{aa} - Daily Average Ambient Temperature	522.92	522.92	522.92	R	AP-42, Chapter 7 - Equation 1-27 ((Tax + Tan)/2)
T_b - Liquid Bulk Temperature	522.94	522.94	522.94	R	AP-42, Chapter 7 - Equation 1-28 (Taa + 6α - 1)
N - Number of Turnovers	99.80	99.80	99.80	dimensionless	
K_n - Saturation Factor	0.47	0.47	0.47	dimensionless	AP-42, Chapter 7 - Page 7.1-18 (For N>36, Kn = (180 + N)/6N; For N<36, Kn = 1)

Potential VOC Emissions

Description	AST-1	AST-2	AST-4	Units	Notes
L_s - Standing Loss	0.43	0.06	0.15	lbs/yr	AP-42, Chapter 7 - Equation 1-2 (365 * Vv * Wv * Ke * Ks)
L_w - Working Loss	1.30	0.23	0.43	lbs/yr	AP-42, Chapter 7 - Equation 1-29 (0.0010 * Mv * Pva * Q * Kn * Kp)
L_t - Total Loss	1.73	0.29	0.58	lbs/yr	AP-42, Chapter 7 - Equation 1-1 (Ls + Lw)
Total VOC Emissions per Tank	1.73	0.29	0.58	lbs/yr	
Total VOC Emissions	**8.7E-04**	**1.5E-04**	**2.9E-04**	**tons/yr**	

TABLE 20
POTENTIAL FUGITIVE PM EMISSIONS FROM UNPAVED ROADS
ENVIVA PELLETS GREENWOOD, LLC

Source Data

Vehicle Activity	Distance Traveled per Roundtrip[1] (ft)	Trips Per Day[1]	Daily VMT	Events Per Year (days)	Empty Truck Weight (lb)	Loaded Truck Weight (lb)	Average Truck Weight (ton)	Annual VMT
Log Delivery to Wood Yard	2,900	168	92	365	30,000	90,000	30.0	33,680
Wood Chips to Truck Tippers	1,800	192	65	365	30,000	90,000	30.0	23,891
Bark to Fuel Pile	5,500	48	50	365	30,000	90,000	30.0	18,250
Employee Parking	400	40	3	365	4,000	4,000	2.0	1,106
							29.6	**76,927**

Notes:

[1] Distance traveled per round trip and annual average daily trip counts were provided by Enviva

Emission Calculations Unpaved Road:

Pollutant	Empirical Constant (k)[1]	Silt Content (S)[2]	Particle Constant a[1]	Particle Constant b[1]	Emission Factor[3]	Emissions (PTE)[4]	
	(lb/VMT)	(%)	(-)	(-)	(lb/VMT)	(lb/hr)	(tpy)
PM	4.9	8.4	0.7	0.45	7.18	6.30	27.6
PM_{10}	1.5	8.4	0.9	0.45	2.05	1.80	7.87
$PM_{2.5}$	0.15	8.4	0.9	0.45	0.20	0.18	0.79

Notes:

[1] Constants (k, a, & b) based on AP-42, Section 13.2.2 (Unpaved Roads), Table 13.2.2-2 for Industrial Roads, November 2006

[2] Silt loading factor based on AP-42, Section 13.2.2 (Unpaved Roads), Table 13.2.2-1, Lumber Sawmills, November 2006

[3] Emission factors calculated based on Equation 1a from AP-42 Section 13.2.2 - Unpaved Roads, 11/06.

Particulate Emission Factor: $E_{ext} = k\,(s/12)^a \times (W/3)^b * ((365-P)/365)$

k = particle size multiplier for particle size range and units of interest

E = size-specific emission factor (lb/VMT)

s = surface material silt content (%)

W = mean vehicle weight (tons)

P=number of days with at least 0.01 in of precipitation during the averaging period =

= 120 Per AP-42, Section 13.2.1, Figure 13.2.1-2 (Greenwood, SC).

[4] Potential emissions calculated from appropriate emission factor times vehicle miles traveled with control efficiency of 90% for water / dust suppression activities. Hourly emissions calculated based on annual emissions and 8,760 hours/year.

Abbreviations:

ft - feet
hr - hour
lb - pound
PM - particulate matter
PM_{10} - particulate matter with an aerodynamic diameter less than 10 microns
$PM_{2.5}$ - particulate matter with an aerodynamic diameter of 2.5 microns or less
tpy - tons per year
yr - year
VMT - vehicle miles traveled
VOC - volatile organic compound

TABLE 21
POTENTIAL FUGITIVE PM EMISSIONS FROM PAVED ROADS
ENVIVA PELLETS GREENWOOD, LLC

Vehicle Activity	Distance Traveled per Roundtrip[1] (ft)	Trips Per Day[1]	Daily VMT	Events Per Year (days)	Empty Truck Weight (lb)	Loaded Truck Weight (lb)	Average Truck Weight (ton)	Annual VMT	PM Emission Factor[2] (lb/VMT)	PM_{10} Emission Factor[2] (lb/VMT)	$PM_{2.5}$ Emission Factor[2] (lb/VMT)	PM Emissions (PTE)[3,4] (lb/day)	PM Emissions (PTE)[3,4] (lb/hr)	PM Emissions (PTE)[3,4] (tpy)	PM_{10} Emissions (PTE)[3,4] (lb/day)	PM_{10} Emissions (PTE)[3,4] (lb/hr)	PM_{10} Emissions (PTE)[3,4] (tpy)	$PM_{2.5}$ Emissions (PTE)[3,4] (lb/day)	$PM_{2.5}$ Emissions (PTE)[3,4] (lb/hr)	$PM_{2.5}$ Emissions (PTE)[3,4] (tpy)
Log Delivery to Wood Yard	700	168	22	365	30,000	90,000	30.0	8,130	2.2	0.44	0.11	4.90	0.20	0.89	0.98	0.041	0.18	0.24	0.010	0.044
Wood Chips to Truck Tippers	700	192	25	365	30,000	90,000	30.0	9,291	2.2	0.44	0.11	5.60	0.23	1.02	1.12	0.047	0.20	0.27	0.011	0.050
Bark to Fuel Pile	700	48	6	365	30,000	90,000	30.0	2,323	2.2	0.44	0.11	1.40	0.058	0.26	0.28	0.012	0.051	0.069	0.0029	0.013
Employee Parking	400	40	3.03	365	4,000	4,000	2.0	1,106	0.1	0.03	0.01	0.042	1.75E-03	7.68E-03	8.42E-03	3.51E-04	1.54E-03	2.07E-03	8.61E-05	3.77E-04
											Total Emissions:	11.9	0.50	2.18	2.39	0.10	0.44	0.59	0.024	0.11

Notes:

[1] Distance traveled per round trip and annual average daily trip counts were provided by Enviva.

[2] Emission factors calculated based on Equation 2 from AP-42 Section 13.2.1 - Paved Roads, 01/11.

where:

E	= emission factor (lb/ton)	
k	= particle size multiplier (dimensionless) for PM	0.011
k	= particle size multiplier (dimensionless) for PM_{10}	0.0022
k	= particle size multiplier (dimensionless) for $PM_{2.5}$	0.00054
sL	= mean road surface silt loading from AP-42 Table 13.2.1-3 for quarries (g/m^2)	8.2
P	= No. days with rainfall greater than 0.01 inch	120 Per AP-42, Section 13.2.1, Figure 13.2.1-2 (Greenwood, SC).

[3] Potential emissions calculated from appropriate emission factor times vehicle miles traveled with control efficiency of 90% for water / dust suppression activities followed by sweeping. Per Table 5 in Chapter 4 of the Air Pollution Engineering Manual, Air and Waste Management Association, page 141. Control efficiency (%) = 96-0.263*V, where V is the number of vehicle passes since application of water.

[4] Hourly emissions calculated based on annual emissions and 8,760 hours/year.

Abbreviations:

ft = feet
hr = hour
lb = pound
PM = particulate matter
PM_{10} = particulate matter with an aerodynamic diameter less than 10 microns
$PM_{2.5}$ = particulate matter with an aerodynamic diameter of 2.5 microns or less
tpy = tons per year
yr = year
VMT = vehicle miles traveled
VOC = volatile organic compound

TABLE 22
POTENTIAL SITE-WIDE GHG EMISSIONS
ENVIVA PELLET GREENWOOD, LLC

Operating Data:

Dryer Heat Input	200.0 MMBtu/hr	RTO-2/RCO-1 Heat Input	63,686.0 MMBtu/yr
Annual Heat Input	1,752,000 MMBtu/yr	Number of Burners	1.0
		Operating Schedule	8,760 hrs/yr
Dryer Duct Burner Heat Input	5 MMBtu/hr		
Number of Burners	1	RTO-3/RCO-2 Heat Input	63,686.0 MMBtu/yr
Operating Schedule	8,760 hrs/yr	Number of Burners	2.0
		Operating Schedule	8,760 hrs/yr
RTO-1 Heat Input	8.0 MMBtu/hr		
Number of Burners	4.0	Emergency Generator Output	865 bhp
Operating Schedule	8,760 hrs/yr	Operating Schedule	500 hrs/yr
		Power Conversion	7,000 Btu/hr/hp
Furnace Bypass Heat Input	7,500 MMBtu/yr	Energy Input	6.06 MMBtu/hr
		Fire Water Pump Output	305 bhp
RTO-4/RCO-3 Burner(s) and Emissions		Operating Schedule	500 hrs/yr
Combustion Heat Input	15,037.8 MMBtu/yr	Power Conversion	7,000 Btu/hr/hp
Operating Schedule	8,760 hrs/yr	Energy Input	2.14 MMBtu/hr

Source Description	Fuel Type	Emission Factors from Table C-1 (kg/MMBtu)[1]			Tier 1 Emissions (short tons)			
		CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	Total CO_2e
Dryer	Wood and Wood Residuals	93.80	0.18	1.07	181,149	348	2,072	183,569
Dryer Duct Burner	Natural Gas	66.88	0.025	0.030	3,229	1.21	1.44	3,232
RTO-1	Natural Gas	66.88	0.025	0.030	20,666	7.72	9.21	20,683
Furnace Bypass	Wood and Wood Residuals	93.80	0.18	1.07	775	1.49	8.87	786
RTO-2/RCO-1	Natural Gas	66.88	0.025	0.030	4,695	1.76	2.09	4,699
RTO-3/RCO-2	Natural Gas	66.88	0.025	0.030	9,390	3.51	4.18	9,398
RTO-4/RCO-3	Natural Gas	66.88	0.025	0.030	1,109	0.41	0.49	1,110
Engine 1 (Generator)	No. 2 Fuel Oil (Distillate)	73.96	0.075	0.18	247	0.25	0.60	248
Engine 2 (Fire Pump)	No. 2 Fuel Oil (Distillate)	73.96	0.075	0.18	87.0	0.088	0.21	87.3

Notes:
[1] Emission factors from Table C-1 and C-2 of GHG Reporting Rule. Emission factors for methane and N_2O already multiplied by their respective GWPs of 25 and 298.

TABLE 23
PROCESS WEIGHT RATE LIMITS AND POTENTIAL EMISSION RATES
ENVIVA PELLET GREENWOOD, LLC

Process ID	EU ID	Source Description	Maximum Unlimited Hourly Throughput	Units	Process Weight Rate PM Limit[1] (lb/hr)	Potential Emission Rate[2] (lb/hr)
P0	E1	Debarker	230	tph	60.04	2.70
	E2	Electric Powered Chipper	175	tph	57.07	1.68
	E3	Green Wood Screening	175	tph	57.07	0.33
	E4	Pile Drop	350	tph	64.76	0.01
	E5	Storage Pile Wind Erosion	350	tph	64.76	0.65
	E46	Truck Dump 1	175	tph	57.07	0.01
	E47	Truck Dump 2	175	tph	57.07	0.01
P1	E6	Green Hammermill 1	435	tph	67.29	2.57
	E7	Green Hammermill 2				
	E8	Green Hammermill 3				
	E9	Green Hammermill 4				
	E58	Green Hammermill 5				
	E10	Green Chip Silo				
P2	E11	Furnace				
	E12	Dryer				
	E11	Furnace Bypass	85	tph	49.62	24.33
	E13	Dry Chip Silo	85	tph	49.62	0.17
P3	E59 - E94	Vertical Dry Hammermill 1 - 36	96	tph	50.87	15.06
	E19	Pelletizer Feed Silo	96	tph	50.87	0.17
P4	E20	Pelletizer 1	48	tph	44.20	4.29
	E21	Pelletizer 2				
	E22	Pelletizer 3				
	E24	Pelletizer 4				
	E25	Pelletizer 5				
	E26	Pelletizer 6				
	E28	Pelletizer 7				
	E29	Pelletizer 8				
	E30	Pelletizer 9				
	E23	Pellet Cooler 1				
	E27	Pellet Cooler 2				
	E31	Pellet Cooler 3				
	E32	Pelletizer 10	48	tph	44.20	4.29
	E33	Pelletizer 11				
	E34	Pelletizer 12				
	E36	Pelletizer 13				
	E37	Pelletizer 14				
	E38	Pelletizer 15				
	E49	Pelletizer 16				
	E50	Pelletizer 17				
	E51	Pelletizer 18				
	E35	Pellet Cooler 4				
	E39	Pellet Cooler 5				
	E52	Pellet Cooler 6				
P5	E40	Pellet Silo 1	96	tph	50.87	0.17
	E41	Pellet Silo 2				
	E42	Loadout	150	tph	55.44	0.99
	E43	Dust Silo	5	tph	12.05	0.28

Notes:

[1] SC Regulation 61-62.5, Standard No. 4, Section VIII Control of PM Emissions

[2] Represents controlled/limited emissions.

APPENDIX D
PERMIT APPLICATION FORMS

FACILITY IDENTIFICATION	
SC Air Permit Number (8-digits only) *(Leave blank if one has never been assigned)* **1240 – 0133**	Application Date **February 2020 (rev. June 2020)**
Facility Name *(This should be the name used to identify the facility at the physical address listed below)* **Enviva Pellets Greenwood, LLC**	Facility Federal Tax Identification Number *(Established by the U.S. Internal Revenue Service to identify a business entity)* **36-1666410**

FACILITY PHYSICAL ADDRESS		
Physical Address: **200 Enviva Way**		County: **Greenwood**
City: **Greenwood**	State: **SC**	Zip Code: **29646**
Facility Coordinates *(Facility coordinates should be based at the front door or main entrance of the facility.)*		
Latitude: **34° 13' 46.26" N**	Longitude: **82° 3' 51.28" W**	☐ NAD27 *(North American Datum of 1927)* Or ☒ NAD83 *(North American Datum of 1983)*

CO-LOCATION DETERMINATION
Are there other facilities in close proximity that could be considered co-located? ☒ No ☐ Yes*
List potential co-located facilities, including air permit numbers if applicable: **Not Applicable**

**If yes, please submit co-location applicability determination details in an attachment to this application.*

COMMUNITY OUTREACH

What are the potential air issues and community concerns? Please provide a brief description of potential air issues and community concerns about the entire facility and/or specific project. Include how these issues and concerns are being addressed, if the community has been informed of the proposed construction project, and if so, how they have been informed.

As part of the expansion, this project would help address community concerns regarding excess fiber and fugitive dust emissions from the facility by authorizing the installation of additional emissions controls and the implementation of enhanced dust control measures Enviva has spent the past year developing relationships with, and providing updates to, the facility's neighbors as well as community and local organizations such as the Greenwood Chamber of Commerce, the Greenwood Partnership Alliance, and Preserving Lake Greenwood. Enviva has sponsored and participated in several community events such as Lake Greenwood Cleanup, Woodland Clinic, and the Greenwood Humane Society to build relationships and establish direct connection to our community manager. Community relations staff has visited with local neighbors and businesses to gauge Enviva's overall performance in the neighborhood. Concerns heard from our neighbors include fugitive dust, excess fiber on the site, and truck traffic, which Enviva has undertaken to mitigate, including by this project. The facility is currently engaged in enhanced dust control practices that have provided tangible results as reported in feedback from our neighbors. The additional emission controls authorized by this project will add further to these tangible results.

Enviva remains committed to being a positive member of the Greenwood Community. Once this permit application is filed, Enviva community relations staff will perform an outreach and engagement to its partners as well as the neighborhood community to explain the scope and benefits of the project through live programs, meetings and materials. There are also plans being developed to remove the excess fiber inherited when Enviva purchased the facility over the next six to nine months.

FACILITY'S PRODUCTS / SERVICES	
Primary Products / Services *(List the primary product and/or service)* **Wood Pellet Manufacturing Facility**	
Primary SIC Code *(Standard Industrial Classification Codes)* **2499 – Wood Products, NEC**	Primary NAICS Code *(North American Industry Classification System)* **32199 – All other wood product manufacturing**

Other Products / Services *(List any other products and/or services)* **N/A**	
Other SIC Code(s): **N/A**	Other NAICS Code(s): **N/A**

AIR PERMIT FACILITY CONTACT *(Person at the facility who can answer technical questions about the facility and permit application.)*			
Title/Position: **Sr, Environmental Engineer and Manager**	Salutation: **Mr.**	First Name: **Kai**	Last Name: **Simonsen**
Mailing Address: **4242 Six Forks Road, Suite 1050**			
City: **Raleigh**		State: **NC**	Zip Code: **27609**
E-mail Address: **Kai.Simonsen@envivabiomass.com**		Phone No.: **948-789-3628**	Cell No.: **919-428-0289**

The signed permit will be e-mailed to the designated Air Permit Contact. If additional individuals need copies of the permit, please provide their names and e-mail addresses.	
Name	**E-mail Address**

CONFIDENTIAL INFORMATION / DATA
Does this application contain confidential information or data? ☒ No ☐ Yes*

If yes, include a sanitized version of the application for public review and **ONLY ONE COPY OF CONFIDENTIAL INFORMATION SHOULD BE SUBMITTED*

LIST OF FORMS INCLUDED *(Identify all forms included in the application package)*	
Form Name	**Included (Y/N)**
Expedited Review Request (DHEC Form 2212)	☐ Yes ☒ No
Equipment/Processes (DHEC Form 2567)	☒ Yes
Emissions (DHEC Form 2569)	☒ Yes
Regulatory Review (DHEC Form 2570)	☒ Yes
Emissions Point Information (DHEC Form 2573)	☒ Yes ☐ No (If No, Explain)

OWNER OR OPERATOR			
Title/Position: **Plant Manager**	Salutation: **Mr.**	First Name: **Croft**	Last Name: **Hollingsworth**
Mailing Address: **200 Enviva Way**			
City: **Greenwood**		State: **SC**	Zip Code: **29646**
E-mail Address: Croft.Hollingsworth@envivabiomass.com		Phone No.: **864-414-9020**	Cell No.:

OWNER OR OPERATOR SIGNATURE

I certify, to the best of my knowledge and belief, that no applicable standards and/or regulations will be contravened or violated. I certify that any application form, report, or compliance certification submitted in this permit application is true, accurate, and complete based on information and belief formed after reasonable inquiry. I understand that any statements and/or descriptions, which are found to be incorrect, may result in the immediate revocation of any permit issued for this application.

Signature of Owner or Operator — Date: 6/29/2020

PERSON AND/OR FIRM THAT PREPARED THIS APPLICATION *(If not the same person as the Professional Engineer who has reviewed and signed this application.)*			
Consulting Firm Name: **Ramboll US Corporation**			
Title/Position: **Managing Principal**	Salutation: **Mr.**	First Name: **Michael**	Last Name: **Carbon**
Mailing Address: **8235 YMCA Plaza Drive, Suite 300**			
City: **Baton Rouge**		State: **LA**	Zip Code: **70810**
E-mail Address: **mcarbon@ramboll.com**		Phone No.: **225-408-2691**	Cell No.:
SC Professional Engineer License/Registration No. (if applicable): **N/A**			

PROFESSIONAL ENGINEER INFORMATION			
Consulting Firm Name: **Ramboll US Corporation**			
Title/Position: **South Region COO**	Salutation: **Mr.**	First Name: **Russell**	Last Name: **Kemp**
Mailing Address: **1600 Parkwood Circle, Suite 310**			
City: **Atlanta**		State: **GA**	Zip Code: **30339**
E-mail Address: **rkemp@ramboll.com**		Phone No.: **678-388-1654**	Cell No.:
SC License/Registration No.: **15807**			
PROFESSIONAL ENGINEER SIGNATURE			
I have placed my signature and seal on the engineering documents submitted, signifying that I have reviewed this construction permit application as it pertains to the requirements of *South Carolina Regulation 61-62, Air Pollution Control Regulations and Standards.*			

Russell A Kemp — 25 JUNE 2020

Signature of Professional Engineer — Date

Bureau of Air Quality
Construction Permit Application
Equipment / Processes

APPLICATION IDENTIFICATION *(Please ensure that the information list in this table is the same on all of the forms and required information submitted in this construction permit application package.)*		
Facility Name *(This should be the name used to identify the facility)* **Enviva Pellets Greenwood, LLC**	SC Air Permit Number (8-digits only) *(Leave blank if one has never been assigned)* **1240 – 0133**	Application Date **February 2020** **(rev. June 2020)**

PROJECT DESCRIPTION
Brief Project Description (What, why, how, etc.): **Enviva is requesting planned changes for the Greenwood plant to increase the pellet production rate and reduce emissions from the DHMs, as well as other changes described in detail in the permit application report.**

ATTACHMENTS	
☒ Process Flow Diagram	Location in Application: **Appendix B**
☒ Detailed Project Description	Location in Application: **Application Report, Sections 1 and 2**

EQUIPMENT / PROCESS INFORMATION							
Equipment ID Process ID	Action	Equipment / Process Description	Maximum Design Capacity (Units)	Control Device ID(s)	Pollutants Controlled (Include CAS#)	Capture System Efficiency and Description	Emission Point ID(s)
P0/E1	☐ Add ☐ Remove ☒ Modify ☐ Other	Debarking	115 ODT/hr	None	None	Not applicable	S0
P0/E2	☐ Add ☐ Remove ☒ Modify ☐ Other	Chipping	88 ODT/hr	None	None	Not applicable	S0
P0/E3	☐ Add ☐ Remove ☒ Modify ☐ Other	Screening	88 ODT/hr	None	None	Not applicable	S0
P0/E4	☐ Add ☐ Remove ☒ Modify ☐ Other	Pile Drop	96 ODT/hr	None	None	Not applicable	S0
P0/E5	☐ Add ☐ Remove ☒ Modify ☐ Other	Pile Erosion	165,000 ft^2 total outer surface area	None	None	Not applicable	S0
P0/E46	☒ Add ☐ Remove ☐ Modify ☐ Other	Truck Dump 1	88 ODT/hr	None	None	Not applicable	S0
P0/E47	☒ Add ☐ Remove ☐ Modify ☐ Other	Truck Dump 2	88 ODT/hr	None	None	Not applicable	S0
P1/E6	☐ Add ☐ Remove ☒ Modify ☐ Other	Green Hammermill 1	75 ODT/hr (total for all)	CD2, CD3	PM_{10}, $PM_{2.5}$, VOC, HAP, TAP	100% (ductwork)	S1, S15
P1/E7	☐ Add ☐ Remove ☒ Modify ☐ Other	Green Hammermill 2		CD2, CD3	PM_{10}, $PM_{2.5}$, VOC, HAP, TAP	100% (ductwork)	

P1/E8	☐ Add ☐ Remove ☒ Modify ☐ Other	Green Hammermill 3	75 ODT/hr (total for all)	CD2, CD3	PM_{10}, $PM_{2.5}$, VOC, HAP, TAP	100% (ductwork)	S1, S15
P1/E9	☐ Add ☐ Remove ☒ Modify ☐ Other	Green Hammermill 4		CD2, CD3	PM_{10}, $PM_{2.5}$, VOC, HAP, TAP	100% (ductwork)	
P1/E58	☒ Add ☐ Remove ☐ Modify ☐ Other	Green Hammermill 5		CD2, CD3	PM_{10}, $PM_{2.5}$, VOC, HAP, TAP	100% (ductwork)	
P1/E10	☐ Add ☐ Remove ☒ Modify ☐ Other	Green Chip Silo	75 ODT/hr	CD2, CD3	PM_{10}, $PM_{2.5}$, VOC, HAP, TAP	100% (ductwork)	
P2/E11	☐ Add ☐ Remove ☒ Modify ☐ Other	Furnace	200 MMBtu/hr	CD2, CD3	PM_{10}, $PM_{2.5}$, VOC, HAP, TAP	100% (ductwork)	
P2/E12	☐ Add ☐ Remove ☒ Modify ☐ Other	Dryer	75 ODT/hr			100% (ductwork)	
P2/E48	☒ Add ☐ Remove ☐ Modify ☐ Other	Dryer Duct Burner	5 MMBtu/hr	None	None	Not Applicable	S16
P2/E13	☐ Add ☐ Remove ☒ Modify ☐ Other	Dry Chip Silo	88 ODT/hr	CD4	PM_{10}, $PM_{2.5}$	100% (ductwork)	S2
P3/E14	☐ Add ☒ Remove ☐ Modify ☐ Other	Dry Hammermill 1					
P3/E15	☐ Add ☒ Remove ☐ Modify ☐ Other	Dry Hammermill 2					

P3/E16	☐ Add ☒ Remove ☐ Modify ☐ Other	Dry Hammermill 3					
P3/E17	☐ Add ☒ Remove ☐ Modify ☐ Other	Dry Hammermill 4					
P3/E18	☐ Add ☒ Remove ☐ Modify ☐ Other	Dry Hammermill 5					
P3/E59 – E94	☒ Add ☐ Remove ☐ Modify ☐ Other	Vertical Dry Hammermill 1 through Vertical Dry Hammermill 36	88 ODT/hr (total for all)	See application narrative and process flow diagram	PM_{10}, $PM_{2.5}$, VOC, HAP, TAPs	100% (ductwork)	S1
P3/E19	☐ Add ☐ Remove ☒ Modify ☐ Other	Pelletizer Feed Silo	88 ODT/hr	CD10	PM_{10}, $PM_{2.5}$	100% (ductwork)	S4
P4/E20	☐ Add ☐ Remove ☒ Modify ☐ Other	Pelletizer 1	45 ODT/hr (total for all)	CD14a - c, CD15	PM_{10}, $PM_{2.5}$, VOC, HAP, TAP	100% (ductwork)	S5
P4/E21	☐ Add ☐ Remove ☒ Modify ☐ Other	Pelletizer 2					
P4/E22	☐ Add ☐ Remove ☒ Modify ☐ Other	Pelletizer 3					
P4/E24	☐ Add ☐ Remove ☒ Modify ☐ Other	Pelletizer 4					

P4/E25	☐ Add ☐ Remove ☒ Modify ☐ Other	Pelletizer 5					
P4/E26	☐ Add ☐ Remove ☒ Modify ☐ Other	Pelletizer 6					
P4/E28	☐ Add ☐ Remove ☒ Modify ☐ Other	Pelletizer 7					
P4/E29	☐ Add ☐ Remove ☒ Modify ☐ Other	Pelletizer 8					
P4/E30	☐ Add ☐ Remove ☒ Modify ☐ Other	Pelletizer 9					
P4/E23	☐ Add ☐ Remove ☒ Modify ☐ Other	Pellet Cooler 1					
P4/E27	☐ Add ☐ Remove ☒ Modify ☐ Other	Pellet Cooler 2					
P4/E31	☐ Add ☐ Remove ☒ Modify ☐ Other	Pellet Cooler 3					
P4/E32	☐ Add ☐ Remove ☒ Modify ☐ Other	Pelletizer 10	45 ODT/hr (total for all)	CD18a - c, CD19	PM_{10}, $PM_{2.5}$, VOC, HAP, TAP	100% (ductwork)	S6
P4/E33	☐ Add ☐ Remove ☒ Modify ☐ Other	Pelletizer 11					

P4/E34	☐ Add ☐ Remove ☒ Modify ☐ Other	Pelletizer 12					
P4/E36	☐ Add ☐ Remove ☒ Modify ☐ Other	Pelletizer 13					
P4/E37	☐ Add ☐ Remove ☒ Modify ☐ Other	Pelletizer 14					
P4/E38	☐ Add ☐ Remove ☒ Modify ☐ Other	Pelletizer 15					
P4/E49	☒ Add ☐ Remove ☐ Modify ☐ Other	Pelletizer 16					
P4/E50	☒ Add ☐ Remove ☐ Modify ☐ Other	Pelletizer 17					
P4/E51	☒ Add ☐ Remove ☐ Modify ☐ Other	Pelletizer 18					
P4/E35	☐ Add ☐ Remove ☒ Modify ☐ Other	Pellet Cooler 4					
P4/E39	☐ Add ☐ Remove ☒ Modify ☐ Other	Pellet Cooler 5					
P4/E52	☒ Add ☐ Remove ☐ Modify ☐ Other	Pellet Cooler 6					

P5/E40	☐ Add ☐ Remove ☒ Modify ☐ Other	Pellet Silo 1	91 ODT/hr	CD20	PM_{10}, $PM_{2.5}$	100% (ductwork)	S7
P5/E41	☐ Add ☐ Remove ☒ Modify ☐ Other	Pellet Silo 2					
P5/E42	☐ Add ☐ Remove ☒ Modify ☐ Other	Loadout	142 ODT/hr	CD22	PM_{10}, $PM_{2.5}$	100% (ductwork)	S8
P5/E43	☐ Add ☐ Remove ☐ Modify ☒ Other	Dust Silo	5 tph	CD23	PM_{10}, $PM_{2.5}$	100% (ductwork)	S9
P6/E44	☐ Add ☐ Remove ☐ Modify ☒ Other	Engine 1 (Generator)	865 hp	None	None	Not applicable	S13
P6/E45	☐ Add ☐ Remove ☐ Modify ☒ Other	Engine 2 (Fire Pump)	305 hp	None	None	Not applicable	S14
P6/E53	☐ Add ☐ Remove ☐ Modify ☒ Other	AST1 - Diesel Storage Tank	2,000 gallons	None	None	Not applicable	E53
P6/E54	☐ Add ☐ Remove ☐ Modify ☒ Other	AST2 - Diesel Storage Tank	359 gallons	None	None	Not applicable	E54
P6/E55	☐ Add ☐ Remove ☐ Modify ☒ Other	AST3 - Diesel Storage Tank	660 gallons	None	None	Not applicable	E55

P7/E56	☒ Add ☐ Remove ☐ Modify ☐ Other	Unpaved Roads	N/A	None	None	Not Applicable	S0
P7/E57	☒ Add ☐ Remove ☐ Modify ☐ Other	Paved Roads	N/A	None	None	Not Applicable	

CONTROL DEVICE INFORMATION					
Control Device ID	Action	Control Device Description	Maximum Design Capacity (Units)	Inherent/Required/Voluntary (Explain)	Destruction/Removal Efficiency Determination
CD3	☐ Add ☐ Remove ☒ Modify ☐ Other	RTO1	4 x 8 MMBtu/hr	Required	95%
CD15	☐ Add ☐ Remove ☒ Modify ☐ Other	RTO2/RCO1	1 x 5.2 MMBtu/hr	Required	95%
CD19	☐ Add ☐ Remove ☒ Modify ☐ Other	RTO3/RCO2	2 x 5.2 MMBtu/hr	Required	95%
CD24	☐ Add ☒ Remove ☐ Modify ☐ Other	Cyclofilter 8			
CD25	☐ Add ☒ Remove ☐ Modify ☐ Other	Cyclofilter 9			
CD26	☐ Add ☒ Remove ☐ Modify ☐ Other	Cyclofilter 10			
CD24	☒ Add ☐ Remove ☐ Modify ☐ Other	Bin Vent Filter 3	3,000 acfm	Voluntary	99%+
CD18c	☒ Add ☐ Remove ☐ Modify ☐ Other	Baghouse 4	50,000 acfm (total for CD18a – c)	Required	99%+

RAW MATERIAL AND PRODUCT INFORMATION			
Equipment ID Process ID Control Device ID	Raw Material(s)	Product(s)	Fuels Combusted
E1-E5,E46-E47 P0	Logs Green Chips	Green Chips, Bark	N/A
E6 – E10, E58 P1	Green Chips	Green Chips	N/A
E11 – E13, E48 P2 CD3	Fuel Green Chips	Heat Dry Chips	Bark, Natural Gas (for oxidizer and duct burner), and Diesel (for cold start-ups)
E59 – E94 P3	Dry Chips	Milled Chips	N/A
E19 P3	Milled Chips	Milled Chips	N/A
E20 – E39, E49 – E52 P4 CD15, CD19	Milled Chips	Pellets	Natural Gas (for oxidizer)
E40-E43 P5	Pellets	Pellets	N/A
E44, E45, E53-E55 P6	Fuel	Power	Diesel

MONITORING AND REPORTING INFORMATION					
Equipment ID Process ID Control Device ID	Pollutant(s)/Parameter(s) Monitored	Monitoring Frequency	Reporting Frequency	Monitoring/Reporting Basis	Averaging Period(s)
CD24	Pressure Drop	Once per shift	Semiannual	Established Range	None
CD18c	Pressure Drop	Once per shift	Semiannual	Established Range	None
CD3	No changes proposed				
CD15					
CD19					

Application Identification (Please ensure that the information list in this table is the same on all of the forms and required information submitted in this construction permit application package.)		
Facility Name (This should be the name used to identify the facility)	SC Air Permit Number (8-digits only) (Leave blank if one has never been assigned)	Application Date
Enviva Pellets Greenwood, LLC	**1240-0133**	**February 2020 (rev. June 2020)**

Attachments

(Check all the appropriate checkboxes if included as an attachment)

☑ Sample Calculations, Emissions Factors Used, etc.	☑ Detailed Explanation of Assumptions, Bottlenecks, etc.
☐ Supporting Information: Manufacturer's Data, etc.	☐ Source Test Analysis
☑ Details on Limits Being Taken for PTE Emissions	☑ NSR Analysis

Summary of Projected Facility-Wide Potential Emissions (Calculated at maximum design capacity.)

Pollutants	Emission Rates Prior to Construction / Modification (tons/year) Colombo Basis			Emission Rates Prior to Construction / Modification (tons/year) Colombo Permitted Emissions Plus Existing Unpermitted Emissions			Emission Rates After Construction / Modification (tons/year) Enviva Basis		
	Uncontrolled	Controlled	Limited	Uncontrolled	Controlled	Limited	Uncontrolled	Controlled	Limited
PM	13,948	151	148	14,289	281	174	12,684	283	168
PM10	13,948	151	148	14,109	253	157	9,667	206	103
PM2.5	11,958	132	128	12,047	215	131	9,102	179	89
SO_2	22.5			27	27	23	27	27	22
NO_X	249			292	292	252	158	166	125
CO	249			361	361	253	173	216	100
VOC	2906	305	247	2,909	308	247	2,491	138	120
Pb	0	0	0	5.10E-02	1.20E-02	3.34E-03	5.10E-02	1.20E-02	3.34E-03
Highest HAP Prior to Construction (Cas # 50-00-0): Formaldehyde	17.2	1.60	1.33	18.0	2.41	1.35	91.4	5.67	4.40
Highest HAP After Construction (Cas # 50-00-0): Formaldehyde	17.2	1.60	1.33	18.0	2.41	1.35	91.4	5.67	4.40
Total HAP Emissions	52.1	5.10	4.22	57.9	10.9	4.38	416.35	29.18	22.40

Include emissions from exempt equipment and emission increases from process changes that were exempt from construction permits.

(*All HAP emitted from the various equipment or processes must be listed in the appropriate "Potential Emission Rates at Maximum Design Capacity" Table)

REFER TO EMISSION CALCULATION TABLES FOR ADDITIONAL HAP EMISSIONS

Potential Emission Rates at Maximum Design Capacity									
Equipment ID / Process ID	Emission Point ID	Pollutants	Calculation Methods / Limits Taken / Other Comments	Uncontrolled		Controlled		Limited	
				lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
P0/E1	S0	PM	Refer to emission calculation tables	2.70	11.82	2.70	11.82	2.70	10.28
		PM_{10}		0.07	0.32	0.07	0.32	0.07	0.28
		$PM_{2.5}$		0.01	0.05	0.01	0.05	0.01	0.05
P0/E2	S0	VOC	Refer to emission calculation tables	0.44	1.92	0.44	1.92	0.44	1.92
		Methanol		0.09	0.38	0.09	0.38	0.09	0.38
		PM		1.68	7.36	1.68	7.36	1.68	7.36
		PM_{10}		0.84	3.68	0.84	3.68	0.84	3.68
		$PM_{2.5}$		0.84	3.68	0.84	3.68	0.84	3.68
P0/E3	S0	PM	Refer to emission calculation tables	0.33	1.46	0.33	1.46	0.33	1.46
		PM_{10}		0.33	1.46	0.33	1.46	0.33	1.46
		$PM_{2.5}$		0.33	1.46	0.33	1.46	0.33	1.46
P0/E4	S0	PM	Refer to emission calculation tables	0.01	0.06	0.01	0.06	0.01	0.06
		PM_{10}		6.16E-03	0.03	6.16E-03	0.03	6.16E-03	2.14E-03
		$PM_{2.5}$		9.33E-04	4.09E-03	9.33E-04	4.09E-03	9.33E-04	4.09E-03
P0/E5	S0	PM	Refer to emission calculation tables	0.65	2.83	0.65	2.83	0.65	2.83
		PM_{10}		0.32	1.41	0.32	1.41	0.32	1.41
		$PM_{2.5}$		0.05	0.21	0.05	0.21	0.05	0.21
		VOC		0.69	3.03	0.69	3.03	0.69	3.03
P0/E46	S0	PM	Refer to emission calculation tables	5.88E-03	0.03	5.88E-03	0.03	5.88E-03	0.03
		PM_{10}		2.78E-03	0.01	2.78E-03	0.01	2.78E-03	0.01
		$PM_{2.5}$		4.21E-04	1.84E-03	4.21E-04	1.84E-03	4.21E-04	1.84E-03
P0/E47	S0	PM	Refer to emission calculation tables	5.88E-03	0.03	5.88E-03	0.03	5.88E-03	0.03
		PM_{10}		2.78E-03	0.01	2.78E-03	0.01	2.78E-03	0.01
		$PM_{2.5}$		4.21E-04	1.84E-03	4.21E-04	1.84E-03	4.21E-04	1.84E-03

REFER TO EMISSION CALCULATION TABLES FOR ADDITIONAL HAP EMISSIONS

Potential Emission Rates at Maximum Design Capacity									
Equipment ID / Process ID	Emission Point ID	Pollutants	Calculation Methods / Limits Taken / Other Comments	Uncontrolled		Controlled		Limited	
				lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
P1/E6-E10, E58; P2/E11-E12	S1	CO	Refer to emission calculation tables	13.65	59.80	13.65	59.80	13.65	59.80
		NOx		25.59	112.07	25.59	112.07	25.59	112.07
		PM		256.77	1,125	2.57	11.25	2.57	11.25
		PM_{10}		256.77	1,125	2.57	11.25	2.57	11.25
		$PM_{2.5}$		256.77	1,125	2.57	11.25	2.57	11.25
		SO_2		5.00	21.90	5.00	21.90	5.00	21.90
		VOC		187.30	820.37	9.36	41.02	9.36	41.02
		Acetaldehyde		14.05	61.53	0.70	3.08	0.70	3.08
		Phenol		11.29	49.47	0.56	2.47	0.56	2.47
		Methanol		11.12	48.71	0.56	2.44	0.56	2.44
		Acrolein		9.11	39.92	0.46	2.00	0.46	2.00
P2/E11 (Furnace Bypass)	S15	CO	Refer to emission calculation tables	25.35	110.38	25.35	110.38	25.35	2.25
		NOx		9.84	40.47	9.84	40.47	9.84	0.83
		PM		24.33	106.15	24.33	106.15	24.33	2.16
		PM_{10}		21.81	95.11	21.81	95.11	21.81	1.94
		$PM_{2.5}$		18.87	82.23	18.87	82.23	18.87	1.68
		SO_2		1.06	4.60	1.06	4.60	1.06	0.09
		VOC		0.72	3.13	0.72	3.13	0.72	0.06
		Acrolein		0.12	0.53	0.12	0.53	0.12	0.003
		Formaldehyde		0.13	0.58	0.13	0.58	0.13	3.30E-03
		Hydrochloric acid		0.57	2.50	0.57	2.50	0.57	0.01
		Manganese		0.05	0.21	0.05	0.21	0.05	1.20E-03
P2/E13	S2	PM	Refer to emission calculation tables	17.14	75.09	0.17	0.75	0.17	0.75
		PM_{10}		17.14	75.09	0.17	0.75	0.17	0.75
		$PM_{2.5}$		17.14	75.09	0.17	0.75	0.17	0.75
		VOC		1.25	5.50	1.25	5.50	1.25	4.69

REFER TO EMISSION CALCULATION TABLES FOR ADDITIONAL HAP EMISSIONS

Potential Emission Rates at Maximum Design Capacity									
Equipment ID / Process ID	Emission Point ID	Pollutants	Calculation Methods / Limits Taken / Other Comments	Uncontrolled		Controlled		Limited	
				lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
P2/E48	S16	CO	Refer to emission calculation tables	0.41	1.80	0.41	1.80	0.41	1.80
		NOx		0.49	2.15	0.49	2.15	0.49	2.15
		PM		0.04	0.16	0.04	0.16	0.04	0.16
		PM_{10}		0.04	0.16	0.04	0.16	0.04	0.16
		$PM_{2.5}$		0.04	0.16	0.04	0.16	0.04	0.16
		SO_2		2.94E-03	0.01	2.94E-03	0.01	2.94E-03	0.01
		VOC		0.03	0.12	0.03	0.12	0.03	0.12
		Ammonia		0.02	0.07	0.02	0.07	0.02	0.07
		Formaldehyde		3.68E-04	1.61E-03	3.68E-04	1.61E-03	3.68E-04	0.002
		Hexane		8.82E-03	0.04	8.82E-03	0.04	8.82E-03	0.04
		Toluene		1.67E-05	7.30E-05	1.67E-05	7.30E-05	1.67E-05	0.000
P3/E59 through E94	S1	CO	Refer to emission calculation tables	-	-	0.17	0.73	0.17	0.62
		NOx		-	-	0.20	0.86	0.20	0.74
		PM		1,506	6,596	15.06	65.96	15.06	56.27
		PM_{10}		1,506	6,596	15.06	65.96	15.06	56.27
		$PM_{2.5}$		1,506	6,596	15.06	65.96	15.06	56.27
		VOC		108.80	476.54	5.44	23.83	5.44	20.33
		Acetaldehyde		0.64	2.79	0.03	0.14	0.03	0.12
		Acrolein		0.96	4.19	0.05	0.21	0.05	0.18
		Methanol		0.52	2.27	0.03	0.11	0.03	0.10
		Propionaldehyde		1.09	4.79	0.05	0.24	0.05	0.20
P3/E19	S4	PM	Refer to emission calculation tables	17.14	75.09	0.17	0.75	0.17	0.75
		PM_{10}		17.14	75.09	0.17	0.75	0.17	0.75
		$PM_{2.5}$		17.14	75.09	0.17	0.75	0.17	0.75
		VOC		0.02	0.08	0.02	0.08	0.02	0.07

REFER TO EMISSION CALCULATION TABLES FOR ADDITIONAL HAP EMISSIONS

Potential Emission Rates at Maximum Design Capacity									
Equipment ID / Process ID	Emission Point ID	Pollutants	Calculation Methods / Limits Taken / Other Comments	Uncontrolled		Controlled		Limited	
				lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
P4/E20-E31	S5	CO	Refer to emission calculation tables	-	-	4.84	21.22	4.84	17.62
		NOx		-	-	0.82	3.58	0.82	2.97
		PM		428.57	1,877	4.32	18.94	4.32	18.94
		PM_{10}		111.86	489.93	1.16	5.07	1.16	5.07
		$PM_{2.5}$		69.13	251.46	0.69	2.51	0.69	2.51
		SO_2		-	-	3.06E-03	0.01	3.06E-03	0.01
		VOC		134.77	590.28	6.74	29.51	6.74	24.51
		Acetaldehyde		1.52	6.68	0.08	0.33	0.08	0.28
		Acrolein		2.26	9.91	0.11	0.50	0.11	0.41
		Formaldehyde		5.77	25.27	0.29	1.27	0.29	1.05
		Phenol		1.14	5.01	0.06	0.25	0.06	0.21
P4/E32, E33, E34, E35, E36, E37, E38, E39, E49, E50, E51, E52	S6	CO	Refer to emission calculation tables	-	-	4.84	21.22	4.84	17.62
		NOx		-	-	0.82	3.58	0.82	2.97
		PM		428.57	1,877	4.36	19.11	4.36	19.11
		PM_{10}		111.86	489.93	1.20	5.24	1.20	5.24
		$PM_{2.5}$		69.13	251.46	0.69	2.51	0.69	2.51
		SO_2		-	-	6.12E-03	0.03	6.12E-03	0.03
		VOC		134.77	590.28	6.74	29.51	6.74	24.51
		Acetaldehyde		1.52	6.68	0.08	0.33	0.08	0.28
		Acrolein		2.26	9.91	0.11	0.50	0.11	0.41
		Formaldehyde		5.77	25.27	0.29	1.27	0.29	1.05
		Phenol		1.14	5.01	0.06	0.25	0.06	0.21
P5/E40, E41	S7	PM	Refer to emission calculation tables	17.14	75.09	0.17	0.75	0.17	0.75
		PM_{10}		17.14	75.09	0.17	0.75	0.17	0.75
		$PM_{2.5}$		17.14	75.09	0.17	0.75	0.17	0.75
P5/E42	S8	PM	Refer to emission calculation tables	98.57	431.74	0.99	4.32	0.99	4.32
		PM_{10}		98.57	431.74	0.99	4.32	0.99	4.32
		$PM_{2.5}$		98.57	431.74	0.99	4.32	0.99	4.32
P5/E43	S9	PM	Refer to emission calculation tables	28.29	123.89	0.28	1.24	0.28	1.24
		PM_{10}		28.29	123.89	0.28	1.24	0.28	1.24
		$PM_{2.5}$		28.29	123.89	0.28	1.24	0.28	1.24

REFER TO EMISSION CALCULATION TABLES FOR ADDITIONAL HAP EMISSIONS

Potential Emission Rates at Maximum Design Capacity											
Equipment ID / Process ID	Emission Point ID	Pollutants	Calculation Methods / Limits Taken / Other Comments	Uncontrolled		Controlled		Limited	
				lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
P6/E44	S13	CO	Refer to emission calculation tables	0.76	0.19	0.76	0.19	0.76	0.19
		NOx		10.95	2.74	10.95	2.74	10.95	2.74
		PM		0.03	8.58E-03	0.03	8.58E-03	0.03	8.58E-03
		PM_{10}		0.03	8.58E-03	0.03	8.58E-03	0.03	8.58E-03
		$PM_{2.5}$		0.03	8.58E-03	0.03	8.58E-03	0.03	8.58E-03
		SO_2		9.41E-03	2.35E-03	9.41E-03	2.35E-03	9.41E-03	2.35E-03
		VOC		0.02	4.77E-03	0.02	4.77E-03	0.02	4.77E-03
		Acetaldehyde		4.64E-03	1.16E-03	4.64E-03	1.16E-03	4.64E-03	1.16E-03
		Benzene		5.65E-03	1.41E-03	5.65E-03	1.41E-03	5.65E-03	1.41E-03
		Formaldehyde		7.14E-03	1.79E-03	7.14E-03	1.79E-03	7.14E-03	1.79E-03
		Toluene		2.48E-03	6.19E-04	2.48E-03	6.19E-04	2.48E-03	6.19E-04
P6/E45	S14	CO	Refer to emission calculation tables	1.75	0.44	1.75	0.44	1.75	0.44
		NOx		2.02	0.50	2.02	0.50	2.02	0.50
		PM		0.10	0.03	0.10	0.03	0.10	0.03
		PM_{10}		0.10	0.03	0.10	0.03	0.10	0.03
		$PM_{2.5}$		0.10	0.03	0.10	0.03	0.10	0.03
		SO_2		3.32E-03	8.30E-04	3.32E-03	8.30E-04	3.32E-03	8.30E-04
		VOC		5.36E-03	1.34E-03	5.36E-03	1.34E-03	5.36E-03	1.34E-03
		Acetaldehyde		1.64E-03	4.09E-04	1.64E-03	4.09E-04	1.64E-03	4.09E-04
		Benzene		1.99E-03	4.98E-04	1.99E-03	4.98E-04	1.99E-03	4.98E-04
		Formaldehyde		2.52E-03	6.30E-04	2.52E-03	6.30E-04	2.52E-03	6.30E-04
		Toluene		8.73E-04	2.18E-04	8.73E-04	2.18E-04	8.73E-04	2.18E-04
P6/E53	E53	VOC	Refer to emission calculation tables	1.98E-04	8.65E-04	1.98E-04	8.65E-04	1.98E-04	8.65E-04
P6/E54	E54	VOC	Refer to emission calculation tables	3.32E-05	1.45E-04	3.32E-05	1.45E-04	3.32E-05	1.45E-04
P6/E55	E55	VOC	Refer to emission calculation tables	6.58E-05	2.88E-04	6.58E-05	2.88E-04	6.58E-05	2.88E-04
P7/E56	S0	PM	Refer to emission calculation tables	63.03	276.09	6.30	27.61	6.30	27.61
		PM_{10}		17.97	78.70	1.80	7.87	1.80	7.87
		$PM_{2.5}$		1.80	7.87	0.18	0.79	0.18	0.79
P7/E57	S0	PM	Refer to emission calculation tables	4.98	21.79	0.50	2.18	0.50	2.18
		PM_{10}		1.00	4.36	0.10	0.44	0.10	0.44
		$PM_{2.5}$		0.24	1.07	0.02	0.11	0.02	0.11

APPLICATION IDENTIFICATION *(Please ensure that the information list in this table is the same on all of the forms and required information submitted in this construction permit application package.)*		
Facility Name *(This should be the name used to identify the facility)* **Enviva Pellets Greenwood, LLC**	SC Air Permit Number (8-digits only) *(Leave blank if one has never been assigned)* **1240- 0133**	Application Date **February 2020 (rev. June 2020)**

STATE AND FEDERAL AIR POLLUTION CONTROL REGULATIONS AND STANDARDS
(If not listed below add any additional regulations that are triggered.)

Regulation	Applicable		Include all limits, work practices, monitoring, record keeping, etc.		
	Yes	No	Explain Applicability Determination	List the specific limitations and/or requirements that apply.	How will compliance be demonstrated?
Regulation 61-62.1, Section II(E) Synthetic Minor Construction Permits	☒	☐	**The facility has a potential to emit greater than the major source threshold for PSD. The facility has limits in place to be classified as a synthetic minor source.**	**Proper operation of the facility's control devices, throughput limitations, and best management practices for uncontrolled sources.**	**Facility will operate control devices for all applicable sources during operation and will minimize emissions from uncontrolled sources through best management practices.**
Regulation 61-62.1, Section II(G) Conditional Major Operating Permits	☐	☒	**The facility is subject to Regulation 61-62.70 Title V Operating Permit Program limits and therefore, this regulation does not apply.**	**Not Applicable**	**Not Applicable**
Regulation 61-62.5, Standard No. 1 Emissions from Fuel Burning Operations	☒	☐	**The duct burner meets the definition of fuel burning operation.**	**20% opacity, 0.6 lb/MMBtu PM, and 2.3 lb/MMBtu SO_2**	**Use of pipeline quality natural gas as fuel**

STATE AND FEDERAL AIR POLLUTION CONTROL REGULATIONS AND STANDARDS *(If not listed below add any additional regulations that are triggered.)*					
Regulation	**Applicable**		**Include all limits, work practices, monitoring, record keeping, etc.**		
	Yes	**No**	**Explain Applicability Determination**	**List the specific limitations and/or requirements that apply.**	**How will compliance be demonstrated?**
Regulation 61-62.5, Standard No. 2 Ambient Air Quality Standards	☒	☐	**Standard No. 2 is generally applicable to sources in South Carolina emitting criteria pollutants. Standard No. 2 Modeling is addressed in Section 6 and Appendix E of this application.**	**State Ambient Air Quality Standards (SAAQS)**	**Enviva has performed air dispersion modeling to demonstrate compliance with the SAAQS. Results are addressed in Section 6 and Appendix E of this application.**
Regulation 61-62.5, Standard No. 3 Waste Combustion and Reduction	☒	☐	**Thermal oxidizers are considered industrial incinerators under this regulation**	**20% opacity and 0.5 lb/MMBtu total heat input**	**Weekly visual inspections**
Regulation 61-62.5, Standard No. 4 Emissions from Process Industries	☒	☐	**This rule is generally applicable to process sources in South Carolina.**	**Process Weight Rate Equation for PM (refer to Table 23 of Appendix C); 20% opacity**	**Use of the facility's PM control devices, weekly visual inspections, and proper operating practices for uncontrolled sources.**
Regulation 61-62.5, Standard No. 5 Volatile Organic Compounds	☐	☒	**Diesel storage tanks have capacities less than 40,000 gallons and facility does not have any other operations listed under Part II of this regulation**	**Not Applicable**	**Not Applicable**
Regulation 61-62.5, Standard No. 5.2 Control of Oxides of Nitrogen	☒	☐	**This rule is applicable to combustion sources rated at 10 MMBtu/hr or greater. The 200 MMBtu/hr furnace (E11) is subject to this rule.**	**Standard 5.2, Section III limitations.**	**Furnace design providing 30% emissions reduction relative to uncontrolled levels and tune-ups on the furnace every 24 months.**

STATE AND FEDERAL AIR POLLUTION CONTROL REGULATIONS AND STANDARDS *(If not listed below add any additional regulations that are triggered.)*					
Regulation	**Applicable**		**Include all limits, work practices, monitoring, record keeping, etc.**		
	Yes	**No**	**Explain Applicability Determination**	**List the specific limitations and/or requirements that apply.**	**How will compliance be demonstrated?**
Regulation 61-62.5, Standard No. 7 Prevention of Significant Deterioration	☐	☒	**The facility is not a PSD major source and proposed modification does not increase emissions above PSD major source levels.**	**Not Applicable**	**Not Applicable**
Regulation 61-62.5, Standard No. 7.1 Nonattainment New Source Review	☐	☒	**The facility is located in Greenwood County, which is designated as attainment or unclassifiable for all NAAQS.**	**Not Applicable**	**Not Applicable**
Regulation 61-62.5, Standard No. 8 Toxic Air Pollutants	☒	☐	**Standard No. 8 is generally applicable to sources in South Carolina emitting TAPs. Standard No. 8 Modeling is addressed in Section 6 and Appendix E of this application.**	**Maximum Allowable Ambient Concentrations (MAAC)**	**Enviva has performed air dispersion modeling to demonstrate compliance with the MAAC for TAPs with potential emissions exceeding their de minimis values. Results are addressed in Section 6 and Appendix E of this application.**
Regulation 61-62.6 Control of Fugitive Particulate Matter	☒	☐	**The facility includes sources of fugitive PM emissions subject to this regulation.**	**Control fugitive PM emissions so that it does not create an undesirable level of air pollution.**	**Proper operating practices for fugitive sources at the facility.**
Regulation 61-62.68 Chemical Accident Prevention Provisions	☐	☒	**The facility does not store any regulated toxic substances.**	**Not Applicable**	**Not Applicable**

STATE AND FEDERAL AIR POLLUTION CONTROL REGULATIONS AND STANDARDS *(If not listed below add any additional regulations that are triggered.)*					
Regulation	**Applicable**		**Include all limits, work practices, monitoring, record keeping, etc.**		
	Yes	**No**	**Explain Applicability Determination**	**List the specific limitations and/or requirements that apply.**	**How will compliance be demonstrated?**
Regulation 61-62.70 Title V Operating Permit Program	☒	☐	**The facility is a major source with respect to the Title V Operating Permit Program because facility-wide emissions of one or more criteria pollutants exceed the major source threshold of 100 tpy.**	**Submit Title V Operating Permit application.**	**Submittal of Title V Operating Permit application**
40 CFR Part 64 - Compliance Assurance Monitoring (CAM)	☒	☐	**CAM applies to emission units located at a Title V major source that use a control device to achieve compliance with an emission limit and whose pre-controlled emissions exceed the major source thresholds.**	**For emission units with post-controlled emissions below the major source thresholds, a CAM plan must be submitted with the first Title V renewal application.**	**CAM will potentially be applicable to sources at the facility. However, no emission units have post-controlled emissions above major source thresholds and, therefore, any CAM plans that may be required will not be due until submittal of the initial Title V renewal. Applicability of 40 CFR 64 requirements will be fully assessed at that time.**
40 CFR 60 Subpart A - General Provisions	☒	☐	**The facility is subject to subparts under Part 60.**	**General Provisions**	**General Provisions**
40 CFR 60 Subpart Db –Industrial-Commercial-Institutional Steam Generating Units	☐	☒	**The facility does not include any steam generating units.**	**Not Applicable**	**Not Applicable**

STATE AND FEDERAL AIR POLLUTION CONTROL REGULATIONS AND STANDARDS *(If not listed below add any additional regulations that are triggered.)*					
Regulation	**Applicable**		**Include all limits, work practices, monitoring, record keeping, etc.**		
	Yes	**No**	**Explain Applicability Determination**	**List the specific limitations and/or requirements that apply.**	**How will compliance be demonstrated?**
40 CFR 60 Subpart Dc – Small Industrial-Commercial-Institutional Steam Generating Units	☐	☒	**The facility does not include any steam generating units.**	**Not Applicable**	**Not Applicable**
40 CFR 60 Subpart IIII – Stationary Compression Ignition Internal Combustion Engines	☒	☐	**This regulation is applicable to the facility's existing diesel-fired emergency generator and fire pump engine. The engines will be unaffected by this proposed project, and the facility will continue to comply with Subpart IIII standards for the engines.**		
40 CFR 60 Subpart Kb – Volatile Organic Liquid Storage Vessels	☐	☒	**The facility's storage tanks do not have maximum storage capacity greater than or equal to 39,890 gallons of a volatile organic liquid and therefore, the facility is not subject to Subpart Kb.**	**Not Applicable**	**Not Applicable**
40 CFR 61 Subpart A - General Provisions	☐	☒	**Subpart A applies if a source is subject to another 40 CFR Part 61 Subpart. The facility is not subject to any Part 61 NESHAPs.**	**Not Applicable**	**Not Applicable**
40 CFR 63 Subpart A - General Provisions	☒	☐	**Subpart A applies if a source is subject to another 40 CFR Part 63 Subpart. The facility does include sources subject to Part 63 NESHAPs.**	**General Provisions**	**General Provisions**

STATE AND FEDERAL AIR POLLUTION CONTROL REGULATIONS AND STANDARDS *(If not listed below add any additional regulations that are triggered.)*					
Regulation	**Applicable**		**Include all limits, work practices, monitoring, record keeping, etc.**		
	Yes	**No**	**Explain Applicability Determination**	**List the specific limitations and/or requirements that apply.**	**How will compliance be demonstrated?**
40 CFR 63 Subpart B - Requirements for Control Technology Determinations for Major Sources in Accordance with Clean Air Act Section 112(g)	☐	☒	**The Greenwood plant will not be subject to 112(g) since it is currently, and will remain, an area source of HAP emissions.**	**Not Applicable**	**Not Applicable**
40 CFR 63 Subpart DDDD – Plywood and Composite Wood Products	☐	☒	**The facility is not a major source of HAP emissions and, further, the wood pellets manufactured at the facility do not meet the definition for any of the PCWP products under §63.2292 that are subject to Subpart DDDD.**	**Not Applicable**	**Not Applicable**
40 CFR 63 Subpart ZZZZ – Stationary Reciprocating Internal Combustion Engines (RICE)	☒	☐	**This regulation is applicable to the facility's existing diesel-fired emergency generator and fire pump engine. The engines will be unaffected by this proposed project, and the facility will continue to comply with Subpart ZZZZ standards for the engines.**		
40 CFR 63 Subpart DDDDD – Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters	☐	☒	**The facility is not a major source of HAP emissions.**	**Not Applicable**	**Not Applicable**
40 CFR 63 Subpart JJJJJJ – Area Sources: Industrial, Commercial, and Institutional Boilers	☐	☒	**The facility does not currently operate any units that meet the Subpart JJJJJJ definition of a boiler and Enviva is not proposing to add boilers to the facility as part of the proposed project.**	**Not Applicable**	**Not Applicable**

* Green House Gas emissions must be quantified if these regulations are triggered.

Bureau of Air Quality
Construction Permit Application
Application Revision Request

CONSTRUCTION PERMIT IDENTIFICATION			
SC Air Permit Number *(8-digits only)* *(Leave blank if unknown or has never been assigned)* **1240 – 0133**	Construction Permit ID **CB**	Date Construction Permit Issued **January 12, 2018**	Revision Request Date **February 2020 (rev. June 2020)**
Facility Name *(This should be the name used to identify the facility)* **Enviva Pellets Greenwood, LLC**			

CONSTRUCTION PERMIT APPLICATION FORMS BEING REVISED *(Amended construction permit forms must be filled out completely and attached to this modification request.)*		
Form #	**Date of Original Submittal**	**Brief Description of Revision**
D-2566	**December 2017**	**Updated contact information**
D-2567	**December 2017**	**New proposed sources were added.**
D-2569	**December 2017**	**The facility updated facility-wide emissions calculations as part of this application.**
D-2570	**December 2017**	**The facility reviewed facility-wide regulatory applicability as part of this application.**
D-2573	**December 2017**	**The facility performed an updated modeling analysis as part of this application.**

OWNER OR OPERATOR			
Title/Position: **Plant Manager**	Salutation: **Mr.**	First Name: **Croft**	Last Name: **Hollingsworth**
Mailing Address: **200 Enviva Way**			
City: **Greenwood**		State: **SC**	Zip Code: **29646**
E-mail Address: **croft.hollingsworth@envivabiomass.com**		Phone No.: **864-414-9020**	Cell No.:

OWNER OR OPERATOR SIGNATURE

I certify, to the best of my knowledge and belief, that no applicable standards and/or regulations will be contravened or violated. I certify that any application form, report, or compliance certification submitted in this permit application is true, accurate, and complete based on information and belief formed after reasonable inquiry. I understand that any statements and/or descriptions, which are found to be incorrect, may result in the immediate revocation of any permit issued for this application.

Signature of Owner or Operator — Date: 6/29/2020

AIR PERMIT CONSULTANT *(If not the same person as the Professional Engineer.)*			
Consulting Firm Name: **Ramboll US Corporation**			
Title/Position: **Managing Principal**	Salutation: **Mr.**	First Name: **Michael**	Last Name: **Carbon**

Mailing Address: **8235 YMCA Plaza Drive, Suite 300**			
City: **Baton Rouge**		State: **LA**	Zip Code: **70810**
E-mail Address: **mcarbon@ramboll.com**		Phone No.: **225-408-2691**	Cell No.:
PROFESSIONAL ENGINEER INFORMATION			
Consulting Firm Name: **Ramboll US Corporation**			
Title/Position: **South Region COO**	Salutation: **Mr.**	First Name: **Russell**	Last Name: **Kemp**
Mailing Address: **1600 Parkwood Circle, Suite 310**			
City: **Atlanta**		State: **GA**	Zip Code: **30339**
E-mail Address: **rkemp@ramboll.com**		Phone No.: **678-388-1654**	Cell No.:
SC License/Registration No.: **15807**			

PROFESSIONAL ENGINEER SIGNATURE

I have placed my signature and seal on the engineering documents submitted, signifying that I have reviewed this construction permit application as it pertains to *South Carolina Regulation 61-62, Air Pollution Control Regulations and Standards.*

RSK 25 JUNE 2020

Signature of Professional Engineer Date

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER NO. 15807 RUSSELL STEPHEN KEMP

A. Application Identification	
1. Facility Name: **Enviva Pellets Greenwood, LLC**	
2. SC Air Permit Number (if known; 8-digits only): **1240-0133**	3. Application Date **February 2020**
4. Project Description: **Enviva is requesting planned changes for the Greenwood plant to increase pellet production rate and reduce emissions from the DHMs, as well as other changes described in detail in the permit application report**	

B. Facility Information	
1. Is your company a Small Business? ☐ Yes ☑ No	2. If a Small Business or small government facility, is Bureau assistance being requested? ☐ Yes ☑ No
3. Are other facilities collocated for air compliance? ☐ Yes ☑ No	4. If Yes, provide permit numbers of collocated facilities: **Not Applicable**

C. Air Contact			
Consulting Firm Name (if applicable): **Ramboll US Corporation**			
Title/Position: **Managing Principal**	Salutation: **Mr.**	First Name: **Michael**	Last Name: **Carbon**
Mailing Address: **8235 YMCA Plaza Drive, Suite 300**			
City: **Baton Rouge**		State: **LA**	Zip Code: **70810**
E-mail Address: **mcarbon@ramboll.com**		Phone No: **225-408-2691**	Cell No:

D. Emission Point Dispersion Parameters
Source data requirements are based on the appropriate source classification. Each emission point is classified as a point, area, volume, or flare source. Contact the Bureau of Air Quality for clarification of data requirements. Include sources on a scaled site map. Also, a picture of area or volume sources would be helpful but is not required. A user generated document or spreadsheet may be substituted in lieu of this form provided all of the required emission point parameters are submitted in the same order, units, etc. as presented in these tables.
Abbreviations / Units of Measure: UTM = Universal Transverse Mercator; °N = Degrees North; °W = Degrees West; m = meters; AGL = Above Ground Level; ft = feet; ft/s = feet per second; ° = Degrees; °F = Degrees Fahrenheit

E. Point Source Data
(Point sources such as stacks, chimneys, exhaust fans, and vents.)

Emission Point ID	Description / Name	Point Source Coordinates (NAD 83)				Release Height AGL (ft)	Temp. (°F)	Exit Velocity (ft/s)	Inside Diameter (ft)	Discharge Orientation	Rain Cap? (Y/N)	Distance to Nearest Property Boundary (ft)	Building		
		UTM E (m)	UTM N (m)	Lat (°N)	Long (°W)								Height (ft)	Length (ft)	Width (ft)
RTO1	Green Hammermill 1-5, Green Chip Silo, Dryer, Furnace, DHMs	401,937.00	3,788,078.00	34.229162	-82.064732	75.46	252.00	58.060	8.333	Vertical	N	~ 150	25.00	60.00	40.00
FBYP1_I	Furnace Bypass Stack "Idle Mode"	401,883.00	3,788,057.00	34.228967	-82.065316	79.75	550.00	2.286	6.000	Vertical	N	~165	53.00	100.00	30.00
FBYP1_F	Furnace Bypass Stack Cold Start-up	401,883.00	3,788,057.00	34.228967	-82.065316	79.75	450.00	6.180	6.000	Vertical	N	~165	53.00	100.00	30.00
DCS	Dry Chip Silo	401,922.17	3,788,115.91	34.229502	-82.064898	84.97	Ambient	43.810	0.984	Horizontal	N	~150	84.00	9.14	--
PFS	Pelletizer Feed Silo	402,010.00	3,788,191.00	34.230187	-82.063953	84.97	Ambient	43.810	0.984	Horizontal	N	~155	84.00	9.14	--
RTO2	Pellet Cooler 1-3; Pelletizer 1-9	401,976.00	3,788,211.00	34.230365	-82.064324	112.53	260.33	52.519	4.495	Vertical	N	~120	82.00	200.00	85.00
RTO3	Pellet Cooler 4-6; Pelletizer 10-18	401,992.00	3,788,227.00	34.230510	-82.064152	112.53	260.33	52.519	4.495	Vertical	N	~115	82.00	200.00	85.00

F. Area Source Data
(Area sources such as storage piles, and other sources that have low level or ground level releases with no plumes.)

Emission Point ID	Description / Name	Area Source Coordinates Projection:				Release Height AGL (ft)	Easterly Length (ft)	Northerly Length (ft)	Angle From North (°)	Distance to Nearest Property Boundary (ft)
		UTM E (m)	UTM N (m)	Lat (°N)	Long (°W)					
Not Applicable										

G. Volume Source Data
(Volume sources such as building fugitives that have initial dispersion vertical depth prior to release.)

Emission Point ID	Description / Name	Volume Source Coordinates Projection:				Release Height AGL (ft)	Initial Horizontal Dimension (ft)	Initial Vertical Dimension (ft)	Distance to Nearest Property Boundary (ft)
		UTM E (m)	UTM N (m)	Lat (°N)	Long (°W)				
CHIP	Electric-Powered Chipping	401,639.00	3,787,901.00	34.227540	-82.067950	6.48	3.17	12.05	~340

H. Flare Source Data (Point sources where the combustion takes place at the tip of the stack.)											
Emission Point ID	Description / Name	Flare Source Coordinates (NAD 83)				Release Height AGL (ft)	Heat Release Rate (BTU/hr)	Distance to Nearest Property Boundary (ft)	Building		
		UTM E (m)	UTM N (m)	Lat (°N)	Long (°W)				Height (ft)	Length (ft)	Width (ft)
Not Applicable											

I. Area Circular Source Data								
Emission Point ID	Description / Name	Area Circular Source Coordinates Projection:				Release Height AGL (ft)	Radius Area (ft)	Distance to Nearest Property Boundary (ft)
		UTM E (m)	UTM N (m)	Lat (°N)	Long (°W)			
Not Applicable								

J. Area Poly Source Data							
Emission Point ID	Description / Name	Area Poly Source Coordinates Projection:				Release Height AGL (ft)	Number of Vertices
		UTM E (m)	UTM N (m)	Lat (°N)	Long (°W)		
Not Applicable							

K. Open Pit Source Data										
Emission Point ID	Description / Name	Open Pit Source Coordinates Projection:				Release Height AGL (ft)	Easterly Length (ft)	Northerly Length (ft)	Volume (ft^3)	Angle from North (°)
		UTM E (m)	UTM N (m)	Lat (°N)	Long (°W)					
Not Applicable										

L. Emission Rates						
Emission Point ID [Model ID]	Pollutant Name	CAS #	Emission Rate (lb/hr)	Same as Permitted	Controlled or Uncontrolled	Averaging Period
Please see Appendix C for Potential Emissions Calculations				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		

APPENDIX E
SUPPORTING DOCUMENTATION FOR MODELING ANALYSES

All AERMOD and BPIP input and output files were provided in a digital format (i.e., USB flash drive) as part of the February 2020 application. The meteorological data and NED file utilized in the modeling analyses were obtained from the SC DHEC website. Therefore, consistent with SC DHEC guidance, these were not included.

APPENDIX F
MODELED SOURCE LAYOUT

RAMBOLL	**MODELED SOURCE LAYOUT** ENVIVA PELLETS GREENWOOD, LLC Greenwood County, South Carolina	FIGURE 1
DRAFTED BY: FXP	DATE: 2/6/2020	1690014763-007