NORTH CAROLINA DIVISION OF AIR QUALITY

Air Permit Review Including Preliminary Determination

Issue Date: DRAFT

Region: Washington Regional Office
County: Martin
NC Facility ID: 5900107
Inspector's Name: Robert Bright
Date of Last Inspection: 05/19/2016
Compliance Code: 3 / Compliance - inspection

Facility Data

Applicant (Facility's Name): Weyerhaeuser NR Company - Plymouth Lumber

Facility Address:
Weyerhaeuser NR Company - Plymouth Lumber
NC Hwy 149 N
Plymouth, NC 27962

SIC: 2421 / Sawmills & Planing Mills General
NAICS: 321113 / Sawmills

Facility Classification: Before: Title V **After:** Title V
Fee Classification: Before: Title V **After:** Title V

Permit Applicability (this application only)

SIP: 15A NCAC 02D .0515, 02D .0515, 02D .0516, 02D .0521, 02D .0524, 02D .0530, 02D .1111, and 15A NCAC 02Q .0113, 02Q .0806
NSPS: NA
NESHAP: Subpart DDDD – initial notification
PSD Avoidance: N/A
NC Toxics: Modeling demonstrated compliance
112(r): N/A
Other: 02Q .0501

Contact Data

Facility Contact	Authorized Contact	Technical Contact
Vernetta Rascoe Environmental Manager (252) 791-3242 PO Box 787 Plymouth, NC 27962	Christopher Strickland Mill Manager (252) 791-3228 PO Box 787 Plymouth, NC 27962+0787	Vernetta Rascoe Environmental Manager (252) 791-3242 PO Box 787 Plymouth, NC 27962

Application Data

Application Number: 5900107.17A
Date Received: 08/15/2017
Application Type: Modification
Application Schedule: PSD

Existing Permit Data
Existing Permit Number: 06389/T23
Existing Permit Issue Date: 12/15/2016
Existing Permit Expiration Date: 11/30/2021

Total Actual emissions in TONS/YEAR:

CY	SO2	NOX	VOC	CO	PM10	Total HAP	Largest HAP
2016	4.34	24.89	380.67	47.12	13.68	30.00	20.11 [Methanol (methyl alcohol)]
2015	3.55	26.28	368.86	49.46	14.13	28.93	19.33 [Methanol (methyl alcohol)]
2014	3.00	20.87	435.13	50.86	14.64	29.95	20.54 [Methanol (methyl alcohol)]
2013	2.40	20.70	432.41	50.29	14.73	29.34	20.16 [Methanol (methyl alcohol)]
2012	1.90	21.10	414.30	50.97	14.44	27.67	18.97 [Methanol (methyl alcohol)]

Review Engineer: Kevin Godwin

Review Engineer's Signature: **Date:**

Comments / Recommendations:
Issue 06389/T24
Permit Issue Date: XX
Permit Expiration Date:

I. Purpose of Application

Weyerhaeuser NR Company - Plymouth Lumber (Weyerhaeuser) is a lumber mill located in Plymouth, Martin County, North Carolina. The facility is currently classified as a major stationary source under the Prevention of Significant Deterioration (PSD) permitting program and is operating under permit No 06389T23.

Weyerhaeuser has proposed the installation of a continuous drying kiln with a theoretical design throughput of 134 million board feet per year (MMBF/yr) that is equipped with a green sawdust burner/gasification system having a maximum heat input of 40 million Btu per hour. Once the new kiln is operating, it will replace two existing steam-heated batch kilns. As part of this project, Weyerhaeuser requests the flexibility to burn 100 percent green sawdust or a blend of green sawdust and dry biomass in the burners for all three continuous drying kilns to maintain the fuel moisture content for proper burner efficiency. To store and transport the dry residual fuel and the additional green sawdust, it plans to add two fuel storage silos, a dry residual transfer system and an enclosed green sawdust conveyor system. A copy of the application, received August 28, 2017, and an addendum to complete the application, received November 9, 2017, are included as Attachment A to this report.

The emission increases from the Weyerhaeuser lumber mill resulting from the proposed operation of the new kiln and the fuel storage and handling exceed the PSD significance level for volatile organic compounds (VOCs) and therefore trigger PSD permitting requirements. This permit change, because it involves a case-by-case technology determination under the PSD regulations, is a significant modification of the permit under 15A NCAC 02Q .0516. As new emissions units not covered under the existing permit, the proposed equipment will not contravene or conflict with any existing permit term or condition. Furthermore, having the flexibility to burn a blend of green sawdust and dry residual wood in the existing continuous drying kiln burners does not contravene or conflict with any existing permit term or condition.

This permit application will be issued as the first part of a two-step significant modification in accordance with 15A NCAC 02Q .0501(c)(2). Because it is a major modification under PSD, the public and the U.S. Environmental Protection Agency (EPA) will be provided 30 days to comment on the draft permit. All comments will be addressed prior to the permit issuance. In addition, a condition will be placed into the permit stating that an application for the second step will be required within 12 months of commencing operation. The second step of the modification will go through another 30-day public notice and a 45-day EPA review.

II. Application Chronology

Date	Event
Jul 20, 2017	Pre-application meeting between NCDAQ and Weyerhaeuser occurred.
Jul 20, 2017	Tom Anderson of the Air Quality Analysis Branch of NCDAQ e-mailed Ms. Andrea Stacy, Federal Land Manager for the National Park Service, informing her of the project. Ms. Stacy determined that it is unlikely that emissions from this project will adversely affect any air quality related values (AQRV) within the National Park Service areas.
Aug 15, 2017	PSD permit application received. The permit application was incomplete because it did not contain the required proof of Public Notice.
Aug 15, 2017	A permit application acknowledgment letter was issued indicating the permit application was incomplete.
Aug 25, 2017	A list of questions in the form of comments on the draft preliminary determination was sent to Weyerhaeuser.

Date	Event
Aug 28, 2017	The proof of Public Notice was received for the completion of our permit application.
Sep 22, 2017	The complete response to the questions emailed on 8/25/17 was received with a request to add dry biomass as a fuel option in all three kiln burners.
Sept 29, 2017	A copy of the PSD permit application was sent to Heather Ceron of EPA Region 4. Additionally, NC DAQ received the resubmission of the toxic air pollutant modeling for the project. (The original modeling demonstration files were hand delivered and misplaced.)
Oct 3, 2017	A draft permit and preliminary determination were sent to Booker Pullen, PSD Permits Supervisor, and Robert Bright, Washington Regional Office for comments. Mr. Bright responded that the drafts look ok.
Oct 9, 2017	An email was sent to Weyerhaeuser requesting that it address all changes in projected actual particulate emissions associated with burning dry biomass as a fuel in the kiln burners.
Oct 12, 2017	Booker Pullen completed his review of the draft permit and preliminary determination and provided comments. All recommended changes suggested by Mr. Pullen were made.
Nov 9, 2017	Weyerhaeuser provided an addendum which includes additional emission sources for the handling of the dry biomass fuel and the information requested on October 9, 2017.
Nov 13, 2017	A copy of the PSD application addendum was emailed to Heather Ceron.
Nov 17, 2017	An email was sent to Christopher Strickland requesting that Weyerhaeuser provide the emissions increases from the burning of dry residual wood in the existing kiln burners.
Nov 21, 2017	Mr. Strickland provided corrected PM emissions estimates and the basis for these estimates as follows; *"According to the manufacturer, the CDK burner is most efficient if the moisture content of the wood fuel is between 51-55%; the manufacturer stated the maximum for efficiency is 56%. The mill takes samples daily to measure the moisture content of the wood fuel. The normal fuel moisture content for Plymouth is around 52-54%, but occasionally rises above 56%, particularly during periods of wet weather. If the fuel moisture content is above 56% the burner operates less efficiently, and operators can either increase the undergrate air to try to maintain the dry bulb temperature in the CDK or they can slow down the lumber push rate to compensate for lower temperatures. Higher undergrate air increases turbulence in the burner and may result in higher ash carryover to the CDK. Slowing the push rate results in higher fuel consumption and likely higher air emissions per unit of lumber dried.* *Therefore, in order to maintain fuel moisture content range of 51%-55%, the mill wants to blend in dry wood residual with the green wood. Air emissions burning blended wet and dry fuel should be indistinguishable from air emissions burning non-blended green fuel, provided the moisture content of the blended fuel approximates the burner specifications. A more consistent fuel moisture content will maintain proper burner efficiency and is expected to lower fuel usage, create more consistent drying, and reduce ash carry over."*
Nov 28, 2017	Application was reassigned to Kevin Godwin.

III. Existing Operations

Weyerhaeuser produces finished dried lumber. Tree-length and precut logs of various sizes and grades are debarked, cut to size, and processed through a sawmill, where logs are cut into lumber. The rough-cut lumber from the sawmill is stacked and dried in two steam heated batch kilns and two continuous drying kilns. Steam is for the batch kilns is supplied by the adjacent Domtar Paper Mill and the continuous drying kilns are heated by green sawdust burner/gasification systems. Planing and trimming in the planer mill finish the dried lumber. The maximum production capacity of the sawmill is 270 MMBF/yr of dried finished lumber. In addition, bark, chips, and planer shavings are shipped offsite as byproducts. These operations are listed under Standard Industrial Classification (SIC) code 2421 for sawmills and planing mills.

Google Satellite image of Weyerhaeuser Plymouth Lumber Mill.

Google Satellite 3D image of the two steam-heated batch kilns (top middle), two continuous direct-fired kilns, and two fuel silos.

IV. Compliance Status

The DAQ has reviewed the compliance status of this facility. During the most recent inspection conducted on May 19, 2016, Robert Bright of the Washington Regional Office (WaRO) indicated that the facility appeared to be operating in compliance with all applicable requirements. Additionally, a signed Title V Compliance Certification (Form E5) indicating that the facility complies with all applicable requirements, was included with the permit application. During the most recent five-year period, Weyerhaeuser Plymouth has had only one compliance issue. On February 8, 2015, it burned dry planer sawdust in the No. 6 Continuous Dry Kiln (**ID No. ES-11-9S**) burner without it being specified on the permit as an allowable fuel. NC DAQ sent the facility a notice of deficiency (NOD) letter on April 1, 2015 and the issue was resolved without any enforcement action taken.

V. Proposed Equipment

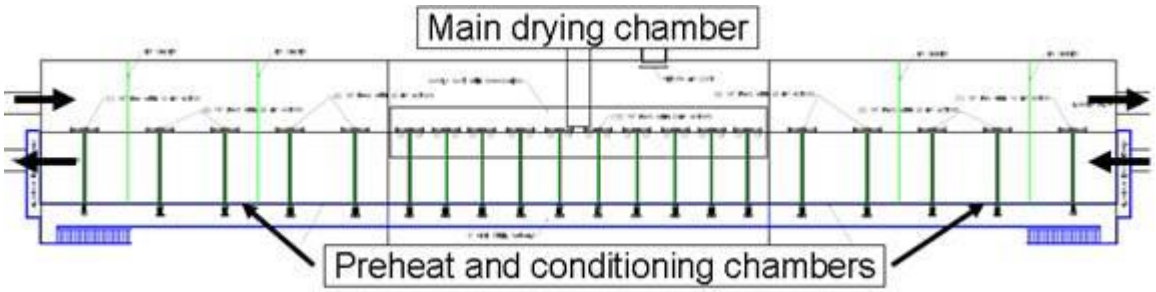
Weyerhaeuser proposes to add continuous drying kiln No. 8 (**ID No. ES-11-S**); No. 3 fuel silo (**ID No. ES-50-3S**); No. 4 fuel silo (**ID No. ES-50-4S**), and dry residual transfer system (**ID No. ES-32**) and associated bagfilter (**ID No. CD-32**). Once it is placed into operation, the new equipment will replace two steam-heated batch kilns - No. 3 (**ID No. ES-11-6S**) and No. 4 (**ID No. ES-11-7S**), and thus eliminate the need for steam to be supplied by the Domtar Paper Mill. The new kiln will be more energy-efficient, less costly to maintain, process wood faster, and improve lumber quality. Additionally, when air emissions resulting from the operation of the Domtar boiler for production of required steam are considered, it will affect an overall reduction of all criteria pollutants emitted in the area except for possibly VOCs. With these changes, the Weyerhaeuser mill will continue to produce a maximum of 270 million board-feet per 12-month period as limited by its sawmill capacity.

The new equipment will be described as follows:

1) Continuous drying kiln No. 8 (**ID No. ES-11-11S**) equipped with a direct-fired green sawdust or a blend of green sawdust and dry biomass burner/gasification system having a maximum heat input of 40 million Btu per hour),
2) Fuel silo No. 3 (522-ton capacity and 6.7 tons per hour maximum loading rate, **ID No. ES-50-3S**)
3) Fuel silo No. 4 (4.5 tons per hour maximum filling rate and 2.5 tons per hour maximum unloading rate, **ID No. ES-50-4S**)
4) Dry residual transfer system (2.5 ton per hour maximum transfer rate; **ID No. ES-32**) and associated bagfilter (2.5 minimum air to cloth ratio, **ID No. CD-32**)

A. <u>Continuous drying kiln No. 8 (**ID No. ES-11-11S**)</u>

The proposed kiln will be used to remove moisture from softwood lumber in a controlled environment. It consists of two tracks traveling in opposite directions and three chambers designed to provide and control the environmental conditions of heat, relative humidity, and air circulation necessary for the proper drying of wood. The first chamber preheats the incoming wet lumber using the heat coming off the dry lumber while providing equalization (added moisture) and saturated cooling for the dry lumber. The moisture conditioning reduces stress and results in a more uniform moisture distribution in the dry lumber. In the middle chamber, heat is introduced to dry the wood. The final chamber provides equalization and saturated cooling for the dry wood while preheating the incoming lumber.



Within the kiln, lumber is automatically advanced based on its moisture content in the central heating zone. In the central chamber, the wet bulb temperature is considerably less than the dry bulb temperature (low relative humidity). As the wood enters the end section (within the first five feet of travel), the wet-bulb temperature rapidly climbs from ambient to approximately 50% of the differential in wet bulb between ambient and the central chamber. As the lumber exits, it reaches a point where the dry wood temperature drops below the wet bulb temperature, causing it to "rain" in the kiln. This "rain" effect conditions the wood and washes off loose sawdust and ash on the lumber preventing much of the particulate matter from becoming air borne. Condensate water will be routed to a treating pond at the adjacent Domtar facility. Gases exhaust through the open exit doors at both ends of the kiln at a fairly constant rate and near 100% humidity.

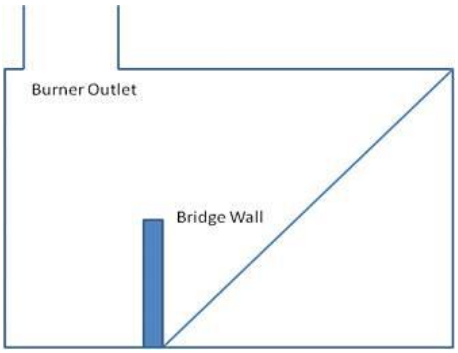
Similar Continuous Dry Kiln

Source: http://www.energyonlineexpo.com/slinkimages/58/millwide_insider_january_2009.pdf

The heating medium for the kiln is a direct-fired burner/gasification system having a maximum heat input of 40 million Btu's per hour. This system consists of slope and dump grates on which green sawdust or a blend of green sawdust and dry biomass is loaded and burned, a fuel burner, a combustion chamber, an afterburner, a blend box, and a centrifugal blower. The green sawdust or fuel blend is gasified and the gas is combusted. The resulting hot combustion gases (at approximately 2000 ^{o}F) are mixed with circulating kiln air in the blend box, raising its temperature up to the dry bulb set point (between 235 and 255 ^{o}F). The dry-bulb temperature is the temperature of a vapor-gas mixture. The blower forces warm air through the duct to a plenum distributing the air to the circulating fans in the central chamber for lumber drying. The combustion exhaust exits through the open doors at both ends of the kiln. During cold start-up, kiln shutdown, or equipment malfunction, the exhaust vents through a by-pass stack.

The burner system is designed to generate less ash and result in less ash carry over into the kiln than traditional direct-fired burner arrangements. The vendor expects only 10% of non-combustible ash to carry over into the kiln. Combustion air is draft underfire air only because overflow air contributes to ash carryover. Bustle air (inserted at burner outlet) is tangential (contributes to swirl) and is provided

by a separate fan with inlet vane damper and fixed speed motor. The bustle air creates an air curtain which serves to block some of the ash carryover. The width of the burner is extended by about four feet while the length and slope of the grate are not changed. A four-foot refractory brick wall is added to provide greater distance between the fuel bed and the burner outlet and, thereby, reduce the likelihood for carryover. The wall also increases the volume and residence time of the burner. The burner has a dump grate at the bottom which removes ash on a continual basis. Ash falls into a water pit and is augured out periodically to a bin (wet ash sludge). Preventing ash build up in the burner further minimizes ash carryover into the kiln.



The blend box is designed to be double the normal length of a typical blend box to provide a more uniform velocity profile entering the fan. This uniform profile results in higher fan efficiency, higher airflows, and better control of recirculation air. The extended length also provides more residence time for the oxidation of VOCs to occur and may reduce VOC emissions from the kiln.

The kiln will be 272 feet in length with the two end chambers 71.5 feet in length and the main drying section 129 feet in length. Lumber will travel through the kiln at an average rate of 6.7 feet per hour and spend approximately 40.6 hours total time in the kiln (roughly 11 hours in each end and 19 hours in the central chamber). The rate may vary given the season of the year, the weather conditions, and/or the incoming lumber moisture content. The vendor guaranteed annual production through the kiln is 121,000 MMBF/yr.

B. Fuel Silo No. 3 (**ID No. ES-50-3S**)

This proposed fuel silo will receive biomass (primarily green sawdust) and store it until it is fed into the kiln burner. The silo will be constructed of concrete, 30 feet in diameter and 92 feet in height, and have a storage capacity of 52,213 cubic feet (ft^3). Based on a green sawdust density of about 20 lb/ft^3, the silo is designed to store 522 tons – approximately a 3.5-day fuel supply for the new kiln burner. A blower will pneumatically convey the sawdust to a cyclone located on the top of the silo and then drop it into the silo through three fill lines. An auger or screw conveyor with hydraulic pusher units will unload and transfer the sawdust from the silo to the kiln burner at up to 6.7 tons per hour.

C. Fuel Silo No. 4 (**ID No. ES-50-4S**)

This proposed fuel silo will receive dry residual biomass and store it until it is blended with green sawdust at the shaker screen, then fed into the surge bin and finally transferred to one of the three other fuel silos. The silo will be 20 feet in diameter and 30 feet in height, and have a storage capacity of 9,500 cubic feet (ft^3). Based on a green sawdust density of about 20 lb/ft^3, the silo is designed to store 95 tons. A blower will pneumatically convey the sawdust to a cyclone located on the top of the silo and then drop it into the silo at a maximum rate of 4.5 tons per hour. An auger or screw conveyor with hydraulic pusher units will unload and transfer the sawdust from the silo to the shaker screen at a rate of up to 2.5 tons per hour.

D. Dry Residual Transfer System (**ID No. ES-32**) and Associated Bagfilter (**ID No. CD-32**)
Dry residual biomass will be pneumatically transported to a cyclone, blended at the shaker screen with green sawdust, fed into a surge bin and then transferred to one of three fuel silos. The cyclone is considered inherent process equipment as its primary function is to separate product and not a control device. The cyclone exhaust will be vented to a bagfilter to reduce particulate emissions. The total bagfilter surface area of 7,163 square feet provides a 2.5 to 1 air to cloth ratio and is expected to capture 99 percent of particulate emissions.

IV. Emissions

A. Continuous drying kilns
The proposed kiln (Kiln No. 8) will be a source of nitrogen oxides (NOx), volatile organic compounds (VOC), carbon monoxide (CO), particulate matter ($PM/PM_{10}/PM_{2.5}$), sulfur dioxide (SO_2), hazardous air pollutants (HAPs), toxic air pollutants (TAPs) and greenhouse gases (GHGs). These compounds will be released into the environment through the open doors at both ends of the kiln and occasionally through a bypass stack. Emissions are the result of both wood combustion and lumber drying. The theoretical drying capacity for the new kiln is 134 MMBF/yr; however, the kiln manufacturer's guaranteed production rate is 121 MMBF/yr, which is the basis for annual potential emissions for the PSD analysis because the vendor requires the kiln to be shutdown periodically for maintenance to maintain the guarantee.

Emission Factors – The EPA Compilation of Air Emission Factors, AP-42, does not contain emission factors specific to lumber dry kilns. The National Council for Air and Stream Improvement[1] (NCASI) February 2013 database of stack testing performed for lumber kilns is the basis for the NOx, and VOC emission rates and some of the HAP and TAP emission rates in the application. Emission factors for wood combustion in NCASI Technical Bulletin No. 1013 (March 2013) *A Comprehensive Compilation and Review of Wood-Fired Boiler Emissions* were used to calculate the emissions of most HAPs and TAPs associated with lumber drying. Weyerhaeuser also relied on the following credible sources for determining emissions from the kiln:

- Unpublished NCASI data measuring PM emissions from lumber drying kilns.
- AP-42, Section 1.6, *Wood Residue Combustion in Boilers,* for SO_2 and PM (dry sawdust) emissions.
- Publicly available stack test results from competitor operations of continuous drying kilns for CO and PM_{10} emissions.
- EPA mandatory GHG reporting rule emission factors and global warming potentials from Subparts A and C (Tables for carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) from wood combustion – specifically 40 CFR 98, Subpart C, Tables C-1 and C-2.

Carbon Monoxide (CO) - CO emissions from the kilns result primarily from incomplete combustion. Complete combustion depends upon oxygen availability (excess air), flame temperature, residence time at flame temperature, combustion zone design, and turbulence. Oxygen will be limited in the gasification burner.

Nitrogen Oxides (NOx) - NOx emissions are the result of oxidation of the nitrogen in the wood fuel during combustion.[2] Thermal NOx is not expected to contribute significantly to emissions since its

[1] NCASI is an independent, non-profit research institute that is recognized as a leading source of reliable data on environmental issues affecting the forest products industry. Weyerhaeuser is a founding member.

[2] The nitrogen content of the wood varies from 0.1 to 0.5% in stem wood and bark. Pine wood bark averages 0.3% N_2 by weight, dry basis. *NCDAQ Estimating Emissions from Generation and Combustion of Wood Waste, July 1998, Ultimate Fuel Analysis of Wood Bark (Babcock & Wilcox)*

formation begins at flame temperatures above 1,200°C. The burner flame temperature is expected to remain below the thermal NOx formation temperature because complete combustion of wood fuels can be achieved at temperatures between 900 and 1,200°C.

Particulate Matter (PM) - Particulate emissions consist of filterable and condensable PM emissions resulting from ash, trace quantities of noncombustible metals, and unburned carbon due to incomplete combustion and sawdust residues on the rough-cut lumber. The burner system and continuous kiln design result in less particulate emissions than those associated with a standard direct-fired drying kiln. The following burner enhancements reduce ash carry over in the main drying section.

- No overfire air (stirring of fuel bed)
- Bustle air, having lots of it and having it introduced in the right manner, to create an air curtain to separate burner from afterburner
- Bridge Wall (separate fuel bed from burner outlet)
- Amount of burner air – 20-30% of total combustion air
- Air leakage minimized and burner chamber vacuum kept low
- Automatic ash removal system (remove ash from burner as generated)

The "rain" effect occurring in the end sections conditions of the continuous dry kilns prevents much of the particulate matter on the lumber from becoming airborne.

Sulfur Dioxide (SO_2) -SO_2 emissions occur from the oxidation of the sulfur in the wood fuel. Because wood is inherently low in sulfur content, SO_2 emissions are low.

Volatile Organic Compounds (VOCs) - Some volatile tannins, resins, fats, waxes, oils, gums, and other aromatic compounds that naturally occur in wood are released during kiln drying of lumber. VOCs emitted depends upon the wood species, the season of the year, the initial and final moisture content of the lumber, and the kiln operating conditions. The kiln is expected to emit mainly monoterpenes (primarily alpha pinene with lesser amounts of beta pinene and limonene) when southern yellow pine is dried. Alpha pinene is heavier than air (4.7 vs. 1) as a vapor, is less dense than water (0.86 vs. 1), has a boiling point at 313ºF, and is normally insoluble in water. However, surfactants present in the wood may increase pinene's solubility. A study conducted at Oregon State University suggests that pinene moves to drying surface of lumber in conjunction with the migration of water.[3] The kiln will also release water soluble volatile organic compounds including acetaldehyde, formaldehyde, methanol, methyl ethyl ketone, and phenol. VOCs like methanol are formed and released as wood is heated. Other VOCs result from the incomplete combustion of green sawdust or a blend of green sawdust and dry biomass in the kiln burner. The VOCs generated during the combustion and drying process are emitted through the kiln exit doors and infrequently through the bypass stack.

Carbon Dioxide (CO_2) - Carbon dioxide will be the primary GHG and is a product of the complete combustion of the biomass in the kiln burner.

Toxic Air Pollutants (TAPs)/Hazardous Air Pollutants (HAPs) - TAP and HAP emissions result from both wood combustion and lumber drying. The most abundant TAPs emitted include acetaldehyde, formaldehyde, and phenol. Methanol is the largest individual HAP.

[3] http://ir.library.oregonstate.edu/jspui/bitstream/1957/5259/1/VOC_Emissions_ocr.pdf "VOC Emissions from Douglas-Fir Lumber Dried in Commercial and Laboratory Kilns; Michael R. Milota, Mark R. Lavery, Oregon State University, Corvallis, Oregon, May 1998.

Estimated Emissions - The applicant has calculated the maximum emissions based on the vendor guarantee rate; a 40 mmBtu/hour firing rate over 8,400 hours[4] during a year, and a fuel mix of 85 percent or more green wood and 15 percent or less dry wood – which are summarized in the following table.

Pollutant	Emission Factor for Kiln 8 (lb/thousand board-feet (MBF)) except as noted.	Potential Kiln 8 Emissions (tpy)	Additional Project Related Potential Kiln 6 and 7 Increases (tpy)	Total Potential Increases (tpy)
CO	0.67[1]	40.87	0	40.87
NOx	0.36[2]	22.06	0	22.06
Filterable PM	0.295 (green)[3]	18.00	0	18.00
PM10	0.18[4] (60% of PM)	10.98	0	10.98
PM2.5	0.15[5] (50% of PM)	9.26	0	9.26
SO2	0.025[6]	4.20	0	4.20
VOC as pinene	3.75[2]	228.85	0	228.85
Lead	3.49E-5 lb/MMBtu	0.01	0	0.01
GHGs as CO2e	190.1 lb/MMBtu[8]	31,938	0	31,938

Notes:
1. Unpublished NCASI CO emission factor data for wood-fired lumber kilns from the following air permit document: Bibler Brothers Lumber Co. in Russellville, AR, dated May 2008.
2. NCASI Wood Products Database, updated Feb. 2013, CDK.
3. Unpublished NCASI particulate emission factor data for wood-fired gasifiers in lumber kilns, provided by David Word (February 2010).
4. Air permit document for Bibler Brothers Lumber Co. in Russellville, AR, dated May 2008. Conservatively based on EPA's "PM Calculator" software for the ratio of PM to PM10 for various wood dryer source classification codes.
5. Particulate Matter Estimating Guide, Weyerhaeuser ET&S, 2003.
6. AP-42, Section 1.6, September 2003.
7. AP-42 Section 1.6, September 2003 (dry wood no control factor)
8. 40 CFR 98 Subpart A and C

B. Fuel silo No. 3 **(ID No. ES-50-3S)**

The fuel silo will emit particulates during the loading of the green sawdust and dry residuals. The maximum loading rate is 6.7 tons per hour. The applicant has calculated a particulate emission factor using the equation for drop operations into storage piles found Chapter 13.2.4, *Aggregate Handling and Storage Piles*, of AP-42 (Fifth Edition, Volume I).

$E = k(0.0032)(U/5)^{1.3}/(M/2)^{1.4}$ *[for storage piles]*

Where:
E = Emission Factor (lb/ton)
k = Particle size multiplier (dimensionless) where k_{PM}=0.75; k_{PM10} = 0.35; and $k_{PM2.5}$ = 0.053
U = mean wind speed (miles/hr); U = 7.8 mph[5]
M = material moisture content (%); M = 4.8%[6]

$E_{PM} = (0.75)(0.0032)(7.8/5)^{1.3}/(4.8/2)^{1.4}$ = 1.26E-3 lb/ton
$E_{PM10} = (0.35)(0.0032)(7.8/5)^{1.3}/(4.8/2)^{1.4}$ = 5.86E-4 lb/ton

[4] The downtime for required maintenance - needed to maintain the guaranteed production rate of 122 million BF/year limits annual operation of the kiln to 8400 hours and 122 million BF/year.
[5] Average wind speed estimated using average annual wind speed for Raleigh, North Carolina listed in Table 7.1-9 of AP-42. Using this speed overestimates emissions because the silo walls protect the sawdust from the wind.
[6] The moisture content of the green sawdust is at least 19% and expected to be around 50%. Using 4.8% moisture provides a very conservative estimate of emissions.

$E_{PM2.5} = (0.053)(0.0032)(7.8/5)^{1.3}/(4.8/2)^{1.4} = 8.88E\text{-}5$ lb/ton

At the 6.7 ton per hour loading rate and 8,400 hours a year of operation, potential emissions are as follows:

Pollutant	Potential Emissions	
PM	0.008 lb/hr	0.035 tpy
PM_{10}	0.004 lb/hr	0.016 tpy
$PM_{2.5}$	0.001 lb/hr	0.002 tpy

The emission factor equation is appropriate since the green sawdust is dropped into a storage pile within the silo. However, particulate emissions are expected to be much less that the estimates because the silo provides protection from wind and more opportunity for dust to settle and because the moisture content of the green sawdust/dry residual mix is much higher.

C. Fuel silo No. 4 (**ID No. ES-50-4S**)

The fuel silo will emit particulates during the loading of the dry residuals. The maximum loading rate is 4.5 tons per hour. The applicant has calculated a particulate emission factor using the equation for drop operations into storage piles found Chapter 13.2.4, *Aggregate Handling and Storage Piles*, of AP-42 (Fifth Edition, Volume I).

At the 4.5 ton per hour loading rate and 8,760 hours a year of operation, potential emissions are as follows:

Pollutant	Potential Emissions	
PM	0.0057 lb/hr	0.025 tpy
PM_{10}	0.0026 lb/hr	0.012 tpy
$PM_{2.5}$	0.0004 lb/hr	0.002 tpy

The emission factor equation is appropriate since the dry residual is dropped into a storage pile within the silo. However, particulate emissions are expected to be much less that the estimates because the silo provides protection from wind and more opportunity for dust to settle.

D. Dry residual transfer system (**ID No. ES-32**)

This system is expected to transfer up to 21,900 tons of dry residuals annually and emit particulate matter. The applicant used unpublished NCASI data that it received from Ric Law on Nov. 1, 2017 to estimate PM and PM10 emissions. The NCASI data is for a pneumatic system transferring dry material (planer, sawdust and chipper shavings) through a cyclone. To estimate PM2.5 emissions, it assumed that 45 percent of the PM10 would be PM2.5 based on the cumulative weight percentages of particulates from a sander controlled by a cyclone and bagfilter as listed in AP-42, App. B.1, Section 10.5. Bagfilter (**ID No. CD-32**) is expected to provide at least 99% control for PM, PM10 and PM2.5.

Pollutant	Potential Emissions	
PM	0.03 lb/hr	0.13 tpy
PM_{10}	0.03 lb/hr	0.13 tpy
$PM_{2.5}$	0.014 lb/hr	0.06 tpy

E. Potential emissions increases from existing sources due to the project

VOC Emissions (Tons/Year)

Affected Sources	Baseline	Potential after Project	Potential Increase
Mold inhibitor application (ES-MIAS)	1.21	1.61	0.40
Planer (ES-11-1S)	2.22	2.95	0.73
Dry trimmer (ES-30)	0.04	0.05	0.01
Planer mill hog (ES-31)	0.42	0.55	0.13
Total	3.89	5.16	1.27

PM Emissions (Tons/Year)

Affected Sources	Baseline	Potential after Project	Potential Increase
Planer* (ES-11-1S)	0.03	0.04	0.01
Dry trimmer* (ES-30)	<0.005	<0.005	<0.005
Planer mill hog* (ES-31)	0.01	0.01	<0.005
Debarkers (F-7/F-7-2)	1.05	1.40	0.35
Total	1.09	1.45	0.36

***** 99.9 percent PM control is provided by a cyclone in series with a bagfilter.

PM10 Emissions (Tons/Year)

Affected Sources	Baseline	Potential after Project	Potential Increase
Planer* (ES-11-1S)	0.03	0.04	0.01
Dry trimmer* (ES-30)	<0.005	<0.005	<0.005
Planer mill hog* (ES-31)	0.01	0.01	<0.005
Debarkers (F-7/F-7-2)	0.21	0.28	0.07
Total	0.33	0.33	0.08

***** 99.9 percent PM10 control is provided by a cyclone in series with a bagfilter.

PM2.5 Emissions (Tons/Year)

Affected Sources	Baseline	Potential after Project	Potential Increase
Planer* (ES-11-1S)	0.01	0.02	0.01
Dry trimmer* (ES-30)	<0.005	<0.005	<0.005
Planer mill hog* (ES-31)	<0.005	<0.005	<0.005
Debarkers (F-7/F-7-2)	0.11	0.14	0.03
Total	0.12	0.16	0.04

***** 99.9 percent PM2.5 control is provided by a cyclone in series with a bagfilter.

V. Regulatory Summary

The following is a list of all air quality regulations applicable to the new equipment:

A. All emission sources

15A NCAC 02Q .0113 "Notification in Areas without Zoning" - As a facility located in an area without zoning, Weyerhaeuser has completed the public notification of its intent to expand the Plymouth Lumber Technologies facility in accordance with this rule. Weyerhaeuser published a legal notice in the Martin County Enterprise newspaper on August 4, 2017, and in the Washington County Roanoke Beacon on August 9, 2017. Additionally, a sign was posted at the main entrance of the lumber mill on August 11, 2017 and remained in place for 30 days. Affidavits of the publication notices and a photograph of the sign was submitted on August 28, 2017 via email and placed in Appendix D of the application.

B. Continuous drying kiln No. 8 (**ID No. ES-11-11S**)

15A NCAC 02D .0504 "Particulates from Wood Burning Indirect Heat Exchangers" - This regulation applies only to indirect heat exchangers which are any equipment used for the alteration of the temperature of one fluid using another fluid in which the two fluids are separated by an impervious surface such that there is no mixing of the two fluids. This does not apply to the direct-fired drying kilns.

15A NCAC 02D .0515 "Particulate from Miscellaneous Industrial Processes" - This regulation limits the amount of particulate matter emissions from any industrial process not subject to any other particulate emission control standard according to the process rate. It applies to the continuous drying kiln. The maximum process rate for the kiln is 26.64 tons per hour (19.94 tons per hour plus 6.7 tons per hour of biomass fired in the burner). When the process rate is less than 30 tons per hour, the allowable emission rate is $E = 4.10\ P^{0.67}$. Therefore, allowable emissions are 37.0 pounds per hour. Actual emissions will be no more than 6.1 pounds per hour. Compliance is demonstrated.

15A NCAC 02D .0516 "Sulfur Dioxide Emissions from Combustion Sources" - This regulation applies to the kiln as it is a source of combustion, but only when its exhaust is discharged from a vent, stack, or chimney. Each kiln has openings at the doors and a by-pass stack on the gasifier. Emissions from the by-pass stack, which vents to the atmosphere during cold start-up, kiln shutdown, or equipment malfunction, shall not exceed 2.3 pounds of sulfur dioxide per million Btu input. Based upon AP-42, Section 1.6, *Wood Residue Combustion in Boilers*," sulfur dioxide emissions from wood combustion are expected to be 0.025 pounds per million Btu. Compliance is indicated.

15A NCAC 02D .0521 "Control of Visible Emissions" - This regulation limits visible emissions from all new sources to less than 20% opacity averaged over a 6-minute period with the exceptions noted in the regulation. Visible emissions from the exhaust stream exiting the kiln doors are expected to be well below the opacity limit. The most visible emissions from the kilns are expected to occur from the gasifier bypass stack. The existing continuous drying kilns had an average of 7 shutdowns per year each. Following each shutdown, startup typically lasts 25-30 hours, which allows the refractory to gradually reheat. The burners operate at idle during a cold start up and exhaust through the bypass stack, and lumber does not enter the kiln until after the end of this start up period. Visible observations of this stack will be required on a semi-annual basis only during a kiln cold startup to ensure compliance. Compliance is expected.

15A NCAC 02D .0524 "New Source Performance Standards (NSPS)" - NSPS, Subpart CCCC regulates solid waste incinerators constructed or reconstructed after November 30, 1999. The kiln will be constructed after the applicability date and has a burner which is considered an incinerator. However, the EPA has defined green sawdust and dry biomass from the sawmill to be clean cellulosic biomass – meaning that these fuels are not secondary materials or solid waste unless discarded. Therefore, the permit will not include NSPS, Subpart CCCC stipulations as it applies to only the burning of solid waste.

15A NCAC 02D .0530 "Prevention of Significant Deterioration" - This regulation is applicable to the proposed kiln due to the significant increase in projected actual VOC emissions. A PSD applicability analysis was performed for the proposed project and it was found to have emissions increases below the PSD significant emissions rates (SERs) for all pollutants except VOC and PM. After a netting analysis, the only pollutant with a facility wide increase in emissions at more than the SER was VOC. See Section VI of this review for a detailed discussion.

15A NCAC 02D .1111 "Maximum Achievable Control Technology, 40 CFR 63 "National Emission Standards for Hazardous Air Pollutants (NESHAP)" - The Weyerhaeuser Plymouth Lumber Mill is a major source of HAPs with respect to NESHAP because it has the potential to emit more than 10 tons of methanol emissions each year. The "Plywood and Composite Wood Products" NESHAP in 40 CFR 63, Subpart DDDD, regulates HAP emissions from activities associated with manufacture of plywood and other composite wood products, including lumber kilns, at major sources. However, the rule does not require any specific emissions reductions, monitoring, recordkeeping, controls or reporting for lumber kilns other than the initial notification. The permit application for the new kiln satisfies the initial notification requirement.

15A NCAC 02D .1806 "Control and Prohibition of Odorous Emissions" – There have been no reports of objectionable odors beyond the facility's boundaries linked to Weyerhaeuser's sawmill and lumber drying operations. All odorous emissions, potentially associated with the proposed kiln and silo, are expected to be insignificant and not contribute to objectionable odors offsite. Compliance is indicated.

15A NCAC 02D .1100 and 02Q .0700 "Control of Toxic Air Emissions" - The proposed kiln project will emit 32 toxic air pollutants (TAPs) and increase the facility-wide projected emissions[7] of these TAPs. The projected facility-wide emissions rates for 25 of these TAPs and the hourly chlorine emissions rate will remain below the toxic permitting emissions rate (TPER) in 02Q .0711 as shown below. Only chlorine requires further assessment.

	Toxic Air Pollutant	TPER	Projected Facility-Wide Emission Rate
1	Acetaldehyde	6.8 lb/hour	1.83 lb/hour
2	Benzo (a) pyrene	2.2 lb/year	0.01 lb/year
3	Beryllium	0.28 lb/year	0.04 lb/year
4	Carbon disulfide	3.9 lb/day	0.3 lb/day
5	Carbon tetrachloride	460 lb/year	10.2 lb/year
6	Chlorine [a]	0.23 lb/hr	0.08 lb/hr
7	Chlorobenzene	46 lb/day	0.04 lb/day
8	Chloroform	290 lb/year	2.2 lb/year
9	Chromium VI	0.013 lb/day	0.001 lb/day
10	Di (2-ethylhexyl) phthalate	0.63 lb/day	0.0001 lb/day
11	Ethylene dichloride	260 lb/year	25.6 lb/year
12	n-Hexane	23 lb/day	0.69 lb/day
13	Hydrogen chloride	0.18 lb/hour	0.03 lb/hour
14	Manganese	0.63 lb/day	0.30 lb/day
15	Mercury	0.013 lb/day	0.002 lb/day
16	Methyl chloroform	250 lb/day	0.09 lb/day
		64 lb/hour	0.004 lb/hour
17	Methyl ethyl ketone	78 lb/day	1.05 lb/day

[7] Projected emissions are based on the maximum expected production rate and NCASI emissions data.

	Toxic Air Pollutant	TPER	Projected Facility-Wide Emission Rate
		22.4 lb/hour	0.04 lb/hour
18	Methyl isobutyl ketone	52 lb/day	1.07 lb/day
		7.6 lb/hour	0.04 lb/hour
19	Methylene chloride	1600 lb/year	24.70 lb/year
		0.39 lb/hour	0.003 lb/hour
20	Nickel	0.13 lb/day	0.02 lb/day
21	Pentachlorophenol	0.063 lb/day	0.0001 lb/day
		0.0064 lb/hour	0.000004 lb/hour
22	Styrene	2.7 lb/hour	0.002 lb/hour
23	Toluene	98 lb/day	0.11 lb/day
		14.4 lb/hour	0.005 lb/hour
24	Trichloroethylene	4000 lb/year	17.4 lb/year
25	Vinyl chloride	26 lb/year	16.1 lb/year
26	Xylene	57 lb/day	0.01 lb/day
		16.4 lb/hour	0.001 lb/hour

a. Chlorine emissions exceeded the lb/day TPER, but did not exceed the lb/hour TPER.

The projected emissions of chlorine and six other TAPs exceed the TPER. 02D .1100 rules prohibit the facility from emitting these TAPs in such quantities that may cause or contribute beyond the premises (adjacent property boundary) to any significant ambient air concentration that may adversely affect human health. 02D .1104 lists the acceptable ambient level in milligrams per cubic meter at 77° F (25° C) and 29.92 inches (760 mm) of mercury pressure.

To demonstrate that the emissions of these seven TAPs will have no significant adverse health effect, Weyerhaeuser has modeled the emissions of these TAPs from all sources located at the facility using the AERMOD modeling system (version 16216r) and following the *2014 North Carolina Air Toxics Modeling Guidelines*. The modeling analysis accounts for building wake and downwash effects and relies on the following meteorological data:

- 2012 to 2016 surface meteorological data set from Station No. 13786 in Elizabeth City, NC;
- 2012 to 2016 upper-air sounding data from Station No. 93768 in Newport, NC; and
- Adjusted friction velocity meteorological files obtained from the North Carolina Division of Air Quality (NCDAQ).

Pseudo-point sources are used in the model to represent doors at each end of the two existing and the one proposed lumber drying kilns and the kiln exhaust temperature is assumed to be 150 degrees Fahrenheit.

Matthew Porter, Meteorologist, NC DAQ Air Quality Analysis Branch, reviewed the modeling and found it was conducted in accordance with current PSD directives and modeling guidance. All toxics are below their respective AAL."

	Toxic Air Pollutant	TPER	Projected Facility-Wide Emission Rate	Projected Emissions Modeled as Percent of AAL
1	Acrolein	0.02 lb/hour	0.27 lb/hour	14.9%
2	Arsenic	0.053 lb/year	8.85 lb/year	17.1%

	Toxic Air Pollutant	TPER	Projected Facility-Wide Emission Rate	Projected Emissions Modeled as Percent of AAL
3	Benzene	8.1 lb/year	205.9 lb/year	6.9%
4	Cadmium	0.37 lb/year	2.71 lb/year	2.0%
5	Chlorine	0.79 lb/day	1.90 lb/day	0.8%
6	Formaldehyde	0.04 lb/hour	2.21 lb/hour	64.3%
7	Phenol	0.24 lb/hour	0.95 lb/hour	4.4%

To provide a greater margin of compliance, the modeled emission rates have been optimized to 98% of the AALs for establishing permit limits. No air toxics permit condition is required because these lumber kilns are regulated under the "Plywood and Composite Wood Products" NESHAP in 40 CFR 63, Subpart DDDD.

C. Two fuel silos (**ID Nos. ES-50-3S and ES-50-4S**) and dry residual transfer system (**ID No. ES-32**)

2D .0515 "Particulate from Miscellaneous Industrial Processes" - This regulation limits the amount of particulate matter emissions from any industrial process not subject to any other particulate emission control standard based on the process rate and applies to the fuel silo. For silos with filling rates less than 30 tons per hour, the allowable emission rate is $E = 4.10\ P^{0.67}$**.**

For fuel silo No. 3 (**ID No. ES-50-3S**), the maximum filling rate is 6.7 tons per hour. At this rate, 2D .0515 limits allowable particulate emissions 14.7 pounds per hour. Particulate emissions are estimated at 0.008 pounds per hour. Compliance is expected.

For fuel silo No. 4 (**ID No. ES-50-4S**), the maximum filling rate is 4.5 tons per hour. At this rate, 2D .0515 limits allowable particulate emissions 11.2 pounds per hour. Particulate emissions are estimated at 0.006 pounds per hour. Compliance is expected.

For dry residual transfer system (**ID No. ES-32**), the maximum transfer rate is 2.5 tons per hour. At this rate, 2D .0515 limits allowable particulate emissions 7.6 pounds per hour. Particulate emissions as controlled by a bagfilter are estimated at 0.03 pounds per hour. Without the bagfilter, particulate emissions would be 3 pounds per hour. Thus, no monitoring of the control device is necessary to maintain compliance. Compliance is expected.

2D .0521 "Control of Visible Emissions" - This regulation limits visible emissions from all new sources to less than 20% opacity averaged over a 6-minute period with the exceptions noted in the regulation. Visible emissions from the silos are expected to be well below the opacity limit without the use of a control device. Therefore, no monitoring is required for fuel silo No. 3 or fuel silo No. 4 to demonstrate compliance. Weyerhaeuser will be required to observe visible emissions from the dry residual transfer system every six months as it does for other particulate emissions sources with bagfilter control devices. Compliance is expected.

VI. New Source Review (NSR)/Prevention of Significant Deterioration (PSD)

All "major stationary sources" of air pollutants regulated under the Clean Air Act (Act) with a "major modification," as defined in 40 CFR 51.166(b)(12), must undergo a preconstruction review consistent with Section 165 of the Act prior to beginning actual construction. A major modification means any physical change in or change in the method of operation of a major stationary source that would result in both a significant emission increase of a regulated NSR pollutant and a significant net emissions increase of that pollutant from the major stationary source.

A "major stationary source" is defined as any one of 28 named source categories with the potential to emit 100 tons per year (tpy) or more, or any other stationary source with the potential to emit at least 250 tpy of one or more NSR/PSD regulated pollutant. Weyerhaeuser is not in one of the named categories but is an existing major stationary source because of its potential to emit VOCs. During each of the last five years, its actual annual VOC emissions have exceeded 250 tons.

As an existing major source, the facility must implement best achievable control technology (BACT) and assess the environment impacts for each pollutant associated with the proposed continuous drying kiln project with a significant emissions increase. A significant emission increase is projected to occur if the sum of the "actual to projected actual" emissions increases and decreases from existing emission units at the site plus the "actual to potential" increases for the new kiln, the fuel silos and the dry residual transfer system equals or exceeds the significance amount listed in 40 CFR 51.166 (b)(23)(i) for a NSR regulated pollutant.

A. Determination of A Significant Emissions Increase

The first step in determining NSR/PSD applicability is to calculate the emission increases in regulated NSR pollutants associated with the project to determine if a significant increase occurred. Weyerhaeuser used August 2013 through July 2015 as the 24-month baseline comparison period because existing sources had more emissions during that 24-month period than in any other since January 2012. As detailed in the table below, the project is projected to cause increases in VOCs and filterable particulate matter emissions above their respective NSR significance levels. The increases in the emissions of all other pollutant are considered insignificant and not subject to NSR/PSD review requirements.

Total Potential Project Related Emissions

Pollutant	Kiln 8 (tpy)	Kilns 6/7 Increases (tpy)	New Fuel Sources (tpy)	Existing Sawmill Increases (tpy)	Total Increases (tpy)	PSD/NSR Significance Level (tpy)	Are Increases Significant?
CO	40.87	0	0	0	41	100	No
NOx	22.06	0	0	0	22	40	No
PM	18.00	0	0.19	0.36	18	25	No
PM10	10.98	0	0.16	0.08	00	15	No
PM2.5	9.26	0	0.06	0.04	9	10	No
SO2	4.20	0	0	0	4	40	No
VOC	228.85	0	0	1.27	230	40	**Yes**
Lead	0.01	0	0	0	<0.1	0.6	No
GHGs as CO2e	31,938	0	0	0	32,000	75,000	No

The next step is to determine if the "**net"** increases in VOC emissions and TSP emissions at the site are significant per the definition of net emissions increase in 40 CFR 52.21(b)(3). Increases and decreases of contemporaneous sources are determined based on the average rate, in tons per year, at which the emissions unit emitted the pollutant during any consecutive 24-month period selected by the within the 10-year period immediately preceding the date a complete permit application is received. All emission units at the facility are affected by the proposed change. Projected emission increases from existing units (planer, dry trimmer, planer mill hog, debarkers and mold inhibitor) may be adjusted by the additional amount that an existing unit could have accommodated. The results of the netting analysis are summarized in the table below.

Source Description	VOC (tpy)
Total projected actual emissions increase due to the project	230.12
***Additions*:** Contemporaneous Increases	0
Subtractions: Additional emissions that could have been accommodated.	(0.75)
Contemporaneous decreases from steam kilns shutdown based on the average annual emissions from the 24-month period of August 2013 to July 2015	(104.59)
"Net" emissions increase	**125**
NSR/PSD significance rates	40
Is "net" emissions increase significant?	**Yes**

VOC emissions related to the proposed kiln project results in both a significant emission increase and a significant "net" emissions increase for the facility and thus, the project is subject to NSR/PSD review. As part of this review, Weyerhaeuser must demonstrate the following:

- The best available control technology (BACT) has been selected for the VOC emissions resulting from the proposed project;
- The VOC emissions from the project's construction and operation will not cause, or contribute to, air pollution more than any national ambient air quality standard (NAAQS) in any air quality control region, or any other applicable emission standard or standard of performance; and
- The project's construction and operation will not cause, or contribute to any other significant adverse impact.

B. Selection of Best Available Control Technology (BACT)
BACT is defined in 40 CFR 51.166 (b)(12) as follows:

> *An emissions limitation...based on the maximum degree of reduction for each pollutant... which would be emitted from any proposed major stationary source or major modification which the reviewing authority, on a case-by-case basis, taking into account energy, environment, and economic impacts and other costs, determines is achievable... for control of such a pollutant.*

As evidenced by the statutory definition of BACT, this technology determination must include a consideration of numerous factors. The structural and procedural framework upon which a decision should be made is not prescribed by Congress under the Act. This void in procedure has been filled by several guidance documents issued by the federal EPA. The only final guidance available is the October 1980 "Prevention of Significant Deterioration – Workshop Manual." As the EPA states on page II-B-1, "A BACT determination is dependent on the specific nature of the factors for that particular case. The depth of a BACT analysis should be based on the quantity and type of pollutants emitted and the degree of expected air quality impacts." (emphasis added). The EPA has issued additional DRAFT guidance suggesting the use of what they refer to as a "top-down" BACT determination method. While the EPA Environmental Appeals Board recognizes the "top-down" approach for delegated state agencies,[8] this procedure has never undergone rulemaking and as such,

[8] See http://es.epa.gov/oeca/enforcement/envappeal.html for various PSD appeals board decisions including standard for review.

the "top-down" process is not binding on fully approved states, including North Carolina.[9] The Division prefers to follow closely the statutory language when making a BACT determination and therefore bases the determination on an evaluation of the statutory factors contained in the definition of BACT in the Clean Air Act.

As stated in the legislative history and in EPA's final October 1980 PSD Workshop Manual, each case is different and the state must decide how to weigh each of the various BACT factors. North Carolina is concerned that the application of EPA's DRAFT suggested "top-down" process will result in decisions that are inconsistent with the Congressionally intent of PSD and BACT. The following are passages from the legislative history of the Clean Air Act and provide valuable insight for state agencies when making BACT decisions.

"*The decision regarding the actual implementation of best available technology is a key one, and the committee places this responsibility with the State, to be determined on a case-by-case judgment. It is recognized that the phrase has broad flexibility in how it should and can be interpreted, depending on site.*

In making this key decision on the technology to be used, the State is to take into account energy, environmental, and economic impacts and other costs of the application of best available control technology. The weight to be assigned to such factors is to be determined by the State. Such a flexible approach allows the adoption of improvements in technology to become widespread far more rapidly than would occur with a uniform Federal standard. The only Federal guidelines are the EPA new source performance and hazardous emissions standards, which represent a floor for the State's decision.

This directive enables the State to consider the size of the plant, the increment of air quality which will be absorbed by any particular major emitting facility and such other considerations as anticipated and desired economic growth for the area. This allows the States and local communities judge how much of the defined increment of significant deterioration will be devoted to any major emitting facility. If, under the design which a major facility proposes, the percentage of increment would effectively prevent growth after the proposed major facility was completed, the State or local community could refuse to permit construction, or limit its size. This is strictly a State and local decision; this legislation provides the parameters for that decision.

One of the cornerstones of a policy to keep clean areas clean is to require that new sources use the best available technology available to clean up pollution. One objection which has been raised to requiring the use of the best available pollution control technology is that a technology demonstrated to be applicable in one area of the country in not applicable at a new facility in another area because of the differences in feedstock material, plant configuration, or other reasons. For this and other reasons the Committee voted to permit emission limits based on the best available technology on a case-by-case judgment at the State level. [emphasis added]. This flexibility should allow for such differences to be accommodated and still maximize the use of improved technology."

The continuous drying kiln with its associated burner/gasification system is subject to BACT review. It's emissions of VOC will result in a significant increase and a significant net increase from the facility. The proposed silo is not a source of VOC emissions and thus it does not require BACT.

[9]North Carolina has full authority to implement the PSD program, 40 CFR Sec. 52.1770

Search of the U.S. EPA's RACT/BACT/LAER Clearinghouse - As part of the BACT assessment, a review was performed of previous BACT determinations made during the past ten years related to VOC emissions from lumber dry kilns (Process Code 30.800). First, the U.S. EPA's RACT/BACT/ LAER Clearinghouse (RBLC) was searched on August 22, 2017 and then an internet search was performed to determine whether unidentified kilns listed in the RBLC were direct-fired, fueled by wood (sawdust, residues, shavings, waste, etc.) and/or continuous drying. Seventeen facilities with final BACT determinations and five facilities with draft BACT determinations appear to have kilns similar in operation to proposed kiln No. 8. In most instances, BACT is a VOC emissions limit per MBF of lumber dried and best work practices – including appropriate kiln design, operation, maintenance and/or minimum moisture content for the dried lumber. In no case is an add-on device to control VOC emissions from a direct-fired continuous lumber drying kiln considered to be BACT. BACT emission limits range from 3.5 to 6.2 lb VOC/MBF.

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Final BACT determinations (VOC emissions) for direct-fred CDKs firing wood including residues, shavings, sawdust or waste listed in application

No.	Company Name	RBLC ID	Permit Date	Process Description	Fuel fired in burner	VOC Limit lb/MB	BACT
1	WEST FRASER-OPELIKA	AL-0257	11/1/2013	Two Direct fired CDKs	Wood shavings	3.76	
2	WEST FRASER, INC. -	AL-0258	4/15/2013	Two direct fired CDKs	Wood residue	3.76	
3	MILLPORT WOOD PRODUCTS	AL-0273	12/30/2014	Direct fired CDK	Not listed	4.7	WP: proper O&M
4	BIBLER BROTHERS LUMBER	AR-0101	8/25/2008	Two direct fired CDKs	Wood residue	3.8	
5	OLA	AR-0120	2/11/2015	Direct fired CDK	Wood residue		WP
6	CADDO RIVER LLC	AR-0143	2/8/2017	Direct fired CDK	Wood	3.8	
7	WHITEHOUSE LUMBER MILL	FL-0343	9/9/2014	Direct fired CDK	Woodwaste	3.76	WP: proper O&M and minimize overdrying
8	GRACEVILLE LUMBER MILL	FL-0358	7/14/2016	Direct fired CDK	Sawdust	3.5	WP: lumber moisture
9	SIMPSON LUMBER CO, LLC	GA-0146	4/25/2012	Direct fired CDK	Woodwaste	3.83	WP: proper O&M
10	SIMPSON LUMBER COMPANY,	SC-0136	8/29/2012	Direct fired CDK	Dry woodwaste	3.8	WP
11	WEST FRASER - NEWBERRY	SC-0151	4/30/2013	Two direct fired CDKs	Sawdust	3.76	WP: proper O&M
12	West Frazer LUMBER MILL	TX-0607	12/15/2011	Two direct fired CDKs	Wood	3.5	WP: proper T, process mgmt, % moisture

Final BACT determinations (VOC emissions) for direct-fred CDKs firing wood including residues, shavings, sawdust or waste not listed in application

1	The Westervelt Company	AL-0259	8/21/2013	Direct fired CDK	Woodwaste	3.76	WP: proper O&M
2	West Frazer Joyce Mill	LA-0252	8/16/2011	Three direct fired CDKs	Green Sawdust	6.2	WP: proper design and operation
3	KAPSTONE CHARLESTON	SC-0163	1/20/2015	Direct fired CDK	Green Sawdust	3.76	WP: proper O&M
4	SIMPSON LUMBER COMPANY,	SC-0164	6/20/2014	Direct fired CDK	Green Sawdust	3.76	WP: proper O&M
5	NEW SOUTH COMPANIES -	SC-0165	10/15/2014	Direct fired CDK	Woodwaste	4.2	WP: See * footnote

Draft BACT determinations for direct-fired CDKs firing woodwaste or green sawdust - not included in application

1	RESOLUTE FOREST PRODUCTS	AL-0305	6/24/2015	Direct fired CDK	Wood	3.76	WP
2	NEW SOUTH LUMBER	SC-0162	6/18/2013	Direct fired CDK	Woodwaste		WP: proper O&M
3	NEW SOUTH LUMBER CO. - DAR	SC-0166	1/26/2016	Two direct fired CDKs	Green Sawdust	[5.84]	WP
4	New South CAMDEN PLANT	SC-0169	6/18/2014	Direct fired CDK	Wood	3.76	WP: proper O&M
5	GEORGIA PACIFIC -	SC-0176	10/27/2016	Direct fired CDK	Wood	[5.84]	WP: 12% target moisture

*The lumber kiln drying operation target final moisture content will be 12% or greater for boards, 15% for all other lumber, 2. The lumber kiln will be operated following a dry-bulb temperature set-point of 250°F or less. 3. Routines for preventative maintenance will be as detailed in a monitoring plan based on manufacturer's recommendations or at least the minimum:

The applicant listed 20 final BACT determinations for VOC emissions from kilns (batch and continuous) with burners firing biomass and one final BACT determination for VOC emissions from two wood-fired boilers.[10] See Table 5-1 in the application. Most of these determinations require a work practice approach to limiting VOC emissions and none call for add-on VOC emissions controls. BACT is proper kiln design and work practices such as proper maintenance and operation. Based on the BACT determinations considered, Weyerhaeuser is proposing the work practice of maintaining the kiln dry bulb set temperature at or below 260 °F as BACT.

[10] AL-0260 was inadvertently included because it was incorrectly labeled as a kiln - process type code 30.8 (wrong process type code in RBLC)

Evaluation of VOC Control Technology Feasibility - Condensation, incineration (thermal or catalytic oxidation), absorption, adsorption, and biofiltration are the primary methods for controlling VOC emissions. The use of any of these control technologies first requires the kiln exhaust to be effectively captured. Unlike conventional kilns, continuous drying kilns do not have any vents - except for the burner bypass stack. With lumber continually entering and exiting through the doorways, the kilns cannot be sealed for total emissions capture.

It is technically possible to capture part of the VOC emissions by adding roof vents. To be effective, these roof vents must to be located across the top of each doorway or above sections added on the both ends of the kiln to not interfere with lumber drying/conditioning occurring across the entire length of the kiln. Bibler Brothers Lumber Company in Russellville, Arkansas installed vent hoods and a stack at each doorway of a continuous drying kiln and estimates that half of the kiln exhaust stream is captured.

The next technical hurdle is routing captured emissions to the control device. The stickiness of the exhaust stream due to the presence of volatile resinous compounds may cause dampers to malfunction or excessive buildup resulting in blockages. When it arrives at the control device, the exhaust stream is expected to contain only a very dilute concentration of VOCs, be saturated with water, and be at a temperature between 150 and 160 degrees Fahrenheit. Additionally, the primary VOCs are mono-terpenes (i.e. alpha pinene) which are not very soluble in water. Under these conditions, absorption, adsorption, catalytic oxidation, condensation, incineration, and biofiltration are not considered technically feasible control technologies.

- Scrubbing is ineffective because monoterpenes are not very water soluble.
- Adsorption is impractical because the high temperature required to desorb monoterpenes damages the absorption media.
- Catalytic oxidation is not viable because monoterpenes and the wood combustion products contaminate the catalyst.
- Condensation is not effective because the kiln exhaust is already well below condensation temperature of the terpenes and the condensate would require treatment prior to its discharge.
- Incineration is not practical because the exhaust stream will be at 100 percent humidity.
- Biofilters are not feasible because microorganisms that break down the VOCs generally do not thrive at temperatures more than 110 degrees Fahrenheit. The applicant expects the temperature of the kiln exhaust air to be at least 150 degrees Fahrenheit.

Work Practice Standards - Work practice standards have long been recognized by the EPA and other regulatory agencies to be effective methods for limiting VOC emissions. The PSD regulations require a work practice standard if, after consideration of the environmental, energy, and economics impacts of add-on control technology, it becomes infeasible to install controls. Work practices have been determined to be appropriate as BACT for the two-existing continuous drying kilns at the site. To minimize the volatilization of VOCs with high boiling points, work practices for these PSD regulated sources include maintaining the kiln dry bulb set temperature at or below 260 ^{o}F. This practice keeps the wood from being overdried and is an appropriate work practice for VOCs.

Selection of BACT for VOC Emissions - After careful evaluation of BACT options and their technically feasibility, NCDAQ proposes the following work practices as BACT:

- The Permittee shall operate the continuous drying kiln (**ID No. ES-11-11S)** in a manner which minimizes VOC emissions by maintaining the kiln dry bulb set temperature at or below 260 ^{o}F.

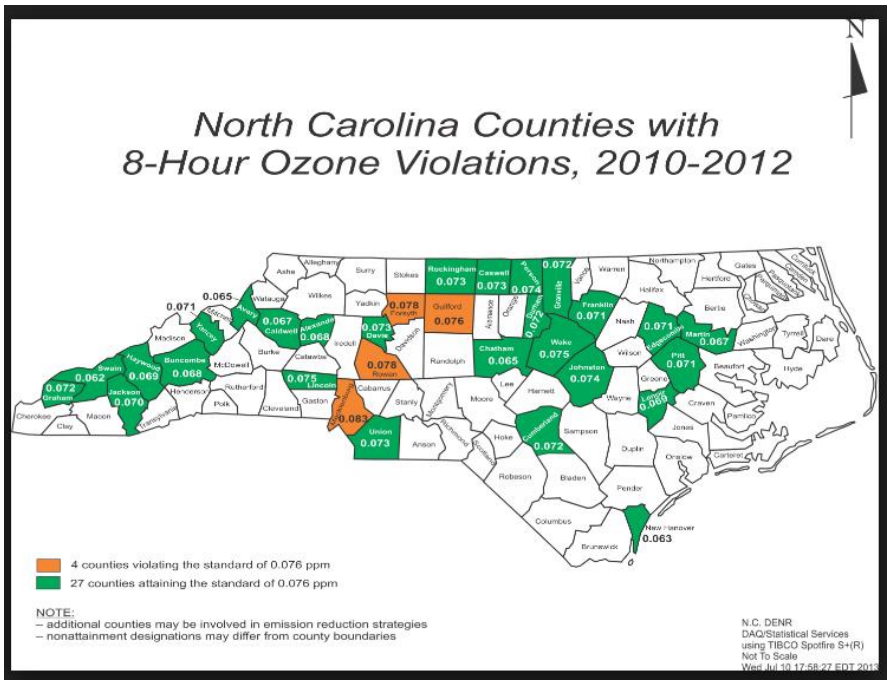
- Monitoring/Reporting/Recordkeeping –The Permittee will be required to monitor and record the dry bulb set temperature in the continuous dry kiln once per day and submit semiannual reports summarizing temperature monitoring and maintenance performed for the continuous drying kiln.

C. Air Quality Ambient Impact Analysis

When a significant emissions increase is projected to occur, PSD regulations [40 CFR 51.166 (k)] require an applicant to perform an ambient impact analysis to demonstrate that the proposed project will not:

1. Exceed any National Ambient Air Quality Standard (NAAQS) at any location during any time; and
2. Will not cause any allowable PSD increment to be exceeded.

Site Location - The coordinates for the Weyerhaeuser lumber mill are 35º 51' 0" (latitude) and 76º 46' 0" (longitude) and the elevation is approximately 10 feet above mean sea level. The terrain surrounding the site is predominantly flat, coastal plain swampland. Weyerhaeuser is in a rural area just west of the city of Plymouth in Martin County along the Washington County border in eastern North Carolina near the Roanoke River. Neither county is considered a nonattainment area with respect to ozone, PM10 or SO_2. As shown below, Martin County is attaining the 8-hour ozone standard. The minor sources baseline date was triggered on December 1, 1983 for Martin County and on June 2, 1981 for Washington County. Both counties are considered Class II Areas with ambient air increments for PM10 and SO_2.



Class I Area Impact Analysis - The nearest Class I area is the Swanquarter National Wildlife Refuge located less than 45 miles southeast of the mill. Ms. Andrea Stacy, Federal Land Manager for the National Park Service, determined that it is unlikely that emissions from this project will adversely affect any air quality related values (AQRV) within the National Park Service areas. (See her July 20, 2017 email in Appendix C of the application.)

Ozone Impact Analysis - The proposed project will increase the emissions of VOCs and NOx – both of which are precursors to ozone formation - from the facility. To demonstrate air quality will not be

impacted, the applicant followed the example of Scenario A in Section 7 of the draft *Guidance on the Development of Modeled Emission Rates for Precursors (MERP) as a Tier I Demonstration Tool for Ozone and PM2.5 under the PSD Permitting Program* (EPA-454/R-16-006) and showed the projected emissions increase at 40 percent of the lowest MERP. A total impact less than 100% indicates that the critical air quality impact will not be exceeded when considering the combined impacts of precursors on 8-hour daily maximum ozone concentrations.

D. Additional Impacts Analysis

The PSD regulations, 40 CFR 51.166(o), require the applicant to evaluate the impact on visibility, vegetation, and soils that would occur because of the proposed project and the general commercial, residential, industrial, and other growth associated with the source or modification.

Visibility – The proposed modification to the Weyerhaeuser will not result in a significant increase of NOx, SO2, or particulate. These are the pollutants that contribute to visibility impairment. With no significant increase occurring for these pollutants, there should not be an impact on visibility in and around the facility. Therefore, no visibility impairment analysis is required.

Vegetation and Soils –The proposed modification is not expected to harm vegetation and soils in the area. The applicant claims no adverse impact on vegetation or soils because of this project. This claim is reasonable given that is no non-attainment area in and around Plymouth, NC,

NOx emissions are much more likely than VOC emissions to contribute to ozone formation and harm vegetation and soils. NOx enters the leaves of plants through openings known as stomata. Its presence in significant quantities may result in biochemical changes such as visible foliar injury, premature senescence, increased leaf abscission, and altered plant growth and yield as well as physiological effects including changes in photosynthesis, specific enzymes, metabolic pools, and the translocation of photosynthesis. High gaseous concentrations of NOx may lead to poor chlorophyll production and tissue damage. Symptoms of air pollution-related damage from NOx include reduction in growth rates, reduction in reproductive rates, direct foliar damage, and mortality. Damage to the plant ground cover could increase soil temperature, moisture stress, and/or increase runoff and soil erosion. A net decrease in NOx emissions in the area is expected due to decreased operation of the Domtar wood-fired boiler.

Growth Impacts – No long-term growth in population is expected from this project. The Weyerhaeuser Plymouth Mill employs 190 persons and will not require any additional employees after the project is complete.

VII. Proposed Permit Modifications

The existing permit (No. 06389T23) will be modified as follows:

Page No.	Section	Description of Changes
Cover Letter	N/A	Update cover letter with new responsible official, application date, permit numbers, date and PSD increment statement.
Permit Cover	N/A	Insert new issuance and complete application date and application number
3	1.0 Table	• Add one continuous drying kiln (No. 8) equipped with a direct-fired green (or a blend of green sawdust and dry biomass) sawdust burner/gasification system (40 million Btu per hour maximum heat input) (**ID No. ES-11-11S**) • Add a blend of green sawdust and dry biomass as a fuel option for the continuous drying kilns (Nos. 6 and 7) (**ID Nos. ES-11-9S and ES-11-10S)** • Add dry residual biomass transfer system (2.5 tons per hour maximum transfer rate) (**ID No. ES-32**) with bagfilter (7,163 square feet in filter area) (**ID No. CD-32**) • Add No. 3 fuel silo storing up to 522 tons of green sawdust or blended green and dry residual biomass (**ID No. ES-50-3S)** • Add No. 4 fuel silo storing green sawdust or blended green and dry residual biomass with a 4.5 ton per hour maximum filling rate and 2.5 ton per hour maximum unloading rate. (**ID No. ES-50-4S)** • Renumber reference pages.
5 to 6	2.1.B	• Add dry residual biomass transfer system (**ID No. ES-32**) as subject to all permit conditions in this section.
9 to 11	2.1 D	• Add wood-fired continuous lumber drying kiln No. 8 (**ID No. ES-11-11S**) as subject to all permit conditions in the section except the best available control technology requirement for carbon monoxide emissions. • Add a condition requiring the Permittee report the date of that lumber drying kiln No. 8 (**ID No. ES-11-11S**) is placed into service and submit a permit application within 12 months of its initial operation.
12	2.1 E	Add No. 3 and No. 4 fuel silos (**ID No. ES-50-3S and ES-50-4S)** as subject to all permit conditions in the section.
14 to 23	3.0	Update to most recent version of the General Conditions (v5.1, 8/3/2017)

A copy of the proposed DRAFT permit is included as Attachment B to this review.

VIII. Public Notice Requirements

40 CFR 51.166(q) requires that the permitting agency make available to the public a preliminary determination on the proposed project, including all materials considered in making this determination. With respect to this preliminary determination the NCDAQ:

A. will make available on its website, a copy of the preliminary determination and all information submitted and considered. In addition, a copy of this same information will be available at the NCDAQ Washington Regional Office and the NCDAQ Central Office in Raleigh, NC.

B. will publish a public notice, by advertisement in the Martin County Enterprise[11]of this preliminary decision and an opportunity for public comment.
C. will send a copy of the public notice to the applicant, EPA Region IV for comment, and officials having cognizance over the location of the setting of the project as follows:
    1. Any affected state/local air agency – No other state or local agencies are expected to be affected by this project.
    2. Chief Executive of the county in which the proposed project is to be located. A notice will be sent to the Martin County Manager, Mr. David Bone and to the Washington County Manager/County Attorney Mr. Curtis Potter.
    3. Federal Land Manager (Ms. Andrea Stacy, National Park Service)

IX. Conclusion

Based on the application submitted and the review of this proposal by the NCDAQ, the NCDAQ is making a preliminary determination that the project can be approved and a permit issued. A final determination will be made following public notice and comment and consideration of all comments.

[11] The Martin County Enterprise is likely to reach more residents living near the facility than the Washington Roanoke Beacon. The Martin County Enterprise has a fairly wide distribution in local stores and covers more townships.

APPENDIX A

DRAFT PERMIT

APPENDIX B

PUBLIC NOTICE

APPENDIX C

LISTING OF ENTITIES AND ASSOCIATED MATERIALS

NEWSPAPER	XX	Public Notice
OFFICIALS	Mr. Sam Styons City Manager, Town of Plymouth 124 East Water Street Plymouth, NC 27962 (252) 793-9101	Public Notice
SOURCE	Mr. Christopher Strickland Mill Manager Weyerhaeuser NR Company – Plymouth Lumber Mill Post Office Box 787 Plymouth, NC 27962 (252) 791-3228	Preliminary Determination, Draft Permit & Public Notice
EPA	Ms. Heather Ceron Air Permits Section U.S. EPA Region 4 Sam Nunn Atlanta Federal Building 61 Forsyth Street, S.W. Atlanta, Georgia 30303-3104 (404) 562-9185 Preliminary Determination, Draft Permit, and Public Notice, via electronic mail to: ceron.heather@epa.gov with cc to lorinda.sheppard@epa.gov	Preliminary Determination, Draft Permit & Public Notice
FLM	Ms. Jill Webster Branch of Air Quality 7333 W. Jefferson Avenue, Suite 375 Lakewood, CO 80235-2017 (303) 914-3804	None
FAYETTEVILLE REGIONAL OFFICE	Mr. Robert Fisher NC DAQ Air Quality Regional Supervisor 943 Washington Square Mall Washington, NC 27889 (252) 946-6481	Preliminary Determination, Draft Permit & Public Notice