Georgia-Pacific Wood Products LLC

EXPEDITED PSD PERMIT APPLICATION

WARRENTON EXPANSION AND WOOD-FIRED BOILER SHUTDOWN

TITLE V PERMIT NO. 2421-301-0003-V-03-0
FACILITY ID NO. 04-13-301-00003

Warrenton Chip N-Saw (CNS)
Warrenton, Georgia

Submitted to the
Georgia Environmental Protection Division

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1. EXECUTIVE SUMMARY

Georgia-Pacific Wood Products LLC (GP) owns and operates the Warrenton, Georgia Chip-N-Saw (Warrenton CNS) facility. The facility produces dimensional southern yellow pine (SYP) lumber and is categorized under North American Industrial Classification System (NAICS) code 321113 for sawmills. The facility operates under a Title V Major Source Operating Permit last renewed by the Georgia Environmental Protection Division (EPD) on April 6, 2011. Warrenton CNS is located in Warren County, which has been designated by the United States Environmental Protection Agency (U.S. EPA) as in attainment or unclassified for all criteria pollutants. Warrenton CNS is classified as a major stationary source under the Prevention of Significant Deterioration (PSD) permitting program since it has the potential-to-emit (PTE) more than 250 tons per year (tpy) of at least one criteria pollutant.

This permit application requests authorization to construct and operate a phased expansion at the Warrenton CNS. GP also requests the permit application be processed as an expedited application. The first phase will include the shutting down of the Wood-fired Boiler (400B) and ancillary sources (Boiler Ash Handling) along with Batch Kiln 201. A natural gas (NG)-Fired Boiler will be brought onsite to continue to operate Batch Kilns 202 and 203 until the second phase of the project. Batch Kiln 203 will have steam coils raised within the kiln to accommodate taller charges (stacks) of lumber. Batch Kiln 202 will have minor efficiency upgrades (full scope yet to be determined). Phase I will also include the addition of a 120 million board foot per year (MMBF/yr) direct-fired continuous dual-path kiln (CDK), a sawdust fuel silo, bark screen, bark hog, bark truck load out, two additional sizing saws, second small chipper and autograder in the planer mill. Phase I will also include the replacement of the existing trim saw, chipping edger, planer trim saw, existing small chipper, and drum screen with more efficient and/or larger capacity units.

Phase II of the project will include the removal of the NG-fired Package Boiler and Batch Kilns 202 and 203, the addition of a second 120 MMBF/yr direct-fired CDK and the replacement of the debarker, several interior sawmill saws, planer, planer mill cyclone and various material handling systems with more efficient and/or larger capacity units. Other sawmill (green end) or planer mill (dry end) ancillary equipment components not identified here may be replaced or modified with an overall goal of reaching an estimated maximum hourly production rate of 40 and 50 MMBF, at the sawmill and planer mill, respectively. Section 2 of this application discusses Phase I and Phase II in more detail.

The permitting applicability analysis has been completed for the project as a whole and for each independently, as it is possible that future market conditions may not be favorable to move forward with parts or all of Phase II. . As discussed in Section 3 of this application, Phase I project emission increases for particulate matter (PM), PM with an aerodynamic diameter less than 10 and 2.5 microns (PM_{10} and $PM_{2.5}$) and volatile organic compounds (VOC) are greater than the PSD significant emission rates (PSD SERs). Phase II project emission increases for PM, PM_{10}, $PM_{2.5}$, VOC and carbon monoxide (CO) are greater than PSD SERs; therefore, for the reason given above, GP performed a PSD netting analysis for these identified pollutants for each phase of the project. The resulting net emissions increases for both project phases are below the PSD SERs for all pollutants except VOC. Therefore, PSD permitting is required for the proposed project for VOC only. A Best Available Control Technology (BACT) analysis is required for VOC emissions from Batch Kilns 202 and 203, two CDKs and the NG-fired Package Boiler.

2. FACILITY AND PROJECT DESCRIPTION

2.1. FACILITY LOCATION

The Warrenton facility is located approximately one mile east of Warrenton, Georgia on Highway 278. Warren County has been designated by the U.S. Environmental Protection Agency (EPA) as "attainment" or "unclassified" for all criteria pollutants. [1]

The location of the main process area is approximately 347 km East, 3,698 km North (Universal Transverse Mercator coordinates, Zone 17). Refer to Figure 2-1 for the Area Map for additional details.

2.2. ATTAINMENT STATUS OF AREA

As previously stated, the Warrenton CNS is located in Warren County. The current Section 107 attainment status designations for areas within the state of Georgia are summarized in 40 CFR 81.311. Warren County is classified as "better than national standards" for total suspended particulates (TSP, also referred to as PM, and which includes PM_{10}) and for the 1971 sulfur dioxide (SO_2) NAAQS. Warren County is designated as "unclassifiable/attainment" for carbon monoxide (CO), the 1-hr nitrogen dioxide (NO_2) standard, the 24-hour and annual $PM_{2.5}$ standard, lead, and ozone. Warren County is designated as "cannot be classified or better than national standards" for the annual NO_2 standard. Warren County has not yet been designated for the 1-hour SO_2 NAAQS.

2.3. PROCESS DESCRIPTION (CURRENT OPERATIONS)

The production process is composed of three principal processes: 1) Green End Processing, which includes log handling, debarking, and cutting; 2) Lumber Manufacturing, which includes sorting, packing, drying, and planing/finishing; and 3) By-Product Processing, which includes sawdust, bark, and chip conveying. This section describes the process as it stands currently. The proposed project, detailed in Section 2.4, will remove and replace a significant portion of the existing equipment listed in the subsections below and in some cases add new equipment.

2.3.1. Green End Processing

Operations at the Warrenton facility begin with delivery of logs to the storage area (log crane or dry log deck) via truck. Logs taken from the storage area or directly off the log trucks are fed to the first set of sizing saws (102S), followed by the debarker (102S) where the bark is removed. The logs are sent through a metal detector to identify logs containing metal. Logs are processed through a second sizing saw (102S). Logs without apparent defects are sent to the sawmilling operation (100). Logs that are too large or crooked may be resold to another facility or transferred to the big chipper (103S).

The logs are sent to the chip-n-saw machine where the cylindrical logs are processed with high speed chippers to create a rectangular cant. The sideboards are sent to the chipping edger. The cants are sent to the vertical saw arbor (VSA), to be cut into dimensional lumber and then trimmed to length at the trim saw. The slasher saw cuts reject dimensional lumber. Sawdust and blocks from the slasher and trim saw are processed by the small chipper (104S). The lumber is then sent to the green sorter where it is separated by

[1] 40 CFR 81.311

dimension and length. The green (wet), rough lumber may be sold or transferred to another mill, but the majority of green lumber is sent to the lumber dry kilns and planer mill for further processing.

2.3.2. Lumber Manufacturing

The green lumber is removed from the sorter and sent to a stacker where the lumber is stickered and stacked prior to being moved into the steam-heated Batch Kilns (201, 202, and 203) for drying. The steam used in the kilns is supplied by the facility's wood-fired boiler (400B). Once dried, the lumber is cooled prior to planing.

Dried lumber is sent to the planer mill building where it is planed, trimmed, sorted, and packaged for shipping. The packaged finished product may be stored in lumber sheds prior to shipment offsite. The planer mill building operations generate dry planer shavings. Trim blocks may be hogged and/or shipped off-site. Exhaust from the planer (301) and planer mill trim hog (302) is routed to the planer mill dual shavings cyclone (PMC1/PMC2). A mist system reduces particulate emissions from the planer trim saw (301). A vacuum at the trim saw pulls any remaining particulate matter not controlled by the mist system to PMC1. Hogged material and shavings are pneumatically conveyed through the planer mill shavings dual cyclone (PMC1) and planer mill shavings cyclone (PMC2). Exhaust from the planer mill shavings cyclone is routed to the planer mill shavings dual cyclone and planer mill cyclone as well. Material collected in the shavings bin is shipped offsite.

2.3.3. By-Product Processing

The sawing and trimming of green and dry lumber creates wood by-products which are utilized as boiler fuel or sold off-site for various end uses (examples: dry shavings for particleboard, green sawdust for chicken house bedding). Green sawdust generated prior to the log entering the sawmill and bark from the debarker are conveyed to fuel storage for firing in the boiler.

Material processed by the big and small chippers and chips and sawdust from other processes are conveyed to the drum screen (105). The screen separates the sawdust from the chips. The sawdust is conveyed to either the sawdust truck loading cyclone (105A) for truck loading or to the sawdust boiler fuel cyclone (105A) for transfer to fuel storage. The chips are conveyed to either the chip rail/truck loading cyclone (105B) or the chip auxiliary loading cyclone (105B). One of the two chip/sawdust cyclones operates at any given time.

Green sawdust from various points in the process may be conveyed directly to the fuel storage or to the sawdust truck bin for offsite shipping or to the boiler fuel house (FS-003) to be used as fuel. Bark from log processing is typically sent to the boiler fuel house to be used as fuel, although it may also be sold.

2.3.4. Utilities

A wood residuals-fired boiler provides steam for the three indirect-heated lumber dry kilns. The Babcock and Wilcox Boiler (400B) has a capacity of 85.7 MMBtu/hr and is fired primarily with onsite-generated wood residuals consisting of bark, green sawdust and occasionally dry wood fuel. On occasion, wood residual (pine and hardwood) fuel is purchased on the open market to supplement the onsite-generated fuel mixture.

2.4. OVERVIEW OF THE PROPOSED PROJECT

GP is currently planning an expansion project at Warrenton CNS in addition to shutting down and removing the existing wood-fired boiler and batch steam heated kilns. Given appropriate market conditions, the complete expansion project will take place over the course of the next several years. For simplicity of permitting, GP has broken the project into two phases, anticipating no more than 18 months will separate the completion of one phase and the beginning of the second. Details of Phase I and Phase II are provided below. Warrenton CNS is still evaluating the scope of the Expansion Project and requests that minor scope changes and minor changes to as-built equipment that do not materially change emissions calculations be included under the permitting of this project. GP will provide notification to EPD as any significant project changes related to the project are identified.

Figures 2-2 and 2-3 present emission units and show the process flow of the proposed Chip-N-Saw operations post Phase I and Phase II of the project.

2.4.1. Phase I Scope

The first phase of the project will include the shutdown of the wood-fired boiler and one of the three existing Batch Kilns (201). A rental NG-fired Package Boiler will provide steam to Batch Kiln 202 and 203 until Phase II of the project is implemented. Phase I will also include the addition of a new continuous dual path kiln (CDK) and upgrade and modernization of several sawmill and planer mill process units. Total future production is expected to be 170 MMBF upon completion of Phase I based on a design capacity of 120 MMbf from the new kiln and projected actual production of 50 MMbf from the existing kilns. Refer to the below descriptions of each project comprising Phase I.

- Sizing Saws (102S) (Modification) - Two sizing saws will be added to the existing sizing saw located after the debarker. The saws will not add additional cuts to the logs, but will add efficiency to the process to allow two cuts to be made simultaneously, rather than the one existing saw making the 2 cuts concurrently. A total of four sizing saws (one before the debarker and three after) will exist at the facility after the project.

- Trim Saw (101), Edger (106) (New) – The existing trim saw and chipping edger will be replaced with more efficient units. The edger will be changed from a chipping edger that produces chips and sawdust to a board edger that has a saw as the primary edging mechanism and a chipper as the second edging mechanism. The board edger will produce sawdust, chips and wood strips.

- Small Chippers (104S) (New) – The small chipper and corresponding cyclone (currently serving the trim saw) will be replaced with a bottom or side discharging chipper that discharges chips and sawdust to a target box and then to a conveyor. The new small chipper will not be equipped with a cyclone. A second bottom or side discharging small chipper will be installed to serve the new board edger.

- Shaker Screen (105) New – The existing drum screen will be replaced with a shaker screen to mechanically sort sawdust, chips and oversized chips from the chip-n-saw, VSA, and small chipper. Oversized chips will be fed back to the small chipper for further chipping.

- Stacker (New) - GP will be relocating a green lumber stacker from an idled mill. While the stacker is not an emission source itself, the new stack will add reliability to sawmill operations.

- Sawdust and Chip Handling (Modified/New) – sawdust and chip material transfer systems will be upgraded to more efficiently convey these materials as needed with green end and sawmill upgrades mentioned above.
- Continuous Kiln (204) (New) – A new dual fuel (green sawdust and natural gas) direct-fired CDK (204) will be constructed. The CDK will have approximately 120 million board foot (MMBF) annual drying capacity and be equipped with a 35 MMBTU/hr sawdust gasifier burner and/or natural gas burner. The plant is evaluating whether the new kiln will be fueled by sawdust only, natural gas only, or a combination sawdust/natural gas burner. An individual sawdust or natural gas burner will not exceed 35 MMBTU/hr. A combination sawdust/ natural gas burner would be comprised of a 35 MMBtu/hr sawdust burner with a small 7.0 MMBtu/hr natural gas burner, for a total of 42 MMBtu/hr from both fuels. All three burner scenarios are represented in the project emissions analysis and the worst case emissions are represented in the toxics modeling.
- Batch Kilns (201-203) (Modified/Removed) - Upon completing the shakedown of the new CDK, one of the three existing steam heated Batch Kilns, Batch Kiln 201, will be shutdown and removed from the site. Warrenton CNS plans to modify existing Batch Kiln 203 to raise the steam heating coils within the kiln to allow for taller stacks of lumber. This modification is expected to increase capacity of Batch Kiln 203 to 40 - 50 MMBF annual drying capacity. The plant is still evaluating whether Batch Kiln No. 202 will also undergo modifications to improve drying efficiency and be utilized with Batch Kiln 203. The projected annual production for Batch Kilns 202 and 203 will be 50 MMBF once the new CDK has gone through the shakedown period and entered normal operation.
- NG-fired Package Boiler (400C) (New) – A rental NG-fired Package Boiler will be brought onsite to supply steam to Batch Kilns 202 and 203. Warrenton CNS is still evaluating the steam demand for Phase I of the project. The proposed plan is to bring a 20,000 pound steam Package Boiler to provide steam only to Batch Kiln 203 until modifications are completed on Batch Kiln 202. Once the second batch kiln is brought back online, a 30,000 pound steam Package Boiler will replace the 20,000 pound boiler. Emissions for the 30,000 pound Package Boiler are presented in the project calculations and regulatory applicability for both boiler sizes are evaluated. The rental boiler and Batch Kilns 202 and 203 will be removed from the site when the second CDK is added under Phase II.
- Sawdust Fuel Cyclone (105C) (New) – A new high efficiency sawdust fuel cyclone (105C) will be added to provide sawdust to the new CDK and a second future CDK to be added in Phase II.
- Wood-fired Boiler (400B) & Boiler Sawdust Cyclone (105B) (Removed)– The wood-fired boiler with multiclone and ESP, as well as associated flyash hopper , fly ash storage and associated conveyors, will be removed from the site after the startup and shakedown of the new CDK. The existing sawdust boiler fuel cyclone (105B) will also be removed from the site.
- Bark Handling (105) (Modified/New) – Warrenton CNS is still evaluating modifications to the bark handling system since the plant will need to ship bark waste generated by the process after the wood-fired boiler is decommissioned. Currently bark, removed by the debarker, is mechanically conveyed to the fuel house. Warrenton CNS may continue to utilize the existing conveyor system to the fuel house and use front end loaders to load the bark for offsite shipment.

Another option being considered is to add a bark screen, bark hog, bark surge bin and truck load with associated new mechanical conveyors to move the bark from the debarker to each of the aforementioned equipment.

- Planer Trim Saw (301) (New) - The existing planer trim saw will be replaced with a new high speed trim saw. The new trim saw, like the existing trim saw, will be controlled with a misting system as well as a vacuum from PMC1 to pull any remaining particulate matter not controlled by the mist system to PMC1.
- Lumber Autograder, lug loader and ink-jet printers (New) – Warrenton CNS currently uses manual graders to evaluate boards exiting the planer. Automatic lumber grading is a relatively new technology that uses a combination of cameras and laser scanners to identify the defects in the board and make the trim and grade decision. While the autograder, lug loader and ink jet printers are not emission sources themselves, they will provide potential throughput improvements from increased board feed rates.
- Roads (500) – A new gravel path extending just north of the log truck circle and around the back side of the logyard will be constructed to allow trucks to transport bark, sawdust and chips offsite from the green end process.

2.4.2. Phase II Scope

The goal of the second phase of the overall expansion project will be to increase production of the plant to 240 MMBF. This will occur with the addition of a second CDK (similar to the one installed in Phase I), removal of Batch Kiln 202 and 203 and the NG-fired Package Boiler. Further upgrades and modernization of the green end, sawmill and planer mill process units will occur to meet the new plant's kiln drying capacity. Warrenton CNS is still evaluating the extent of the Expansion Project and scope changes are possible as mentioned above. At present, the components comprising Phase II are listed below.

- Debarker (102) (New) - The CNS debarker will be replaced with a high speed ring debarker. The high speed debarker is a partially enclosed machine equipped with a series of feed rolls and a rotating knife arm assembly. The debarker is utilized to remove the bark covering of logs traveling through the machine.
- Interior Saws (101) (New) – The remaining interior saws including the Chip-N-Saw, VSA, and Slasher Saw will be replaced with more efficient modern saws that will optimize log positioning for chipping, cutting, and profiling.
- Sawdust and Chip Handling (Modified/New) – sawdust and chip material transfer systems will continue to be upgraded to more efficiently convey these materials as needed with the Phase II upgrades.
- Continuous Kiln (205) – A second dual fuel CDK (205) will be constructed. The CDK will have approximately 120 million board foot (MMBF) annual drying capacity and be equipped with a 35 MMBTU/hr sawdust gasifier burner and/or natural gas burner. As with the first CDK, GP will evaluate whether the new kiln will be fueled by sawdust only, natural gas only, or a combination sawdust/natural gas burner.

- Batch Kilns (202 and 203) (Removed) - Upon completing the shakedown of the second CDK, the remaining steam heated Batch Kilns (202 & 203) will be shutdown and removed from the site.
- Planer Mill (300/302/PMC1/PMC2) - The CNS planer will be replaced with a new high-speed planer, trim hog, and planer shaving conveying systems (pneumatic and mechanical). The planer shaving and material separation units (PMC1 & PMC2) will be replaced with larger capacity air separation units to accommodate additional material throughput.
- Roads (500) – The gravel road used by log delivery trucks on the south side of the log yard and the gravel road installed on the north side of the logyard during Phase I for sawdust, chip and bark removal, will be paved under Phase II to help mitigate dust generated by the increase in truck traffic due to the mill expansion.

3. EMISSION CALCULATIONS

To determine the appropriate permitting path for the project, it is necessary to calculate the emission increases expected to occur as a direct result of the proposed project and compare those increases to each pollutant's PSD significant emission rate (SER). Under the federal PSD permitting program, which the Georgia Environmental Protection Division (EPD) has adopted by reference with exceptions noted and incorporated in the rules, emission increases are calculated differently for new emission units and existing emission units. For new emission units, emission increases resulting from a project are defined as the difference between the potential-to-emit (PTE) of the unit following completion of the project and the baseline actual emissions before the project ("baseline actual-to-potential" emissions test). The PSD regulations state that baseline actual emissions for a new emission unit are equal to zero.

For existing emissions units, the emissions increase resulting from a proposed project may be calculated using either the "baseline actual-to-potential" emissions test described above or the "baseline actual-to-projected actual" emissions applicability test. The latter test allows an applicant to calculate a projected actual emission rate, which is the maximum annual emission rate that an existing emissions unit is projected to emit in any one of the five years (or ten years in certain circumstances) following the completion of a project.[2] For projects involving both new and existing emission units, a hybrid methodology that includes both the "baseline actual-to-potential" and the "baseline actual-to-projected actual" emissions increase tests can be used. GP has chosen the hybrid method and is using the "baseline actual-to-projected actual" test for all of the existing emission units.

Once project emission increases are determined, a major PSD modification is triggered if both a significant emissions increase (i.e., "Step 1" project emission calculations) and a significant net emissions increase (i.e., "Step 2" netting analysis) occur. A Step 2 netting analysis was required to determine whether emissions of PM, PM_{10}, $PM_{2.5}$, CO, and VOC exceed their respective SER, and, therefore, PSD triggered. As will be detailed in further sections, all but VOC emissions from the project were below respective SERs. As such, PSD review was triggered for VOC only. The following sections detail the selected emission factors, calculation methodologies for baseline actual, projected actual, potential emissions, and netting calculations.

As previously mentioned, the project will occur in a phased approach, and per EPD's request, GP evaluated both phases of the project separately for PSD permitting applicability. Detailed emissions analyses are provided in Appendix B.

3.1. OVERVIEW OF EMISSION FACTORS

To calculate emissions at the facility, GP determined the appropriate emission factors and control device efficiencies to use for each emission source. Emission factors were obtained using various methodologies and sources. These include:

- National Council for Air and Stream Improvement, Inc. (NCASI);
- U.S. EPA's *AP-42 Compilation of Air Emission Factors (5th Edition, Revised);*

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[2] The ten year period applies if the project involves increasing the unit's design capacity or PTE and full utilization of the unit would result in a significant emissions increase for a regulated pollutant.

- U.S. EPA's Mandatory Greenhouse Gas (GHG) Reporting Regulation (40 CFR 98); and
- Stack test data from testing conducted at Warrenton as well as other similar GP and competitor facilities.

The sources of information for emission factor determination and calculation methodologies are discussed in greater detail in the following sections.

3.1.1. NCASI Emission Factors

NCASI conducts research and provides technical information to all member companies through a variety of publications, including technical bulletins, special reports, handbooks, and newsletters. The emission factor information presented in the technical bulletins is typically deemed the most accurate available for the wood products industry if representative mill-specific test data or similar GP test data are unavailable.

GP is an active member of NCASI and utilized Technical Bulletins No. 1013, *A Comprehensive Compilation and Review of Wood-Fired Boiler Emissions*, (March 2013), and No. 1020, *Compilation of Criteria Air Pollutant Emissions Data for Sources at Pulp and Paper Mills including Boilers – An Update to Technical Bulletin 884,* (December 2013), to estimate emissions for several wood combustion pollutants as part of this application. In addition, the NCASI 2013 Wood Products Database, a NCASI July 2014 memo for *$PM_{2.5}$ Emissions from Drum Debarking* and a January 2015 Special Report, *Estimating the Potential for PM2.5 Emissions from Wood and Bark Handling* were also utilized to estimate particulate emissions for several wood material handling units.

3.1.2. U.S. EPA AP-42 Emission Factors

Emission factors from U.S. EPA's AP-42 database (5^{th} edition unless otherwise noted) were utilized for natural gas and wood combustion, several material handling activities and fugitive PM emissions for the specified sources:

- Section 1.4, *Natural Gas Combustion*
- Section 1.6, *Wood Residue Combustion in Boilers*
- Section 13.2.1, *Paved Roads*
- Section 13.2.2, *Unpaved Roads*
- Section 13.2.4, *Aggregate Handling and Storage Piles*

In addition to the current AP-42 factors, emission factors from obsolete sections that are maintained in the FIRE (Factor Information Retrieval Software) were used for sawing and debarking, as these data points remain the best data available for these sources.

3.1.3. Greenhouse Gas Emission Factors

The U.S. EPA Mandatory Greenhouse Gas reporting rule emission factors and global warming potentials (GWP) from Subpart C were used to calculate carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) emissions from sawdust combustion. Tables C-1 and C-2 to Subpart C of Part 98 list default CO_2, CH_4, and N_2O emission factors and high heat values for various fuel types.

3.1.4. Stack Test Data

Emission factors for PM, CO, VOC, and oxides of nitrogen (NO_X) from the kilns are based on testing of similar GP and competitor operations. GP typically selects the median value as representative of the various tests and may add one or two standard deviations to ensure that the factor accurately represents variations in the actual emission rates. Each selected stack testing-based emission factor is explained in detail in the emission calculations included as Appendix B. In addition, the VOC emission factor from the kilns was calculated according to the methodology as discussed in the following paragraph.

The estimation of VOC emissions from wood products may not be well represented by U.S. EPA Method 25A due to low Flame Ionization Detector (FID) response factors for some VOC components such as formaldehyde and methanol. Recognizing that development of an ideal method was a long, technically challenging process, GP participated along with NCASI, the American Forest and Paper Association (AF&PA), and the U.S. EPA's Emission Measurement Center in a cooperative effort to develop an interim VOC emission measurement protocol designed to better approximate total VOC emissions from wood products industry sources. The resulting interim protocol known as Wood Products Protocol No. 1 (WPP1) measures VOC on an "as propane" basis using EPA Method 25A and the result is adjusted using separate, site-specific determinations of formaldehyde and methanol to correct the results for poor FID response for these compounds. This protocol was approved in July 2007 by the U.S. EPA and is published on EPA's Emission Measurement Center's website as "Other Test Method 26 (OTM26)".

Stack test data has also been used to calculate emissions from various other existing and new emission units including the sawdust and chip loading cyclones, planer mill cyclone and sawdust fuel silo cyclone, and the wood-fired boiler included in the Step 2 netting analysis.

3.2. BASELINE ACTUAL EMISSIONS (BAE)

Baseline Actual Emissions are defined by Chapter 391-3-1-.02(7)(a)2(i)(II) as "*the average rate, in tons per year, at which the emissions unit actually emitted the pollutant during any consecutive 24-month period selected by the owner or operator within the 10-year period immediately preceding either the date the owner or operator begins actual construction of the project, or the date a complete permit application is received by the Department for a permit…*". Total baseline actual emissions (BAE) for the modified or affected sources were calculated from the 24-month annualized baseline period of March 2013 to February 2015 using representative emission factors for all pollutants, as detailed in Appendix B. Throughput information was based on actual production data for this period.

3.3. PROJECTED ACTUAL EMISSIONS

As mentioned previously, under the PSD permitting program, emission increases are calculated differently for new emissions units and existing emissions units. For modifications to existing units, GP has chosen to calculate emission increases as the difference between the future projected actual emissions (PAE) and BAE.

Projected actual emissions are defined by Chapter 391-3-1-.02(7)(a)2(ii)), as "the maximum annual rate, in tons per year, at which an existing emissions unit is projected to emit a regulated NSR pollutant in any one of the 5 years (12-month period) following the date the unit resumes regular operation after the project, or in any one of the 10 years following that date, if the project involves increasing the emissions unit's design capacity or its potential to emit that regulated NSR pollutant and full utilization of the unit would result in a significant emissions increase or a significant net emissions increase at the major stationary source."[3] To determine the maximum annual rate, a source must consider all relevant information, including historical operational data, the company's expected business activity and the company's highest projections of business activity for the five or ten year period after implementation of the project.

The PSD rules state that in determining PAE, the owner or operator of a source shall consider all relevant information, including but not limited to, historical operational data, the company's own representations, the company's expected business activity and the company's highest projections of business activity, the company's filings with the State or Federal regulatory authorities, and compliance plans under the approved State Implementation Plan.[4] For this analysis, the projected actual production rates under Phase I are assumed to equal the potential estimated capacity of the new CDK and projected operation of Batch Kilns 202 and 203 of 50 MMBF/yr.

In developing the projected actual emissions, the Georgia Environmental Protection Division's (EPD's) PSD rule [391-3-1-.02(7)(a)2(ii)(II)III] specifies that the projected actual emission rate "may exclude, in calculating any increase in emissions that results from the particular project, that portion of the unit's emissions following the project that an existing unit could have accommodated during the consecutive 24-month period used to establish the baseline actual emissions… and that is also unrelated to the particular project, including any increased utilization due to product demand growth…". GP chose not to exclude any "could have accommodated" emissions for this project.

3.4. POTENTIAL EMISSIONS FOR NEW SOURCES

Emission increases for new sources must be based on the potential emission rate of the units. As part of the proposed projects, a majority of the existing process units are proposed to be replaced with higher capacity and/or more efficient units. In addition, several new units will be added to the process, e.g. two CDKs, a new bark line and an additional small chipper. Potential emissions have been calculated for all of these new sources and are included in Phase I and Phase II project emissions analyses.

3.5. ASSOCIATED SOURCE EMISSIONS INCREASES

As the increased kiln throughput attributable to the proposed project potentially impacts production throughout the facility, pollutant emission increases associated with the potentially "affected" sources have also been calculated as part of the PSD applicability analysis. For the purposes of this analysis, it is assumed that all process equipment at the facility could be impacted by the proposed projects. The increases in pollutant emissions from all of the "affected sources" have been calculated based on the projected production for Phase I and the potential production capacity of the facility for Phase II.

3.6. PROJECT EMISSIONS INCREASES

Under Step 1 of the PSD analysis, the emissions increases for the project are calculated by summing the individual emission increases of all new or modified emission units as well as the associated emission increases. These total project emission increases are then compared to the PSD SERs to identify

[3] The 5-year projection applies to sources that do not modify the unit's existing design capacity or their PTE.
[4] 40 CFR 52.21(b)(41)(ii)(a)

pollutants that trigger further review. A summary of emissions increases for Phase I and Phase II are presented in Appendix B.

As shown in the Phase I and Phase II Step 1 Tables in Appendix B, when considered alone, the proposed projects under Phase I would trigger PSD permitting requirements for PM, PM_{10}, $PM_{2.5}$, and VOC and under Phase II for PM, PM_{10}, $PM_{2.5}$, CO and VOC. Therefore, a Step 2 netting analysis is required for these pollutants, as discussed in the following section.

3.7. CALCULATION OF NET EMISSIONS INCREASES

As the project emissions increases are significant for PM, PM_{10}, $PM_{2.5}$, CO, and VOC, the net emissions increases must be calculated for these pollutants. The term "net emission increase' is defined at 40 CFR 52.21(b)(3)(i). This calculation includes the emissions increase calculated above, as well as those described in §52.21(b)(3)(i)(b):

> *Any other increases and decreases in actual emissions at the major stationary source that are contemporaneous with the particular change and are otherwise creditable. Baseline actual emissions for calculating increases and decreases under this paragraph (b)(3)(i)(b) shall be determined as provided in paragraph (b)(48) of this section, except that paragraphs (b)(48)(i)(c) and (b)(48)(ii)(d) of this section shall not apply.*

Further, from §52.21(b)(3)(ii):

> *An increase or decrease in actual emissions is contemporaneous with the increase from the particular change only if it occurs between:*
>
> *(a) The date five years before construction on the particular change commences; and*
>
> *(b) The date that the increase from the particular change occurs.*

Projects for the Warrenton CNS were reviewed for five years prior to construction and through project implementation. No modifications to emission units have been made at Warrenton CNS in the five years prior to this expansion project. Contemporaneous decreases associated with the decommissioning or replacement of equipment associated with these projects are evaluated.

3.7.1. Calculation of Emission Increases and Decreases

Baseline actual emissions for sources included in the contemporaneous period were calculated as described in §52.21(b)(3)(i)(b), which specifies that such baseline actual emissions calculations need not use the same consecutive 24-month period to determine baseline emissions for all units. Therefore, the baseline period for each contemporaneous project is based on its operating rate and may be unique from all other projects in the contemporaneous period as well as the baseline period used for emissions calculated during Step 1 of the PSD permitting applicability analysis.

- Current Project Decrease – Shutdown of the Wood-fired Boiler (400B) - The wood-fired boiler with multiclone and ESP will be decommissioned and removed from the site once the new CDK has been constructed and gone through a shakedown period. The baseline emissions are defined by the 24-month period of June 2005 through May 2007.

- Current Project Decrease – Removal of the Boiler Sawdust Cyclone (105B) – The existing sawdust boiler fuel cyclone will be removed from the site as it will no longer be needed to supply sawdust to the boiler. However, since sawdust was directed between the sawdust boiler cyclone and the sawdust truck loading cyclone (which will continue to operate) no emissions decrease will be accounted for.
- Current Project Decrease – Removal of boiler flyash hopper and fly ash storage will occur once the wood-fired boiler has been decommissioned. The baseline emissions are defined by the 24-month period of June 2005 through May 2007.
- Current Project Decrease – Removal of Batch Kilns 201, 202 and 203. As previously mentioned, 201 will be shutdown during Phase I while Batch Kilns 202 and 203 will not be shutdown and removed until Phase II. The baseline emissions are defined by the 24-month period of March 2013 – February 2015.

3.7.2. Calculation of Net Emission Increases

As discussed previously, PSD permitting is required if both a significant emissions increase ("Step 1") and a significant net emissions increase ("Step 2") occurs. The Phase I and Phase II Step 2 Netting Emission Analysis tables presented below in Tables 3-1 and 3-2 provide summaries of the final PSD applicability assessment for the projects. As shown in these tables PSD permitting is required only for VOC.

Table 3-1 Phase I Net Emissions Increase

	PM (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	CO (tpy)	VOC (tpy)	SO_2 (tpy)	NO_X (tpy)	Lead (tpy)	GHG CO_2e (tpy)
Project Emission Increases	29.04	21.65	11.43	93.69	289.53	1.72	37.47	0.01	52110.82
Contemporaneous Increases & Decreases									
None									
Project Decreases									
400B - Wood fired Boiler	-8.0	-9.8	-9.1	-381.3	-11.4	-6.9	-40.1	0.0	-48055.4
201 - Batch Kiln 1	-0.2	-0.3	-0.3		-85.6				
401 - Fuel and Ash Storage (IS)	-0.4	-0.2	0.0						
101 - Interior Saws (IS) - Edger & Trim Saw	-0.91	-0.30	-0.09						
105 - Screen (IS)	-0.49	-0.27	-0.09						
Bark Handling	-0.05	-0.02	-3.24E-03						
Sawdust Handling	-0.04	-0.02	-2.64E-03						
Chip Handling	-0.28	-0.13	-1.98E-02						
104 - Small Chipper Cyclone	-0.86	-0.42	-0.15						
Net Emission Increases	**17.8**	**10.1**	**1.6**	**-287.7**	**192.5**	**-5.2**	**-2.6**	**0.0**	**4055.4**
Significant Emission Rate	**25**	**15**	**10**	**100**	**40**	**40**	**40**	**0.7**	**75,000**
Significant Net Emissions Increase?	**No**	**No**	**No**	**No**	**Yes**	**No**	**No**	**No**	**No**

Table 3-2 Phase II Net Emissions Increase

	PM (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	CO (tpy)	VOC (tpy)	SO_2 (tpy)	NO_X (tpy)	Lead (tpy)	GHG CO_2e (tpy)
Project Emission Increases									
Phase I/II Project Increases	30.96	31.04	19.63	164.45	658.90	3.29	29.88	0.03	71,430
Contemporaneous Increases & Decreases									
None									
Project Decreases									
400B - Wood fired Boiler	-8.0	-9.8	-9.1	-381.3	-11.4	-6.9	-40.1	0.0	-48,055
201, 202, 203 - Batch Kilns 1,2,3	-0.6	-1.1	-1.1		-263.7				
401 - Fuel and Ash Storage (IS)	-0.4	-0.2	0.0						
101 - Interior Saws (IS) - Edger & Trim Saw	-0.91	-0.30	-0.09						
Bark Handling	-0.05	-0.02	-3.24E-03						
Sawdust Handling	-0.04	-0.02	-2.64E-03						
Chip Handling	-0.28	-0.13	-1.98E-02						
102 - Debarker	-4.71	-2.59	-0.02						
104 - Small Chipper	-0.86	-0.42	-0.15						
105 - Screen (IS)	-0.49	-0.27	-0.09						
302 - Planer Mill Cyclone & Shavings Handling	-2.65	-1.87	-0.97						
Net Emission Increases	**11.9**	**14.3**	**8.1**	**-216.9**	**383.8**	**-3.6**	**-10.2**	**0.0**	**23,375**
Significant Emission Rate	**25**	**15**	**10**	**100**	**40**	**40**	**40**	**0.7**	**75,000**
Significant Net Emissions Increase?	**No**	**No**	**No**	**No**	**Yes**	**No**	**No**	**No**	**No**

4. REGULATORY APPLICABILITY

This section summarizes all federally-enforceable and state-enforceable air regulations that are potentially applicable to the project. Both applicable and important non-applicable regulations are addressed. Supporting process information for the proposed project is provided in the application forms contained in Appendix D. Information contained on the application forms is provided for determining regulatory applicability and demonstrating compliance with applicable requirements, and should not be considered proposed permit terms, limits, or conditions.

4.1. FEDERAL AIR QUALITY REGULATIONS

The federal regulations potentially applicable to the proposed project are Prevention of Significant Deterioration (PSD) regulations in 40 CFR 51.166; New Source Performance Standards (NSPS) in 40 CFR 60; National Emission Standards for Hazardous Air Pollutants (NESHAP) in 40 CFR 63; and Title V Operating Permit regulations in 40 CFR 70. These requirements are codified in the Georgia Rules for Air Quality Control, specifically Rules 391-3-1-.02(7), (8), (9), and 391-3-1-.03(10), respectively. A discussion of these regulations is provided in the following subsections.

4.1.1. Prevention of Significant Deterioration – 40 CFR 51

Implementation of the PSD regulations has been delegated in full to the State of Georgia. These air quality regulations are contained in Georgia Rules for Air Quality Control Rule 391-3-1-02(7). The PSD regulations apply to major modifications at major stationary sources, which are considered those sources belonging to any one of the 28 source categories listed in the regulations that has the potential to emit more than 100 tons per year of any PSD-regulated compound, or any other source which has the potential to emit more than 250 tons per year of any PSD compound. A major modification is defined as "any change to a major stationary source that would result in a significant emissions increase of any pollutant subject to regulation under the Act." Major modifications must meet certain pre-construction review and permitting requirements. Warrenton CNS does not belong to one of the 28 listed categories but does emit greater than 250 tons per year of a PSD-regulated air compound. Thus, Warrenton CNS is a major PSD source.

The emissions calculation methodology used to determine PSD applicability was described in Section 3. The emission factors and throughputs used to estimate emissions are presented in Appendix B. The project emissions increases presented in the Step 2 Tables for Phase I and Phase II show that only VOC emissions increases are greater than the PSD SER. Therefore, a BACT analysis is required for VOC for new and modified units at which a VOC emissions increase will occur. The BACT analysis is presented in Section 5 of this application.

EPD has amended EPA's "reasonable possibility" rules outlined under 40 CFR 52.21(r)(6). EPD's rules state that for projects at an existing emissions unit at a major stationary source that are required to obtain a construction permit, and where the owner or operator elects to use the "baseline actual-to-projected actual" applicability test in paragraphs (b)(41)(ii)(a) through (c) of 40 CFR 52.21, then in lieu of EPA's "reasonable possibility" rules, an applicant must comply with the provisions specified under paragraph 391-3-1-.02(7)(b)15.(i). These provisions require monitoring of emissions and recordkeeping for projects that require a state construction permit and use the "baseline actual-to-projected actual" applicability test. Phase I of the proposed expansion project meets both of these specifications, while Phase II only meets the construction permit requirement as PTE emissions were presented for the final project phase. As such GP will be required to monitor the emissions for 10 years following Phase I of the project, or until Phase II is complete, to show that the project did not cause a significant increase in emissions of any PSD regulated pollutant other than VOC (or reduced list of pollutants, as specified by EPD). GP will also be required to keep records of these emissions and all information required under 391-3-1-.02(7)(b)15.(i)(I) for a total of 15 years.

4.1.2. New Source Performance Standards (NSPS) – 40 CFR 60

NSPS apply to any stationary source for which standards are promulgated, and which is constructed, reconstructed or modified after the effective date of the applicable standard to the affected facility. NSPS requirements are promulgated under 40 CFR 60 pursuant to Section 111 of the Clean Air Act.

4.1.2.1. NSPS Subpart A – General Provisions

All affected sources are subject to the general provisions of NSPS Subpart A unless specifically excluded by the source-specific NSPS. Subpart A requires initial notification and performance testing, recordkeeping, and monitoring and provides reference methods and mandates general control device requirements for all other subparts as applicable.

4.1.2.2. NSPS Subpart Dc

NSPS Subpart Dc, Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units, regulates small steam generating units with maximum heat input capacities greater than 10 MMBTU/hr and less than 100 MMBTU/hr for which construction, modification, or reconstruction was commenced after June 9, 1989. As previously mentioned, Warrenton CNS is still evaluating the steam demand for Phase I and has not chosen the rental boiler (or boilers if they go with a smaller boiler at first and move to a larger boiler later). While the rental boilers being considered are in the 25 – 40 MMBtu/hr range, it is undetermined at this time whether the rental boiler(s) will be a post- 1989 era construction or not. If the boiler(s) are post-1989era construction the unit will be subject to NSPS Subpart Dc. Since Subpart Dc does not contain any PM or SO_2 emission standards for boilers that burn 100% natural gas, and since PM and SO_2 are the only pollutants regulated under Subpart Dc, there are no emissions limits that apply. Warrenton CNS will be required to maintain monthly records of the amount of natural gas used according to 40 CFR 60.48c(g)(2) if the boiler(s) is subject to NSPS Dc.

4.1.2.3. Non-applicability of Other NSPS

NSPS standards are developed for particular industrial source categories. There are no NSPS standards that apply specifically to lumber mills and no emission units proposed for installation or modification are defined as affected facilities under any NSPS; therefore, no NSPS, other than Dc, may be triggered.

4.1.3. National Emission Standards for Hazardous Air Pollutants (NESHAP) – 40 CFR 63

NESHAP, federal regulations found in Title 40 Parts 61 and 63 of the CFR, are emission standards for HAPs that apply to major sources of HAPs (facilities that exceed the major source thresholds of 10 tpy of a single HAP and 25 tpy of any combination of HAPs) or specifically designated area sources under Part 63. The Part 63 NESHAPs apply to sources in specifically regulated industrial source classifications (Clean Air Act Section 112(d)) or on a case-by-case basis (Clean Air Act Sections 112(g) and 112(j)) where EPA has failed to promulgate a 112(d) standard. Warrenton CNS is a major source of HAPs.

4.1.3.1. 40 CFR Part 63 Subpart A – General Provisions

All affected sources are subject to the general provisions of Part 63 NESHAP Subpart A unless specifically excluded by the source-specific NESHAP. Subpart A requires initial notification and performance testing, recordkeeping, monitoring, provides reference methods, and mandates general control device requirements for all other subparts as applicable. If other Part 63 subparts are applicable, the provisions of Subpart A also apply.

4.1.3.2. 40 CFR Part 63 Subpart DDDD – National Emission Standards for Hazardous Air Pollutants: Plywood and Composite Wood Products

Warrenton CNS is subject to the Plywood and Composite Wood Products (PCWP) Maximum Achievable Control Technology (MACT) standard, 40 CFR 63, Subpart DDDD. This rule applies to any PCWP manufacturing facility located at a major source of HAP emissions. Lumber kilns are within the affected sources under the PCWP MACT pursuant to 40 CFR 63.2232(b); therefore, the lumber kilns are subject to this rule. However, no control requirements are specified by the rule for either existing or new/reconstructed lumber kilns, so this project will not change the applicability of PCWP MACT to the mill.

4.1.3.3. 40 CFR Part 63 Subpart DDDDD – National Emission Standards for Hazardous Air Pollutants: Industrial, Commercial, and Institutional Boilers and Process Heaters

40 CFR Part 63, Subpart DDDDD, NESHAP for Industrial-Commercial-Institutional Boilers and Process Heaters (Boiler MACT), was promulgated on September 13, 2004 with compliance nominally required 3 years later, by September 13, 2007. However, the rule was vacated and remanded to U.S. EPA by the D.C. Circuit Court of Appeals in June 2007 (made final in the Court's mandate issued on July 30, 2007). On April 29, 2010, EPA re-proposed the Boiler MACT regulations. On March 21, 2011, EPA promulgated the Boiler MACT rules and at the same time said it would issue a notice of reconsideration of certain aspects of the rule. Proposed standards were published December 23, 2011 after reconsideration and the final reconsidered rule was published on January 31, 2013. The compliance date for Boiler MACT is January 31, 2016.

As previously mentioned GP is still evaluating the NG-fired boiler of choice. GP will comply with the applicable requirements for the manufactured year of the rental boiler that is brought onsite by the Boiler MACT compliance date.

The existing wood-fired boiler (400B) is subject to the Boiler MACT rules. However, Warrenton CNS plans to decommission the boiler prior to the required compliance date. Note, Warrenton CNS submitted a four month Boiler MACT compliance extension request to EPD for the existing wood-fired boiler on March 3, 2015. Warrenton CNS is currently awaiting a decision by EPD on the extension request. If granted, the existing wood-fired boiler would be required to be decommissioned or in compliance with the Rule by May 31, 2015.

4.1.4. Title V Operating Permits – 40 CFR 70

Warrenton CNS currently operates under Title V Permit No. 2421-301-0003-V-03-0. GP requests that a revised Title V permit be issued under Georgia Air Regulations as a major modification. Permit application forms are included in Appendix D.

4.2. GEORGIA AIR QUALITY REGULATIONS

Georgia has promulgated air pollution control requirements under Georgia Rules for Air Quality Control (GRAQC) Chapter 391-3-1. Most of these regulations are part of the Georgia state implementation plan (SIP) for compliance with the Clean Air Act and most SIP regulations are federally-enforceable. Generally applicable requirements, such as those pertaining to requirements to obtain air quality permits and malfunction reporting, are not discussed because these requirements are widely recognized as being applicable to significant sources of air pollution. A brief discussion of both applicable and key non-applicable requirements is included in this section.

4.2.1. Visible Emissions - GRAQC 391-3-1-.02(2)(b)

This regulation limits visible emissions to 40 percent from facility sources unless regulated elsewhere. This generally applicable requirement applies to all point sources at Warrenton CNS.

4.2.2. Fuel-Burning Equipment - GRAQC 391-3-1-.02(2)(d) and (g)

GRAQC 391-3-1-.02(2)(d) regulates emissions of PM, opacity, and NOx from fuel-burning equipment. The direct-fired CDKs and NG-fired Package Boiler will be subject to this regulation. Requirements differ based on the size of the unit and date of installation. Both direct-fired CDKs will have a capacity of 35-42 MMBTU/hr and the NG-Package Boiler will be between 20 – 40 MMBtu/hr. As a piece of fuel-burning equipment installed after 1972 greater than 10 MMBTU/hr, PM is limited to 0.24 MMBtu/hr for the CDKs each and 0.25 MMBtu/hr for the NG-fired Package Boiler according to the formula:

$$P = 0.5(10/R)^{0.5},$$

where R is the heat input rate in MMBTU/hr and P is the allowable emission rate in lb/MMBtu. The emission factor used for the PSD applicability analysis is more stringent (~0.07 lb/MMBtu) than this allowable rate. Opacity is limited to 20% except for one six minute period per hour of not more than 27% opacity. Compliance will be maintained through proper operation of the equipment.

The NO_x limitations apply to fuel-burning equipment greater than 250 MMBtu/hr firing coal, oil, or gas. The direct-fired CDKs will fire sawdust and natural gas less than 250 MMBtu/hr, and therefore, the NO_x requirements do not apply. The NG-fired Package Boiler will fire natural gas less than 250 MMBtu/hr, and therefore, the NO_x requirements do not apply to the Package Boiler either.

GRAQC 391-3-1-.02(2)(g), Sulfur Dioxide, regulates emissions of sulfur dioxide from new sources (constructed/modified after January 1, 1972) capable of firing fossil fuels at a rate exceeding 250 MMBtu/hr. Neither the new CDKs nor the NG-fired Package Boiler will fire fossil fuels at a rate exceeding 250 MMBtu/hr and therefore these requirements will not apply.

4.2.3. Particulate Emissions from Manufacturing Processes - GRAQC 391-3-1-.02(2)(e)

Particulate Emissions from Manufacturing Processes addresses PM emissions. All units not subject to the fuel-burning equipment PM emissions at the facility are subject to this generally applicable requirement as follows:

$E = 4.1P^{0.67}$ (P <= 30 ton/hr)

$E = 55P^{0.11} – 40$ (P > 30 ton/hr)

Where P is the process input weight rate in tons/hr and E is the allowable emission rate in lb/hr. Compliance will be maintained through proper equipment operation of PM emitting sources.

4.2.4. Fugitive Dust - GRAQC 391-3-1-.02(2)(n)

The fugitive dust rule stipulates that all persons responsible for any operation, process, handling, transportation or storage facility which may result in fugitive dust shall take all reasonable precautions to prevent such dust from becoming airborne. Some reasonable precautions which could be taken to prevent dust from becoming airborne include, but are not limited to, the following:

(i) Use, where possible, of water or chemicals for control of dust in the demolition of existing buildings or structures, construction operations, the grading of roads or the clearing of land;

(ii) Application of asphalt, water, or suitable chemicals on dirt roads, materials, stockpiles, and other surfaces which can give rise to airborne dusts;

(iii) Installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty materials. Adequate containment methods can be employed during sandblasting or other similar operations;

(iv) Covering, at all times when in motion, open bodied trucks, transporting materials likely to give rise to airborne dusts;

(v) The prompt removal of earth or other material from paved streets onto which earth or other material has been deposited.

The percent opacity from any fugitive dust source listed in above shall not equal or exceed 20 percent.

4.2.5. VOC Emissions from Major Sources - GRAQC 391-3-1-.02(2)(tt)

This regulation limits VOC emissions for certain counties in Georgia, as outlined in 391-3-1-.02(2)(tt)(3). Warrenton CNS is located in Warren County, and therefore, this rule does not apply.

4.2.6. NO_x Emissions from Major Sources - GRAQC 391-3-1-.02(2)(yy)

This regulation limits NO_x emissions for certain counties in Georgia, as outlined in 391-3-1-.02(2)(yy)(2). Warrenton CNS is located in Warren County, and therefore, this rule does not apply.

4.2.7. NO_x Emissions from Fuel-Burning Equipment - GRAQC 391-3-1-.02(2)(lll)

GRAQC 391-3-1-.02(2)(lll) sets a limit for the emissions of NOx for certain fuel-burning equipment installed or modified on or after May 1, 1999. Per GRAQC 391-3-1-.02(2)(lll)(6(iii)(I), the requirements of this regulation do not apply to fuel-burning equipment in Warren County and therefore, this rule does not apply.

4.2.8. NO_x Emissions from Small Fuel-Burning Equipment - GRAQC 391-3-1-.02(2)(rrr)

This regulation sets forth NO_x emissions limits and work practices for small fuel-burning equipment in certain counties in Georgia, as outlined in 391-3-1-.02(2)(rrr)(4). Warrenton CNS is located in Warren County which is not listed in the definition of affected unit for this rule and therefore, this rule does not apply to the facility.

4.2.9. Prevention of Significant Deterioration of Air Quality - GRAQC 391-3-1-.02(7)

See Section 4.1.1 above for discussion of PSD applicability. EPD has incorporated EPA's "reasonable possibility" rules as outlined under 40 CFR 52.21(r)(6) by reference, with certain exceptions. EPD's rules state that for projects at an existing emissions unit at a major stationary source that are required to obtain a permit under the Construction (SIP) Permit requirements of paragraph 391-3-1-.03(1) of the state rules, and where the owner or operator elects to use the "baseline actual-to-projected actual" applicability test in paragraphs (b)(41)(ii)(a) through (c) of 40 CFR 52.21, then in lieu of EPA's "reasonable possibility" rules, an applicant must comply with the provisions specified under paragraph 391-3-1-.02(7)(b)15.(i). Warrenton CNS is using the "baseline actual-to-projected actual" applicability test for Phase I of the proposed expansion project, therefore the following State rules apply to Phase I. Phase II, however, does not rely on the "baseline actual-to-project actual" test and instead utilizes a "baseline-to-potential" test; therefore, once Phase II is implemented (defined as decommissioning the two Batch Kilns), this rule will no longer apply to the proposed project.

Georgia Rule 391-3-1-.02(7)(b)(15)(i)(l)

Before beginning actual construction of the project, the owner or operator shall document and maintain a record of the following information:

i. a description of the project - *this application satisfies this requirement.*

ii. identification of the emissions unit(s) whose emissions of a regulated NSR pollutant could be affected by the project - *this application satisfies this requirement.*

iii. a description of the applicability test used to determine that the project is not a major modification for any regulated NSR pollutant, including the baseline actual emissions, the projected actual emissions, the amount of emissions excluded and an explanation for why such amount was excluded, and any netting calculations, if applicable - *this application satisfies this requirement.*

iv. the records required under (I-III. above) shall be retained for a period of 10 years following resumption of regular operations after the change, or for a period of 15 years following resumption of regular operations after the change if the project increases the design capacity of or potential to emit of a regulated NSR pollutant at such emissions unit. Since the project will increase the capacity of the facility, the mill must retain the records for a period of 15 years after project implementation - *The Warrenton CNS will retain the records identified by i-iii above for a period of 15 years following Phase I of the project implementation.*

Georgia Rule 391-3-1-.02(7)(b)(15)(i)(ll)

The owner or operator shall provide a copy of the information set out in subparagraph (7)(b)15.(i)(l) of this rule with the application for construction required under paragraph 391-3-1-.03(1) of these rules.

This application satisfies the recordkeeping requirements specified above.

Georgia Rule 391-3-1-.02(7)(b)(15)(i)(lll)

The owner or operator shall monitor the emissions of any regulated NSR pollutant that could increase as a result of the project and that is emitted by any emissions unit identified in subparagraph (7)(b)15.(i)(I)ll. of this rule, and calculate and maintain a record of the annual emissions, in tons per year on a calendar year basis, for a period of five years following resumption of regular operations after the change, or for a period of ten years following resumption of regular operations after the change if the project increases the design capacity of or potential-to-emit that regulated NSR pollutant at such emissions unit. These records shall be retained for a period of five years past the end of each calendar year. If an owner or operator is required to, or elects to, exclude emissions associated with startups, shutdowns, and/or malfunctions from estimations of projected actual emissions for PSD applicability purposes as allowed by subparagraph (7)(a)2.(ii)(II)ll. of this rule, the owner or operator may exclude such emissions from the calculation of annual emissions.

The design capacity of Batch Kiln 203 may be increased with the raising of steam coils within the kiln. As such, Warrenton CNS will calculate annual emissions, in tons per year, on a calendar year basis, for a period of 10 years after project implementation, or until Phase II of the project is implemented. Warrenton CNS will maintain a record of such emissions for a period of 5 years past the end of the last calendar year of emissions tracking.

Georgia Rule 391-3-1-.02(7)(b)(15)(i)(lV)

If the owner or operator excluded demand growth emissions from the projected actual emissions for a project and that project is subject to the requirements of subparagraph (7)(a)2.(ii)(II)III.A.(B) of this rule, the owner or operator shall calculate the actual increase in emissions due to demand growth, in tons per year on a calendar year basis, for a period 10 years following resumption of regular operations after the change. These records shall be retained for a period of five years past the end of each calendar year.

Warrenton CNS did not exclude demand growth emissions from the projected actual emissions for this project. Therefore, this recordkeeping requirement does not apply.

Georgia Rule 391-3-1-.02(7)(b)(15)(i)(V)

The owner or operator shall submit a report to the Division within 60 days after the end of each year during which records must be generated under subparagraphs (7)(b)15.(i)(III) and (IV) of this rule setting out the unit's annual emissions and, if applicable, the unit's actual increase in emissions due to demand growth during the calendar year that preceded submission of the report.

Warrenton CNS will submit a report to the Division within 60 days after the end of each year, for a period of ten years after Phase I of the project implementation and until Phase II of the project is implemented, as required under subparagraph (7)(b)15.(i)(III) above.

4.2.10. New Source Performance Standards - GRAQC 391-3-1-.02(8)

See Section 4.1.2 above for discussion of NSPS applicability.

4.2.11. Emission Standards for Hazardous Air Pollutants - GRAQC 391-3-1-.02(9)

See Section 4.1.3 above for discussion of NESHAP applicability.

5. BEST AVAILABLE CONTROL TECHNOLOGY

Pursuant to federal PSD regulation 40 CFR 52.21(j), and Georgia State air regulation 391-3-1-.02(7), any major stationary source or major modification subject to PSD review is required to include a Best Available Control Technology (BACT) analysis. As defined under the PSD regulations (40 CFR 52.21(b)(12), and adopted by reference by the Georgia Environmental Protection Division (EPD), BACT means:

> *... an emission limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under [the] Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results.*

A BACT analysis is required for each new or physically modified emission unit at which there will be a net emissions increase of a PSD-regulated pollutant. Since VOC emissions from the proposed project are the only PSD-regulated pollutant to exceed the applicable PSD SER, a BACT analysis for only VOCs from modified or new units at which a net increase of VOCs is projected is required. New and modified emission units emitting VOC emissions include the modified Batch Kilns 202 and 203, the new CDK 204 and the new NG-fired Package Boiler in Phase I of the Project. The NG-fired Package Boiler and Batch Kilns 202 and 203 will be removed in Phase II of the project, leaving CDK 204 and a second new CDK 205 as the only new or modified VOC emission units. Each of these units are considered in this BACT analysis.

5.1. BACT DETERMINATION METHODOLOGY

The primary purpose of BACT is to optimize consumption of PSD air quality increments and thereby enlarge the potential for future economic growth without significantly degrading air quality[5]. Guidelines for the evaluation of BACT can be found in US EPA's Guidelines for Determining Best Available Control Technology (BACT) (US EPA, 1978) and in the PSD Workshop Manual (US EPA, 1990). These guidelines were drafted by the US EPA to provide a consistent approach to BACT and to ensure that the impacts of alternative emission control systems are measured by the same set of parameters. In addition,

[5] United States Environmental Protection Agency (US EPA), *Guidelines for Determining Best Available Control Technology (BACT),* 1978; 1980.

through implementation of these guidelines, BACT in one area of the country may not be identical to BACT in another area. According to US EPA (1980):

> *BACT analyses for the same types of emissions unit and the same pollutants in different locations or situations may determine that different control strategies should be applied to the different sites, depending on site-specific factors. Therefore, BACT analyses must be conducted on a case-by-case basis.*

The BACT requirements are intended to ensure that the control systems incorporated in the design of proposed or modified equipment reflect the latest in control technologies used in a particular industry and take into consideration existing and future air quality in the vicinity of the facility. BACT must, at a minimum, demonstrate compliance with NSPS for a source (if applicable). An evaluation of the air pollution control techniques and systems, including a cost-benefit analysis of alternative control technologies capable of achieving a higher degree of emission reduction than the proposed control technology, is required. The cost-benefit analysis requires the documentation of the materials, energy, and economic penalties associated with the proposed and alternative control systems, as well as the environmental benefits derived from these systems. A decision on BACT is to be based on sound judgment, balancing environmental benefits with energy, economic, and other impacts (US EPA, 1978).

In December 1987, EPA issued a policy memorandum that established a new “top-down” approach to BACT decision-making. In October 1990, EPA issued a draft “New Source Review Workshop Manual” that outlines a five-step “top-down” process to be used for all BACT assessments. EPD utilizes the same Manual for assessing BACT analyses submitted as part of PSD permit applications.

The five steps of the “top-down” review are presented below.

5.1.1. Step 1 – Identify all Control Technologies

The first step in the BACT analysis is to identify all available control technologies for each new or modified emission unit and regulated pollutant required to be evaluated. The only pollutant required to be evaluated for PSD for this project is VOC. As previously mentioned, the new or modified VOC sources to be evaluated include two existing Batch Kilns, a NG-fired Package Boiler, and two continuous kilns. Potentially applicable emission control technologies were investigated by reviewing the EPA’s RACT/BACT/LAER Clearinghouse (RBLC) control technology database, technical literature, control equipment vendor information, and by using process knowledge and engineering experience. The RBLC lists control technologies that have been approved in PSD permits issued by state regulatory agencies as BACT for numerous process units. Process units in the database are grouped into categories by industry type.

5.1.2. Step 2 Elimination Of Technically Infeasible Control Technologies

The second step in the BACT assessment is to eliminate technically infeasible control technologies. Each control technology is considered and those that are clearly technically infeasible are eliminated from further consideration in the BACT analysis. If a control technology has been installed and operated successfully on a similar emission source, then it has been demonstrated in practice and is considered technically feasible. If a control technology has not been demonstrated on a similar source, then the applicant must determine if the technology is applicable to the emission source under consideration. A control technology is eliminated from further consideration if it is shown that the technology has not been demonstrated on similar emission sources and that it cannot be applied to the emissions source under consideration.

5.1.3. Step 3 – Ranking Of Control Technologies By Control Effectiveness

Once technically infeasible options are removed from consideration, the remaining options are ranked based on their control effectiveness. If there is only one remaining option, or if all of the remaining technologies could achieve equivalent control efficiencies, ranking based on control efficiency is not required.

5.1.4. Step 4 Evaluation of Control Technologies

The fourth step in the top-down BACT assessment is to evaluate the cost effectiveness of the control technologies that are were not eliminated in Step 2 and document the results.

Cost effectiveness evaluations were prepared for each of the technically feasible control technologies identified for each emission unit. These evaluations were performed using EPA's "Air Pollution Control Cost Manual" as described in the following paragraphs.[6]

The Manual provides detailed engineering information that reflects the latest innovations in the industry and costing information that is up-to-date and relevant. The cost information in the Manual provides a rough "order of magnitude" cost estimate, nominally accurate to within ± 30%. The Manual provides capital and annual operating costing procedures and data for several different types of pollution control systems.

The Total Purchased Equipment Cost represents the delivered cost of the control equipment, auxiliary equipment, and instrumentation. Auxiliary equipment consists of all the structural, mechanical, and electrical components required for the efficient operation of the control device. Auxiliary equipment costs are estimated as a straight percentage of the equipment cost using factors from the Manual. Direct installation costs consist of the direct expenditures for materials and labor for site preparation, foundations, structural steel, equipment erection, piping, electrical work, and painting. Indirect installation costs include engineering and supervision of contractors, construction and field expenses, contractor construction fees, and engineering contingencies. Other indirect costs include equipment startup, performance testing, working capital, and interest costs during construction.

Annual operating costs are comprised of both direct and indirect operating costs. Direct annual operating costs include labor, maintenance, replacement parts, raw materials, utilities (including fuel costs, electricity costs, process water costs, wastewater treatment costs, compressed air costs, etc.), and waste disposal. Indirect annual operating costs include plant overhead, taxes, insurance, general administration, and charges for capital. Replacement part costs, such as the cost of replacement catalysts, were included where applicable, while raw material costs were estimated based upon the unit cost and the annual consumption. With the exception of overhead, indirect operating costs were calculated as a percentage of the total capital costs. The indirect capital costs were based on the capital recovery factor (CRF) which is defined as:

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[6] EPA, *OAQPS Control Cost Manual*, 6th edition, EPA 452/B-02-001, June 2002. http://www.epa.gov/ttn/catc/dir1/c_allchs.pdf

$$CRF = \frac{i(1+i)^n}{(1+i)^n - 1}$$

where i is the annual interest rate and n is the life of the control equipment, in years. The control equipment life is based on the normal life of the control equipment and is set at 20 years for the control options evaluated. For this analysis, an interest rate of 7% was used for all control equipment calculations based on information provided in the Manual.[7]

5.1.5. Step 5 – BACT Selection

In the final step, one pollutant specific control option is proposed as BACT for each emission unit under review based on evaluations from the previous step.

5.2. BACT DETERMINATION FOR NATURAL GAS-FIRED PACKAGE BOILER

This analysis is being conducted to determine the best available control technology for VOC emissions from the new, natural gas-fired Package Boiler when burning 100% natural gas. As mentioned in Section 2.4.1, Warrenton may utilize a 20,000 pound steam/hr or 30,000 pound steam/hr NG-fired boiler, depending whether one or two of the existing Batch Kilns are being operated. Both boiler's VOC emission profile and operation would be comparable on a lb/MMbtu basis. The following analysis is based on either boiler with cost estimates based on the 30,000 pound steam/hr boiler as the use of the larger boiler would result in a lower cost effectiveness value.

5.2.1. Step 1 - Identification of Control Technologies

There are several approaches that can be used to reduce VOC emissions from boilers. The first involves combustion modification techniques and a second approach involves the addition of post-combustion controls. The third technique involves the use of "good combustion practices". All three of these approaches are addressed in the following sections.

5.2.1.1. Combustion Modification - Overfire Air

The main combustion modification technique for reducing VOC emissions is the use of an overfire air system. The reduction in VOC emissions realized from this technique is highly dependent upon the uncontrolled VOC concentration, combustion chamber oxygen content, distribution of the air (e.g., portion of the air introduced through the burners versus through the overfire air ports), and type and method of fuel being fired. The use of an overfire air system ensures that complete combustion takes place, usually in the upper portion of a boiler's combustion chamber, to reduce the level of VOCs in the boiler exhaust gases.

The use of an overfire air system in a natural gas-fired boiler can reduce VOC emissions up to 25% compared to VOC emission levels in boilers without an overfire air system.

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[7] EPA, *OAQPS Control Cost Manual*, 6th edition, Section 2, Chapter 1, page 1-52. http://www.epa.gov/ttn/catc/dir1/c_allchs.pdf

5.2.1.2. Post-Combustion Control - Oxidation Catalyst

The primary post-combustion technique used to reduce VOC emissions is the use of an oxidation catalyst system. These conventional systems can provide approximately 75% reduction of VOC emissions by passing the boiler flue gas exhaust through a catalyst bed that converts the exhaust gases to carbon dioxide and water vapor. These systems work best if the flue gas exhaust temperature is within the range of 600-1,100 degrees Fahrenheit (°F), with an optimum temperature of about 800°F. If the exhaust gas stream temperature of the combustion device in question is lower than the optimum temperature range, then additional heat is needed in order to raise the temperature to the desired level. This may add significant operating costs to the control system since fuel must be burned in order to supply the additional heat.

5.2.1.3. Good Combustion Practices

Another approach that can be used to minimize VOC emissions from boilers is the use of "good combustion practices". Examples of "good combustion practices" for a natural gas-fired boiler include operator practices, maintenance practices, maintaining proper stoichiometric fuel-to-air ratios, monitoring of fuel quality and consistency, temperature, and combustion air distribution. Additionally, a start-up, shutdown and malfunction plan should be developed and followed to ensure that emissions are minimized to the extent practicable during these periods of operation. All of these factors can affect the pollutant emission rate generated by the boiler, as well as the boiler combustion efficiency.

By following these "good combustion practices", VOC emissions will be minimized. There is no specific percent reduction that can be given for using good combustion practices, however, without their use, VOC emissions from a natural gas-fired boiler could increase by a factor of 100% or more, as compared to a boiler that uses good combustion practices. It is in the facility's interest to use good combustion practices so that boiler efficiency is not compromised.

5.2.1.4. Review of RACT/BACT/LAER Clearinghouse

Searches of the RACT/BACT/LAER Clearinghouse (RBLC) were conducted to identify technologies for the control of VOC emissions from boilers with natural gas-fired burners. Searches were only conducted for RBLC determinations added during or after January 2000 and for small industrial-sized boilers with a heat input range between 25-35 million British thermal units per hour (MMBtu/hr). The RBLC technology listings are provided in Appendix C and are summarized as good combustion control or no control.

5.2.1.5. Review of Technologies in Use at Georgia-Pacific's Manufacturing Facilities

GP operates a number of wood products facilities in the United States, but only uses a small number of natural gas-fired package boilers, since much of the heat for lumber kilns is provided by steam supplied from boilers located at the site or adjacent manufacturing facilities, or from direct-fired sawdust or planer shaving burners in the kiln itself.

None of the newer NG-fired Package Boilers at GP's facilities employ overfire air systems to improve combustion efficiency and reduce VOC emissions since they are designed with state-of-the-art combustion air control systems that minimize VOC emissions to the same extent as if the boiler employed an overfire air system. In addition, none of these boilers have add-on controls for VOC.

5.2.2. Step 2 - Technical Feasibility Analysis

All control technologies listed above are technically feasible.

5.2.3. Step 3 - Ranking of Control Technologies by Control Effectiveness

The next step in the BACT analysis is to rank the various control options not eliminated in the previous step. Table 5-1 presents the remaining technologies.

TABLE 5-1. VOC Control Technology Hierarchy

CONTROL TECHNOLOGY	CONTROL EFFICIENCY
Oxidation Catalyst	75%
Overfire Air System	Up to 25%
Good Combustion Practices	No specific value

5.2.4. Step 4 – Cost Effectiveness Evaluation of Remaining Control Technologies

This step of the BACT process is necessary when the top control is not selected as BACT. Step 4 determines the economic impact of the feasible control options listed in Step 3 and then selects the most appropriate technology as BACT for the Package Boiler. The economic analysis is based on cost data supplied by the equipment suppliers, GP experience at other locations, and the use of cost estimating spreadsheets contained in Chapter 2 of EPA's Office of Air Quality Planning & Standards (OAQPS) Control Cost Manual, 6th Edition, January 2002 (Chapter 2-Cost Estimating Methodology).

5.2.4.1. Oxidation Catalyst

To estimate the cost for the purchase and installation of an oxidation catalyst system to reduce VOC emissions from the Package Boiler, GP prorated an estimate for a system that was designed for use with a recovery furnace that will be converted to burn 100% natural gas at one of its paper mills in the state of Alabama. The proration was performed by scaling the costs based on the ratio of exhaust gas flow between the converted recovery furnace to a gas-fired boiler and the proposed Package Boiler, then using the “rule of six-tenths” to calculate the estimated cost for installing an oxidation catalyst system for the Package Boiler.

As stated earlier, it is necessary to raise the exhaust temperature of the Package Boiler in order for an oxidation catalyst system to work properly if the exhaust temperature is below the optimum value for the catalyst to work effectively. In order to work effectively, the exhaust gas temperature from the Package Boiler must be raised from 550 ^{o}F to approximately 800 °F for the catalyst to optimally reduce VOC emissions. The cost for a duct burner was also calculated since the exhaust gas temperature from the Package Boiler is not high enough to allow the oxidation catalyst to work optimally. The use of a duct burner to raise the exhaust temperature from 550 °F to 800 °F, would also require the facility to burn approximately 3 MMBtu of natural gas per hour at a cost of $105,120 per year (based on a current natural gas cost of $4.00/MMBtu) (see Table 5-12 in Appendix C to this report). The use of a duct burner would also slightly increase VOC emissions by approximately 0.07 tons per year (tons/yr).

The potential VOC emission rate from the boiler is approximately 0.91 tons/yr based on 8,760 hours of operation per year. Therefore, the total tons of VOC generated would be equal to 0.07 + 0.91 = 0.98 tons/yr. Assuming a minimum VOC reduction of 75% with the use of the VOC catalyst system, 0.69 tons of VOCs would be removed. As shown in Table 5-3, this equates to a cost effectiveness of approximately $256,000/ton of VOC removed. Details of the cost analysis used to determine the cost effectiveness are also contained in Table 5-10 and 5-11 in Appendix C.

This value is above any reasonable level of cost for reducing VOC emissions. Therefore, it is economically infeasible to use an oxidation catalyst system to remove VOC emissions from the NG-fired Package Boiler. In addition, the use of a duct burner increases the amount of VOC due to the combustion of natural gas. For these reasons, an oxidation catalyst system for the NG-fired Package Boiler will not be discussed further as part of this BACT analysis.

5.2.4.2. Overfire Air System

Although the natural gas burner system that GP will be purchasing **does not** include an overfire air system, VOC emissions will be minimized to a level equivalent to what would be possible with the installation of an overfire air system. For this reason, it is not necessary to perform a cost effectiveness evaluation for an overfire air system.

5.2.4.3. Good Combustion Practices

GP will utilize good combustion practices for the Package Boiler at all times when the unit is in operation. Since the facility will utilize this last feasible control technology, it is not necessary to perform a cost effectiveness evaluation.

5.2.5. Step 5 - Select BACT

GP believes that good combustion practices for the NG-fired Package Boiler represent BACT. This is equivalent to the "highest" BACT control technologies listed in Table 5-13 from the RBLC, which consistently indicates good combustion practices and/or design/proper combustion techniques. As discussed in Step 4 of this analysis, it is economically infeasible to use an oxidation catalyst system. Also as discussed in Step 4 of this analysis, GP will install a NG-fired Package Boiler utilizing a burner system that meets a VOC emission level equivalent to that which would be achieved through the use of an overfire air system, but without actually installing an overfire air system.

The BACT emission limits for VOC emissions contained in Table 5-13 in Appendix C range from 0.0007 lb/MMBtu to 0.024 lbs/MMBtu. This wide range in emission rates is due to a number of variables, including boiler size and physical configuration, combustion design, year of manufacture, and whether or not the VOC emission rate is based on boiler design or an AP-42 emission factor.

The facility agrees to a VOC BACT permit limit of 0.0054 lb/MMBtu, which is based on an AP-42 emission factor for small industrial boilers firing natural gas (see Table 1.4-2). This value is within the range of BACT entries for VOC emissions from natural gas-fired boilers.

5.3. BACT DETERMINATION FOR BATCH KILNS

This analysis is being conducted to determine the best available control technology for VOC emissions from the modified batch steam-heated lumber kiln numbers 202 and 203.

5.3.1. Step 1 - Identification of Control Technologies

The first step in the BACT analysis is to identify all available control technologies for each new or modified emission unit and regulated pollutant required to be evaluated. The only pollutant required to be evaluated for this project is VOCs from the modified Batch Kilns. Potentially applicable emission control technologies were investigated by reviewing the EPA's RACT/BACT/LAER Clearinghouse (RBLC) control technology database, technical literature, control equipment vendor information, and by using process knowledge and engineering experience from similar GP facilities. The RBLC lists control technologies that have been approved in PSD permits issued by state regulatory agencies as BACT for numerous process units. Process units in the database are grouped into categories by industry type.

A search of the RBLC database was performed to identify the emission control technologies and emission rates that were determined by permitting authorities as BACT for the wood products industry (Process Code 30.800 in the RBLC system). The results of the search indicate that no add-on control technologies have been implemented as part of a PSD or LAER permitting effort to control VOC emissions from lumber drying kilns. In addition, even though this BACT analysis is only being performed for VOCs, we have reviewed the other PSD-regulated pollutants in the RBLC and determined that no add-on control technologies have been implemented to control any other PSD-regulated pollutants for lumber drying kilns. A summary of the RBLC findings is included in Table 5-12 in Appendix C.

GP operates a number of batch lumber drying kilns across the US. None of the batch lumber drying kilns at any of GP's manufacturing facilities utilize controls to remove VOCs. In addition, to the best of GP's knowledge, no lumber kilns operating in the US utilize pollution controls to remove VOCs.

While add-on controls have not been demonstrated for lumber drying kilns, the following control technologies have been demonstrated to remove VOC emissions for other industrial processes:

- Thermal Oxidation
- Catalytic Oxidation
- Condensation
- Carbon Adsorption
- Wet Scrubbing
- Biofiltration
- Proper Kiln Design and Operation

A brief description of each of the VOC control technologies listed above is provided in the following sections.

5.3.1.1. Thermal Oxidation

Thermal oxidizers work on the principle of reacting VOCs from an industrial process exhaust gas stream with oxygen in air to form carbon dioxide and water vapor as shown in the following chemical reaction:

$$VOCs + O_2 + heat \rightarrow H_2O + CO_2$$

This reaction occurs when the exhaust gases from an industrial process are heated to a sufficiently high temperature, typically 1,400-1,600 °F with a residence time in the combustion chamber between one-half to one second.

Thermal oxidizers can be designed as conventional thermal units, recuperative units, or regenerative thermal oxidizers (RTOs). A conventional thermal oxidizer does not utilize heat recovery with a heat exchanger. Therefore, the supplemental fuel cost is extremely high and is not suitable for applications with high exhaust gas flow and low VOC concentrations. In a recuperative thermal oxidizer, the VOC-laden inlet gases are preheated by the combustion exhaust gas stream of the oxidizer through the use of a heat exchanger. The heat exchanger will recover as much as 95% of the heat from the exhaust gases and preheat the combustion air, thereby providing significant fuel savings (to heat up the combustion air with supplemental fuel) compared to a system that does not incorporate a heat exchanger. An RTO consists of at least two separate chambers packed with ceramic media. The VOC-laden gas enters one hot ceramic bed where the gas is heated to the desired combustion temperature. Auxiliary fuel may be required in this stage, depending on the heat content of the VOCs contained in the inlet gas stream. The gas stream is directed through the other ceramic bed, where the heat released from combustion is recovered and stored in the ceramic bed. The process gas flow then is switched so that the inlet gas stream can be preheated by the heat recovered in the ceramic bed. The RTO is operated using an alternating cycle for the two ceramic beds, recovering up to 95% of the thermal energy generated by the combustion process during normal operation. RTO's have the potential to remove 99+% of VOCs from a gas stream, depending on the specific VOCs present in the gas stream. Based on our knowledge of lumber kiln exhaust gases (as lower VOC concentrations result in lower destruction values), it is conservatively assumed that an RTO would achieve 95% VOC destruction.

5.3.1.2. Regenerative Catalytic Oxidation

Similar to an RTO, a regenerative catalytic oxidizer (RCO) oxidizes VOCs to carbon dioxide and water vapor using a metallic catalyst. An RCO allows the oxidation of VOCs to take place at a much lower temperature compared to an RTO. Oxidation of VOCs in an RCO usually takes place at temperatures ranging from 500-600 °F. This creates the opportunity to reduce fuel expenses and materials of construction costs for the RTO (since the materials of construction will be subject to much lower temperatures, thereby reducing the risk of rapid corrosion or deterioration of the materials of construction). The addition of a combustion air preheater will further reduce the fuel costs. These types of oxidizers are just as capable in removing VOCs from a gas stream. VOC destruction efficiencies have the potential to be 95% or greater, depending on the specific VOC compounds present in the exhaust gas stream. Based on our knowledge of the exhaust gases from a lumber kiln (as lower VOC concentrations result in lower destruction values), we are assuming that an RCO would achieve a minimum VOC destruction efficiency of 90%.

5.3.1.3. Condensation

Condensation systems remove VOC emissions by condensing VOCs within the exhaust gas stream by either increasing pressure or lowering the temperature of the exhaust gases. The condensed VOCs are then destroyed in a separate combustion device or the materials are recovered for sale. Condensation requires that the exhaust stream be cooled to a temperature low enough such that the vapor pressure of the exhaust gases are lower than the VOC concentration of the exhaust gases.

5.3.1.4. Carbon Adsorption

Carbon adsorption systems can potentially be used to remove VOCs from exhaust gas streams. The core component of a carbon adsorption system is an activated carbon bed contained in a steel vessel. The VOC-laden exhaust gases pass through the carbon bed where the VOC is adsorbed on the activated carbon. The cleaned gas is discharged to the atmosphere. The spent carbon is regenerated either at an on-site regeneration facility or by an off-site activated carbon supplier. One method used to regenerate spent activated carbon is by using steam to displace adsorbed organic compounds at high temperatures.[8]

The VOC removal efficiency is dependent upon the absorption capacity for each of the specific organic compounds that make-up the exhaust gas stream. The adsorption capacity for a particular contaminant represents the amount of the contaminant that can be adsorbed on a unit weight of activated carbon consumed at the conditions present in the application. Typical adsorption capacities for moderately adsorbed compounds range from 5 to 30 percent of the weight of the carbon. In the adsorption process, molecules of a contaminated gas stream are attracted to and accumulate on the surface of the activated carbon. Carbon is a commonly used adsorbent due to its very large surface area. While most organic compounds will adsorb on activated carbon to some degree, the adsorption process is most effective on higher molecular weight and high boiling point compounds. Compounds having a molecular weight over 50 and a boiling point greater than 50 degrees centigrade are good candidates for adsorption.

5.3.1.5. Wet Scrubbing

Scrubbing of VOCs contained in an exhaust gas stream is usually accomplished in a packed column (or other type of column) where the VOCs are absorbed by countercurrent flow of a scrubbing liquid. Scrubbing liquids include water, a caustic solution, or another liquid media that will interact to remove the VOC compounds. Wet scrubbing is most effective for water soluble VOC compounds, such as alcohols. Removal efficiencies for hydrophilic VOCs (VOCs that mix, dissolve or are wetted by water) can exceed 90%, depending upon the specific chemical compound(s) that make-up the VOCs within the exhaust gas stream. The VOC compound(s) to be scrubbed from the exhaust gas stream must be soluble in the absorbing liquid and even then, for any given absorbent liquid, only VOCs that are soluble in the scrubbing liquid can be removed.

5.3.1.6. Biofiltration

Biofiltration is a technology where a VOC-laden exhaust stream is directed through a biologically active media. Biofiltration uses microorganisms to break down organic compounds into carbon dioxide, water, and salts. When the biofilter is built, the microorganisms are already on the material that is used as a filter bed. The filter bed material normally used is peat, soil, or compost, but granulated activated carbon

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[8] Shepard, Austin. Activated Carbon Adsorption for Treatment of VOC Emissions. Presented at 13th Annual EnviroExpo, Boston Massachusetts- May 2001. http://www.carbtrol.com/voc.pdf.

and polystyrene can also be used. The choice of filter bed material is very important because it has to supply the nutrients for the microorganisms, support biological growth, and have good sorption capacity.

The biological process is oxidation by microorganisms and can be written as follows:

$$VOC + O_2 + \text{microorganisms} + \text{nutrients} \rightarrow CO_2 + H_2O + \text{Heat} + \text{microorganisms}$$

The microorganisms live in a thin layer of moisture, or the “biofilm”, which is built around the particles of the filter material. The contaminated gas stream is diffused through the biofilter and adsorbed onto the biofilm. The biofilm is the where the oxidation process actually takes place. The VOCs contained in the exhaust gas stream are not permanently transferred to the filter bed material.

Temperature, oxygen level, and pH of the exhaust gas stream affect the level of VOC removal. Microorganisms work best when the temperature is between 85 and 105 °F. Gas stream temperatures well above 105 °F will kill the bacteria contained in the filter media and thereby negate its effectiveness. Also, since most of the biological degradations are aerobic in nature, the oxygen level is very important in the biofiltration process. In fact, oxygen is not used directly in the gaseous form, but the microorganisms use the oxygen present in the dissolved form in the biofilm. The microorganisms are most efficient at neutral pH values (pH around 7). Thus, the pH level of the contaminated gas stream must be maintained at a neutral level.

Biofilters are most effective in removing water soluble VOC compounds and have demonstrated removal efficiencies for individual hydrophilic compounds such as methanol and formaldehyde that exceed 90%. Vendors claim that this technology has the capability to remove approximately 50-70% of the **total** VOCs, emitted from a gas stream (comprised of VOC compounds with varying degrees of water solubility) when used under favorable operating conditions of low temperature, readily available oxygen, and neutral pH conditions. Based on GP’s familiarity with the operation of biofiltration units on other process units within the Building Products Industry, the control efficiency is likely much lower than the vendor claims. Stack test data for the Board Press at the Weyerhaeuser Oriented Strand Board facility in Elkin, NC, indicates that the biofilter only achieves approximately 15 percent control of total VOCs. Stack test data for the Board Press at GP's Particleboard facility in Thomson, GA, indicates that the biofilter only achieves approximately 10 percent control of total VOCs. The aforementioned control efficiencies are based on total VOC presented on a carbon basis.

5.3.1.7. Proper Kiln Design and Operation

The naturally-occurring VOCs in lumber are driven-off from the heat used to dry the lumber within the kiln. Lumber is dried to specific moisture content for quality control purposes. Proper design and operation of the lumber kilns prevents over drying of the lumber that may release additional VOCs to the atmosphere. As a result, proper operation of the kilns will minimize VOC emissions to the atmosphere.

5.3.2. Step 2 - Technical Feasibility Analysis

The second step of the BACT assessment is the elimination of any technically infeasible control technologies discussed in Step 1. Each control technology presented in Step 1 is considered and those that are clearly technically infeasible are eliminated. If a control technology has been installed and operated successfully on a similar emission source, then it is assumed to have been demonstrated in practice and is considered technically feasible. If the control technology has not been demonstrated on a similar source, then the applicant must determine if the technology is available and applicable to the emission source under consideration. A control technology is eliminated from further consideration if it can be shown that the technology has not been demonstrated on similar emission sources and that it also is not commercially available or cannot be applied to the emissions source under consideration. As stated in Section 5.1.2 of this BACT analysis, eliminating a control technology requires clear documentation of the technical difficulties that would preclude the use of the control option being evaluated, using physical, chemical, and engineering principles.

Batch Kiln Nos. 202 and 203 are essentially insulated building structures with two rail tracks and doorways at each end of the kilns. At the top of the kiln, above the lumber, is a series of air circulation fans and baffles, and exhaust vents in the roof. The airflow from the fans is heated as it passes through the steam coils. The airflow then enters the first of two tracks of stacked lumber. The stacks of lumber have sticks between each layer to allow for airflow through the layers of lumber and baffles around each stack to keep the air from bypassing the lumber. After the air exits the first track of stacked lumber it is passed through the steam coils and re-heated, and is directed through the second track of stacked lumber. Heated air exits the second track of lumber and negative pressure from the fans draws it back to the top of the kiln to be recirculated.

The series of fans in the top of the kiln drives the uniform distribution of air flow across the lumber stacks by pressurizing one side of the kiln at a time. Thus, the kiln is positively pressurized on one side of the kiln from the static pressure generated by the fan, and an increase in vapor pressure (a result of the air in the kiln heating up and picking up moisture from the lumber). The fan direction is reversed every few hours to balance the moisture content of the lumber. Maintaining the correct atmospheric moisture conditions inside of the kiln is also critical to the quality control of the drying process. The equally spaced air vents in the top of the kiln are opened at different intervals throughout the drying process to maintain a controlled wet bulb temperature (relative humidity). When kiln vents are opened, wet, moist air exhausts through the positive pressure side vents, with the vents on the negative pressure side remaining closed.

Attempting to pull a constant negative pressure on a Batch Kiln to capture the exhaust gases, and therefore the emissions, makes it virtually impossible to control the wet bulb temperature, maintain equal heat distribution in the kiln, and equalize airflow through the various layers of lumber. Maintaining a constant negative pressure inside of the kiln would also result in increased energy usage to dry the lumber. Therefore, it is not technically feasible to capture the exhaust gases from a Batch Kiln and operate the kiln with the proper level of quality control. Since the exhaust gases cannot be captured and directed through a single exhaust stack, it is not technically feasible to utilize an “add-on” pollution control device.

5.3.3. Step 3 - Ranking of Control Technologies by Control Efficiency

In the third step of the top-down analysis, the remaining technically feasible control technologies are ranked in order of their control efficiency. As previously discussed, since it is not feasible to capture exhaust gases from a Batch Kiln during the drying process, no add-on pollution control devices would be considered technically feasible. Therefore, the only remaining control technology for consideration is proper design and operation of the Batch Kilns.

5.3.4. Step 4 – Cost Effectiveness Evaluation of Control Technologies

The fourth step in the top-down BACT assessment procedure is to evaluate the cost effectiveness of the control technologies ranked in Step 3 and document the results.

Since all add-on pollution control devices were eliminated in Step 2, the only remaining feasible control technology listed in Step 3 is "proper design and operation" of the batch lumber kiln. Since this control option is considered the top (and only remaining) control option for a batch lumber kiln, a cost effectiveness evaluation is not required.

5.3.5. Step 5 - Select BACT

Based on the technical infeasibility of any add-on control devices for a Batch Kiln, "proper design and operation" of the batch lumber kilns is being proposed as BACT. This determination is consistent with the information contained in the RBLC (see Table 5-14 in Appendix C), which indicates that no control technologies have been implemented to control VOC emissions from lumber drying kilns.

If a source is subject to a NSPS or NESHAP, the minimum control efficiency to be considered in a BACT analysis must result in an emission rate no less than or equal to the NSPS or NESHAP emission rate, whichever is more stringent. In other words, the applicable NSPS or NESHAP limit represents the maximum allowable emission limit for an emission source. There is no applicable NSPS for batch lumber drying kilns. However, batch lumber kilns are considered "affected sources" under 40 CFR 63, Subpart DDDD – National Emission Standards for Hazardous Air Pollutants: Plywood and Composite Wood Products (PCWP). There are no applicable emission limits or pollution controls that have been established for batch lumber kilns under the PCWP NESHAP.

GP is proposing a BACT VOC emission limit for Batch Kiln Nos. 202 and 203 at the Warrenton GA CNS based on an emission factor of 4.28 lb/MMBF (as carbon). This emission limit will be achieved through the proper design and operation of the kilns and minimizing over-drying while meeting relevant lumber moisture specifications. This limit is within the range of BACT determinations listed in Table 5-14 in Appendix C, which summarizes the BACT limits in PSD permits issued to other batch lumber kilns around the country which show a range from 3.5 to 7.0 lb VOC/MBF. The variation in emission rates among the entries in the database can be explained by several factors. First, VOC emission rates from lumber kilns vary due to different species of lumber used throughout the country. Second, lumber kilns designed by different manufacturers operate with different targets for moisture content and use different drying temperatures. As a result, the VOC emission rates for lumber kilns will vary due to changes in these two variables. To the best of our knowledge, no add-on pollution controls have been applied to Batch Kilns, and VOC emissions from all batch lumber kilns are emitted directly to atmosphere from the kiln exhaust vents.

5.4. BACT DETERMINATION FOR DIRECT-FIRED CONTINUOUS DUAL PATH KILNS

This analysis is being conducted to determine the best available control technology for VOC emissions from the new CDK. As previously mentioned, one new CDK (204) will be constructed and operated in Phase I of the project. During Phase II of the project, Batch Kiln 203 will be removed and a second CDK (205) will be constructed.

5.4.1. Step 1 - Identification of Control Technologies

Potentially applicable control technologies for the direct-fired CDKs are identical to those presented for the existing modified Batch Kilns, except the need to treat particulate matter emissions (emitted from the direct-fired sawdust burner into the kiln drying chamber) prior to the use of thermal and catalytic oxidation controls. As previously stated in section 5.3.1, no add-on controls have been demonstrated for lumber drying kilns, regardless of drying method (batch, continuous, direct or indirect-fired). The list of potentially applicable control technologies that have been demonstrated to remove VOC emissions from other industrial processes has been updated and provided below for the CDKs to include the need to treat particulate matter emission prior to thermal and catalytic oxidation controls:

- Wet electrostatic precipitator (WESP) followed by Thermal Oxidation
- WESP followed by Catalytic Oxidation
- Condensation
- Carbon Adsorption
- Wet Scrubbing
- Biofiltration
- Proper Kiln Design and Operation

Please refer back to sections 5.3.1.3 through 5.3.1.7 for descriptions of condensation, carbon adsorption, wet scrubbing, biofiltration and proper kiln design and operation, as these control technologies would have the same descriptions as those presented for indirect-fired Batch Kilns as direct-fired CDKs. The following subsections provide a description of a WESP followed by thermal oxidation as well as a WESP followed by catalytic oxidation control technologies.

5.4.1.1. Thermal Oxidation with Use of Wet Electrostatic Precipitation

Thermal oxidizers work on the principle of reacting VOCs from in an industrial process exhaust gas stream from an industrial process with oxygen in air to form naturally occurring carbon dioxide and water vapor as shown in the following chemical reaction:

$$\text{VOCs} + O_2 + \text{heat} \rightarrow H_2O + CO_2$$

This reaction occurs when the exhaust gases from an industrial process are heated to a sufficiently high temperature, typically 1,400-1,600 °F with a residence time in the combustion chamber between one-half to one second.

Thermal oxidizers can be designed as conventional thermal units, recuperative units, or regenerative thermal oxidizers (RTOs). A conventional thermal oxidizer does not utilize heat recovery with a heat exchanger. Therefore, the supplemental fuel cost is extremely high and is not suitable for applications with high exhaust gas flow and low VOC concentrations. In a recuperative thermal oxidizer, the VOC-laden inlet gases are preheated by the combustion exhaust gas stream of the oxidizer through the use of a heat exchanger. The heat exchanger will recover as much as 95% of the heat from the exhaust gases and preheat the combustion air, thereby providing significant fuel savings (to heat up the combustion air with supplemental fuel) compared to a system that does not incorporate a heat exchanger. An RTO consists of at least two separate chambers packed with ceramic media. The VOC-laden gas enters one hot ceramic bed where the gas is heated to the desired combustion temperature. Auxiliary fuel may be required in this stage, depending on the heat content of the VOCs contained in the inlet gas stream. The gas stream is directed through the other ceramic bed, where the heat released from combustion is recovered and stored in the ceramic bed. The process gas flow then is switched so that the inlet gas stream can be preheated by the heat recovered in the ceramic bed. The RTO is operated using an alternating cycle for the two ceramic beds, recovering up to 95% of the thermal energy generated by the combustion process during normal operation. RTO's have the potential to remove 99+% of VOCs from a gas stream, depending on the specific VOCs present in the gas stream. Based on our knowledge of lumber kiln exhaust gases (as lower VOC concentrations result in lower destruction values), it is conservatively assumed that an RTO would achieve 95% VOC destruction.

RTO performance is subject to particulate matter (PM) contained in the exhaust gas stream. Therefore an exhaust gas stream with PM loading must be removed from the exhaust gas prior to entering the RTO. The placement of WESPs ahead of an RTO has been used in the oriented strand board (OSB) industry to control PM and VOC emissions from the rotary driers. WESPs are used instead of dry ESPs when wet, sticky or flammable particulate material is collected, making it a preferred method of PM removal prior to the RTO. PM removal efficiencies of the WESP range from 90 -99+%, depending upon the design of the ESP.

5.4.1.2. Regenerative Catalytic Oxidation with Use of Wet Electrostatic Precipitation

Similar to an RTO, a regenerative catalytic oxidizer (RCO) oxidizes VOCs to carbon dioxide and water vapor using a metallic catalyst. An RCO allows the oxidation of VOCs to take place at a much lower temperature compared to an RTO. Oxidation of VOCs in an RCO usually takes place at temperatures ranging from 500-600 °F. This creates the opportunity to reduce fuel expenses and materials of construction costs for the RTO (since the materials of construction will be subject to much lower temperatures, thereby reducing the risk of rapid corrosion or deterioration of the materials of construction). The addition of a combustion air preheater will further reduce the fuel costs. These types of oxidizers are just as capable in removing VOCs from a gas stream. VOC destruction efficiencies have the potential to be 95% or greater, depending on the specific VOC compounds present in the exhaust gas stream. Based on our knowledge of the exhaust gases from a lumber kiln (as lower VOC concentrations result in lower destruction values), we are assuming that an RCO would achieve a minimum VOC destruction efficiency of 90%.

PM removal is even more critical for RCOs than RTOs as the catalyst may be blinded by PM build-up. Additionally, RCOs are sensitive to poisoning from heavy metals present in the exhaust gas stream. As such, it is necessary to remove PM emissions prior to directing the exhaust gases through the RCO. WESPs have the highest PM control efficiency for this type of system, compared to wet scrubbers or high efficiency cyclones, with a PM removal efficiency of 90-99+%, depending upon the particle size fraction of the PM material being removed.

5.4.2. Step 2 - Technical Feasibility Analysis

The second step in the BACT assessment is the elimination of any technically infeasible control technologies discussed in Step 1. Each control technology presented in Step 1 is considered and those that are clearly technically infeasible are eliminated. If a control technology has been installed and operated successfully on a similar emission source, then it is assumed to have been demonstrated in practice and is considered technically feasible. If a control technology has not been demonstrated on a similar source, then the applicant must determine if the technology is applicable to the emission source under consideration. A control technology is eliminated from further consideration if it is shown that the technology has not been demonstrated on similar emission sources and that it also is not commercially available or it cannot be applied to the emissions source under consideration.

To the best of our knowledge, no control technologies for the removal of VOC emissions have been applied to, or demonstrated for lumber kilns (batch or continuous), or upon exhaust gas streams with a similar characteristics to the exhaust gases from lumber kilns. There are a number of inherent difficulties in designing a technically feasible control system for a lumber kiln. Because no emission control technologies have been applied to lumber kilns, actual operational and maintenance problems are not fully understood. Basic technical challenges identified with controlling lumber kilns with the use of several potential control technologies, are categorized as follows:

- Exhaust gas collection; and
- Collection and treatment of condensate

Sections 5.4.1.1 and 5.4.1.2 address the technical challenges listed above and how these challenges affect the ability of applying emission controls to lumber kilns. Sections 5.4.3 – 5.4.8 provide detailed discussions for each control technology with regards to technical challenges to control VOC emissions from the lumber kilns.

5.4.2.1. Exhaust Gas Collection

Drying within continuous lumber kilns is facilitated by combustion air from a wood-fired burner (the new CDK for this project will use a sawdust burner) mixed with circulating air in a blend chamber. A centrifugal blower forces the heated air through a duct to a plenum that distributes the air to circulating fans inside the kiln. The heated air transfers moisture from the lumber to the air that is circulated throughout the kiln. Heated air from the process is directed through openings at both ends of the kiln. The continuous kiln end openings must remain open at all times to facilitate the continuous loading and unloading of lumber. The process exhaust air (including products of combustion from the direct-fired burner and VOCs from lumber drying) are vented through the end openings and through one or more powered vent exhaust stacks located just inside of and above the kiln end openings. Powered vents within kiln stacks above kiln end openings are a new technology that Georgia-Pacific has employed on two kilns as recently as the third quarter of 2014. GP's new technology results in an estimated 80% of the exhaust air being directed through the powered vent exhaust stacks, and the remaining 20% exhausted through the kiln end openings. Adding additional draft to achieve a higher exhaust rate through the stacks (and less through the kiln end openings) is not achievable as it disrupts the humidity and temperature gradient process conditions required for proper heat transfer and conditioning of the wood.

5.4.2.2. Collection and Treatment of Condensation

The process air both within and exhausted from the kiln has a relative humidity of 100%. While the drying section within the kiln may reach temperatures up to 250 °F, the temperature of the exhaust gases from both of the kiln ends and exhaust stacks is typically between 110 °F and 150 °F. If the temperature of the process exhaust gas stream is not maintained, the exhaust gases will cool as they flow from the exhaust stack through the ductwork to a chosen control device. As the temperature of the process exhaust gas is reduced, water and VOC constituents from the process air will condense and be deposited on the inside of the ductwork. Condensation on the ductwork poses several problems including the quantity generated, the weight of the water buildup, and the buildup of "stickies" from the condensation of VOC compounds. The lumber enters the kiln with a moisture content of approximately 48% and is dried to a moisture content of approximately 13%. An estimated 0.23 gallons of water per board foot is removed from southern yellow pine during the drying process[9]. For a kiln that processes 125,000 MBF per year, a total of 29 million gallons per year of water will be removed. The weight of the condensate generated could cause the exhaust ductwork to collapse without extensive design and support and a drainage system to capture and discharge the condensate to a treatment system. Handling, treating and discharging this quantity of condensate is considered technically infeasible for many of the lumber kilns GP operates for several reasons. First of all, all of the facilities are designated as zero discharge facilities. Secondly, most do not have an onsite wastewater treatment facility (WWTF) to treat the condensate or access to a publicly-owned treatment works (POTW) to dispose of the condensate.

In addition to the quantity and weight of condensate buildup in the exhaust ductwork, kiln condensate is very "sticky" due to the presence of resinous compounds in the exhaust gases, and points of condensation will, over time, build-up and could cause severe blockages and malfunctions of dampers and ductwork connections. The quantity of "stickies" that might build-up is unknown, but severe control system malfunctions are likely as well as a large amount of time and labor expended to clean out the build-up of sticky material, based on previous and current experience within our wood products facilities. Also, stickies are very flammable and would require a robust fire detection and suppression system within the ductwork to prevent fires that could be caused by a spark from the direct fired kiln.

To avoid generating a large quantity of condensate (containing both water and stickies), that would otherwise be considered technically infeasible to manage, GP proposes to heat the process air exiting the kiln stacks to a temperature above the point of condensation. Based on previous experience with condensation within GP plywood, OSB and particleboard capture and control systems, GP concludes the process air captured from the kiln stacks would need to be heated to a minimum of 220 °F in order to capture and treat VOCs in the exhaust gas stream.

5.4.2.3. Wet Electrostatic Precipitator (WESP) followed by Thermal Oxidation

As previously mentioned, RTO performance can be affected by particulate matter contained in the exhaust gas stream. Therefore, particulate matter emissions must be removed from the exhaust gas stream prior to entering the RTO. Particulate matter emissions from the direct fired burner supplying heat to the dryer could lead to bed fouling, performance degradation or fires as the particulate becomes entrained on the media bed. Depending on design of the media, particulate buildup could lead to media bed plugging, blocking airflow through the media bed, resulting in an increase pressure drop. This in turn will require the exhaust fan to work harder and consume more energy. Fouling of the media bed reduces the effectiveness of the unit's ability to transfer heat. At the same time, the buildup of particulate matter presents a serious fire hazard (especially in the presence of "stickies" generated by heating the wood).

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[9] (USDA Agricultural Handbook AH-188: Dry Kiln Operator's Manual)
http://www.fpl.fs.fed.us/products/publications/several_pubs.php?grouping_id=101&header_id=p

To minimize the PM build-up in the media bed, WESPs placed ahead of the RTO is one method currently being used in several GP OSB facilities to control PM and VOC emissions from rotary dryers. GP has determined through experience at other facilities that bed fouling is still an issue, even with a WESP situated ahead of the RTO on a direct fired dryer unit. The bed fouling led to a shortened media life that required complete replacement of the media more frequently than expected. While bed fouling over the course of operation does not render the operation of a WESP/RTO technically infeasible, it does add to the cost of operating the unit, which will be addressed further under Step 4 of this BACT analysis

5.4.2.4. Wet Electrostatic Precipitation & Catalytic Oxidation

PM removal is even more critical for RCOs than RTOs as the catalyst may be blinded by the build-up of PM. RCOs are also sensitive to poisoning by heavy metals that may be contained in the exhaust gas stream. As such, PM removal is necessary in order to prevent blinding of the catalyst inside of the RCO. Blinding of the catalyst occurs when PM coats the catalyst, thereby preventing the coated sections of the catalyst from aiding in the oxidation of VOCs in the exhaust gas stream. The RCO catalyst is also sensitive to poisoning with exhaust gas streams that contain silicon, phosphorous, arsenic and many other heavy metals. While blinding by PM may be reversed by burning off the PM, poisoning requires replacement of the catalyst as the metals become chemically bound to the active surface which reduces the total surface area capable of promoting oxidation. GP has placed RCO media baskets within OSB control systems including a system utilizing a WESP and RTO. After a three month operation period the sample baskets were removed and analyzed. The systems not utilizing the WESP were blinded or poisoned to the point that process air was unable to contact the catalyst. Catalyst removed from the unit employing a WESP showed some blinding and significant poisoning. The catalyst vendor stated that the catalytic oxidation is not a viable control technology for this type of gas stream due to the PM, metals and acidic content of the exhaust gas even with the use of a WESP. Based on this analysis, this control technology is considered technically infeasible and will not be discussed any further.

5.4.2.5. Condensation

Condensation requires that the exhaust stream be cooled to a temperature low enough such that the vapor pressure of the exhaust gases are lower than the VOC concentration of the exhaust gases. The primary constituent of the VOC in the exhaust gas stream from the lumber kilns is terpenes, which would require the temperature of the exhaust stream to be lowered to well below 32°F in order to have a low enough vapor pressure to use condensation. A temperature of 32°F would cause the water vapor in the stream to freeze, and the resulting ice particles would clog the unit. As such, we do not believe that condensation is technically feasible to control VOC emissions from a lumber kiln.

5.4.2.6. Carbon Adsorption

Carbon adsorption systems work on the principle that VOC within the exhaust gas condenses on the surface of the adsorbent. Once the surface has adsorbed all the VOC it can, the VOC is desorbed to generate the adsorbent. Humidity within an exhaust gas has a noticeable effect on the absorption of VOC, particularly in gas streams with high humidity as the water vapor will condense on the adsorbent in addition to the VOC. One study reported desorbing of VOC from the carbon as water displaced the

VOC.[10] As previously mentioned, exhaust gas from the kiln has a relative humidity of 100%; therefore the humidity of the exhaust gas will compete with VOC adsorption and greatly reduce the VOC control of the unit.

Although some VOCs can be desorbed with the use of a chemical treatment, terpenes, the primary VOC constituent in kiln exhaust gases, must be thermally desorbed. As a result, the temperature necessary for desorption are excessively high and would likely damage any commercially-available adsorption media.[11] Adsorption capacity of a carbon system is higher with lower temperature exhaust since desorption takes place near the boiling point of the VOC within the exhaust gas. As previously mentioned, GP proposes to heat the exhaust gas above 220 ˚F to prevent condensing of the gas stream in the ductwork. This temperature is above the boiling point for some of the VOC components within the exhaust gas (e.g. formaldehyde and methanol) and nears the boiling point of pinenes and terpenes. Therefore, VOC control is expected to be greatly reduced at this high exhaust temperature. It is also likely that the "stickies" contained in the kiln exhaust gas stream would plug the activated carbon bed with a build-up of condensable PM. Based on all of these reasons, this control technology is considered technically infeasible and will not be discussed further.

5.4.2.7. Wet Scrubbing

Wet scrubbing is most effective for exhaust gas streams that contain water soluble VOC compounds, such as methanol. However, the primary VOC constituents of kiln exhaust gases, pinenes and terpenes, are not water soluble. Therefore, these constituents would not be easily adsorbed in a wet scrubber, and the VOC removal efficiency would be quite low, on the order of 10-20%. In addition, the viscous nature of the "stickies" within the exhaust gas will easily plug the absorption media. Therefore, this control technology is considered technically infeasible.

5.4.2.8. Biofiltration

To the best of our knowledge, no vendor has designed a biofiltration system to remove VOC emissions from an exhaust gas stream with characteristics similar to those of a lumber kiln. As previously discussed, to prevent condensation and the buildup of "stickies" inside of the exhaust ductwork between the kiln and control equipment, GP believes it would be necessary to heat the kiln exhaust gases to temperatures above that which condensation would occur (220F+). Gas stream temperatures well above 105 °F would kill the bacteria contained in the filter media of the biofilter and thereby render the system ineffective.

As previously mentioned, the primary constituent in the exhaust gas is terpene, which is a long-chained hydrocarbon that is highly water insoluble. Not only is it expected that the biofilter will be ineffective at breaking down terpene, the highly viscous nature ("sticky") of this VOC is expected to build up within the biofilter bed and plug the media.

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[10] US EPA, "Technical Bulletin - Choosing an adsorption System for VOC", EPA 456/F-99-004, May 1999 http://www.epa.gov/ttn/catc/dir1/fadsorb.pdf

[11] Georgia EPD, "Prevention of Significant Air Quality Deterioration Review of the Langdale Forest Products Co- Valdosta, Georgia (Lowndes County)." Preliminary Determination, Permit Application No. 18039 October 7, 2008. http://www.georgiaair.org/airpermit/downloads/permits/18500009/psd18039/1850009pd.pdf

GP has looked at biofiltration in depth with a biofilter vendor that utilizes newer technology from the traditional systems utilizing bioactive media such as soil, peat or compost. However, the company has not yet provided a system, or even a pilot plant, that had demonstrated effective removal of VOCs from a kiln exhaust. The use of biofiltration to remove VOCs from a lumber kiln exhaust gas stream is therefore deemed technically infeasible and is not considered further in this BACT analysis.

5.4.3. Step 3 - Ranking of Control Technologies by Control Efficiency

Although we are not certain whether or not it is technically feasible to capture and transport kiln exhaust gases to a pollution control system for the reasons outlined in sections 5.4.1 and 5.4.2, we are considering the use of a WESP followed by an RTO in more detail to assure that we have thoroughly examined all possible control technologies as part of this BACT analysis. A summary of the VOC control efficiencies of the remaining technically feasible control technologies, ranked in order of decreasing control effectiveness, is presented below:

- WESP/RTO = 95 percent;
- Work Practices = base case.

5.4.4. Step 4 – Cost Effectiveness Evaluation of Control Technologies

The fourth step in the top-down BACT assessment procedure is to evaluate the cost effectiveness of the control technologies that are were not eliminated in Step 2 and document the results. Please refer back to section 5.1.4 for details on how the cost effectiveness calculations are performed.

5.4.4.1. Economic Costs

The control technologies considered in the analysis cause significant economic impacts. It is also likely that the costs included in this BACT analysis are underestimated due to difficulty of accurately estimating a system that has not been demonstrated in practice. Unknown maintenance and operational problems due to the unique characteristics of lumber kiln exhaust gases could result in higher costs than those presented in this Step of the BACT analysis.

The cost of controlling VOCs with an RTO and WESP is estimated at approximately $10,359 per ton of VOC removed for the two proposed wood-fired kilns based on the results shown in the detailed cost effectiveness spreadsheet provided in Appendix E. This cost effectiveness value is largely due to the cost of heating the kiln exhaust air to prevent condensing of the moisture and stickies within the exhaust air. Based on the high cost effectiveness for removing VOCs from the lumber kilns, GP does not believe it is economically feasible to use this control technology.

5.4.4.2. Environmental Impacts

There would also be associated energy and environmental impacts resulting from use and combustion of propane in the RTO. The combustion of propane as an auxiliary fuel would create additional NO_X, CO, and CO_2 emissions. The creation of these emissions simply to reduce VOC emissions is a negative environmental effect, as the combustion of propane increases the potential of increasing ozone formation.

Reduction of VOC, and small amounts of HAPs and toxic air pollutants (TAPs),would have a negligible impact on air quality in the vicinity of the facility. Under the PSD program, VOCs are regulated to prevent significant deterioration of air quality due to ozone formation. Ozone is formed in the atmosphere due to atmospheric chemical reactions of NOx and VOC oxidized by sunlight, and excessive ambient concentrations of ozone in the lower atmosphere can be injurious to human health and damage vegetation. The facility is located in a lightly populated and developed area of Georgia and ambient concentrations of ozone in this area are in attainment with the NAAQS for this pollutant. Moreover, it should also be noted that VOC emissions from the lumber kilns are small compared to the biogenic (naturally occurring) VOC emissions from forests in the vicinity of the facility and, consequently, any reduction of VOC emissions from the lumber kilns will have a negligible effect upon ozone formation and ozone concentrations in the area.

5.4.4.3. Energy Impacts

The control technologies require energy to operate fans to move the exhaust gases through a significant amount of ductwork, requiring over 200 KWH of electricity per year for a WESP/RTO control system. The indirect heated ducting and the RTO also require the use of supplemental fuel to heat the ductwork and maintain the appropriate combustion temperature within the RTO (~ 122,600 MMBtu per year for duct heating and ~53,000 MMBtu per year for RTO control).

5.4.4.4. Proper Kiln Design and Operation

The only economically cost effective control technology for removing VOC emissions from a continuous lumber kiln is the use of "proper design and operating practices". Since this control option is the top BACT control technology, a cost effectiveness evaluation is not required.

5.4.5. Step 5 - Select BACT

Results of the top-down BACT analysis indicate that there are no demonstrated control techniques in practice, numerous technical challenges, and no cost-effective add-on control technologies for removing VOC emissions from lumber drying kilns and, consequently, the BACT proposed for the lumber kilns is "no control" with the use of "proper design and operating practices" (be consistent with terminology) as BACT. GP proposes a VOC emission limit of 4.28 lb/MBF (as carbon) as BACT[12]. This BACT limit applies during all operating conditions as there are no significant changes to the VOC emissions generated by the kilns during startup and shutdown compared to normal operation.

The proposed BACT work practices for the continuous lumber kilns consist of (1) proper kiln maintenance and (2) minimizing over-drying while meeting the relevant lumber moisture specifications (target final lumber moisture content of 12 percent or greater as measured at the planer mill).

Limiting over-drying has a direct impact on the minimization of VOC emissions. The VOCs emitted from southern pine lumber drying consist of approximately 80-90 percent terpenes and pinenes which are native compounds in the wood. Emissions of these compounds are largely proportional to the amount of moisture removed from the lumber as it is dried inside of the kilns.

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[12] VOC emissions for the project were presented on a WPP1 basis per William Wehrum's 2006 memo and EPA's subsequent July 2007 Interim VOC Measurement Protocol for the Wood Products Industry. However, data within the RBLC predates these two guidance documents and presents VOC emissions on a carbon basis. To remain consistent with previous BACT analyses, GP performed the BACT analysis using project VOC emissions on a carbon basis.

GP proposes to demonstrate compliance with these work practices by measuring the moisture content of the lumber as it comes out of the planer machine. Due to seasonal variability of wood moisture content and drying times, GP proposes a rolling 12-month average for comparison to the 12 percent moisture content target. Maintenance of a 12-month rolling average lumber moisture content of 12 percent or greater will represent compliance with the proposed work practices. GP will calculate the 12-month rolling average moisture content within 15 days of the end of each calendar month.

In addition to monitoring moisture content, following a preventative maintenance plan will assist in minimizing VOC emissions. Proper maintenance of kiln equipment ensures optimal drying conditions which minimizes the possibility of over-drying. GP proposes to develop and implement a maintenance plan within 180 days of start-up of the continuous kiln. The development of site specific maintenance plans for proper kiln maintenance is consistent with recent BACT determinations in EPA Region 4.

GP requests that the specific conditions of the maintenance plan not be incorporated directly into the permit to allow for greater operational flexibility however, GP is willing to make the maintenance plan available to GA EPD upon request. Due to the relatively new nature of continuous kilns, best performance and maintenance parameters may need to be updated as experience is gained through kiln operation.

6. TOXIC AIR POLLUTANT ANALYSIS

6.1. INTRODUCTION

The *Georgia EPD PSD Permit Application Guidance Document*[13] requires all PSD permit applications to include an assessment of potential impacts of toxic air pollutants (TAP) following Georgia EPD's *Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions*[14] ("*Guideline*" hereinafter). The basic steps in the air toxics impact assessment are as follows:

1. Quantify emissions of TAPs from each emission unit;
2. Determine the acceptable ambient concentrations (AAC) for each TAP;
3. Conduct a dispersion modeling analysis to compute an ambient air concentration; and
4. Compare the modeled concentration to the AAC.

The following sections present the data and methodology used in the TAP analysis as well as comparison of modeled impacts to the AAC.

6.2. TOXIC AIR POLLUTANT EMISSIONS

As discussed during the pre-application meeting with EPD for the expansion project, Phase II of the project would represent the worst case emissions release and resulting modeled concentrations; therefore only Phase II would require a TAP modeling analysis. GP quantified emissions of 84 TAPs from the lumber manufacturing process at the Warrenton CNS including the two CDK and finishing (i.e., stencil and logo application) operations. GP reviewed and selected the best available emission factors among the following resources:

- Site-specific source test data for comparable lumber kilns
- National Council for Air and Stream improvement (NCASI) Wood Products Emission Factor Database (February 2013 revision) and related technical bulletins
- EPA AP-42 emission factors for natural gas combustion (Section 1.4) and wood residue combustion (Section 1.6)
- Mass balance based on TAP content and material usage for stencil and logo inks

Short-term TAP emissions were quantified by determining the most conservative emission rate among CDK operating scenarios for lumber drying using wood residue combustion, natural gas combustion, and the combination wood and natural gas burner. Long-term TAP emissions were quantified based on the potential annual fuel combustion and production rates. Detailed emissions calculations are provided in Appendix B of this application.

6.3. ACCEPTABLE AMBIENT CONCENTRATIONS

The *Guideline* provides the methodology for determining the AAC for TAPs based on various sources of toxicity data. Georgia EPD maintains a database of AAC for common TAPs.[15] AAC for all TAPs

[13]Georgia EPD, "*Georgia EPD Permit Application Guidance Document,*" September 18, 2012.
[14]Georgia EPD, "*Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions*" June 21, 1998.
[15]http://www.georgiaair.org/airpermit/downloads/sspp/modeling/gaepdEPD_aacs_052113.xls.

considered in the analysis were obtained from the Georgia EPD database with the exception of the following TAPs.

6.3.1. 2-Methylnaphthalene

An AAC for 2-methylnaphthlalene was not available in the Georgia EPD database. An AAC of 7.14 μg/m^3 was derived using methodology provided in the *Guideline*:

AAC (μg/m^3) = TWA (mg/m^3) × 1000 (μg/mg) × (40 hrs/Hours of Operation) ÷ Safety Factor

where:

TWA = 3 mg/m^3 – American Conference of Government and Industrial Hygienists

Hours of Operation = 168 hours per week

Safety Factor = 100 (non-carcinogens)

6.3.2. Acrolein

The AAC for acrolein was updated from that in the GA EPD database based on a review of more recent technical data. Georgia EPD previously recommended a value of 0.15 μg/m^3 for the annual acrolein AAC[16] for use in a similar GP permit application, based on a 2010 Texas Commission of Environmental Quality (TCEQ) study.[17]

6.3.3. Formaldehyde

GP proposed[18] an alternative annual average AAC for formaldehyde of 3.3 μg/m^3. This value is based on a TCEQ study[19] that determined a chronic effects screening level (ESL) of 3.3 μg/m^3 for critical effects of eye, nose, and airway discomfort and is the lowest screening value TCEQ quantified for any chronic adverse impacts, including carcinogenic effects that TCEQ determined have a higher ESL (5.5 μg/m^3). These values are more conservative screening levels than the EPA's prioritized chronic dose-response value for screening risk assessments[20] of 9.8 μg/m^3 for chronic noncancerous effects citing U.S. Agency for Toxic Substances and Disease Registry (ASTDR) studies.

6.4. DISPERSION MODELING ANALYSIS

6.4.1. Model Selection

Dispersion models compute downwind pollutant concentrations by simulating the evolution of a plume over time and space given inputs including the quantity of emissions and the initial conditions (e.g., velocity and temperature) of the stack exhaust to the atmosphere. In accordance with the *Guideline*, the modeling analysis was performed using ISCST3 (version 02035), the Georgia EPD approved computer dispersion model for toxic air pollutant analyses.

[16] E-mail from Mr. Eric Cornwell (Georgia EPD) to Mr. Matt Stresing (GP), December 10, 2014.
[17] Texas Commission on Environmental Quality, "*Development Support Document-Acrolein*", November 19, 2010.
[18] E-mail from Mr. Ryan Gesser (GP) to Ms. Yan Huang (Georgia EPD), March 25, 2015.
[19] Texas Commission on Environmental Quality, "*Development Support Document-Formaldehyde*", August 7, 2008.
[20] EPA, "Prioritized Chronic Dose-Response Values," (Revised May 9, 2014).
http://www2.epa.gov/sites/production/files/201405/documents/table1.pdf.

6.4.2. Building Downwash

Due to safety factors built into determination of AAC as specified by the *Guideline*, Georgia EPD does not require the use of building downwash calculations with the ISCST3 model. Therefore, no building downwash analysis was conducted.

6.4.3. Dispersion Coefficients

The dispersion environment was determined using the Auer scheme in which the land use within a three kilometer area surrounding the facility was evaluated to determine whether the area is rural or urban. The area surrounding Warrenton CNS is predominantly rural; therefore, rural dispersion coefficients were selected for the modeling analyses.

6.4.4. Meteorological Data

The modeling analysis was conducted using five years of surface meteorological data (1974 through 1978) from Augusta, Georgia, with concurrent upper air data from Athens, Georgia. The pre-processed meteorological data was obtained from Georgia EPD.[21]

6.4.5. Receptors and Terrain

A Cartesian receptor grid extending approximately 20 kilometers (km) from the facility centroid was used in the modeling. The grid receptors consist of the following spacing:

- 50 m intervals along the facility property boundary
- Facility centroid to 3 km spaced at 100 m intervals
- 3 km to 5 km spaced at 500 m intervals
- 5 km to 10 km spaced at 1,000 m intervals
- 10 km to 20 km spaced at 2,000 m intervals

Far-field and near-field views of the receptor grid and ambient air boundary are shown in Figure 6-1 and 6-2, respectively.

Terrain elevations from the National Elevation Dataset (NED) acquired from USGS[22] were processed with AERMAP (version 11103) to develop the receptor terrain elevations. All receptor locations are represented in the Universal Transverse Mercator projection, Zone 17, North American Datum 1983.

6.4.6. Source Characterization

The ISCST3 dispersion model allows for emissions units to be represented as point, area, or volume sources. Emissions from the Warrenton CNS are released from both well-defined points and fugitive processes. The location and ground level base elevation of each emission point was determined from estimated location of the new CDKs.

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21 http://www.georgiaair.org/airpermit/html/sspp/modeling/iscmetdata.htm

22 http://www.mrlc.gov/viewerjs

Each CDK emits from two stacks (one at each end of the kiln) and from the ends of each kiln that remain open during continuous operations. GP utilized the kiln designer's estimate and observation of comparable operations at other facilities that 80% of the total airflow and emissions is directed up the stacks and 20% of the total airflow and emissions is released through the kiln ends. The kiln stacks were modeled using typical stack parameters and emissions from the open kiln ends were modeled as volume sources to represent the non-vertical discharge. Ink application for stencils and logos are made within an enclosed area of the manufacturing plant from which the organic emissions emanate. A ground-based volume source was used to represent these sources using initial plume dimensions based on the building dimensions and guidance provided in Table 3-1 of the *User's Guide for the AMS/EPA Regulatory Model – AERMOD*[23].

Table 6-1 provides the source parameters for the point and volume sources in the modeling analysis.

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[23] EPA, "*User's Guide for the AMS/EPA Regulatory Model-AERMOD*", September 2004.

Table 6-1. Source Parameters

Point Sources					
Source	**Model ID**	**Stack Height**	**Exit Temperature**	**Exit Velocity**	**Stack Diameter**
		(m)	**(K)**	**(m/s)**	**(m)**
CDK No. 1 West Stack	CDK01WS	12.57	316.48	17.73	0.86
CDK No. 1 East Stack	CDK01ES	12.57	316.48	17.73	0.86
CDK No. 2 West Stack	CDK02WS	12.57	316.48	17.73	0.86
CDK No. 2 East Stack	CDK02ES	12.57	316.48	17.73	0.86

Volume Sources				
Source	**Model ID**	**Release Height**	**Initial Lateral Dimension**	**Initial Vertical Dimension**
		(m)	**(m)**	**(m)**
CDK No. 1 West Fugitives	CDK01WF	3.05	1.13	1.77
CDK No. 1 East Fugitives	CDK01EF	3.05	1.13	1.77
CDK No. 2 West Fugitives	CDK02WF	3.05	1.13	1.77
CDK No. 2 East Fugitives	CDK02EF	3.05	1.13	1.77
Ink/Logo	INKLOGO	5.33	5.67	4.96

Figure 6-1. Far-Field View of the Receptor Grid and Elevations

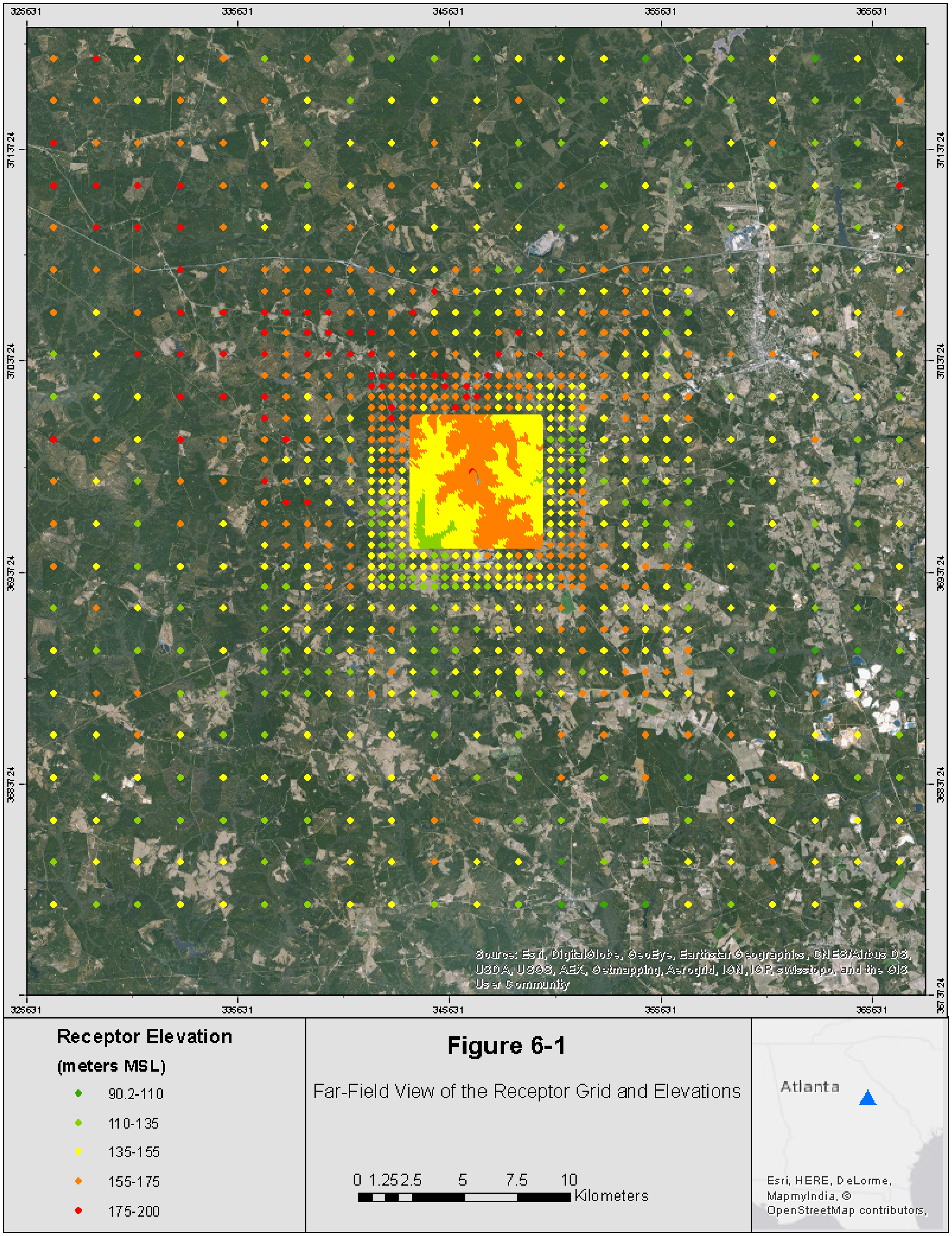
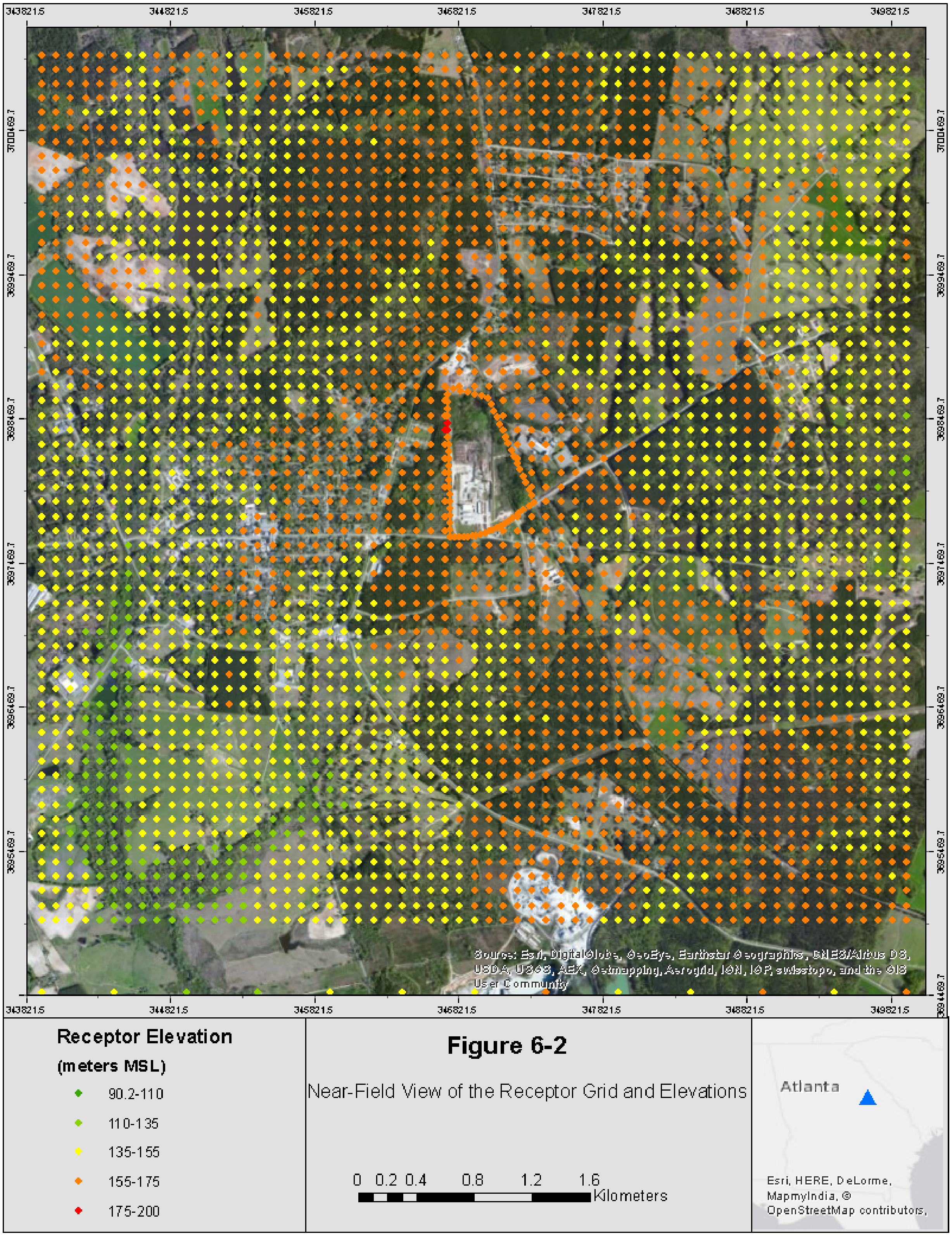


Figure 6-2. Near-Field View of the Receptor Grid and the Ambient Air Boundary



6.5. SCREENING MODELING ANALYSES

A conservative screening analysis was initially conducted to evaluate the ambient impacts of each of the 84 quantified TAPs. The screening analysis was conducted using the dispersion modeling options and meteorological, receptor, and source data presented in Sections 6.4.1 through 6.4.6 input to ISCST3 to calculate ground level concentrations for a normalized emission rate of 1 gram per second (g/s). Emissions units with multiple stacks were modeled at 1 g/s divided by the number of emission points in the source; for example, each CDK was modeled with two stacks each emitting at 0.25 g/s and two kiln ends emitting at 0.25 g/s. Source groups representing the CDK stacks, ends, and ink application were utilized to determine the maximum impact associated with each source group for each averaging period and meteorological data year because point sources and fugitive emissions have different dispersion characteristics. Table 6-3 summarizes the results of the screening modeling analysis for normalized emissions.

Table 6-3. Summary of ISCST3 Dispersion Modeling for Normalized Emissions

CDK Stacks

Averaging Period	Modeled Concentration (μg/m^3 per g/s)					
	1974	1975	1976	1977	1978	Maximum
1-hr	65.87	78.03	67.49	82.33	102.27	102.27
24-hr	15.89	16.25	23.26	15.87	16.78	23.26
Annual	1.29	1.57	1.68	1.55	1.64	1.68

CDK Fugitives

Averaging Period	Modeled Concentration (μg/m^3 per g/s)					
	1974	1975	1976	1977	1978	Maximum
1-hr	1,883.39	1,931.95	1,916.43	1,916.43	1,855.32	1,931.95
24-hr	242.63	179.92	304.18	206.83	199.31	304.18
Annual	25.49	25.69	26.13	23.61	22.18	26.13

Stencil/Logo

Averaging Period	Modeled Concentration (μg/m^3 per g/s)					
	1974	1975	1976	1977	1978	Maximum
1-hr	2,242.20	1,990.93	3,196.60	2,187.79	2,187.79	3,196.60
24-hr	230.54	189.50	340.54	208.98	303.15	340.54
Annual	19.98	22.74	22.66	17.61	24.30	24.30

For each TAP and averaging period, the screening model result was determined by scaling the normalized modeled concentrations by the potential emission rate for each source group and adding the maximum modeled concentrations. As specified in the *Guideline*, 15-minute average concentrations were determined using a 1.32 scaling factor for 1-hour average model results. This approach is conservative because the maximum modeled concentration attributable to source group is not necessarily paired in time (i.e., averaging period) and space (i.e., receptor location). Screening analysis results less than the AAC for each averaging period represent an acceptable ambient impact. Screening analysis results greater than or equal to the AAC would trigger a refined modeling analysis. As an example to demonstrate the screening analysis approach, Table 6-4 summarizes the screening analysis for formaldehyde.

Table 6-4. Screening Analysis for Formaldehyde

Source Group	Short-term Emission Rate	Long-term Emission Rate	15-min Average (μg/m^3)	24-hour Average (μg/m^3)	Annual Average (μg/m^3)
Total CDK Emissions	2.57 lb/hr	10.20 tpy			
CDK Stack Emissions (80%)	2.05 lb/hr	8.16 tpy			
CDK Fugitive Emissions (20%)	0.51 lb/hr	2.04 tpy			
Stencil/Logo	0.00 lb/hr	0.00 tpy			
CDK Stack Emissions	0.2588 g/s	0.2348 g/s	34.94	6.02	0.39
CDK Fugitive Emissions	0.0647 g/s	0.0587 g/s	175.33	23.04	1.53
Stencil/Logo	0.0000 g/s	0.0000 g/s	0.00	0.00	0.00
Screening Analysis Impact			210.26	29.06	1.93
AAC			245	--	3.3

Appendix E presents detailed results of the screening analysis for each TAP, which demonstrates that facility-wide emissions of each TAP do not result in an exceedance of an AAC. Therefore, no refined analyses were conducted and the screening analyses demonstrate the proposed project at Warrenton CNS will not have an adverse effect on ambient air quality.

7. ADDITIONAL IMPACTS, OZONE REVIEW, AND CLASS I AREA REVIEW

7.1. ADDITIONAL IMPACTS

An additional impacts analysis is required under the PSD requirements at 40 CFR §52.21(o) to evaluate the effects of economic growth and the effect on soils, vegetation, and visibility from regulated compounds emitted in significant quantities from a new or modified major stationary source.

7.1.1. Growth Analysis

The growth analysis evaluates the impact associated with the project on the general commercial, residential, and industrial growth within the project vicinity. PSD requires an assessment of the secondary impacts from applicable projects. Although the proposed project is expected to employ approximately 25 temporary workers for construction activities, negligible growth during construction is expected and minimal long-term growth (i.e., general commercial, residential, industrial or other secondary growth in the area) is expected following the completion of the project because no additional employees will be required to operate the modified mill. Therefore, no analysis of secondary impacts from associated growth is warranted for this project.

7.1.2. Soils and Vegetation

The PSD regulations require an evaluation of the impact of project emissions on soils and vegetation. The analysis is required only for those pollutants for which PSD review is triggered. According to *A Screening Procedure for the Impacts of Air Pollution on Plants, Soils and Animals*[24], the relevant pollutants for soils and vegetation are NO_2, SO_2 and CO. The project triggers PSD review for VOC only and does not have a significant net emissions increase of NO_2, SO_2 or CO. Therefore, a soils and vegetation analysis is not necessary because no significant impacts are expected.

7.1.3. Class II Area Visibility

The PSD regulations require an evaluation of the impact of project emissions on visibility in Class II areas. The analysis is required only for those pollutants for which PSD review is triggered. The relevant pollutants for visibility are PM, NO_X and SO_2. The project triggers PSD review for VOC only and does not have a significant net emissions increase of PM, NO_X and SO_2. Therefore, a visibility analysis is not necessary because no significant impacts are expected.

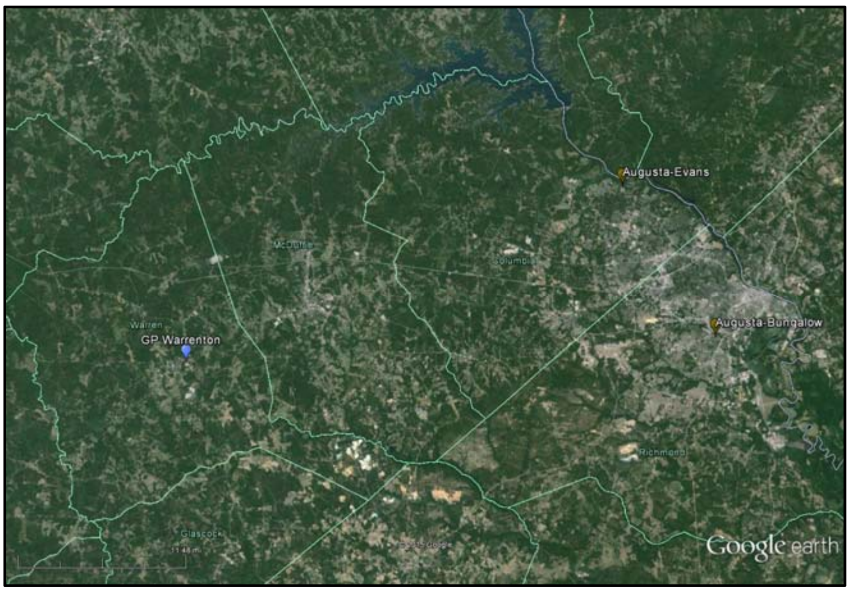
7.2. OZONE AIR QUALITY REVIEW

An application for a PSD permit must include an analysis of the ambient air quality in the vicinity of the proposed project for each compound for which the project is subject to PSD review. Because the proposed project triggers PSD review for VOC, an ambient impact analysis for ozone is required. In addition, as the emissions of VOC exceed the monitoring *de minimis* level of 100 tpy, an evaluation is required to determine if representative ozone data are available in lieu of pre-construction ozone monitoring.

[24] EPA, "*A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils and Animals,*" December 12, 1980.

Figure 7-1 illustrates the location of two ambient ozone monitors operated by Georgia EPD in the Augusta Core Based Statistical Area (CBSA) at Evans (AIRS ID 13-073-0001) and Bungalow Road (AIRS ID 13-245-0091) that are within 60 km and generally downwind from (i.e., to the east of) the Warrenton CNS. The concentrations from the two monitors provide a representative indication of ozone concentrations in the general vicinity, and downwind from, the Warrenton CNS. Georgia EPD's *2014 Ambient Monitoring Plan*[25] describes the siting, exposure, measurement techniques and frequency, and related technical details for each monitor. The existence of representative monitors with current data that were collected appropriately precludes the need for additional pre-construction ambient ozone monitoring.

Figure 7-1. Location of Augusta Area Ozone Monitors relative to the Warrenton CNS



GP reviewed the current and historical design values[26] for each monitor, which represents the 3-year average of the 4th highest daily 8-hour concentration, relative to the ozone NAAQS of 75 parts per billion (ppb). Table 7-1 summarizes these values and demonstrates that each monitor measures ambient ozone concentrations in attainment with the applicable NAAQS and has trended toward improved ozone air quality over the last 10 or more years.

25 Georgia EPD, *2014 Ambient Monitoring Plan*. http://www.georgiaair.org/amp/2014_Ambient_Air_Monitoring_Plan.pdf.

26 EPA tabulated design values, http://www.epa.gov/airtrends/values.html.

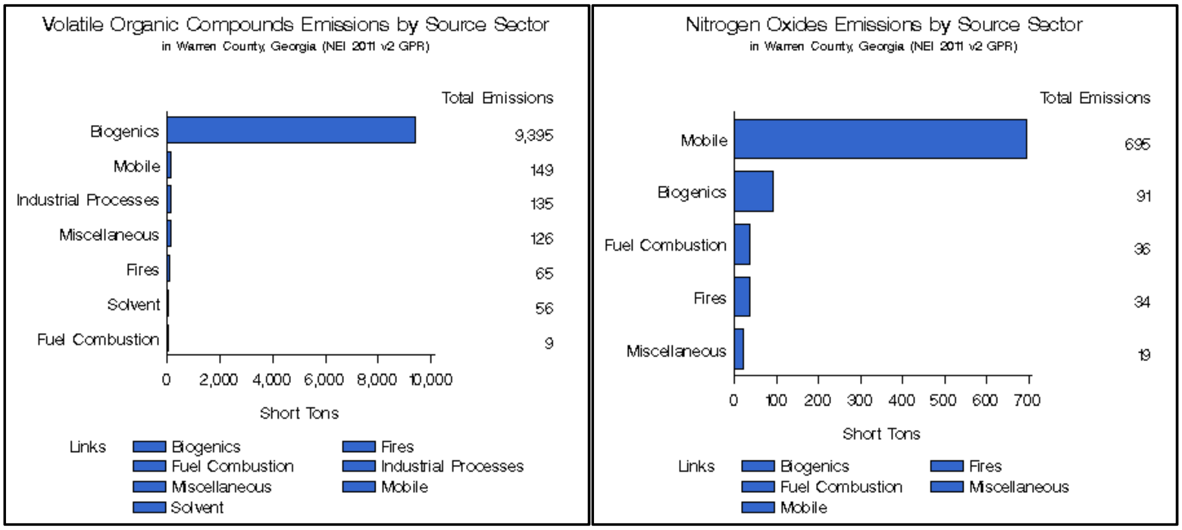
Table 7-1. Summary of Augusta Area Ozone Design Values, 2005-2014

Design Value*	Evans (ppb)	Bungalow Road (ppb)
2001-2003	No Data	83
2002-2004	No Data	83
2003-2005	No Data	79
2004-2006	No Data	81
2005-2007	73	81
2006-2008	74	79
2007-2009	71	73
2008-2010	69	71
2009-2011	68	69
2010-2012	70	72
2011-2013	68	69
2012-2014	65	65

Ozone is formed by the reaction of sunlight on air containing VOC and NO_X. In the southeastern United States, ozone formation is limited by NO_X emissions due to high amounts of biogenic VOC in the atmosphere. VOC and NO_X emissions by source sector in Warren County were compiled from the EPA Air Emission Sources database.[27] Figure 7-2 summarizes these emissions and shows that the proposed project at Warrenton CNS will increase VOC emissions (383.8 tons) in Warren County by 3.9% compared to the existing inventory, a relatively insignificant amount. Because ozone formation is NO_X limited in the southeast, the increase in VOC emissions from the proposed project is not expected to significantly affect ozone concentrations in the vicinity of or downwind of Warrenton CNS. Further, NO_X emissions are primarily emitted from mobile and industrial sources. The proposed project will not cause a permanent increase in mobile source traffic in the area and as an industrial source has a *net decrease* of NO_X emissions.

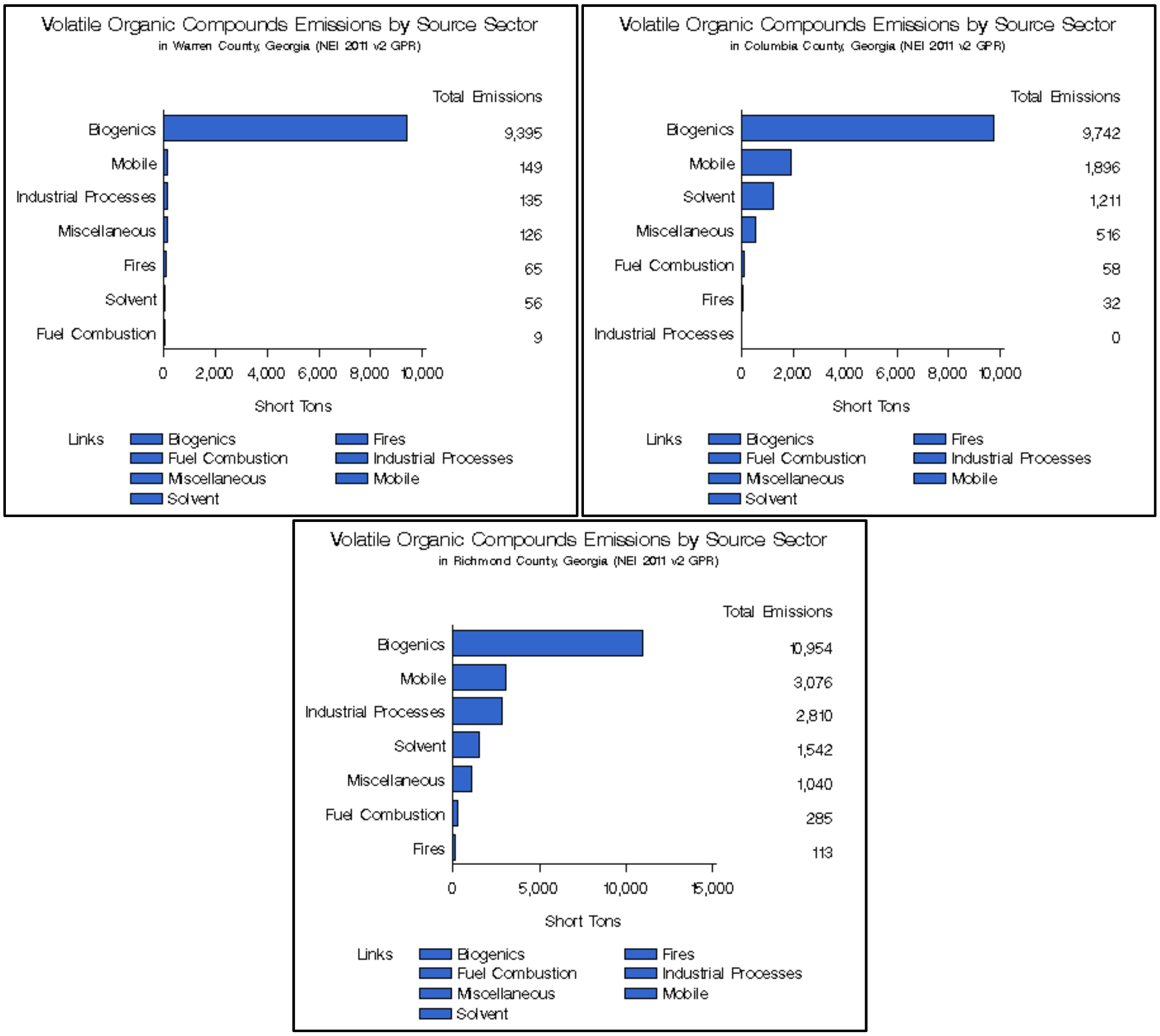
27 http://www.epa.gov/air/emissions/index.htm.

Figure 7-2. Summary of Ozone Precursor Emissions in Warren County, Georgia



Furthermore, the net emissions increase of VOC caused by the project is even less relative to VOC emissions in Columbia and Richmond Counties depicted in Figure 7-3, where the Evans and Bungalow Road ozone monitors are located, respectively, that demonstrate attainment and improved air quality relative to the ozone NAAQS.

Figure 7-3. Summary of VOC Emissions in Warren County, Columbia County (Evans), and Richmond County (Augusta), Georgia



Because the project will cause a net decrease of NO_X emissions and the significant net emissions increase in VOC emissions is small relative to the existing background emissions inventory, ozone concentrations in the vicinity of Warrenton CNS are not expected to be significantly affected by the proposed project.

7.3. CLASS I AREA IMPACTS

Class I areas are areas of particular value from a natural, scenic, recreational, and/or historical perspective. PSD permitting regulations afford Class I areas additional protection against adverse impacts on PSD increments and air quality related values (e.g., visibility and deposition). EPA and Federal Land Manager guidance generally requires that sources located within 300 km of one or more Class I areas evaluate whether PSD Class I increments and certain air quality related values be adversely affected. There are seven Class I areas located within 300 km of Warrenton CNS (approximate distances listed):

Shining Rock Wilderness	210 km
Great Smoky Mountain National Park	215 km

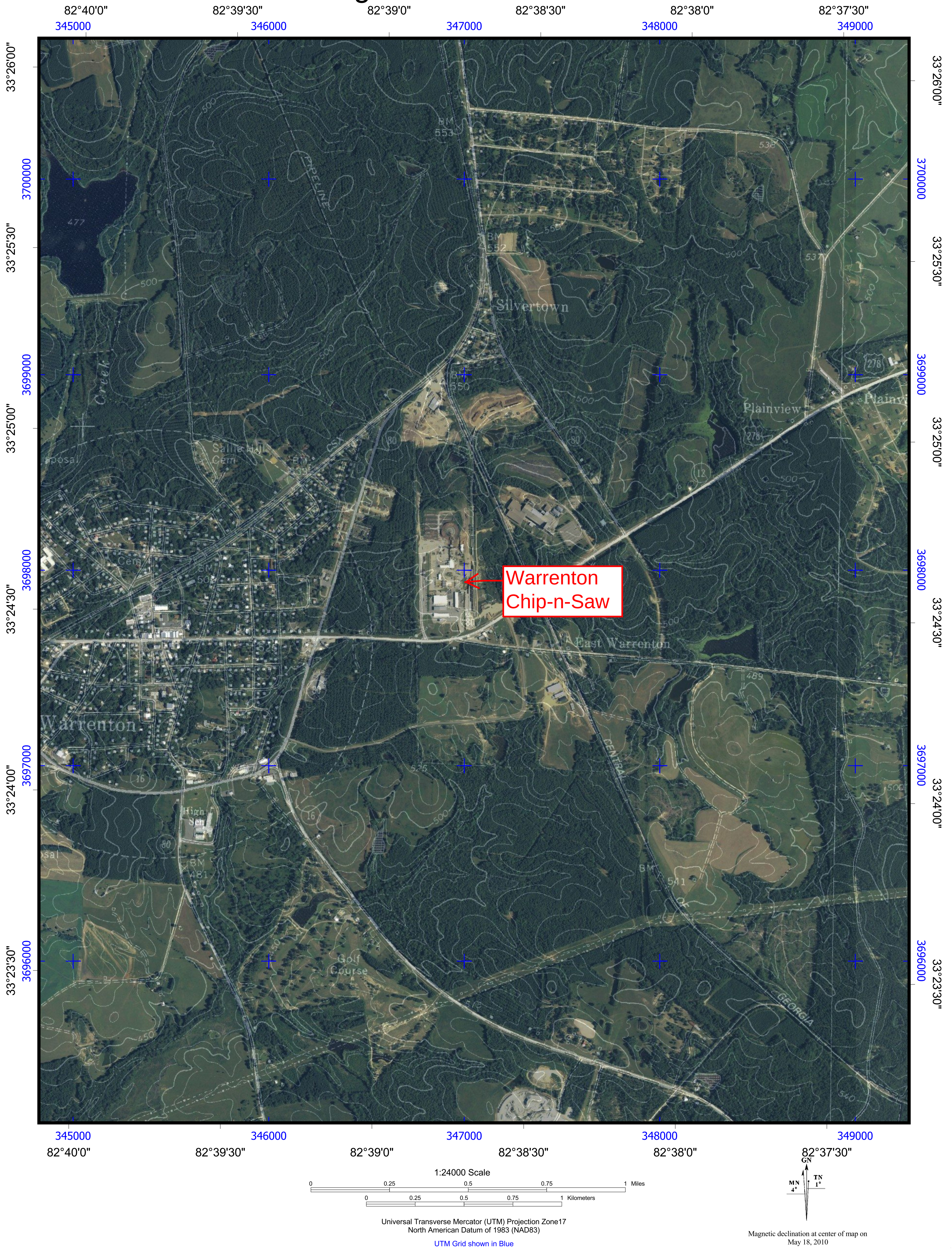
Cohutta Wilderness	230 km
Joyce Kilmer Slickrock Wilderness	240 km
Wolf Island National Wildlife Refuge	260 km
Cape Romain National Wildlife Refuge	280 km
Okefenokee National Wildlife Refuge	300 km

The proposed project would cause a significant net emissions increase only of VOC, which is not a visibility- or deposition-affecting pollutant and for which there are no Class I PSD Increment. For this reason and because the project would not cause significant increases of NO_X, SO_2, or PM that may affect visibility or deposition and for which PSD Class I Increments have been established, Class I area impact analyses are not required.

APPENDIX A

FACILITY MAP AND PROCESS DIAGRAMS

Figure 2-1: AREA MAP



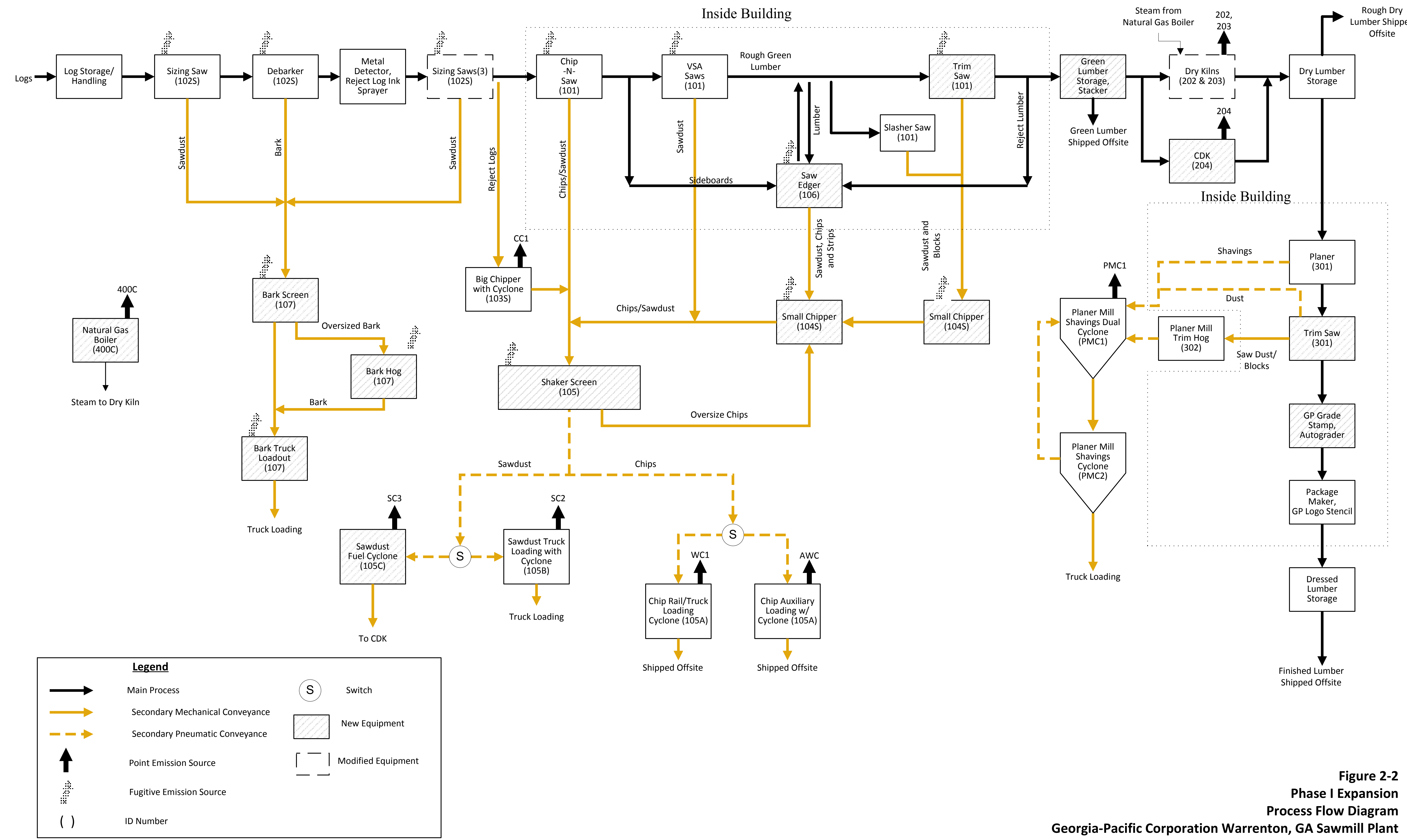
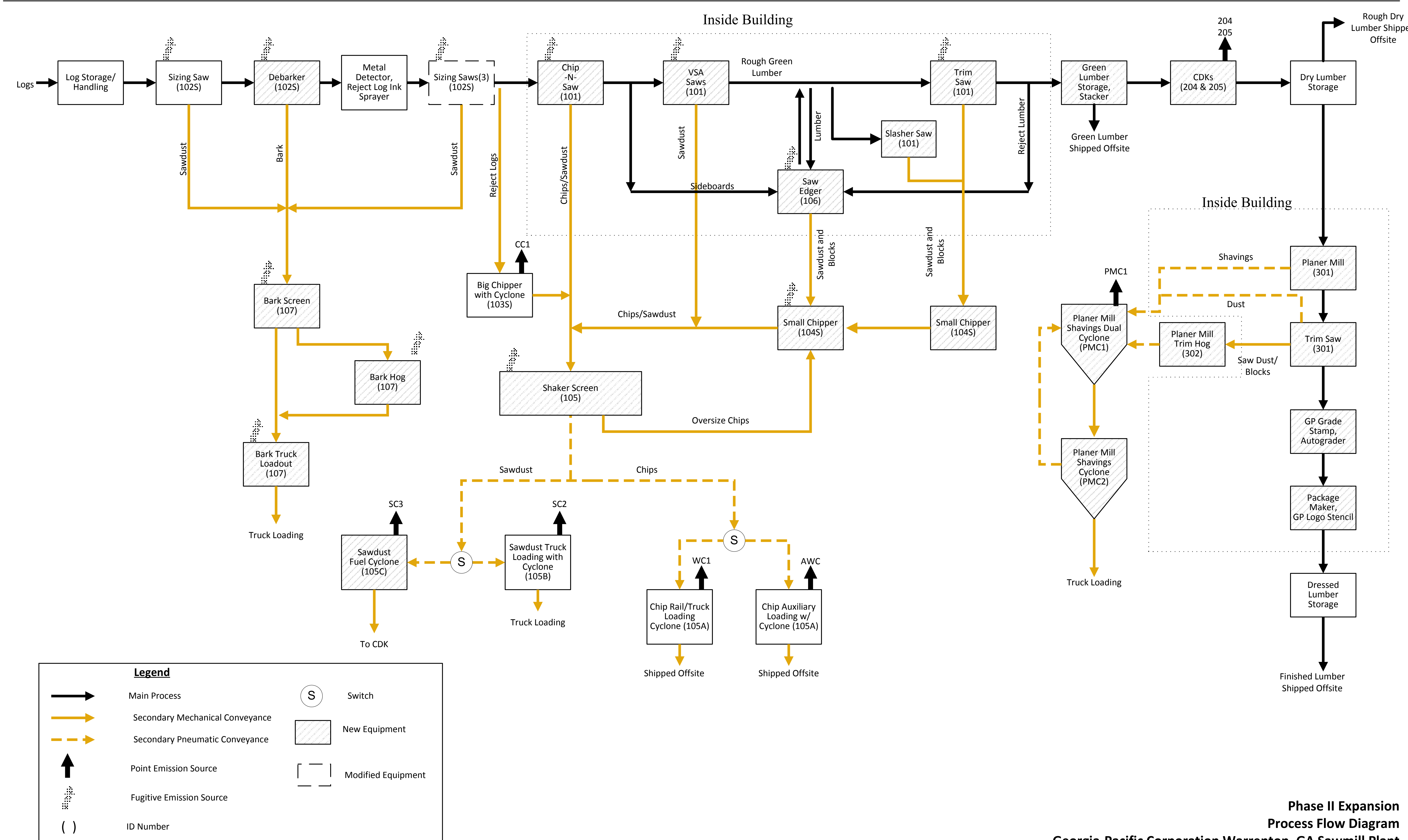


Figure 2-2
Phase I Expansion
Process Flow Diagram
Georgia-Pacific Corporation Warrenton, GA Sawmill Plant

April 2015



Phase II Expansion
Process Flow Diagram
Georgia-Pacific Corporation Warrenton, GA Sawmill Plant

April 2015

APPENDIX B

EMISSION CALCULATIONS

GP Warrenton Chip-N-Saw
Historical and Future Production Summary

Table 1. Production Information Used for Emission Calculations

Process	Baseline Production (Production)	Baseline Production (hours)	Phase 1 Projected Operation (Production)	Phase 1 Projected Operation (hours)	Phase 2 Projected Operation (Production)	Phase 2 Projected Operation (hours)
Boiler - Wood Waste	50,960 tpy	7,814 hr/yr				
Logs Processed	470,734 tpy		799,000 tpy	8,760 hr/yr	1,128,000 tpy	8,760 hr/yr
Sawmill Operation (permitted)		4,463 hr/yr		8,760 hr/yr		8,760 hr/yr
Sawmill Operation (expected)				6,000 hr/yr		6,000 hr/yr
Bark	47,073 tpy		79,900 tpy		112,800 tpy	
Chips	144,102 tpy		193,800 tpy		273,600 tpy	
Dry Shavings	28,820 tpy		51,000 tpy		57,600 tpy	
Sawdust	19,214 tpy		34,000 tpy		48,000 tpy	
Kiln 1	31,192 Mbf/yr					
Kilns 2 & 3	64,876 Mbf/yr		50,000 Mbf/yr	8,760 hr/yr		
CDK No. 1			120,000 Mbf/yr	8,760 hr/yr	120,000 Mbf/yr	8,760 hr/yr
CDK No. 2					120,000 Mbf/yr	
Total Kiln Production	96,068 Mbf/yr		170,000 Mbf/yr		240,000 Mbf/yr	
Planer Mill		4,017 hr/yr	170,000 Mbf/yr	8,760 hr/yr	240,000 Mbf/yr	8,760 hr/yr
NG Package Boiler				8,760 hr/yr		
Logo Paint Usage	391 gallons/yr		692 gallons/yr		977 gallons/yr	
Reject Log Spray Paint	11 gallons/yr		20 gallons/yr		28 gallons/yr	
Fuel Oil Use	76,278 gallons/yr		134,980 gallons/yr		190,560 gallons/yr	
Natural Gas Use (Tanks)	2,959 gallons/yr		5,236 gallons/yr		7,392 gallons/yr	

1. Boiler Baseline is June 2005- May 2007. Baseline for remaining equipment is March 2013- February 2015.
2. Historical Log Usage based on 4.9 tons of logs/MBF, Bark produced equal 10% of total logs processed, Chips produced equal 1.5 tons/MBF, Shavings produced equal 0.3 tons/MBF, and Sawdust produced equal 0.2 tons/MBF
3. Phase I Future Log Usage based on 4.7 tons of logs/MBF, Bark produced equal 10% of total logs processed, Chips produced equal 1.14 tons/MBF, Shavings produced equal 0.3 tons/MBF, and Sawdust produced equal 0.2 tons/MBF
4. Phase II Future Log Usage based on 4.7 tons of logs/MBF, Bark produced equal 10% of total logs processed, Chips produced equal 1.14 tons/MBF, Shavings produced equal 0.24 tons/MBF, and Sawdust produced equal 0.2 tons/MBF
5. Logo Paint usage based on historical operation of 4.07 E-03 gallon/MBF and Reject Log Spray of 1.16E-04 gal/MBF
6. Fuel oil usage based on historical operation of 0.727 gallons/MBF and Natural gas usage based on historical operation of 0.016 gallons/MBF

GP Warrenton Chip-N-Saw
Baseline Wood fired Boiler Emissions

Table 1. Fuel Information

Woodwaste	4,500	Btu/lb

Table 2. Boiler Operating Information

Baseline Operation	458,642	MMBtu/yr
Baseline Period	June 2005 - May 2007	

Table 3. Criteria Emission Calculations

Pollutant	Emission Factors Wood (lb/MMBtu)	Emissions BAE (tpy)
PM	0.04	8.03
PM_{10}	0.04	9.84
$PM_{2.5}$	0.04	9.12
CO	1.66	381.35
VOC as propane	0.05	11.44
SO_2	0.03	6.88
NO_X	0.17	40.07
Lead	1.91E-05	4.39E-03
CO_2	206.79	47,422
CH_4	1.59E-02	3.64
N_2O	7.94E-03	1.82
Total CO2e	209.56	48,055

1. PM based on August 2006 stack test for Warrenton boiler for filterable PM.

2. PM10 equal to 74% of filterable PM and PM2.5 equal to 65% of filterable PM per NCASI TB 884, Table 9.6b (ESP). Both include 0.017 lb/MMBtu for condensable PM per AP-42, Table 1.6-1.

3. CO and NOx based on January 2014 BMACT investigative sampling/testing at Warrenton.

4. Lead based on NCASI Technical Bulletin 1013 (March 2013), Table 4.3, median values plus two standard deviations for boilers with electrostatic precipitators or fabric filters.

5. Remaining criteria pollutants based on NCASI TB 884 (August 2004), Table 9.6a&b, Stokers.

6. GHG emissions based on 40 CFR Part 98 Subpart C Table C-1 and C2: Default CO_2 Emission Factors and High Heat Values for Various Types of Fuel and Default CH4 and N2O Factors for Various Types of Fuel (Used value for "Wood and Wood Residuals" in Table C-1 and "Biomass Fuels - Solid" in Table C-2)

7. Total CO2e based on 40 CFR Part 98 Subpart A Table C-1: Global Warming Potential (CC_2e Emission Factors)

GP Warrenton Chip-N-Saw
Baseline Saw and Screen Emissions

Table 1. Baseline Log and Saw Parameters

Log Length -prior to sizing saws	40	ft/log
Log Length after sizing saws	12.50	ft/log
Log Diameter	0.60	ft
Density	58	lb/ft^3
Throughput	470,734	tpy
No. Logs - prior to sizing	1,447,278	annual
No. Logs - after sizing	4,631,289	annual

1. Number of logs calculated from log throughput (tpy) / density (lb/ft^3) /

Table 2. Saw Baseline Actual Emissions

Saw	Maximum No. Cuts	Kerf (inches)	Sawdust Generated (tpy)	Emission Factor (lb/ton) PM	PM_{10}	$PM_{2.5}$	PM Emissions (tpy)	PM_{10} Emissions (tpy)	$PM_{2.5}$ Emissions (tpy)
Sizing Saws	4	0.5	1961	1.00	0.36	0.11	0.98	0.35	0.11
VSA Saw	3	0.12	1,130	1.00	0.36	0.11	0.17	0.06	0.02
Slasher Saw	4	0.38	47	1.00	0.36	0.11	0.01	2.54E-03	7.77E-04
Trim Saw	7	0.25	5,492	1.00	0.36	0.11	0.82	0.30	0.09
Planer Trim Saw	7	0.25	24,761	-	-	-	Included in Planer Mill Cyclone Emissions		

1. Sawdust calculated from No. logs per year * No. cuts * log area (ft^2) * kerf width (ft) * density (lb/ft^3)/2000.
Slasher saw processes 1% of total logs. ``
2. PM (TSP)/PM10 emission factors per FIRE database for SCC 30700803 for sawdust storage pile handling. PM2.5 obtained from EPA's PMCALC database sawdust handling.
3. A control efficiency was assumed for the all saws (other than sizing saws) based on partial enclosure of the individual saws. The level of control claimed is conservative (as the sawdust generated contains 50% moisture) and consistent with Air Pollution Engineering Manual, 2nd Ed., AWMA, c2000, Ch 15, p. 694.
Control efficiency = 70%
4. Planer trim saw has a misting system as a primary control system for dust from the saw. The trim saw also has a drop point from the planer mill cyclone, therefore emissions not controlled by the misting system are captured by the planer cyclone and accounted for with that system.
5. Annual emissions calculated from emission factor (lb/ton) * sawdust (tpy) / 2000 (lb/ton)

Table 3. Drum Screen Emission Calculations

Unit	Throughput (tpy)	Emission Factor (lb/ton) PM	PM_{10}	$PM_{2.5}$	PM Emissions (tpy)	PM_{10} Emissions (tpy)	$PM_{2.5}$ Emissions (tpy)
Drum Screen	163,316	2.00E-02	1.10E-02	3.800E-03	4.9E-01	2.7E-01	9.3E-02

1. Throughput for the drum screen is assumed to be equal to total plant chip and sawdust production.
2. Emission factor per FIRE database, SCC Code 3-07-008-01, Log Debarking.
3. EPA PM CALC database for SCC Code 3-07-008-01 (Log Debarking) $PM_{2.5}$ = 19% of PM.
4. A control efficiency was assumed for the drum screen based on partial enclosure of the screen itself. The level of control claimed is conservative (as the sawdust generated contains 50% moisture) and consistent with Air Pollution Engineering Manual, 2nd Ed., AWMA, c2000, Ch 15, p. 694.
Control efficiency = 70%
5. Annual emissions calculated from emission factor (lb/ton) * throughput (tpy) / 2000 (lb/ton)

GP Warrenton Chip-N-Saw
Baseline Bark, Chip and Planer Shavings Handling Emissions

Table 1. Baseline Process Information

Logs Processed	470,734	tpy
Bark Generation	47,073	tpy
Chip Generation	144,102	tpy
Typical Bark and Chip Moisture Content	50%	

Table 2. Bark and Chip Handling Emission Calculations

Unit	Throughput (tpy)	Emission Factor (lb/ton) PM	PM_{10}	$PM_{2.5}$	PM Emissions (tpy)	PM_{10} Emissions (tpy)	$PM_{2.5}$ Emissions (tpy)
Debarker (102S)	470,734	2.00E-02	1.10E-02	7.50E-05	4.71	2.59	1.77E-02
Edging Chipper	72,051	1.53E-02	1.70E-04	2.78E-05	0.08	9.19E-04	5.01E-04

1. Debarker PM and PM_{10} emission factors from EPA FIRE database, SCC 30700801 (Log Debarking).
2. Debarker PM2.5 emission rate based on information from NCASI July 2014 memo for PM2.5 Emissions from Drum Debarking. Emission factor presented was 4.5 E-05 lb/ton log processed. Subtracted a out a 90% control for Drum debarker and added a 50% saftey factor to the test data point since the data was for drum debarker and this is a ring debarker.
3. The Edging Chipper is assumed to process 50% of plant chips.
4. Edging Chipper emission factors developed based on information for chips contained in NCASI's Special Report, entitled "Estimating the Potential for PM2.5 Emissions from Wood and Bark Handling". Only southern pine was included in the development of the emission factor. A safety margin equal to two standard deviations was applied to the average value. Emission factor was presented as lb/dry ton of material processed.
5. A control efficiency was assumed for the edging chipper based on partial enclosure of the sawmill building for PM and PM10 only. The level of control claimed is conservative and consistent with Air Pollution Engineering Manual, 2nd Ed., AWMA, c2000, Ch 15, p. 694.
Control efficiency = 70%
6. Edging Chipper PM Annual Emissions (tpy) = Emission Factor (lb/dry ton) * Max Annual Throughput (tons/yr) * (1 - Moisture Content) / 2,000 lb/tonPM Annual Emissions (tpy) = Emission Factor (lb/dry ton) * Max Annual Throughput (tons/yr) * (1 - Moisture Content) / 2,000 lb/ton*(1-.70 control efficency)

Table 3. Chipper Emission Calculations

	Throughput tons	Emission Factor lb/ODT PM	PM_{10}	$PM_{2.5}$	PM Emissions (tpy)	PM_{10} Emissions (tpy)	$PM_{2.5}$ Emissions (tpy)
Big Chipper (103S)	2,882	1.50E-01	7.42E-02	2.70E-02	0.11	0.05	0.02
Small Chipper (104S)	22,864	1.50E-01	7.42E-02	2.70E-02	0.86	0.42	0.15

1. Big chipper throughput assumed to be equal to 2% of total facility chip generation.
2. Small chipper throughput assumed to be equal to 14% of total chip and sawdust facility generation.
3. PM Emission factor based on NCASI 2013 Wood Products database for green end material handling (all green chippers with cyclones). Used max test value plus 20% safety factor for PM.
4. PM_{10} emission factor was developed by calculating uncontrolled PM assuming 99% control in PM rate referenced above. The PM10/PM ratio for wood chips from NCASI's Special Report, "Estimating the Potential for PM2.5 Emissions from Wood and Bark Handling" of 0.0099 was applied. An assumed 50% control from the cyclone of PM10 emissions was then applied per AP-42 Appendix B.2 Table B.2-3 for low efficiency cyclones.
5. $PM_{2.5}$ emission factor was developed by calculating uncontrolled PM assuming 99% control in PM rate referenced above. The PM10/PM ratio for wood chips from NCASI's Special Report, "Estimating the Potential for PM2.5 Emissions from Wood and Bark Handling" of 0.0018 was applied.
6. Emission factors are provided as pound emissions per oven dried ton of material processed. Chips contain 50% moisture on average. The moisture content is removed from the weight of the material throughput.
7. Annual emissions calculated from emission factor (lb/ODT ton) * chips (tpy)* (100 - 50% moisture)/100/ 2000 (lb/ton).

Table 4. Chip, Sawdust & Planer Mill Cyclone Emissions

Unit	Airflow (scfm)	Operating Hours	Emission Factor (gr/dscf) PM	PM_{10}	$PM_{2.5}$	PM Emissions (tpy)	PM_{10} Emissions (tpy)	$PM_{2.5}$ Emissions (tpy)
Sawdust Truck Loading Cyclone (105B)	4,672	4,463	3.82E-04	6.34E-04	4.38E-04	0.03	0.06	3.91E-02
Chip Truck/Rail Loading Cyclone (105A)	8,294	4,463	1.00E-02	4.97E-03	6.49E-04	1.59	0.79	1.03E-01
Planer Mill Cyclone (PMC1)	49,925	4,017	3.06E-03	2.17E-03	1.13E-03	2.63	1.86	0.97

1. Sawdust loading emission factors based on the stack testing of the sawdust cyclone in 2013. Data used is the average of three runs.
2. Chip loading emission factor for PM based on typical vendor data for greenend cyclones. PM10 and PM2.5 based on testing of similar units plus a safety factor of 20%.
3. Planer Cyclone PM/PM10/PM2.5 Emission data based on 2013 testing of Warrenton Planer Mill Cyclone.

GP Warrenton Chip-N-Saw
Baseline Batch No. 1, 2 & 3 Kiln Emissions

Table 1. Kiln Information

Baseline Annual Capacity, Kiln #1	31,192	MBF/Yr
Baseline Annual Capacity, Kiln #2&#3	64,876	MBF/Yr

Table 2. Criteria Emission Calculations

Pollutant	Emission Factor	Unit	Reference	Emissions BAE (tpy) Kiln 1	Emissions BAE (tpy) Kiln 2&3
PM (f)	0.013	lb/MBF	1	0.20	0.42
PM (c)	0.020	lb/MBF	2	0.31	0.65
PM_{10} (f+c)	0.022	lb/MBF	2	0.34	0.71
$PM_{2.5}$ (f+c)	0.022	lb/MBF	2	0.34	0.71
VOC as C	4.280	lb/MBF	3	66.75	138.84
VOC as WPP1	5.490	lb/MBF	3	85.62	178.09

1. Based on Georgia-Pacific developed Title V factors, August 2012. Average plus 2 standard deviations. Filterable PM only.
2. Based on Georgia-Pacific developed Title V factors, August 2012. Average plus 2 standard deviations. FPM10/FPM2.5 + CPM.
3. Based on Georgia-Pacific developed emission factors using test data for Columbia, McCormick, and Bibler Brothers - Russellville and Rex Lumber. The selected factor is the median of available data plus one standard deviation.
4. VOC is based on the WPP1 methodology where VOC (as WPP1) equals VOC (as C3H8) plus MEOH and HCHO minus 0.458 times 0.65 times methanol emission rate.

GP Warrenton Chip-N-Saw
Baseline Wind Erosion of Storage Pile Emissions

Table 1. Storage Pile Wind Erosion Emissions

Storage Pile	Silt Content (s)	No. Dry Days per Year (d)	% time winds >12 mph (f)	Emission Factor (lb/day/acre) PM	Emission Factor (lb/day/acre) PM_{10}	Emission Factor (lb/day/acre) $PM_{2.5}$	Pile Area (acre)	PM Emissions (tpy)	PM_{10} Emissions (tpy)	$PM_{2.5}$ Emissions (tpy)
Boiler Fuel Pile	7.50	255	6	3.51	1.66	0.25	0.101	0.065	0.031	0.0046
Boiler Ash	80	255	6	37.45	17.71	2.68	0.046	0.314	0.148	0.022
Total								0.38	0.18	0.03

1. Silt content per AP-42, Section 13.2.4, *Aggregate Handling and Storage Piles* , Table 13.2.4-1, silt value for overburden for fuel pile. Silt value for ash per fly ash. Silt value for ground woodwaste is misc. fill materials.
2. Number of days in a year with at least 0.254 mm (0.01 in) of precipitation, AP-42 Section 13.2.2, *Unpaved Roads* , Figure 13.2.2-1
3. Percent of time windspeed greater than 12 mph calculated from meteorological data for Augusta (2007-2011). Obtained from Georgia EPD at http://www.georgiaair.org/airpermit/html/sspp/modeling.htm
4. Emissions calculated from NCASI Technical Bulletin 424 (March 1984) Figure 10.

$$EF(lb/day/acre) = 1.7 \times \left(\frac{s}{1.5}\right) \times \left(\frac{d}{235}\right) \times \left(\frac{f}{15}\right)$$

PM_{10} and $PM_{2.5}$ % of PM is based on AP-42 section 13.2.4.3 particle size multipliers

5. Fuel pile area is 4386.6 ft2, the ash piles are 50' x 40' x 10' high

GP Warrenton Chip-N-Saw
Baseline Paint and Fuel Tank Emissions

Table 1. Ink/Logo Emissions

Material	Specific Gravity	Use (gallons)	Use (tons)	VOC Content	Methanol Content	Vinyl Acetate Content	Emissions (tpy) VOC	Emissions (tpy) Methanol	Emissions (tpy) Vinyl Acetate
Logo Paint	1.07	391.0	1.7	2.7%	2.5%	0.001%	4.78E-02	4.31E-02	1.74E-05
Reject Paint	1.09	11.1	0.05	5.0%	-	-	2.53E-03	-	-
Total							5.03E-02	4.31E-02	1.74E-05

1. Specific gravity per MSDS.
2. VOC/HAP content for logo paint per May 20, 2010 and June 14, 2010 letters from Danielle Paradis (Williamette Valley Company).
3. Note that the stamp ink does not contain any VOC or HAP and emissions are not calculated.

Table 2. Tank Emission Calculations

Tank ID	Tank Contents	Size (gallons)	Horizontal or Vertical?	Height/Length (ft)	Diameter (ft)	Throughput (gal)	No. Turnovers	VOC Emissions (lb/yr)	VOC Emissions (tpy)
T-01	Diesel	10,000	H	16.0	10.0	76,278	7.6	7.6	3.81E-03
T-02	Gasoline	1,000	H	6.1	5.3	2,959	3.0	1392.4	6.96E-01
Total								1400.0	7.00E-01

The facility has a number of other small (<2,000 gallon) tanks storing materials with vapor pressures similar to or below that of diesel. Based on diesel emissions for much larger tanks, it is assumed that emissions from the other tanks are negligible.

GP Warrenton Chip-N-Saw
Baseline Drop Point Emissions

Table 1. Emission Factor Calculation

Material	Moisture Content[1]	Emission Factor (lb/ton)[2,3] PM	PM_{10}	$PM_{2.5}$
Sawdust	4.8	9.60E-04	4.54E-04	6.88E-05
Chips	4.8	9.60E-04	4.54E-04	6.88E-05
Ash	0.5	2.28E-02	1.08E-02	1.63E-03
Shavings	4.8	9.60E-04	4.54E-04	6.88E-05
Bark	4.8	9.60E-04	4.54E-04	6.88E-05

1. Ash moisture content assumed. For all other materials, moisture content (M) for f set equal to the maximum value for which the equation is appropriate. Actual moisture content is higher.

2. Emission factor calculated from

$$E\ (\text{lb/ton}) = k \times 0.0032 \times \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

where:

k: Particle size multiplier 0.74 PM
0.35 PM_{10}
0.053 $PM_{2.5}$

U: Mean wind speed 6.41 mph

3. Emission factor per AP-42, Section 13.2.4, *Aggregate Handling and Storage Piles*, drop equation.
Mean wind speed for Augusta, GA per EPA TANKS meteorological database.
Assumes one drop point each.

Table 2. Emissions Calculation

Material	Throughput (ton/yr)	No. of Drop Points	PM Emissions (lb/hr)	PM Emissions (tpy)	PM_{10} Emissions (lb/hr)	PM_{10} Emissions (tpy)	$PM_{2.5}$ Emissions (lb/hr)	$PM_{2.5}$ Emissions (tpy)
Sawdust	19,214	4	3.37E-02	3.69E-02	1.59E-02	1.75E-02	2.41E-03	2.64E-03
Chips	144,102	4	2.53E-01	2.77E-01	1.20E-01	1.31E-01	1.81E-02	1.98E-02
Ash	1,019	2	1.06E-02	2.32E-02	5.01E-03	1.10E-02	7.59E-04	1.66E-03
Shavings	28,820	1	3.16E-03	1.38E-02	1.49E-03	6.54E-03	2.26E-04	9.91E-04
Bark	47,073	2	2.06E-02	4.52E-02	9.76E-03	2.14E-02	1.48E-03	3.24E-03
Total			0.321	0.40	0.152	0.19	2.30E-02	0.03

1. Ash throughput based on 2% ash content and mass of fuel and two drop points.

GP Warrenton Chip-N-Saw
Baseline Road Emissions

Table 1. Road Information

Road Segment	Paved/Unpaved	Length (mi)
A	Paved	0.086
B	Paved	0.182
C	Unpaved	0.101
D-1	Paved	0.11
D-2	Unpaved	0.08
E	Paved	0.06
F	Paved	0.201

Sample Location	sL	
P-6	0.25	g/m^2
P-6	0.25	g/m^2
UP-1	1.2	%
P-5	1.08	g/m^2
UP-2	1.6	%
Not sampled	0.4	g/m^2 (used average for paved roads)
P-4	0.24	g/m^2

Information based on review of site layout and truck traffic.

Table 2. Truck Traffic Details

Truck	Material Throughput (tpy)	Truck Weight[1] (tons) Unloaded	Loaded	Average Truck Weight (tons)	BAE Number of Trucks[2]	Routes Traveled (# = No of trips) A	B	C	D1	D2	E	F
Shavings	28,820	15	40	27.5	1153	2	2				2	
Chips	144,102	15	40	27.5	2882	2	2		2	2		2
Logs	470,734	15	40	27.5	18829	2	2	2				
Bark	NA	15	40	27.5	10	2	2		2	2		2
Sawdust	NA	15	40	27.5	25	2	2		2	2		2
Finished Lumber	96,068	15	40	27.5	4803	2	2					2

1. Truck weight based on engineering estimates.
2. Number trucks based on material throughput divided by haul weight.
3. Estimate half of the chips produced are shipped by truck and half by rail.
4. Assumed 10 loads of bark and 25 loads of sawdust were trucked, the rest burned in the boiler.
5. Lumber trucks based on 20 Mbf per truck.

Table 3. Emission Factor Calculation

Segment	Fleet Mean Weight (tons)	Emission Factor[1, 2] PM - Maximum (lb/VMT)	PM_{10} - Maximum (lb/VMT)	$PM_{2.5}$ - Maximum (lb/VMT)
<u>**Paved**</u>				
A	27.5	0.0846	0.0169	4.16E-03
B	27.5	0.0846	0.0169	4.16E-03
D1	27.5	0.32	0.06	1.57E-02
E	27.5	0.13	0.03	6.37E-03
F	27.5	0.08	0.02	4.00E-03
<u>**Unpaved**</u>				
C	27.5	1.85	0.36	3.58E-02
D2	27.5	2.26	0.46	4.63E-02

1. Long term average paved route emission factor is based on Equation 2 of AP-42 Section 13.2.1 (January 2011):

$$E = \left[k \times (sL)^{0.91} \times (W)^{1.02}\right] \times \left(1 - \frac{P}{4N}\right)$$

E =		size specific emission factor (lb/VMT)
k =	0.011	particle size multiplier for particle size range and units of interest, AP-42, Section 13.2.1, Table 13.2.1-1.
	0.0022	
	0.00054	
sL =	*see table above*	road surface silt loading (g/m^2), based on silt content testing conducted on paved roads at the Warrenton mill.
W =		mean vehicle weight (tons)
P =	110	number of days in the averaging period with at least 0.254 mm (0.01 in) of precipitation, AP-42 Section 13.2.1, Figure 13.2.1-2.
N =	365	number of days in the averaging period (e.g., 365 for annual)

2. Unpaved route emission factor is based on Equations 1a and 2 of AP-42 Section 13.2.2 (November 2006):
Equations 1a and 2 (combined):

$$E = k \times \left(\frac{s}{12}\right)^{a} \times \left(\frac{W}{3}\right)^{b} \times \left(\frac{365 - P}{365}\right)$$

E =		size specific emission factor (lb/VMT)
s =	*see table above*	surface material silt content (%), based on silt content testing conducted on unpaved roads at the Warrenton mill.
W =		mean vehicle weight (tons)
k =	4.9	particle size multiplier, AP-42 Section 13.2.2, Table 13.2.2-2.
	1.5	
	0.15	
a =	0.7	empirical constant, AP-42 Section 13.2.2, Table 13.2.2-2.
	0.9	
b =	0.45	empirical constant, AP-42 Section 13.2.2, Table 13.2.2-2.
P =	110	number of days in a year with at least 0.254 mm (0.01 in) of precipitation, AP-42 Section 13.2.2, Figure 13.2.2-1

Table 4. Emission Calculations

Road Segment	Vehicle Miles Traveled Maximum	Emissions PM (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
A	4764.85	0.20	0.04	9.90E-03
B	10083.76	0.43	0.09	2.10E-02
C	3803.53	3.52	0.68	6.80E-02
D1	641.75	0.10	0.02	5.05E-03
D2	466.73	0.53	0.11	1.08E-02
E	138.34	0.01	0.00	4.41E-04
F	3103.62	0.13	0.03	6.21E-03
Total		4.92	0.96	0.12

1. VMT calculated from segment length times number of trips.
2. Emissions Calculated from emission factor (lb/VMT) * VMT / 2000 lb/ton.

GP Warrenton Chip-N-Saw
Phase I Project Emissions Summary

		PM	PM_{10}	$PM_{2.5}$	CO	VOC	SO_2	NO_X	Lead	Total CO_2e
New Equipment - Potential Emissions										
200 - Kilns	204 - Direct Fired Kiln No. 1 Wood/NG Fired	5.46	8.94	6.48	79.72	329.40	1.62	14.94	0.01	32,125
	205 - Fuel Silo	1.93	1.93	0.93						
400C- Boiler	700 - NG Package Boiler	0.32	1.71	1.71	13.97	0.91	0.10	22.53	0.00	19,986
100 - Sawmill	101 - Interior Saws (IS) - Edger & Trim Saw	3.60	1.30	0.40						
	Bark Handling	0.32	0.15	0.02						
	Chip Handling	1.05	0.50	0.08						
	Sawdust Handling	0.18	0.09	0.01						
Modified Equipment - Projected Actual Emissions										
100 - Sawmill	102 - Sizing Saws (IS)	1.66	0.60	0.18						
200 - Kilns	202 & 203 - Existing Batch Kilns	0.33	0.55	0.55		137.25				
500 - Roads	500 - Roads	11.22	2.20	0.26						
Existing Equipment - Projected Actual Emissions										
100 - Sawmill	101 - Interior Saws (IS) - VSA & Slasher Saws	0.30	0.11	0.03						
	102 - Debarker	7.99	4.39	0.03						
	103 - Big Chipper	0.15	0.07	0.03						
	105B - Sawdust Loading	0.08	0.13	0.09						
	105A - Chip Loading	3.11	1.55	0.20						
300 - Planer Mill	301 & 302 - Planer Mill (Planer Mill, Trim Saw, Trim Hog and Cyclones)	6.89	4.87	2.54						
	Planer Shavings Handling	0.02	0.01	1.75E-03						
600 - Inks and Tanks	Inks + Storage Tanks					0.80				
Total		**44.62**	**29.10**	**13.54**	**93.69**	**468.37**	**1.72**	**37.47**	**0.01**	**52,111**

GP Warrenton Chip-N-Saw
Phase I Project Emissions Summary continued

		PM	PM_{10}	$PM_{2.5}$	CO	VOC	SO_2	NO_X	Lead	Total CO_2e
Baseline Actual Emissions										
100 - Sawmill	101 - Interior Saws (IS) - VSA & Slasher Saws	0.18	0.06	0.02						
	102 - Sizing Saws (IS)	0.98	0.35	0.11						
	102 - Debarker	4.71	2.59	0.02						
	103 - Big Chipper	0.11	0.05	0.02						
	105B - Sawdust Loading	0.03	0.06	0.04						
	105A - Chip Loading	1.59	0.79	0.10						
200 - Kilns	Steam Heated Kiln 203	0.42	0.71	0.71		178.09				
300 - Planer Mill	302 - Planer Mill Cyclone	2.63	1.86	0.97						
	Planer Shavings Handling	0.01	0.01	9.91E-04						
500 - Roads	500 - Roads	4.92	0.96	0.12						
600 - Inks and Tanks	Inks + Storage Tanks					0.75				
Total		**15.58**	**7.45**	**2.11**	**0.00**	**178.84**	**0.00**	**0.00**	**0.00**	**0**

Emisisons Summary (tpy)	**PM**	**PM_{10}**	**$PM_{2.5}$**	**CO**	**VOC**	**SO_2**	**NO_X**	**Lead**	**GHG CO_2e**
Step 1									
Proposed Project Emissions (tpy) (New Equiptment Potential Emissions - 0 Baseline Emissions) + (Projected Actual Emissions of Modified Existing Equipment - Baseline Actual Emissions of Modified Existing Equipment)	29.0	21.6	11.4	93.7	289.5	1.7	37.5	0.0	52,111
PSD Significant Emission Rate (SER)	**25**	**15**	**10**	**100**	**40**	**40**	**40**	**0.6**	**75,000**
Exceeds PSD SER and Netting Required? (Yes/No)	**Yes**	**Yes**	**Yes**	**No**	**Yes**	**No**	**No**	**No**	**No**

GP Warrenton Chip-N-Saw
Phase I Emissions Netting Analysis

Phase I Step 2 Emisisons Summary

	PM (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	CO (tpy)	VOC (tpy)	SO_2 (tpy)	NO_X (tpy)	Lead (tpy)	GHG CO_2e (tpy)
Project Emission Increases	29.04	21.65	11.43	93.69	289.53	1.72	37.47	0.01	52110.82
Contemporaneous Increases & Decreases									
None									
Project Decreases									
400B - Wood fired Boiler	-8.0	-9.8	-9.1	-381.3	-11.4	-6.9	-40.1	0.0	-48055.4
201 - Batch Kiln 1	-0.2	-0.3	-0.3		-85.6				
401 - Fuel and Ash Storage (IS)	-0.4	-0.2	0.0						
101 - Interior Saws (IS) - Edger & Trim Saw	-0.91	-0.30	-0.09						
105 - Screen (IS)	-0.49	-0.27	-0.09						
Bark Handling	-0.05	-0.02	-3.24E-03						
Sawdust Handling	-0.04	-0.02	-2.64E-03						
Chip Handling	-0.28	-0.13	-1.98E-02						
104 - Small Chipper Cyclone	-0.86	-0.42	-0.15						
Net Emission Increases	**17.8**	**10.1**	**1.6**	**-287.7**	**192.5**	**-5.2**	**-2.6**	**0.0**	**4055.4**
Significant Emission Rate	**25**	**15**	**10**	**100**	**40**	**40**	**40**	**0.7**	**75,000**
Significant Net Emissions Increase?	**No**	**No**	**No**	**No**	**Yes**	**No**	**No**	**No**	**No**

GP Warrenton Chip-N-Saw
Package Boiler PTE Emissions

Table 1. Fuel Information

Natural Gas	1,026	btu/scf

Table 2. Boiler Operating Information

Fuel Use	37,980.0	(SCF/hr)
	332.7	(MMSCF/yr)
Operating Hours	8,760.0	hours/yr

1. Asssumes 100% load operation 8760 hours a year

Table 3. Criteria Emission Calculations

Pollutant	**Emission Factors**	**Emissions PTE**	
	(lb/MMBtu)	**(lb/hr)**	**(tpy)**
PM (f)	1.9E-03	0.07	0.32
PM_{10} (f+c)	1.0E-02	0.39	1.71
$PM_{2.5}$ (f+c)	1.0E-02	0.00	1.71
CO	8.2E-02	0.00	13.97
VOC	5.4E-03	0.00	0.91
SO_2	5.8E-04	0.00	0.10
NO_X	1.3E-01	0.01	22.53
Lead	4.87E-07	1.85E-08	8.32E-05
CO_2	1.2E+02	4.4	19,965
CH_4	2.2E-03	0.0	0.38
N_2O	2.2E-04	0.0	0.04
Total CO2e	1.2E+02	4.4	19,986

1. PM10, PM2.5, NOx emissions per Boiler Vendor.
1. All other emission factors per EPA AP-42, Tables 1.4-1 and 1.4-2, *Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion* .

Table 4. Hazardous Air Pollutant Emission Calculations

Pollutant	**Emission Factor Natural Gas (lb/MMScf)**	**Emissions PTE (lb/hr)**	**(tpy)**
Hazardous Air Pollutants			
Benzene	2.10E-03	8.0E-05	3.5E-04
Dichlorobenzene	1.20E-03	4.6E-05	2.0E-04
Formaldehyde	7.50E-02	2.8E-03	1.2E-02
Hexane	1.80E+00	6.8E-02	3.0E-01
Naphthalene	6.10E-04	2.3E-05	1.0E-04
Polycyclic Organic Matter	6.60E-04	2.5E-05	1.1E-04
Toluene	3.40E-03	1.3E-04	5.7E-04
Arsenic	2.00E-04	7.6E-06	3.3E-05
Cadmium	1.10E-03	4.2E-05	1.8E-04
Chromium	1.40E-03	5.3E-05	2.3E-04
Cobalt	8.40E-05	3.2E-06	1.4E-05
Manganese	3.80E-04	1.4E-05	6.3E-05
Mercury	2.60E-04	9.9E-06	4.3E-05
Nickel	2.10E-03	8.0E-05	3.5E-04
Toxic Air Pollutants			
Butane	2.10E+00	8.0E-02	3.5E-01
Ethane	3.10E+00	1.2E-01	5.2E-01
Pentane	2.60E+00	9.9E-02	4.3E-01
Propane	1.60E+00	6.1E-02	2.7E-01
Barium	4.40E-03	1.7E-04	7.3E-04
Copper	8.50E-04	3.2E-05	1.4E-04
Molybdenum	1.10E-03	4.2E-05	1.8E-04
Vanadium	2.30E-03	8.7E-05	3.8E-04
Zinc	2.90E-02	1.1E-03	4.8E-03

1. Natural gas emission factors per AP-42 Table 1.4-3 and 1.4-4.

GP Warrenton Chip-N-Saw
CDK No. 1 Potential Criteria Emissions

Table 1. Kiln Information

Kiln #1 Potential Production	120,000	MBF/Yr
	15.1	MBF/hr
Maximum Hours of Operation:	8760	Hrs/Yr
Maximum Design Heat Input Capacity of Primary Burne	35.0	MMBtu/Hr
Design Capacity of Combo Burner		
Sawdust	35.0	MMBtu/Hr
Natural Gas	7.0	MMBtu/Hr
Natural Gas	1,026	btu/scf

Table 2. Criteria Emission Calculations

Pollutant	Sawdust Gasifier Drying Emissions Emission Factor	Unit	Natural Gas Drying Emissions Emission Factor	Unit	Sawdust Only Firing PTE (lb/hr)	(tpy)	Natural Gas Only Firing PTE (lb/hr)	(tpy)	Sawdust/NG Combo Firing PTE (lb/hr)	(tpy)
PM (f)	0.091	lb/MBF	0.0019	lb/MMbtu	1.37	5.46	0.26	1.06	1.39	5.52
			0.0130	lb/MBF						
PM (c)	0.063	lb/MBF	0.0056	lb/MMbtu	0.95	3.78	0.50	2.05	0.99	3.95
			0.0200	lb/MBF						
PM_{10} (f+c)	0.149	lb/MBF	0.0074	lb/MMbtu	2.25	8.94	0.59	2.46	2.30	9.17
			0.0220	lb/MBF						
$PM_{2.5}$ (f+c)	0.108	lb/MBF	0.0294	lb/MMbtu	1.63	6.48	1.36	5.83	1.84	7.38
			0.0220	lb/MBF						
CO	0.520	lb/MMbtu	0.082	lb/MMbtu	18.20	79.72	2.87	12.55	18.77	82.23
VOC as C	4.280	lb/MBF	4.2800	lb/MBF	64.63	256.80	64.63	256.80	64.63	256.80
VOC as WPP1	5.490	lb/MBF	5.490	lb/MBF	82.90	329.40	82.90	329.40	82.90	329.40
SO_2	0.011	lb/MMbtu	0.001	lb/MMbtu	0.37	1.62	0.02	0.09	0.38	1.64
NO_X	0.064	lb/MMbtu	0.097	lb/MMbtu	2.24	9.81	3.41	14.94	2.92	12.80
Lead	9.11E-05	lb/MMbtu	4.87E-07	lb/MMbtu	3.19E-03	1.40E-02	1.71E-05	7.47E-05	0.00	0.01
CO_2	2.07E+02	lb/MMbtu	1.17E+02	lb/MMbtu	7,238	31,701	4,094	17,933	8056.61	35287.94
CH_4	1.59E-02	lb/MMbtu	2.20E-03	lb/MMbtu	0.56	2.43	0.08	0.34	0.57	2.50
N_2O	7.94E-03	lb/MMbtu	2.20E-04	lb/MMbtu	0.28	1.22	0.01	0.03	0.28	1.22
GHG	2.07E+02	lb/MMbtu	1.17E+02	lb/MMbtu	7,239	31,705	4,094	17,933	8057.46	35291.66
Total CO2e	2.10E+02	lb/MMbtu	1.17E+02	lb/MMbtu	7,334	32,125	4,098	17,951	8154.12	35715.05

1. Wood firing PM, CO, NOx, VOC and NG firing VOC Emission factors are based on the average plus one standard deviation from site test data from several facilities: GP - Columbia, GP - McCormick, Bibler Brothers - Russellville, Rex Lumber - Grace Mills.
2. Wood firing SO2 Emission factor from NCASI TB 1020 (December 2013), Table 10.4, median value.
3. Wood firing Lead Emission factor from NCASI Technical Bulletin 1013 (March 2013), Table 4.3, maximum of the median values plus two standard deviations for all available classes of boilers/control devices.
4. Natural Gas firing PM, CO, NOx, SO2 and Lead emission factors from AP-42 Chapter 1.4 converted to lb/MMBtu basis assuming 1026 btu/scf per GHG EF (40 CFR 98). NG drying emissions also include emissions associated with wood drying (indirect-fired kiln emissions on a lb/MBF basis) based on GP developed Title V factors, August 2012. Average plus 2 standard deviations.
5. VOC (as WPP1) equals VOC (as C3H8) plus MEOH and HCHO minus 0.458 times 0.65 times methanol emisison rate.
6. GHG Emission factors are from Tables C-1 and C-2 of EPA's Mandatory Reporting Rule for Greenhouse Gases (40 CFR 98). Factors are converted from kg/MMBtu to lb/MMBtu.

GP Warrenton Chip-N-Saw
CDK No. 1 Potential HAP Emissions from Wood Firing

Table 1. Kiln Information

Future Annual Capacity, Kiln #21	120,000	MBF/year
	15.1	MBF/hr
Maximum Hours of Operation:	8760	Hrs/Yr
Maximum Design Heat Input Capacity	35.0	MMBtu/hr
	306,600	MMBtu/yr

Table 2. Hazardous Air Pollutant Emission Calculations

Pollutant	CAS Number	Emission Factors		Kiln Emission Rates[1]	
		lb/MBF	lb/MMBtu	lb/hr	tpy
Acetaldehyde[4]	75-07-0	5.04E-02	--	7.61E-01	3.02E+00
Acetophenone	98-86-2	--	2.21E-06	7.73E-05	3.38E-04
Acrolein[7]	107-02-8	6.00E-03	1.52E-04	9.59E-02	3.83E-01
Benzene	71-43-2	--	2.82E-04	9.87E-03	4.32E-02
Bis(2-Ethylhexyl)phthalate (also di-)	117-81-7	--	5.58E-08	1.95E-06	8.55E-06
Bromomethane (Methyl bromide)	74-83-9	--	4.40E-06	1.54E-04	6.75E-04
Carbon Disulfide	75-15-0	--	1.50E-04	5.25E-03	2.30E-02
Carbon Tetrachloride	56-23-5	--	1.39E-05	4.87E-04	2.13E-03
Chlorobenzene	108-90-7	--	1.99E-05	6.97E-04	3.05E-03
Chloroform	67-66-3	--	3.06E-06	1.07E-04	4.69E-04
Chloromethane (Methyl Chloride)	74-87-3	--	3.19E-05	1.12E-03	4.89E-03
Cumene	98-82-8	--	2.12E-05	7.43E-04	3.26E-03
Dichloroethane, 1,2- (Ethylene dichloride)	107-06-2	--	3.50E-05	1.23E-03	5.37E-03
Dichloromethane (Methylene chloride)	75-09-2	--	3.38E-05	1.18E-03	5.19E-03
Dichloropropane, 1,2- (Propylene dichloride)	78-87-5	--	2.02E-05	7.06E-04	3.09E-03
Di-n-butyl Phthalate	84-74-2	--	4.00E-05	1.40E-03	6.13E-03
Dinitrophenol, 2,4-	51-28-5	--	1.57E-07	5.50E-06	2.41E-05
Dinitrotoluene, 2,4-	121-14-2	--	1.13E-06	3.96E-05	1.73E-04
Ethylbenzene	100-41-4	--	3.76E-05	1.31E-03	5.76E-03
Formaldehyde[2]	50-00-0	8.50E-02	--	1.28E+00	5.10E+00
Hexachlorobenzene	118-74-1	--	1.24E-06	4.33E-05	1.89E-04
Hexane	110-54-3	--	3.46E-04	1.21E-02	5.30E-02
Hydrogen Chloride	7647-01-0	--	4.64E-04	1.63E-02	7.12E-02
Methanol[3]	67-56-1	2.40E-01	--	3.62E+00	1.44E+01
MIBK	108-10-1	1.20E-03	5.34E-04	3.68E-02	1.54E-01
Naphthalene	91-20-3	--	9.76E-06	3.41E-04	1.50E-03
4-Nitrophenol	100-02-7	--	1.12E-07	3.91E-06	1.71E-05
Pentachlorophenol	87-86-5	--	5.38E-08	1.88E-06	8.24E-06
Phenol[4]	108-95-2	1.24E-02	--	1.87E-01	7.42E-01
POM[6]	Various	--	1.52E-04	5.32E-03	2.33E-02
Propionaldehyde	123-38-6	1.20E-03	2.57E-05	1.90E-02	7.59E-02
Styrene	100-42-5	--	1.85E-05	6.47E-04	2.83E-03
Tetrachloroethene (Tetrachloroethylene, Perchlo	127-18-4	--	2.95E-05	1.03E-03	4.53E-03
Toluene	108-88-3	1.20E-04	4.40E-06	1.97E-03	7.88E-03
Trichloroethane, 1,1,1- (Methyl Chloroform)	71-55-6	--	4.72E-05	1.65E-03	7.23E-03
Trichloroethene (Trichloroethylene)	79-01-6	--	2.39E-05	8.36E-04	3.66E-03
Trichlorophenol, 2,4,6-	88-06-2	--	3.28E-07	1.15E-05	5.02E-05
Vinyl Chloride	75-01-4	--	2.21E-05	7.73E-04	3.38E-03
Xylene	1330-20-7	2.40E-04	6.26E-06	3.84E-03	1.54E-02
PAHs[4]					
Furan	11-00-09	--	2.35E-11	8.21E-10	3.60E-09
Anthracene	120-12-7	--	2.11E-07	7.39E-06	3.24E-05
Acenaphthene	83-32-9	--	1.24E-07	4.33E-06	1.89E-05
Acenaphthylene	208-96-8	--	6.97E-07	2.44E-05	1.07E-04
Benzo(a)anthracene	56-55-3	--	1.51E-08	5.29E-07	2.32E-06
Benzo(a)pyrene	50-32-8	--	1.82E-08	6.38E-07	2.80E-06
Benzo(b)fluoranthene	205-99-2	--	1.51E-08	5.29E-07	2.32E-06
Benzo(e)pyrene	192-97-2	--	9.54E-08	3.34E-06	1.46E-05
Benzo(k)fluoranthene	207-08-9	--	2.20E-08	7.69E-07	3.37E-06
2-Chloronapthalene	91-58-7	--	1.44E-08	5.04E-07	2.21E-06
Chrysene[5]	218-01-9	--	4.56E-08	1.60E-06	6.99E-06
Dioxins		--	3.39E-11	1.18E-09	5.19E-09
Dibenzo(a,h)anthracene	53-70-3	--	2.54E-08	8.88E-07	3.89E-06
Fluorene	86-73-7	--	2.27E-07	7.94E-06	3.48E-05
Fluoranthene [Benzo(j,k) fluorine]	206-44-0	--	5.48E-07	1.92E-05	8.41E-05
Indeno(1,2,3,c,d)pyrene	193-39-5	--	1.10E-08	3.83E-07	1.68E-06
2-Methylnaphthalene	91-57-6	--	1.55E-06	5.42E-05	2.37E-04
Perylene	198-55-0	--	7.90E-09	2.76E-07	1.21E-06
Phenanthrene	85-01-8	--	3.17E-06	1.11E-04	4.86E-04
Pyrene	129-00-0	--	1.19E-06	4.15E-05	1.82E-04
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	--	7.60E-13	2.66E-11	1.16E-10

GP Warrenton Chip-N-Saw
CDK No. 1 Potential HAP Emissions from Wood Firing

Pollutant	CAS Number	Emission Factors		Kiln Emission Rates[1]	
		lb/MBF	lb/MMBtu	lb/hr	tpy
Metal HAPs[4]					
Antimony	7440-36-0	--	4.27E-06	1.50E-04	6.55E-04
Arsenic	7440-38-2	--	2.80E-05	9.81E-04	4.29E-03
Beryllium	7440-41-7	--	1.04E-07	3.65E-06	1.60E-05
Cadmium	7440-43-9	--	5.81E-06	2.03E-04	8.90E-04
Chromium total		--	1.87E-05	6.56E-04	2.87E-03
Chromium VI	18540-29-9	--	2.82E-07	9.87E-06	4.32E-05
Cobalt	7440-48-4	--	7.33E-07	2.57E-05	1.12E-04
Manganese	7439-96-5	--	1.52E-04	5.33E-03	2.33E-02
Mercury	7439-97-6	--	1.88E-06	6.57E-05	2.88E-04
Nickel	7440-02-0	--	1.64E-05	5.75E-04	2.52E-03
Phosphorus	7723-14-0	--	1.18E-04	4.14E-03	1.81E-02
Selenium	7782-49-2	--	1.24E-06	4.34E-05	1.90E-04

1. Emission Rates (lb/hr) = Emission Factor (lb/MMBtu) * Fuel Usage (ton/yr) * Fuel Heat Content (Btu/lb) / Hours of Operation (hr/yr) * (2,000 lb/ton) * (MMBtu/106 Btu)
Emission Rates (tpy) = Emission Factor (lb/MMBtu) * Fuel Usage (ton/yr) * Fuel Heat Content (Btu/lb) * (MMBtu/106 Btu)
or:
Emission Rates (lb/hr) = Emission Factor (lb/MBF) * Production Rate (MBF/yr) / Hours of Operation (hr/yr)
Emission Rates (tpy) = Emission Factor (lb/MBF) * Production Rate (MBF/yr) * (ton/2,000 lb)
2. Formaldehyde emission factor based median of the GP Columbia, MS (2/2/11), GP McCormick, SC (2/14/12, 7/17/13), Bibler Bros Russellville, AR (Kiln 1 2/23/10, Kiln 3 3/12/09) tests.
One standard deviation (based on individual test runs) was added to average for conservancy:
3. Methanol factor based on median of GP tests on continuous direct fired dry planer shaving burners at Columbia, MS (2/2/11) and McCormick, SC (2/14/12, 7/17/13).
One standard deviation (based on individual test runs) was added to average for conservancy:
4. Emission factors for all other pollutants from March 2013 NCASI database and Technical Bulletin 1013 (2013) median plus 2 standard deviations (if available) or plus 20% (when a standard deviation is not available or in the case that the standard deviation is greater than the median) for boiler with mechanical collector (or boiler with a wet scrubber for metals). Furan and Dioxin converted from ug/OD ton wood fired to lb/MMBtu using 8,400 Btu/lb heat content from NCASI TB1013. 2,3,7,8-Tetrachlorodibenzo-p-dioxin is calculated as the mean value listed in the NCA database plus 20%.
5. Chrysene emission factors based on AP-42 Table 1.6-3 plus 20%.
6. Total POM summarized from EPA AP-42, Section 1.6, Wood Residue Combustion in Boilers, Table 1.6-3.
7. NCASI TB 845 (2002), Table BB1 Steam FSK Emission factor plus a 20% safety factor.

GP Warrenton Chip-N-Saw
CDK No. 1 Potential HAP Emissions from Natural Gas Firing

Table 1. Fuel Information

Natural Gas	1,026	btu/scf

Table 2. Kiln Information

Future Annual Capacity, Kiln #1	120,000	MBF/year
	15.1	MBF/hr
Maximum Hours of Operation:	8760	Hrs/Yr
Maximum Design Heat Input Capacity	35.0	MMBtu/hr
	306,600	MMBtu/yr

Table 2. Hazardous and Toxic Air Pollutant Emission Calculations

Pollutant	CAS Number	Emission Factors		Kiln Emission Rates	
		lb/MBF	lb/MMscf[4]	lb/hr	tpy
Acetaldehyde[3]	75-07-0	5.04E-02	--	7.61E-01	3.02E+00
Acrolein[3]	107-02-8	6.00E-03	--	9.06E-02	3.60E-01
Benzene	71-43-2	--	2.10E-03	7.16E-05	3.14E-04
Dichlorobenzene		--	1.20E-03	4.09E-05	1.79E-04
Formaldehyde[2]	50-00-0	2.53E-02	7.50E-02	3.84E-01	1.53E+00
Hexane	110-54-3	--	1.80E+00	6.14E-02	2.69E-01
Naphthalene	91-20-3	--	6.10E-04	2.08E-05	9.11E-05
POM	Various	--	6.60E-04	2.25E-05	9.86E-05
Toluene	108-88-3	--	3.40E-03	1.16E-04	5.08E-04
Arsenic	7440-38-2	--	2.00E-04	6.82E-06	2.99E-05
Cadmium	7440-43-9	--	1.10E-03	3.75E-05	1.64E-04
Chromium	7440-47-3	--	1.40E-03	4.78E-05	2.09E-04
Cobalt	7440-48-4	--	8.40E-05	2.87E-06	1.26E-05
Manganese	7439-96-5	--	3.80E-04	1.30E-05	5.68E-05
Mercury	7439-97-6	--	2.60E-04	8.87E-06	3.88E-05
Methanol[2]	67-56-1	2.51E-01	--	3.78E+00	1.50E+01
Methyl Isobutyl Ketone[5]	108-10-1	1.20E-03	--	1.81E-02	7.20E-02
Nickel	7440-02-0	--	2.10E-03	7.16E-05	3.14E-04
Phenol[3]	108-95-2	1.24E-03	--	1.87E-02	7.42E-02
Propionaldehyde[3]	123-38-6	1.20E-03	--	1.81E-02	7.20E-02
Toluene[3]	108-88-3	1.20E-04	3.40E-03	1.93E-03	7.71E-03
Xylene[3]	1330-20-7	2.40E-04	--	3.62E-03	1.44E-02
Butane	106-97-8	--	2.10E+00	7.16E-02	3.14E-01
Ethane	74-84-0	--	3.10E+00	1.06E-01	4.63E-01
Pentane	109-66-0	--	2.60E+00	8.87E-02	3.88E-01
Propane	74-98-6	--	1.60E+00	5.46E-02	2.39E-01
Barium	7440-39-3	--	4.40E-03	1.50E-04	6.57E-04
Copper	7440-50-8	--	8.50E-04	2.90E-05	1.27E-04
Molybdenum	7439-98-7	--	1.10E-03	3.75E-05	1.64E-04
Vanadium	7440-62-2	--	2.30E-03	7.85E-05	3.44E-04
Zinc	7440-66-6	--	2.90E-02	9.89E-04	4.33E-03

1. Emission Rates (lb/hr) = Emission Factor (lb/MMBtu) * Fuel Usage (ton/yr) * Fuel Heat Content (Btu/lb) / Hours of Operation (hr/yr) * (2,000 lb/ton) * (MMBtu/106 Btu)
Emission Rates (tpy) = Emission Factor (lb/MMBtu) * Fuel Usage (ton/yr) * Fuel Heat Content (Btu/lb) * (MMBtu/106 Btu)
or:
Emission Rates (lb/hr) = Emission Factor (lb/MBF) * Production Rate (MBF/yr) / Hours of Operation (hr/yr)
Emission Rates (tpy) = Emission Factor (lb/MBF) * Production Rate (MBF/yr) * (ton/2,000 lb)
2. NCASI Wood Products Electronic Database, Updated February 2013. Emission factor is the median plus 1 standard deviation.
3. NCASI Wood Products Electronic Database, Updated February 2013. Emission factor is the median plus 20%.
4. Emission factors for all other pollutants for natural gas combustion per AP-42 Table 1.4-3 and 1.4-4.
5. NCASI TB 845 (2002), Table BB1 Steam FSK Emission factor plus a 20% safety factor.
6. NCASI Wood Products Electronic Database, Updated February 2013. Emission factor is the median.

GP Warrenton Chip-N-Saw
CDK No. 1 Potential HAP Emissions from Combination Wood/NG Firing Burner

Table 1. Fuel Information

Natural Gas	1,026	btu/scf

Table 2. Kiln Information

Future Annual Capacity, Kiln #1	120,000	MBF/year
	15.1	MBF/hr
Maximum Hours of Operation:	8760	Hrs/Yr
Maximum Design Heat Input Capacity	Wood-Firing Portion	
	35.0	MMBtu/hr
	306,600	MMBtu/yr
	NG-Firing Portion	
	7.0	MMBtu/hr
	7.E-03	MMscf/hr
	60	MMscf/yr

Table 2. Hazardous Air Pollutant Emission Calculations

Pollutant	CAS Number	Emission Factors			Kiln Emission Rates[1]	
		Production Based	Wood-fired	NG-fired		
		lb/MBF	lb/MMBtu	lb/MMscf	lb/hr	tpy
Acetaldehyde[4]	75-07-0	5.04E-02	--	--	7.61E-01	3.02E+00
Acetophenone	98-86-2	--	1.84E-06	--	6.44E-05	2.82E-04
Acrolein[8]	107-02-8	6.00E-03	1.52E-04	--	9.59E-02	3.83E-01
Benzene	71-43-2	--	2.35E-04	2.10E-03	8.24E-03	3.61E-02
Bis(2-Ethylhexyl)phthalate (also di-)	117-81-7	--	4.65E-08	--	1.63E-06	7.13E-06
Bromomethane (Methyl bromide)	74-83-9	--	3.67E-06	--	1.28E-04	5.63E-04
Butane	106-97-8	--	--	2.10E+00	1.43E-02	6.28E-02
Carbon Disulfide	75-15-0	--	1.25E-04	--	4.38E-03	1.92E-02
Carbon Tetrachloride	56-23-5	--	1.16E-05	--	4.06E-04	1.78E-03
Chlorobenzene	108-90-7	--	1.66E-05	--	5.81E-04	2.54E-03
Chloroform	67-66-3	--	2.55E-06	--	8.93E-05	3.91E-04
Chloromethane (Methyl Chloride)	74-87-3	--	2.66E-05	--	9.31E-04	4.08E-03
Cumene	98-82-8	--	1.77E-05	--	6.20E-04	2.71E-03
Dichlorobenzene		--	--	1.20E-03	8.19E-06	3.59E-05
Dichloroethane, 1,2- (Ethylene dichloride)	107-06-2	--	2.92E-05	--	1.02E-03	4.48E-03
Dichloromethane (Methylene chloride)	75-09-2	--	2.82E-05	--	9.87E-04	4.32E-03
Dichloropropane, 1,2- (Propylene dichloride)	78-87-5	--	1.68E-05	--	5.88E-04	2.58E-03
Di-n-butyl Phthalate	84-74-2	--	3.33E-05	--	1.17E-03	5.10E-03
Dinitrophenol, 2,4-	51-28-5	--	1.31E-07	--	4.59E-06	2.01E-05
Dinitrotoluene, 2,4-	121-14-2	--	9.42E-07	--	3.30E-05	1.44E-04
Ethane	74-84-0	--	--	3.10E+00	2.12E-02	9.26E-02
Ethylbenzene	100-41-4	--	3.13E-05	--	1.10E-03	4.80E-03
Formaldehyde[2]	50-00-0	8.50E-02	--	2.53E-02	1.28E+00	5.10E+00
Hexachlorobenzene	118-74-1	--	1.03E-06	--	3.61E-05	1.58E-04
Hexane	110-54-3	--	2.88E-04	1.80E+00	2.24E-02	9.79E-02
Hydrogen Chloride	7647-01-0	--	3.87E-04	--	1.35E-02	5.93E-02
Methanol[3]	67-56-1	2.51E-01	--	--	3.78E+00	1.50E+01
MIBK	108-10-1	1.20E-03	4.45E-04	--	3.37E-02	1.40E-01
Naphthalene	91-20-3	--	8.13E-06	6.10E-04	2.89E-04	1.26E-03
4-Nitrophenol	100-02-7	--	9.32E-08	--	3.26E-06	1.43E-05
Pentachlorophenol	87-86-5	--	4.48E-08	--	1.57E-06	6.87E-06
Pentane	109-66-0	--	--	2.60E+00	1.77E-02	7.77E-02
Phenol[4]	108-95-2	1.24E-02	--	--	1.87E-01	7.42E-01
POM[6]	Various	--	1.52E-04	6.60E-04	5.32E-03	2.33E-02
Propane	74-98-6	--	--	1.60E+00	1.09E-02	4.78E-02
Propionaldehyde	123-38-6	1.20E-03	2.14E-05	--	1.89E-02	7.53E-02
Styrene	100-42-5	--	1.54E-05	--	5.39E-04	2.36E-03
Tetrachloroethene (Tetrachloroethylene, Perchlo	127-18-4	--	2.46E-05	--	8.61E-04	3.77E-03
Toluene	108-88-3	1.20E-04	3.67E-06	3.40E-03	1.96E-03	7.86E-03
Trichloroethane, 1,1,1- (Methyl Chloroform)	71-55-6	--	3.93E-05	--	1.38E-03	6.02E-03
Trichloroethene (Trichloroethylene)	79-01-6	--	1.99E-05	--	6.97E-04	3.05E-03
Trichlorophenol, 2,4,6-	88-06-2	--	2.73E-07	--	9.56E-06	4.19E-05
Vinyl Chloride	75-01-4	--	1.84E-05	--	6.44E-04	2.82E-03
Xylene	1330-20-7	2.40E-04	5.22E-06	--	3.81E-03	1.52E-02
PAHs[4]						
Acenaphthene	83-32-9	--	1.03E-07	--	3.61E-06	1.58E-05
Acenaphthylene	208-96-8	--	5.81E-07	--	2.03E-05	8.91E-05
Anthracene	120-12-7	--	1.76E-07	--	6.16E-06	2.70E-05
Benzo(a)anthracene	56-55-3	--	1.26E-08	--	4.41E-07	1.93E-06
Benzo(a)pyrene	50-32-8	--	1.52E-08	--	5.32E-07	2.33E-06
Benzo(b)fluoranthene	205-99-2	--	1.26E-08	--	4.41E-07	1.93E-06
Benzo(e)pyrene	192-97-2	--	7.95E-08	--	2.78E-06	1.22E-05
Benzo(k)fluoranthene	207-08-9	--	1.83E-08	--	6.41E-07	2.81E-06
2-Chloronapthalene	91-58-7	--	1.20E-08	--	4.20E-07	1.84E-06
Chrysene[5]	218-01-9	--	3.80E-08	--	1.33E-06	5.83E-06
Dioxins		--	2.82E-11	--	9.87E-10	4.33E-09
Dibenzo(a,h)anthracene	53-70-3	--	8.88E-09	--	3.11E-07	1.36E-06
Fluoranthene [Benzo(j,k) fluorine]	206-44-0	--	4.57E-07	--	1.60E-05	7.01E-05
Fluorene	86-73-7	--	1.89E-07	--	6.62E-06	2.90E-05
Furan	11-00-09	--	1.96E-11	--	6.84E-10	3.00E-09
Indeno(1,2,3,c,d)pyrene	193-39-5	--	9.13E-09	--	3.20E-07	1.40E-06
2-Methylnaphthalene	91-57-6	--	1.29E-06	--	4.52E-05	1.98E-04
Perylene	198-55-0	--	6.58E-09	--	2.30E-07	1.01E-06
Phenanthrene	85-01-8	--	2.64E-06	--	9.24E-05	4.05E-04
Pyrene	129-00-0	--	9.88E-07	--	3.46E-05	1.51E-04
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	--	6.33E-13	--	2.22E-11	9.70E-11

GP Warrenton Chip-N-Saw
CDK No. 1 Potential HAP Emissions from Combination Wood/NG Firing Burner

Pollutant	CAS Number	Emission Factors			Kiln Emission Rates[1]	
		lb/MBF	lb/MMBtu	lb/MMscf	lb/hr	tpy
Metal HAPs[4]						
Antimony	7440-36-0	--	1.47E-06	--	5.13E-05	2.25E-04
Arsenic	7440-38-2	--	1.01E-05	2.00E-04	3.55E-04	1.55E-03
Barium	7440-39-3	--	--	4.40E-03	3.00E-05	1.31E-04
Beryllium	7440-41-7	--	4.23E-08	--	1.48E-06	6.48E-06
Cadmium	7440-43-9	--	3.09E-06	1.10E-03	1.16E-04	5.07E-04
Chromium	7440-47-3	--	--	1.40E-03	9.55E-06	4.18E-05
Chromium total		--	1.00E-05	--	3.51E-04	1.54E-03
Chromium VI	18540-29-9	--	2.82E-07	--	9.87E-06	4.32E-05
Cobalt	7440-48-4	--	6.11E-07	8.40E-05	2.20E-05	9.62E-05
Copper	7440-50-8	--	--	8.50E-04	5.80E-06	2.54E-05
Manganese	7439-96-5	--	1.27E-04	3.80E-04	4.44E-03	1.95E-02
Mercury	7439-97-6	--	8.26E-07	2.60E-04	3.07E-05	1.34E-04
Molybdenum	7439-98-7	--	--	1.10E-03	7.50E-06	3.29E-05
Nickel	7440-02-0	--	8.84E-06	2.10E-03	3.24E-04	1.42E-03
Phosphorus	7723-14-0	--	9.85E-05	--	3.45E-03	1.51E-02
Selenium	7782-49-2	--	1.03E-06	--	3.62E-05	1.59E-04
Vanadium	7440-62-2	--	--	2.30E-03	1.57E-05	6.87E-05
Zinc	7440-66-6	--	--	2.90E-02	1.98E-04	8.67E-04

1. Emission Rates (lb/hr) = Emission Factor (lb/MMBtu) * Fuel Usage (ton/yr) * Fuel Heat Content (Btu/lb) / Hours of Operation (hr/yr) * (2,000 lb/ton) * (MMBtu/106 Btu)
Emission Rates (tpy) = Emission Factor (lb/MMBtu) * Fuel Usage (ton/yr) * Fuel Heat Content (Btu/lb) * (MMBtu/106 Btu)
or:
Emission Rates (lb/hr) = Emission Factor (lb/MBF) * Production Rate (MBF/yr) / Hours of Operation (hr/yr)
Emission Rates (tpy) = Emission Factor (lb/MBF) * Production Rate (MBF/yr) * (ton/2,000 lb)
2. Formaldehyde emission factor based median of the GP Columbia, MS (2/2/11), GP McCormick, SC (2/14/12, 7/17/13), Bibler Bros Russellville, AR (Kiln 1 2/23/10, Kiln 3 3/12/09) tests.
One standard deviation (based on individual test runs) was added to average for conservancy:
3. Methanol factor based on median of GP tests on continuous direct fired dry planer shaving burners at Columbia, MS (2/2/11) and McCormick, SC (2/14/12, 7/17/13).
One standard deviation (based on individual test runs) was added to average for conservancy:
4. Emission factors for all other wood fired pollutants from March 2013 NCASI database and Technical Bulletin 1013 (2013) median plus 2 standard deviations (if available) or plus 20% (whe
is not available or in the case that the standard deviation is greater than the median) for boiler with mechanical collector (or boiler with a wet scrubber for metals). Furan and Dioxin converted
fired to lb/MMBtu using 8,400 Btu/lb heat content from NCASI TB1013. 2,3,7,8-Tetrachlorodibenzo-p-dioxin is calculated as the mean value listed in the NCASI database plus 20%.
5. Chrysene emission factors based on AP-42 Table 1.6-3 plus 20%.
6. Total POM summarized from EPA AP-42, Section 1.6, Wood Residue Combustion in Boilers, Table 1.6-3.
7. Emission factors for natural gas combustion per AP-42 Table 1.4-3 and 1.4-4.
8. NCASI TB 845 (2002), Table BB1 Steam FSK Emission factor plus a 20% safety factor.

GP Warrenton Chip-N-Saw
Phase I Batch No. 2 & 3 Kiln Projected Actual Emissions

Table 1. Kiln Information

Projected Annual Production, Kiln #2 & #3	50,000	MBF/Yr
	6.8	MBF/hr
Maximum Hours of Operation:	8760	Hrs/Yr

Table 2. Criteria Emission Calculations

Pollutant	Emission Factor	Unit	Reference	Emissions PAE (lb/hr)	Emissions PAE (tpy)
PM (f)	0.013	lb/MBF	1	0.09	0.33
PM (c)	0.020	lb/MBF	2	0.14	0.50
PM_{10} (f+c)	0.022	lb/MBF	2	0.15	0.55
$PM_{2.5}$ (f+c)	0.022	lb/MBF	2	0.15	0.55
VOC as C	4.280	lb/MBF	3	29.20	107.00
VOC as WPP1	5.490	lb/MBF	3	37.46	137.25

1. Based on Georgia-Pacific developed Title V factors, August 2012. Average plus 2 standard deviations. Filterable PM only.
2. Based on Georgia-Pacific developed Title V factors, August 2012. Average plus 2 standard deviations. FPM10/FPM2.5 + CPM.
3. Based on Georgia-Pacific developed emission factors using test data for Columbia, McCormick, and Bibler Brothers - Russellville and Rex Lumber. The selected factor is the median of available data pluse one standard deviation.
4. VOC is based on the WPP1 methodology where VOC (as WPP1) equals VOC (as C3H8) plus MEOH and HCHO minus 0.458 times 0.65 times methanol emission rate.

Table 2. Hazardous Air Pollutant Emission Calculations

Pollutant	Emission Factor	Unit	Reference	Emissions PAE (lb/hr)	Emissions PAE (tpy)
Acetaldehyde	5.04E-02	Lb/MBF	1	0.34	1.26
Acrolein	7.20E-03	Lb/MBF	1	0.05	0.18
Formaldehyde	2.51E-02	Lb/MBF	2	0.17	0.63
Methanol	2.43E-01	Lb/MBF	2	1.66	6.07
Phenol	1.24E-02	Lb/MBF	1	0.08	0.31
Propionaldehyde	3.50E-03	Lb/MBF	1	0.02	0.09
Toluene	1.20E-04	Lb/MBF	1	0.00	0.00
Xylene	2.40E-04	Lb/MBF	1	0.00	0.01
Total HAPs				**2.30**	**8.44**

1. Emission factor is based NCASI 2013 Wood Products Database for indirect fired southern pine batch lumber kilns. Data point is average + 20% safety factor.
2. Emission factor is based NCASI 2013 Wood Products Database for indirect fired southern pine batch lumber kilns. Data point is average + 1 Standard Deviation safety factor.

GP Warrenton Chip-N-Saw
Phase I New Equipment PTE Emissions

Table 1. Log and Saw Parameters

Log Length - prior to sizing saw	40	ft/log
Log Length after sizing	12.50	ft/log
Log Diameter	0.60	ft
Density	58	lb/ft^3
Throughput - Potential	1,128,000	tpy
Throughput	188	tph
No. Logs - Maximum prior to sizing	3,468,050	annual
No. Logs - Maximum prior to sizing	578	hourly
No. Logs - Maximum after sizing	11,097,762	annual
No. Logs - Maximum after sizing	1,850	hourly
Total Sawdust Generation	48,000	tpy
Total Bark Generation	112,800	tpy
Total Chip Generation	273,600	tpy
Typical Bark and Chip Moisture Content	50%	

Notes:

1. Number of logs calculated from log throughput (tpy) / density (lb/ft^3) / area (ft^2) * 2000 lb/ton / individual log length (ft).

Table 2. Trim Saw Potential Emissions

								Potential Emissions					
	Maximum	Kerf	Sawdust Generated		Emission Factor (lb/ton)			PM		PM_{10}		$PM_{2.5}$	
Saw	**No. Cuts**	**(inches)**	**(tph)**	**(tpy)**	**PM**	**PM_{10}**	**$PM_{2.5}$**	**(lb/hr)**	**(tpy)**	**(lb/hr)**	**(tpy)**	**(lb/hr)**	**(tpy)**
Sawmill Trim Saw	7	0.25	2	13,160	1.00	0.36	0.11	0.66	1.97	0.24	0.71	0.072	0.22
Edger - Sawing Type			2	10,840	1.00	0.36	0.11	0.54	1.63	0.20	0.59	0.060	0.18
Planer Trim Saw	7	0.25	1.55	9,322	-	-	-	Included in Planer Mill Cyclone Emissions					

1. Trim Sawdust calculated from No. logs per year * No. cuts * log area (ft^2) * kerf width (ft) * density (lb/ft^3)/2000. Edger estimated as 50% sawdust minus sawdust generated at trim saw.
2. A control efficiency was assumed for the saws based on partial enclosure of the individual saws. The level of control claimed is conservative (as the sawdust generated contains 50% moisture) and consistent with Air Pollution Engineering Manual, 2nd Ed., AWMA, c2000, Ch 15, p. 694.

Control efficiency = 70%

3. Annual emissions calculated from emission factor (lb/ton) * sawdust (tpy) / 2000 (lb/ton)*(1-control efficiency)
4. Short term emissions calculated from emission factor (lb/ton) * sawdust (tph)*(1-control efficiency)

GP Warrenton Chip-N-Saw
Phase I New Equipment PTE Emissions

Table 3. Drop Point Emission Factor Calculations for Bark, Chip and Sawdust Handling Systems

Material	Moisture Content[1]	Emission Factor (lb/ton)[2,3] PM	PM_{10}	$PM_{2.5}$
Bark	4.8	9.60E-04	4.54E-04	6.88E-05
Chips	4.8	9.60E-04	4.54E-04	6.88E-05
Sawdust	4.8	9.60E-04	4.54E-04	6.88E-05

1. Ash moisture content assumed. For all other materials, moisture content (M) for f set equal to the maximum value for which the equation is appropriate. Actual moisture content is higher.

2. Emission factor calculated from
where:

$$E\ (\text{lb/ton}) = k \times 0.0032 \times \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

k: Particle size multiplier	0.74	PM
	0.35	PM_{10}
	0.053	$PM_{2.5}$
U: Mean wind speed	6.41	mph

3. Emission factor per AP-42, Section 13.2.4, *Aggregate Handling and Storage Piles* , drop equation.
Mean wind speed for Augusta, GA per EPA TANKS meteorological database.
Assumes one drop point each.

Table 4. Bark Chip and Sawdust Potential Emissions Calculation

Equipment/Material	Throughput (tph)	Throughput (tpy)	No. Drop Points	PM Emissions (lb/hr)	PM Emissions (tpy)	PM_{10} Emissions (lb/hr)	PM_{10} Emissions (tpy)	$PM_{2.5}$ Emissions (lb/hr)	$PM_{2.5}$ Emissions (tpy)
Bark Handling System	18.8	112,800	6	1.08E-01	3.25E-01	5.12E-02	1.54E-01	7.76E-03	2.33E-02
Chip Handling System	45.6	273,600	8	3.50E-01	1.05E+00	1.66E-01	4.97E-01	2.51E-02	7.53E-02
Sawdust Handling System	8.0	48,000	8	6.14E-02	1.84E-01	2.91E-02	8.72E-02	4.40E-03	1.32E-02

1. Bark Handling system consists of new Bark Screen, Bark Hog, and Bark Truck Loadout.
2. Chip Handling System includes drop points to conveyors from saws, chippers, screens and truck loadouts. A new saw egder and small chipper and shaker screen will be added to the system in Phase I. The trim saw chipper will also be replaced in Phase I.
3. Sawdust Handling System includes drop points to conveyors from saws, chippers, screens and truck loadouts. A new saw egder and small chipper and shaker screen will be added to the system in Phase I. The trim saw chipper will also be replaced in Phase I.
4. Annual emissions calculated from emission factor (lb/ton) * throughput (tpy) / 2000 (lb/ton) * # of drop points
5. Short term emissions calculated from emission factor (lb/ton) * throughput (tph) * # of drop points

Table 5. Fuel Silo Cyclone Emissions

Unit	Airflow (dscf)	Operating Hours	Emission Factor PM (gr/dscf)	Emission Factor PM_{10} (gr/dscf)	Emission Factor $PM_{2.5}$ (gr/dscf)	Potential Emissions PM (lb/hr)	PM (tpy)	PM_{10} (lb/hr)	PM_{10} (tpy)	$PM_{2.5}$ (lb/hr)	$PM_{2.5}$ (tpy)
Fuel Silo Cyclone	4,867	8,760	1.05E-02	1.05E-02	5.12E-03	0.44	1.93	0.44	1.93	0.21	0.93

Existing cyclone fan rated at 4,672 scfm. Assuming 70F, .8 RH, 18.7 psia = 3826 acfm, 4867 dscfm
PM emission factor is based on vendor data from Fisher-Klosterman provided on 10/30/2014 (Proposal No. FKP-2014-0411-01, Rev. 0) and 11/6/2014 (email from Shurti Parkar, Fisher-Klosterman). The PM_{10} and $PM_{2.5}$ factors apply the Particle Size Analysis (PSA) conducted during the 2013 test of the Warrenton Sawdust Cyclone.

GP Warrenton Chip-N-Saw
Phase I Saws and Screen Projected Actual Emissions

Table 1. Log and Saw Parameters

Log Length - prior to sizing saw	40	ft/log
Log Length	12.50	ft/log
Log Diameter	0.60	ft
Density	58.00	lb/ft^3
Throughput - Projected Actual	799,000	tpy
Projected hours of Operation	6000	hours
Throughput - Projected Actual	133	tph
No. Logs - prior to sizing - projected actual	2,456,536	annual
No. Logs - prior to sizing - projected actual	409	hourly
No. Logs - after sizing - projected actual	7,860,914	annual
No. Logs - after sizing - projected actual	1,310	hourly

Notes:

1. Number of logs calculated from log throughput (tpy) / density (lb/ft^3) / area (ft^2) * 2000 lb/ton / individual log length (ft).
2. Note - Projected hours of operation are used to calculate worst-case short term emissions below and not meant to limit operations below 8760.

Table 2. Saw Projected Actual Emissions

Saw	Maximum No. Cuts	Kerf (inches)	Sawdust Generated (tph)	Sawdust Generated (tpy)	Emission Factor (lb/ton) PM	Emission Factor (lb/ton) PM_{10}	Emission Factor (lb/ton) $PM_{2.5}$	Projected Actual Emissions PM (lb/hr)	PM (tpy)	PM_{10} (lb/hr)	PM_{10} (tpy)	$PM_{2.5}$ (lb/hr)	$PM_{2.5}$ (tpy)
Sizing Saws	4	0.5	0.6	3,329	1.00	0.36	0.11	0.55	1.66	0.06	0.60	0.018	0.18
VSA Saw	3	0.12	0.32	1,918	1.00	0.36	0.11	0.10	0.29	0.03	0.10	0.011	0.03
Slasher Saw	4	0.38	0.01	80	1.00	0.36	0.11	4.00E-03	1.20E-02	1.44E-03	4.31E-03	4.39E-04	1.32E-03

1. Sawdust calculated from No. logs per year * No. cuts * log area (ft^2) * kerf width (ft) * density (lb/ft^3)/2000.
   Slasher saw processes 1% of total logs.
2. Throughput of planer saw is conversvatively assumed as the same as lumber. Actual will be lower.
3. PM (TSP)/PM10 emission factors per FIRE database for SCC 30700803 for sawdust storage pile handling. PM2.5 obtained from EPA's PMCALC database sawdust handling
4. A control efficiency was assumed for the all saws (other than sizing saws) based on partial enclosure of the individual saws. The level of control claimed is conservative (as the sawdust generated contains 50% moisture) and consistent with Air Pollution Engineering Manual, 2nd Ed., AWMA, c2000, Ch 15, p. 694.
   Control efficiency = 70%
5. Planer trim saw has a misting system as a primary control system for dust from the saw. The trim saw also has a drop point from the planer mill cyclone, therefore emissions not controlled by the misting system are captured by the planer cyclone and accounted for with that system.
6. Sizing Sawdust calculated from No. logs per year * No. cuts * log area (ft^2) * kerf width (ft) * density (lb/ft^3)/2000.
7. Annual emissions calculated from emission factor (lb/ton) * sawdust (tpy) / 2000 (lb/ton)*(1-control efficiency)
8. Short term emissions calculated from emission factor (lb/ton) * sawdust (tph) *(1-control efficiency)

GP Warrenton Chip-N-Saw
Phase I Bark and Chip Handling Projected Actual Emissions

Table 1. Process Information

Logs Processed	799,000	tpy
Projected Bark Generation	79,900	tpy
Projected Chip Generation	193,800	tpy
Typical Bark and Chip Moisture Content	50%	
Projected Hours of Operation:	6000	hr/yr

1. Note - Projected hours of operation are used to calculate worst-case short term emissions below and not meant to limit operations below 8760.

Table 2. Debarker Emission Calculations

	Projected Actual Throughput		Emission Factor			PM Emissions		PM_{10} Emissions		$PM_{2.5}$ Emissions	
			PM	PM_{10}	$PM_{2.5}$						
Unit	(tph)	(tpy)		(lb/ton)		(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Debarker (102S)	133.2	799,000	2.00E-02	1.10E-02	7.50E-05	2.66	7.99	1.46E+00	4.39	9.99E-03	3.00E-02

1. Debarker PM and PM_{10} emission factors from EPA FIRE database, SCC 30700801 (Log Debarking).
2. Debarker PM2.5 emission rate based on information from NCASI July 2014 memo for PM2.5 Emissions from Drum Debarking. Emission factor presented was 4.5 E-05 lb/ton log processed. Subtracted a out a 90% control for Drum debarker and added a 50% saftey factor to the test data point since the data was for drum debarker and this is a ring debarker.
3. Annual emissions calculated from emission factor (lb/ton) * throughput (tpy) / 2000 (lb/ton)*(1-control efficiency)
4. Short term emissions calculated from emission factor (lb/ton) * throughput (tph)*(1-Control efficiency)

Table 3. Big Chipper Emission Calculations

	Projected Actual Throughput		Emission Factor			PM Emissions		PM_{10} Emissions		$PM_{2.5}$ Emissions	
			PM	PM_{10}	$PM_{2.5}$						
	(tph)	(tpy)		lb/ODT		(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Big Chipper (103S)	0.6	3,876	1.50E-01	7.42E-02	2.70E-02	2.42E-05	0.15	1.20E-05	0.07	4.36E-06	0.03

1. Big chipper throughput assumed to be equal to 2% of total facility chip generation.
3. PM Emission factor based on NCASI 2013 Wood Products database for green end material handling (all green chippers with cyclones). Used max test value plus 20% safety factor for PM.

4. PM_{10} emission factor was developed by calculating uncontrolled PM assuming 99% control in PM rate referenced above. The PM10/PM ratio for wood chips from NCASI's Special Report, "Estimating the Potential for PM2.5 Emissions from Wood and Bark Handling" of 0.0099 was applied. An assumed 50% control from the cyclone of PM10 emissions was then applied per AP-42 Appendix B.2 Table B.2-3 for low efficiency cyclones.
5. $PM_{2.5}$ emission factor was developed by calculating uncontrolled PM assuming 99% control in PM rate referenced above. The PM10/PM ratio for wood chips from NCASI's Special Report, "Estimating the Potential for PM2.5 Emissions from Wood and Bark Handling" of 0.0018 was applied.
6. Emission factors are provided as pound emissions per oven dried ton of material processed. Chips contain 50% moisture on average. The moisture content is removed from the weight of the material throughput.
7. Annual emissions calculated from emission factor (lb/ODT ton) * chips (tpy)* (100 - 50% moisture)/ 2000 (lb/ton).
8. Short term emissions calculated from emission factor (lb/ODT ton) * chips (tpy)* (100 - 50% moisture)/ 2000 (lb/ton).

GP Warrenton Chip-N-Saw
Phase I & II Truck Loading Projected Actual Emissions

Table 1. Chip/Sawdust Cyclone Emissions

Unit	Airflow (scfm)	Projected Actual Operating Hours	Emission Factor (gr/dscf) PM	PM_{10}	$PM_{2.5}$	PM Emissions (lb/hr)	(tpy)	PM_{10} Emissions (lb/hr)	(tpy)	$PM_{2.5}$ Emissions (lb/hr)	(tpy)
Sawdust Loading (105B)	4,672	8,760	4.58E-04	7.61E-04	5.25E-04	0.02	0.08	3.05E-02	0.13	2.10E-02	9.21E-02
Chip Loading (105A)	8,294	8,760	1.00E-02	4.97E-03	6.49E-04	0.71	3.11	3.53E-01	1.55	4.61E-02	2.02E-01

1. Sawdust loading emission factors based on stack testing of the sawdust cyclone in 2013 plus a safety factor of 20%.
2. Chip loading emission factor for PM based on typical vendor data for greenend cyclones. PM10 and PM2.5 based on stack testing of similar unit plus a safety factor of 20%.

GP Warrenton Chip-N-Saw
Phase I Planer Mill Projected Actual Emissions

Table 1. Planer Mill Cyclone Emissions

Unit	Airflow (scfm)	Projected Actual Operating Hours	Emission Factor (gr/dscf) PM	PM_{10}	$PM_{2.5}$	Projected Actual Emissions PM (lb/hr)	PM (tpy)	PM_{10} (lb/hr)	PM_{10} (tpy)	$PM_{2.5}$ (lb/hr)	$PM_{2.5}$ (tpy)
Planer Mill (PMC1)	49,925	8,760	3.68E-03	2.60E-03	1.35E-03	1.57	6.89	1.11	4.87	0.58	2.54

1. Note that the planer mill and planer mill trim hog exhaust to the cyclone.
2. PM/PM10/PM2.5 Emission data based on 2013 testing of Warrenton Planer Mill Cyclone + 20% safety factor.

Table 2. Planer Shavings Handling Emission Factor Calculation

Material	**Moisture Content[1]**	**Emission Factor (lb/ton)[2,3] PM**	**PM_{10}**	**$PM_{2.5}$**
Shavings	4.8	9.60E-04	4.54E-04	6.88E-05

1. Ash moisture content assumed. For all other materials, moisture content (M) for f set equal to the maximum value for which the equation is appropriate. Actual moisture content is higher.

$$E\ (\text{lb/ton}) = k \times 0.0032 \times \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

2. Emission factor calculated from
   where:
   - k: Particle size multiplier 0.74 PM; 0.35 PM_{10}; 0.053 $PM_{2.5}$
   - U: Mean wind speed 6.41 mph

3. Emission factor per AP-42, Section 13.2.4, *Aggregate Handling and Storage Piles* , drop equation.
   Mean wind speed for Augusta, GA per EPA TANKS meteorological database.
   Assumes one drop point each.

Table 3. Planer Shaving Handling Emissions Calculation

Material	**Throughput (tph)**	**Throughput (tpy)**	**No. Drop Points**	**PM Emissions (lb/hr)**	**PM Emissions (tpy)**	**PM_{10} Emissions (lb/hr)**	**PM_{10} Emissions (tpy)**	**$PM_{2.5}$ Emissions (lb/hr)**	**$PM_{2.5}$ Emissions (tpy)**
Shavings	5.8	51,000	1	5.59E-03	2.45E-02	2.64E-03	1.16E-02	4.00E-04	1.75E-03

GP Warrenton Chip-N-Saw
Phase 1 Road Emissions

Table 1. Road Information

Road Segment	BAE Paved/Unpaved	Length (mi)
A	Paved	0.086
B	Paved	0.182
C	Unpaved	0.101
D-1	Paved	0.11
D-2	Unpaved	0.08
E	Paved	0.06
F	Paved	0.201
G	Unpaved	0.27

Sample Location	sL	
P-6	0.25	g/m^2
P-6	0.25	g/m^2
UP-1	1.2	%
P-5	1.08	g/m^2
UP-2	1.6	%
Not sampled	0.4	g/m^2 (used average for paved roads)
P-4	0.24	g/m^2
Not sampled	1.4	% (used average for unpaved roads)

Information based on review of site layout and truck traffic.

Table 2. Truck Traffic Details

Truck	PAE Material Throughput (tpy)	Truck Weight[1] (tons) Unloaded	Loaded	Average Truck Weight (tons)	Number of Trucks[2]	Routes Traveled (# = No of trips) A	B	C	D1	D2	E	F	G
Shavings	51000	15	40	27.5	2040	2	2				2		
Chips	193800	15	40	27.5	3876	2	2						2
Logs	799000	15	40	27.5	31960	2	2	2					
Bark	79900	15	40	27.5	3196	2	2						2
Green Sawdust	NA	15	40	27.5	25	2	2						2
Finished Lumber	170,000 Mbf/yr	15	40	27.5	8500	2	2					2	

1. Truck weight based on engineering estimates.
2. Number trucks based on material throughput divided by haul weight.
3. Estimate half of the chips produced are shipped by truck and half by rail.
4. Assumes 25 loads of sawdust to be trucked, the rest burned in the kiln.
5. Lumber trucks based on 20 Mbf per truck.

Table 3. Emission Factor Calculation

Segment	Fleet Mean Weight (tons)	Emission Factor[1, 2] PM - Maximum (lb/VMT)	PM_{10} - Maximum (lb/VMT)	$PM_{2.5}$ - Maximum (lb/VMT)
<u>Paved</u>				
A	27.5	0.08	0.02	4.16E-03
B	27.5	0.08	0.02	4.16E-03
D1	27.5	0.32	0.06	1.57E-02
E	27.5	0.13	0.03	6.37E-03
F	27.5	0.08	0.02	4.00E-03
<u>Unpaved</u>				
C	27.5	1.85	0.36	3.58E-02
D2	27.5	2.26	0.46	4.63E-02
G	27.5	2.06	0.41	4.11E-02

GP Warrenton Chip-N-Saw
Phase 1 Road Emissions Continued

1. Long term average paved route emission factor is based on Equation 2 of AP-42 Section 13.2.1 (January 2011):

$$E = \left[k \times (sL)^{0.91} \times (W)^{1.02}\right] \times \left(1 - \frac{P}{4N}\right)$$

E =		size specific emission factor (lb/VMT)
k =	0.011	particle size multiplier for particle size range and units of interest, AP-42, Section 13.2.1, Table 13.2.1-1.
	0.0022	
	0.00054	
sL =	*see data above*	road surface silt loading (g/m^2), based on silt content testing conducted on paved roads at the Warrenton mill.
W =		mean vehicle weight (tons)
P =	110	number of days in the averaging period with at least 0.254 mm (0.01 in) of precipitation, AP-42 Section 13.2.1, Figure 13.2.1-2.
N =	365	number of days in the averaging period (e.g., 365 for annual)

2. Unpaved route emission factor is based on Equations 1a and 2 of AP-42 Section 13.2.2 (November 2006):
Equations 1a and 2 (combined):

$$E = k \times \left(\frac{s}{12}\right)^{a} \times \left(\frac{W}{3}\right)^{b} \times \left(\frac{365 - P}{365}\right)$$

E =		size specific emission factor (lb/VMT)
s =		surface material silt content (%), based on silt content testing conducted on unpaved roads at the Warrenton mill.
W =		mean vehicle weight (tons)
k =	4.9	particle size multiplier, AP-42 Section 13.2.2, Table 13.2.2-2.
	1.5	
	0.15	
a =	0.7	empirical constant, AP-42 Section 13.2.2, Table 13.2.2-2.
	0.9	
b =	0.45	empirical constant, AP-42 Section 13.2.2, Table 13.2.2-2.
P =	110	number of days in a year with at least 0.254 mm (0.01 in) of precipitation, AP-42 Section 13.2.2, Figure 13.2.2-1

Table 4. Emission Calculations

Road Segment	Vehicle Miles Traveled [1] Maximum	Emissions PM (lb/hr)	PM (tpy)	PM_{10} (lb/hr)	PM_{10} (tpy)	PM_{25} (lb/hr)	$PM_{2.5}$ (tpy)
A	8530.7	0.08	0.36	0.02	0.07	0.00	0.02
B	18053.3	0.17	0.76	0.03	0.15	0.01	0.04
C	6455.9	1.36	5.98	0.26	1.15	0.03	0.12
D1	0.0	0.00	0.00	0.00	0.00	0.00	0.00
D2	0.0	0.00	0.00	0.00	0.00	0.00	0.00
E	244.8	0.00	0.02	0.00	0.00	0.00	0.00
F	3417.0	0.03	0.14	0.01	0.03	0.00	0.01
G	3844.2	0.90	3.96	0.18	0.79	0.02	0.08
Total		2.56	11.22	0.50	2.20	0.06	0.26

1. VMT calculated from segment length times number of trips.
2. Emissions Calculated from emission factor (lb/VMT) * VMT / 2000 lb/ton.
3. D1 and D2 routes will no longer be used for normal truck traffic in Phase II.

GP Warrenton Chip-N-Saw
Ph I - Paint and Fuel Tank Emissions

Table 1. Ink/Logo Emissions

Material	Specific Gravity	Use (gallons)	Use (tons)	VOC Content	Methanol Content	Vinyl Acetate Content	Emissions (tpy) VOC	Emissions (tpy) Methanol	Emissions (tpy) Vinyl Acetate
Logo Paint	1.07	692	3.1	2.7%	2.5%	0.001%	8.46E-02	7.63E-02	3.09E-05
Reject Paint	1.09	20	0.09	5.0%	-	-	4.48E-03	-	-
Total							8.91E-02	7.63E-02	3.09E-05

1. Specific gravity per MSDS.
2. VOC/HAP content for logo paint per May 20, 2010 and June 14, 2010 letters from Danielle Paradis (Williamette Valley Company).
3. Note that the stamp ink does not contain any VOC or HAP and emissions are not calculated.

Table 2. Tank Emission Calculations

Tank ID	Tank Contents	Size (gallons)	Horizontal or Vertical?	Height/Length (ft)	Diameter (ft)	Throughput (gal)	No. Turnovers[2]	VOC Emissions (lb/yr)	VOC Emissions (tpy)
T-01	Diesel	10,000	H	16.0	10.0	134,980	13.5	9.2	4.58E-03
T-02	Gasoline	1,000	H	6.1	5.3	5,236	5.2	1421.2	7.11E-01
Total								1430.3	7.15E-01

The facility has a number of other small (<2,000 gallon) tanks storing materials with vapor pressures similar to or below that of diesel. Based on diesel emissions for much larger tanks, it is assumed that emissions from the other tanks are negligible.

GP Warrenton Chip-N-Saw
Phase II Project Emissions Summary

		PM	PM_{10}	$PM_{2.5}$	CO	VOC	SO_2	NO_X	Lead	Total CO_2e
New Equipment - Potential Emissions										
200 - Kilns	204 - Direct Fired Kiln No. 1	5.52	9.17	7.38	82.23	329.40	1.64	14.94	0.01	35,715
	205 - Fuel Silo	1.93	1.93	0.93						
	206- Direct Fired Kiln No. 2	5.52	9.17	7.38	82.23	329.40	1.64	14.94	0.01	35,715
	102 - Debarker	3.38	1.86	0.04						
100 - Sawmill	*101 - Interior Saws (IS)*	4.02	1.45	0.44						
	104 - Small Chipper	Included in Sawdust and Chip Handling								
	105 - Screen (IS)	Included in Sawdust and Chip Handling								
	Bark Handling	0.32	0.15	0.02						
	Chip Handling	1.05	0.50	0.08						
	Sawdust Handling	0.18	0.09	0.01						
300 - Planer Mill	301 & 302 - Planer Mill (Planer Mill, Trim Saw, Trim Hog and Cyclones)	8.15	5.76	3.00						
	Planer Shaving Handling	0.03	0.01	1.98E-03						
Modified Equipment - Potential Emissions										
100 - Sawmill	*102 - Sizing Saws (IS)*	2.35	0.85	0.26						
500 - Roads	500 - Roads	2.73	0.55	0.13						
Existing Equipment - Potential Emissions										
100 - Sawmill	103 - Big Chipper	0.21	0.10	0.04						
	105B - Sawdust Loading	0.08	0.13	0.09						
	105A - Chip Loading	3.11	1.55	0.20						
600 - Inks and Tanks	*Inks + Storage Tanks*					0.86				
Total		**38.58**	**33.26**	**20.02**	**164.45**	**659.66**	**3.29**	**29.88**	**0.03**	**71,430**

GP Warrenton Chip-N-Saw
Phase II Project Emissions Summary

		PM	PM_{10}	$PM_{2.5}$	CO	VOC	SO_2	NO_X	Lead	Total CO_2e
Baseline Actual Emissions										
100 - Sawmill	103 - Big Chipper	0.11	0.05	0.02						
	102 - Sizing Saws (IS)	0.98	0.35	0.11						
	105B - Sawdust Loading	0.03	0.06	0.04						
	105A - Chip Loading	1.59	0.79	0.10						
500 - Roads	500 - Roads	4.92	0.96	0.12						
600 - Inks and Tanks	*Inks + Storage Tanks*					0.75				
Total		**7.62**	**2.21**	**0.39**	**0.00**	**0.75**	**0.00**	**0.00**	**0.00**	**0**

Emisisons Summary (tpy)	PM	PM_{10}	$PM_{2.5}$	CO	VOC	SO_2	NO_X	Lead	GHG CO_2e
Step 1									
Proposed Project Emissions (tpy) (New Equiptment Potential Emissions - 0 Baseline Emissions) + (Projected Actual Emissions of Modified Existing Equipment - Baseline Actual Emissions of Modified Existing Equipment)	31.0	31.0	19.6	164.5	658.9	3.3	29.9	0.0	71,430
PSD Significant Emission Rate (SER)	**25**	**15**	**10**	**100**	**40**	**40**	**40**	**0.6**	**75,000**
Exceeds PSD SER and Netting Required? (Yes/No)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**No**	**No**	**No**

GP Warrenton Chip-N-Saw
Phase II Emissions Netting Analysis

Phase II Step 2 Emisisons Summary

	PM (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	CO (tpy)	VOC (tpy)	SO_2 (tpy)	NO_X (tpy)	Lead (tpy)	GHG CO_2e (tpy)
Project Emission Increases									
Phase I/II Project Increases	30.96	31.04	19.63	164.45	658.90	3.29	29.88	0.03	71,430
Contemporaneous Increases & Decreases									
None									
Project Decreases									
400B - Wood fired Boiler	-8.0	-9.8	-9.1	-381.3	-11.4	-6.9	-40.1	0.0	-48,055
201, 202, 203 - Batch Kilns 1,2,3	-0.6	-1.1	-1.1		-263.7				
401 - Fuel and Ash Storage (IS)	-0.4	-0.2	0.0						
101 - Interior Saws (IS) - Edger & Trim Saw	-0.91	-0.30	-0.09						
Bark Handling	-0.05	-0.02	-3.24E-03						
Sawdust Handling	-0.04	-0.02	-2.64E-03						
Chip Handling	-0.28	-0.13	-1.98E-02						
102 - Debarker	-4.71	-2.59	-0.02						
104 - Small Chipper	-0.86	-0.42	-0.15						
105 - Screen (IS)	-0.49	-0.27	-0.09						
302 - Planer Mill Cyclone & Shavings Handling	-2.65	-1.87	-0.97						
Net Emission Increases	**11.9**	**14.3**	**8.1**	**-216.9**	**383.8**	**-3.6**	**-10.2**	**0.0**	**23,375**
Significant Emission Rate	**25**	**15**	**10**	**100**	**40**	**40**	**40**	**0.7**	**75,000**
Significant Net Emissions Increase?	**No**	**No**	**No**	**No**	**Yes**	**No**	**No**	**No**	**No**

GP Warrenton Chip-N-Saw
CDK No. 2 Potential Criteria Emissions

Table 1. Kiln Information

Future Annual Capacity, Kiln #2		120,000	MBF/Yr
		15.1	MBF/hr
Maximum Hours of Operation:		8760	Hrs/Yr
Maximum Design Heat Input Capacity		35.0	MMBtu/Hr
Design Capacity of Combo Burner			
	Sawdust	35.0	MMBtu/Hr
	Natural Gas	7.0	MMBtu/Hr
Natural Gas		1026	btu/scf

Table 2. Criteria Emission Calculations

Pollutant	Sawdust Gasifier Emissions Emission Factor	Unit	Natural Gas Emissions Emission Factor	Unit	Sawdust Only Firing PTE (lb/hr)	(tpy)	Natural Gas Only Firing PTE (lb/hr)	(tpy)	Sawdust/NG Combo Firing PTE (lb/hr)	(tpy)
PM (f)	0.091	lb/MBF	0.0019	lb/MMbtu	1.37	5.46	0.26	1.06	1.39	5.52
			0.0130	lb/MBF						
PM condensable	0.063	lb/MBF	0.0056	lb/MMbtu	0.95	3.78	0.19	0.85	0.99	3.95
			0.0200	lb/MBF						
PM_{10} (f+c)	0.149	lb/MBF	0.0074	lb/MMbtu	2.25	8.94	0.26	1.14	2.30	9.17
			0.0220	lb/MBF						
$PM_{2.5}$ (f+c)	0.108	lb/MBF	0.0294	lb/MMbtu	1.63	6.48	1.03	4.51	1.84	7.38
			0.0220	lb/MBF						
CO	0.520	lb/MMbtu	0.082	lb/MMbtu	18.20	79.72	2.87	12.55	18.77	82.23
VOC as C	4.280	lb/MBF	4.2800	lb/MBF	64.63	256.80	64.63	256.80	64.63	256.80
VOC as WPP1	5.490	lb/MBF	5.490	lb/MBF	82.90	329.40	82.90	329.40	82.90	329.40
SO_2	0.011	lb/MMbtu	0.001	lb/MMbtu	0.37	1.62	0.02	0.09	0.38	1.64
NO_X	0.064	lb/MMbtu	0.097	lb/MMbtu	2.24	9.81	3.41	14.94	2.92	12.80
Lead	9.11E-05	lb/MMbtu	4.87E-07	lb/MMbtu	3.19E-03	1.40E-02	1.71E-05	7.47E-05	0.00	0.01
CO_2	2.07E+02	lb/MMbtu	1.17E+02	lb/MMbtu	7,238	31,701	4,094	17,933	8056.61	35287.94
CH_4	1.59E-02	lb/MMbtu	2.20E-03	lb/MMbtu	0.56	2.43	0.08	0.34	0.57	2.50
N_2O	7.94E-03	lb/MMbtu	2.20E-04	lb/MMbtu	0.28	1.22	0.01	0.03	0.28	1.22
GHG	2.07E+02	lb/MMbtu	1.17E+02	lb/MMbtu	7,239	31,705	4,094	17,933	8057.46	35291.66
Total CO2e	2.10E+02	lb/MMbtu	1.17E+02	lb/MMbtu	7,334	32,125	4,098	17,951	8154.12	35715.05

1. Wood firing PM, CO, NOx, VOC and NG firing VOC Emission factors are based on the average plus one standard deviation from site test data from several facilities:
GP - Columbia, GP - McCormick, Bibler Brothers - Russellville, Rex Lumber - Grace Mills.
2. Wood firing SO2 Emission factor from NCASI TB 1020 (December 2013), Table 10.4, median value.
3. Wood firing Lead Emission factor from NCASI Technical Bulletin 1013 (March 2013), Table 4.3, maximum of the median values plus two standard deviations
for all available classes of boilers/control devices.
4. Natural Gas firing PM, CO, NOx, SO2 and Lead emission factors from AP-42 Chapter 1.4 converted to lb/MMBtu basis assuming 1026 btu/scf per GHG EF (40 CFR 98).
NG drying emissions also include emissions associated with wood drying (indirect-fired kiln emissions on a lb/MBF basis) based on GP developed Title V factors, August 2012. Average plus 2 standard deviations.
5. VOC (as WPP1) equals VOC (as C3H8) plus MEOH and HCHO minus 0.458 times 0.65 times methanol emisison rate.
6. GHG Emission factors are from Tables C-1 and C-2 of EPA's Mandatory Reporting Rule for Greenhouse Gases (40 CFR 98).
Factors are converted from kg/MMBtu to lb/MMBtu.

GP Warrenton Chip-N-Saw
CDK No. 2 Potential HAP Emissions from Wood Firing

Table 1. Kiln Information

Future Annual Capacity, Kiln #2	120,000	MBF/year
	15.1	MBF/hr
Maximum Hours of Operation:	8760	Hrs/Yr
Maximum Design Heat Input Capacity	35.0	MMBtu/hr
	306,600	MMBtu/yr

Table 2. Hazardous Air Pollutant Emission Calculations

Pollutant	CAS Number	Emission Factors		Kiln Emission Rates[1]	
		lb/MBF	lb/MMBtu	lb/hr	tpy
Acetaldehyde[4]	75-07-0	5.04E-02	--	7.61E-01	3.02E+00
Acetophenone	98-86-2	--	2.21E-06	7.73E-05	3.38E-04
Acrolein[7]	107-02-8	6.00E-03	1.52E-04	9.59E-02	3.83E-01
Benzene	71-43-2	--	2.82E-04	9.87E-03	4.32E-02
Bis(2-Ethylhexyl)phthalate (also di-)	117-81-7	--	5.58E-08	1.95E-06	8.55E-06
Bromomethane (Methyl bromide)	74-83-9	--	4.40E-06	1.54E-04	6.75E-04
Carbon Disulfide	75-15-0	--	1.50E-04	5.25E-03	2.30E-02
Carbon Tetrachloride	56-23-5	--	1.39E-05	4.87E-04	2.13E-03
Chlorobenzene	108-90-7	--	1.99E-05	6.97E-04	3.05E-03
Chloroform	67-66-3	--	3.06E-06	1.07E-04	4.69E-04
Chloromethane (Methyl Chloride)	74-87-3	--	3.19E-05	1.12E-03	4.89E-03
Cumene	98-82-8	--	2.12E-05	7.43E-04	3.26E-03
Dichloroethane, 1,2- (Ethylene dichloride)	107-06-2	--	3.50E-05	1.23E-03	5.37E-03
Dichloromethane (Methylene chloride)	75-09-2	--	3.38E-05	1.18E-03	5.19E-03
Dichloropropane, 1,2- (Propylene dichloride)	78-87-5	--	2.02E-05	7.06E-04	3.09E-03
Di-n-butyl Phthalate	84-74-2	--	4.00E-05	1.40E-03	6.13E-03
Dinitrophenol, 2,4-	51-28-5	--	1.57E-07	5.50E-06	2.41E-05
Dinitrotoluene, 2,4-	121-14-2	--	1.13E-06	3.96E-05	1.73E-04
Ethylbenzene	100-41-4	--	3.76E-05	1.31E-03	5.76E-03
Formaldehyde[2]	50-00-0	8.50E-02	--	1.28E+00	5.10E+00
Hexachlorobenzene	118-74-1	--	1.24E-06	4.33E-05	1.89E-04
Hexane	110-54-3	--	3.46E-04	1.21E-02	5.30E-02
Hydrogen Chloride	7647-01-0	--	4.64E-04	1.63E-02	7.12E-02
Methanol[3]	67-56-1	2.40E-01	--	3.62E+00	1.44E+01
MIBK	108-10-1	1.20E-03	5.34E-04	3.68E-02	1.54E-01
Naphthalene	91-20-3	--	9.76E-06	3.41E-04	1.50E-03
4-Nitrophenol	100-02-7	--	1.12E-07	3.91E-06	1.71E-05
Pentachlorophenol	87-86-5	--	5.38E-08	1.88E-06	8.24E-06
Phenol[4]	108-95-2	1.24E-02	--	1.87E-01	7.42E-01
POM[6]	Various	--	1.52E-04	5.32E-03	2.33E-02
Propionaldehyde	123-38-6	1.20E-03	2.57E-05	1.90E-02	7.59E-02
Styrene	100-42-5	--	1.85E-05	6.47E-04	2.83E-03
Tetrachloroethene (Tetrachloroethylene, Perchlo	127-18-4	--	2.95E-05	1.03E-03	4.53E-03
Toluene	108-88-3	1.20E-04	4.40E-06	1.97E-03	7.88E-03
Trichloroethane, 1,1,1- (Methyl Chloroform)	71-55-6	--	4.72E-05	1.65E-03	7.23E-03
Trichloroethene (Trichloroethylene)	79-01-6	--	2.39E-05	8.36E-04	3.66E-03
Trichlorophenol, 2,4,6-	88-06-2	--	3.28E-07	1.15E-05	5.02E-05
Vinyl Chloride	75-01-4	--	2.21E-05	7.73E-04	3.38E-03
Xylene	1330-20-7	2.40E-04	6.26E-06	3.84E-03	1.54E-02
PAHs[4]					
Furan	11-00-09	--	2.35E-11	8.21E-10	3.60E-09
Anthracene	120-12-7	--	2.11E-07	7.39E-06	3.24E-05
Acenaphthene	83-32-9	--	1.24E-07	4.33E-06	1.89E-05
Acenaphthylene	208-96-8	--	6.97E-07	2.44E-05	1.07E-04
Benzo(a)anthracene	56-55-3	--	1.51E-08	5.29E-07	2.32E-06
Benzo(a)pyrene	50-32-8	--	1.82E-08	6.38E-07	2.80E-06
Benzo(b)fluoranthene	205-99-2	--	1.51E-08	5.29E-07	2.32E-06
Benzo(e)pyrene	192-97-2	--	9.54E-08	3.34E-06	1.46E-05
Benzo(k)fluoranthene	207-08-9	--	2.20E-08	7.69E-07	3.37E-06
2-Chloronapthalene	91-58-7	--	1.44E-08	5.04E-07	2.21E-06
Chrysene[5]	218-01-9	--	4.56E-08	1.60E-06	6.99E-06
Dioxins		--	3.39E-11	1.18E-09	5.19E-09
Dibenzo(a,h)anthracene	53-70-3	--	2.54E-08	8.88E-07	3.89E-06
Fluorene	86-73-7	--	2.27E-07	7.94E-06	3.48E-05
Fluoranthene [Benzo(j,k) fluorine]	206-44-0	--	5.48E-07	1.92E-05	8.41E-05
Indeno(1,2,3,c,d)pyrene	193-39-5	--	1.10E-08	3.83E-07	1.68E-06
2-Methylnaphthalene	91-57-6	--	1.55E-06	5.42E-05	2.37E-04
Perylene	198-55-0	--	7.90E-09	2.76E-07	1.21E-06
Phenanthrene	85-01-8	--	3.17E-06	1.11E-04	4.86E-04
Pyrene	129-00-0	--	1.19E-06	4.15E-05	1.82E-04
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	--	7.60E-13	2.66E-11	1.16E-10

GP Warrenton Chip-N-Saw
CDK No. 2 Potential HAP Emissions from Wood Firing

Pollutant	CAS Number	Emission Factors		Kiln Emission Rates[1]	
		lb/MBF	lb/MMBtu	lb/hr	tpy
Metal HAPs[4]					
Antimony	7440-36-0	--	4.27E-06	1.50E-04	6.55E-04
Arsenic	7440-38-2	--	2.80E-05	9.81E-04	4.29E-03
Beryllium	7440-41-7	--	1.04E-07	3.65E-06	1.60E-05
Cadmium	7440-43-9	--	5.81E-06	2.03E-04	8.90E-04
Chromium total		--	1.87E-05	6.56E-04	2.87E-03
Chromium VI	18540-29-9	--	2.82E-07	9.87E-06	4.32E-05
Cobalt	7440-48-4	--	7.33E-07	2.57E-05	1.12E-04
Manganese	7439-96-5	--	1.52E-04	5.33E-03	2.33E-02
Mercury	7439-97-6	--	1.88E-06	6.57E-05	2.88E-04
Nickel	7440-02-0	--	1.64E-05	5.75E-04	2.52E-03
Phosphorus	7723-14-0	--	1.18E-04	4.14E-03	1.81E-02
Selenium	7782-49-2	--	1.24E-06	4.34E-05	1.90E-04

1. Emission Rates (lb/hr) = Emission Factor (lb/MMBtu) * Fuel Usage (ton/yr) * Fuel Heat Content (Btu/lb) / Hours of Operation (hr/yr) * (2,000 lb/ton) * (MMBtu/106 Btu)
Emission Rates (tpy) = Emission Factor (lb/MMBtu) * Fuel Usage (ton/yr) * Fuel Heat Content (Btu/lb) * (MMBtu/106 Btu)
or:
Emission Rates (lb/hr) = Emission Factor (lb/MBF) * Production Rate (MBF/yr) / Hours of Operation (hr/yr)
Emission Rates (tpy) = Emission Factor (lb/MBF) * Production Rate (MBF/yr) * (ton/2,000 lb)

2. Formaldehyde emission factor based median of the GP Columbia, MS (2/2/11), GP McCormick, SC (2/14/12, 7/17/13), Bibler Bros Russellville, AR (Kiln 1 2/23/10, Kiln 3 3/12/09) tests.
One standard deviation (based on individual test runs) was added to average for conservancy:

3. Methanol factor based on median of GP tests on continuous direct fired dry planer shaving burners at Columbia, MS (2/2/11) and McCormick, SC (2/14/12, 7/17/13).
One standard deviation (based on individual test runs) was added to average for conservancy:

4. Emission factors for all other pollutants from March 2013 NCASI database and Technical Bulletin 1013 (2013) median plus 2 standard deviations (if available) or plus 20% (when a standard deviation is not available or in the case that the standard deviation is greater than the median) for boiler with mechanical collector (or boiler with a wet scrubber for metals). Furan and Dioxin converted from ug/OD ton wood fired to lb/MMBtu using 8,400 Btu/lb heat content from NCASI TB1013. 2,3,7,8-Tetrachlorodibenzo-p-dioxin is calculated as the mean value listed in the NCA database plus 20%.

5. Chrysene emission factors based on AP-42 Table 1.6-3 plus 20%.

6. Total POM summarized from EPA AP-42, Section 1.6, Wood Residue Combustion in Boilers, Table 1.6-3.

7. NCASI TB 845 (2002), Table BB1 Steam FSK Emission factor plus a 20% safety factor.

GP Warrenton Chip-N-Saw
CDK No. 2 Potential HAP Emissions from Natural Gas Firing

Table 1. Fuel Information

Natural Gas	1,026	btu/scf

Table 2. Kiln Information

Future Annual Capacity, Kiln #2	120,000	MBF/year
	15.1	MBF/hr
Maximum Hours of Operation:	8760	Hrs/Yr
Maximum Design Heat Input Capacity	35.0	MMBtu/hr
	306,600	MMBtu/yr

Table 2. Hazardous and Toxic Air Pollutant Emission Calculations

Pollutant	CAS Number	Emission Factors		Kiln Emission Rates	
		lb/MBF	lb/MMscf[4]	lb/hr	tpy
Acetaldehyde[3]	75-07-0	5.04E-02	--	7.61E-01	3.02E+00
Acrolein[3]	107-02-8	6.00E-03	--	9.06E-02	3.60E-01
Benzene	71-43-2	--	2.10E-03	7.16E-05	3.14E-04
Dichlorobenzene		--	1.20E-03	4.09E-05	1.79E-04
Formaldehyde[2]	50-00-0	2.53E-02	7.50E-02	3.84E-01	1.53E+00
Hexane	110-54-3	--	1.80E+00	6.14E-02	2.69E-01
Naphthalene	91-20-3	--	6.10E-04	2.08E-05	9.11E-05
POM	Various	--	6.60E-04	2.25E-05	9.86E-05
Toluene	108-88-3	--	3.40E-03	1.16E-04	5.08E-04
Arsenic	7440-38-2	--	2.00E-04	6.82E-06	2.99E-05
Cadmium	7440-43-9	--	1.10E-03	3.75E-05	1.64E-04
Chromium	7440-47-3	--	1.40E-03	4.78E-05	2.09E-04
Cobalt	7440-48-4	--	8.40E-05	2.87E-06	1.26E-05
Manganese	7439-96-5	--	3.80E-04	1.30E-05	5.68E-05
Mercury	7439-97-6	--	2.60E-04	8.87E-06	3.88E-05
Methanol[2]	67-56-1	2.51E-01	--	3.78E+00	1.50E+01
Methyl Isobutyl Ketone[5]	108-10-1	1.20E-03	--	1.81E-02	7.20E-02
Nickel	7440-02-0	--	2.10E-03	7.16E-05	3.14E-04
Phenol[3]	108-95-2	1.24E-03	--	1.87E-02	7.42E-02
Propionaldehyde[3]	123-38-6	1.20E-03	--	1.81E-02	7.20E-02
Toluene[3]	108-88-3	1.20E-04	3.40E-03	1.93E-03	7.71E-03
Xylene[3]	1330-20-7	2.40E-04	--	3.62E-03	1.44E-02
Butane	106-97-8	--	2.10E+00	7.16E-02	3.14E-01
Ethane	74-84-0	--	3.10E+00	1.06E-01	4.63E-01
Pentane	109-66-0	--	2.60E+00	8.87E-02	3.88E-01
Propane	74-98-6	--	1.60E+00	5.46E-02	2.39E-01
Barium	7440-39-3	--	4.40E-03	1.50E-04	6.57E-04
Copper	7440-50-8	--	8.50E-04	2.90E-05	1.27E-04
Molybdenum	7439-98-7	--	1.10E-03	3.75E-05	1.64E-04
Vanadium	7440-62-2	--	2.30E-03	7.85E-05	3.44E-04
Zinc	7440-66-6	--	2.90E-02	9.89E-04	4.33E-03

1. Emission Rates (lb/hr) = Emission Factor (lb/MMBtu) * Fuel Usage (ton/yr) * Fuel Heat Content (Btu/lb) / Hours of Operation (hr/yr) * (2,000 lb/ton) * (MMBtu/106 Btu)
Emission Rates (tpy) = Emission Factor (lb/MMBtu) * Fuel Usage (ton/yr) * Fuel Heat Content (Btu/lb) * (MMBtu/106 Btu)
or:
Emission Rates (lb/hr) = Emission Factor (lb/MBF) * Production Rate (MBF/yr) / Hours of Operation (hr/yr)
Emission Rates (tpy) = Emission Factor (lb/MBF) * Production Rate (MBF/yr) * (ton/2,000 lb)
2. NCASI Wood Products Electronic Database, Updated February 2013. Emission factor is the median plus 1 standard deviation.
3. NCASI Wood Products Electronic Database, Updated February 2013. Emission factor is the median plus 20%.
4. Emission factors for all other pollutants for natural gas combustion per AP-42 Table 1.4-3 and 1.4-4.
5. NCASI TB 845 (2002), Table BB1 Steam FSK Emission factor plus a 20% safety factor.
6. NCASI Wood Products Electronic Database, Updated February 2013. Emission factor is the median.

GP Warrenton Chip-N-Saw
CDK No. 2 Potential HAP Emissions from Combination Wood/NG Firing Burner

Table 1. Fuel Information

Natural Gas	1,026	btu/scf

Table 2. Kiln Information

Future Annual Capacity, Kiln #2	120,000	MBF/year
	15.1	MBF/hr
Maximum Hours of Operation:	8760	Hrs/Yr
Maximum Design Heat Input Capacity	Wood-Firing Portion	
	35.0	MMBtu/hr
	306,600	MMBtu/yr
	NG-Firing Portion	
	7.0	MMBtu/hr
	7.E-03	MMscf/hr
	60	MMscf/yr

Table 2. Hazardous Air Pollutant Emission Calculations

Pollutant	CAS Number	Emission Factors			Kiln Emission Rates[1]	
		Production Based	Wood-fired	NG-fired		
		lb/MBF	lb/MMBtu	lb/MMscf	lb/hr	tpy
Acetaldehyde[4]	75-07-0	5.04E-02	--	--	7.61E-01	3.02E+00
Acetophenone	98-86-2	--	1.84E-06	--	6.44E-05	2.82E-04
Acrolein[8]	107-02-8	6.00E-03	1.52E-04	--	9.59E-02	3.83E-01
Benzene	71-43-2	--	2.35E-04	2.10E-03	8.24E-03	3.61E-02
Bis(2-Ethylhexyl)phthalate (also di-)	117-81-7	--	4.65E-08	--	1.63E-06	7.13E-06
Bromomethane (Methyl bromide)	74-83-9	--	3.67E-06	--	1.28E-04	5.63E-04
Butane	106-97-8	--	--	2.10E+00	1.43E-02	6.28E-02
Carbon Disulfide	75-15-0	--	1.25E-04	--	4.38E-03	1.92E-02
Carbon Tetrachloride	56-23-5	--	1.16E-05	--	4.06E-04	1.78E-03
Chlorobenzene	108-90-7	--	1.66E-05	--	5.81E-04	2.54E-03
Chloroform	67-66-3	--	2.55E-06	--	8.93E-05	3.91E-04
Chloromethane (Methyl Chloride)	74-87-3	--	2.66E-05	--	9.31E-04	4.08E-03
Cumene	98-82-8	--	1.77E-05	--	6.20E-04	2.71E-03
Dichlorobenzene		--	--	1.20E-03	8.19E-06	3.59E-05
Dichloroethane, 1,2- (Ethylene dichloride)	107-06-2	--	2.92E-05	--	1.02E-03	4.48E-03
Dichloromethane (Methylene chloride)	75-09-2	--	2.82E-05	--	9.87E-04	4.32E-03
Dichloropropane, 1,2- (Propylene dichloride)	78-87-5	--	1.68E-05	--	5.88E-04	2.58E-03
Di-n-butyl Phthalate	84-74-2	--	3.33E-05	--	1.17E-03	5.10E-03
Dinitrophenol, 2,4-	51-28-5	--	1.31E-07	--	4.59E-06	2.01E-05
Dinitrotoluene, 2,4-	121-14-2	--	9.42E-07	--	3.30E-05	1.44E-04
Ethane	74-84-0	--	--	3.10E+00	2.12E-02	9.26E-02
Ethylbenzene	100-41-4	--	3.13E-05	--	1.10E-03	4.80E-03
Formaldehyde[2]	50-00-0	8.50E-02	--	2.53E-02	1.28E+00	5.10E+00
Hexachlorobenzene	118-74-1	--	1.03E-06	--	3.61E-05	1.58E-04
Hexane	110-54-3	--	2.88E-04	1.80E+00	2.24E-02	9.79E-02
Hydrogen Chloride	7647-01-0	--	3.87E-04	--	1.35E-02	5.93E-02
Methanol[3]	67-56-1	2.51E-01	--	--	3.78E+00	1.50E+01
MIBK	108-10-1	1.20E-03	4.45E-04	--	3.37E-02	1.40E-01
Naphthalene	91-20-3	--	8.13E-06	6.10E-04	2.89E-04	1.26E-03
4-Nitrophenol	100-02-7	--	9.32E-08	--	3.26E-06	1.43E-05
Pentachlorophenol	87-86-5	--	4.48E-08	--	1.57E-06	6.87E-06
Pentane	109-66-0	--	--	2.60E+00	1.77E-02	7.77E-02
Phenol[4]	108-95-2	1.24E-02	--	--	1.87E-01	7.42E-01
POM[6]	Various	--	1.52E-04	6.60E-04	5.32E-03	2.33E-02
Propane	74-98-6	--	--	1.60E+00	1.09E-02	4.78E-02
Propionaldehyde	123-38-6	1.20E-03	2.14E-05	--	1.89E-02	7.53E-02
Styrene	100-42-5	--	1.54E-05	--	5.39E-04	2.36E-03
Tetrachloroethene (Tetrachloroethylene, Perchlo	127-18-4	--	2.46E-05	--	8.61E-04	3.77E-03
Toluene	108-88-3	1.20E-04	3.67E-06	3.40E-03	1.96E-03	7.86E-03
Trichloroethane, 1,1,1- (Methyl Chloroform)	71-55-6	--	3.93E-05	--	1.38E-03	6.02E-03
Trichloroethene (Trichloroethylene)	79-01-6	--	1.99E-05	--	6.97E-04	3.05E-03
Trichlorophenol, 2,4,6-	88-06-2	--	2.73E-07	--	9.56E-06	4.19E-05
Vinyl Chloride	75-01-4	--	1.84E-05	--	6.44E-04	2.82E-03
Xylene	1330-20-7	2.40E-04	5.22E-06	--	3.81E-03	1.52E-02
PAHs[4]						
Acenaphthene	83-32-9	--	1.03E-07	--	3.61E-06	1.58E-05
Acenaphthylene	208-96-8	--	5.81E-07	--	2.03E-05	8.91E-05
Anthracene	120-12-7	--	1.76E-07	--	6.16E-06	2.70E-05
Benzo(a)anthracene	56-55-3	--	1.26E-08	--	4.41E-07	1.93E-06
Benzo(a)pyrene	50-32-8	--	1.52E-08	--	5.32E-07	2.33E-06
Benzo(b)fluoranthene	205-99-2	--	1.26E-08	--	4.41E-07	1.93E-06
Benzo(e)pyrene	192-97-2	--	7.95E-08	--	2.78E-06	1.22E-05
Benzo(k)fluoranthene	207-08-9	--	1.83E-08	--	6.41E-07	2.81E-06
2-Chloronapthalene	91-58-7	--	1.20E-08	--	4.20E-07	1.84E-06
Chrysene[5]	218-01-9	--	3.80E-08	--	1.33E-06	5.83E-06
Dioxins		--	2.82E-11	--	9.87E-10	4.33E-09
Dibenzo(a,h)anthracene	53-70-3	--	8.88E-09	--	3.11E-07	1.36E-06
Fluoranthene [Benzo(j,k) fluorine]	206-44-0	--	4.57E-07	--	1.60E-05	7.01E-05
Fluorene	86-73-7	--	1.89E-07	--	6.62E-06	2.90E-05
Furan	11-00-09	--	1.96E-11	--	6.84E-10	3.00E-09
Indeno(1,2,3,c,d)pyrene	193-39-5	--	9.13E-09	--	3.20E-07	1.40E-06
2-Methylnaphthalene	91-57-6	--	1.29E-06	--	4.52E-05	1.98E-04
Perylene	198-55-0	--	6.58E-09	--	2.30E-07	1.01E-06
Phenanthrene	85-01-8	--	2.64E-06	--	9.24E-05	4.05E-04
Pyrene	129-00-0	--	9.88E-07	--	3.46E-05	1.51E-04
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	--	6.33E-13	--	2.22E-11	9.70E-11

GP Warrenton Chip-N-Saw
CDK No. 2 Potential HAP Emissions from Combination Wood/NG Firing Burner

Pollutant	CAS Number	Emission Factors			Kiln Emission Rates[1]	
		lb/MBF	lb/MMBtu	lb/MMscf	lb/hr	tpy
Metal HAPs[4]						
Antimony	7440-36-0	--	1.47E-06	--	5.13E-05	2.25E-04
Arsenic	7440-38-2	--	1.01E-05	2.00E-04	3.55E-04	1.55E-03
Barium	7440-39-3	--	--	4.40E-03	3.00E-05	1.31E-04
Beryllium	7440-41-7	--	4.23E-08	--	1.48E-06	6.48E-06
Cadmium	7440-43-9	--	3.09E-06	1.10E-03	1.16E-04	5.07E-04
Chromium	7440-47-3	--	--	1.40E-03	9.55E-06	4.18E-05
Chromium total		--	1.00E-05	--	3.51E-04	1.54E-03
Chromium VI	18540-29-9	--	2.82E-07	--	9.87E-06	4.32E-05
Cobalt	7440-48-4	--	6.11E-07	8.40E-05	2.20E-05	9.62E-05
Copper	7440-50-8	--	--	8.50E-04	5.80E-06	2.54E-05
Manganese	7439-96-5	--	1.27E-04	3.80E-04	4.44E-03	1.95E-02
Mercury	7439-97-6	--	8.26E-07	2.60E-04	3.07E-05	1.34E-04
Molybdenum	7439-98-7	--	--	1.10E-03	7.50E-06	3.29E-05
Nickel	7440-02-0	--	8.84E-06	2.10E-03	3.24E-04	1.42E-03
Phosphorus	7723-14-0	--	9.85E-05	--	3.45E-03	1.51E-02
Selenium	7782-49-2	--	1.03E-06	--	3.62E-05	1.59E-04
Vanadium	7440-62-2	--	--	2.30E-03	1.57E-05	6.87E-05
Zinc	7440-66-6	--	--	2.90E-02	1.98E-04	8.67E-04

1. Emission Rates (lb/hr) = Emission Factor (lb/MMBtu) * Fuel Usage (ton/yr) * Fuel Heat Content (Btu/lb) / Hours of Operation (hr/yr) * (2,000 lb/ton) * (MMBtu/106 Btu)
Emission Rates (tpy) = Emission Factor (lb/MMBtu) * Fuel Usage (ton/yr) * Fuel Heat Content (Btu/lb) * (MMBtu/106 Btu)
or:
Emission Rates (lb/hr) = Emission Factor (lb/MBF) * Production Rate (MBF/yr) / Hours of Operation (hr/yr)
Emission Rates (tpy) = Emission Factor (lb/MBF) * Production Rate (MBF/yr) * (ton/2,000 lb)
2. Formaldehyde emission factor based median of the GP Columbia, MS (2/2/11), GP McCormick, SC (2/14/12, 7/17/13), Bibler Bros Russellville, AR (Kiln 1 2/23/10, Kiln 3 3/12/09) tests.
One standard deviation (based on individual test runs) was added to average for conservancy:
3. Methanol factor based on median of GP tests on continuous direct fired dry planer shaving burners at Columbia, MS (2/2/11) and McCormick, SC (2/14/12, 7/17/13).
One standard deviation (based on individual test runs) was added to average for conservancy:
4. Emission factors for all other wood fired pollutants from March 2013 NCASI database and Technical Bulletin 1013 (2013) median plus 2 standard deviations (if available) or plus 20% (whe
is not available or in the case that the standard deviation is greater than the median) for boiler with mechanical collector (or boiler with a wet scrubber for metals). Furan and Dioxin converted
fired to lb/MMBtu using 8,400 Btu/lb heat content from NCASI TB1013. 2,3,7,8-Tetrachlorodibenzo-p-dioxin is calculated as the mean value listed in the NCASI database plus 20%.
5. Chrysene emission factors based on AP-42 Table 1.6-3 plus 20%.
6. Total POM summarized from EPA AP-42, Section 1.6, Wood Residue Combustion in Boilers, Table 1.6-3.
7. Emission factors for natural gas combustion per AP-42 Table 1.4-3 and 1.4-4.
8. NCASI TB 845 (2002), Table BB1 Steam FSK Emission factor plus a 20% safety factor.

GP Warrenton Chip-N-Saw
Phase II New Equipment Potential Emissions

Table 1. Log and Saw Parameters

Log Length	12.50	ft/log
Log Diameter	0.60	ft
Density	58.00	lb/ft^3
Throughput - Potential	1,128,000	tpy
Hours of Operation	8760	hours
Sawmill Throughput - Potential	188	tph
Planer Mill Throughput - Potential	235	tph
No. Logs - Maximum (Potential)	11,097,762	annual
No. Logs - Maximum (Potential)	1,850	hourly
Total Chip Generation	273,600	tph
Total Sawdust Generation	48,000	tph
Total Bark Generation	112,800	tph
Total Shavings Generation	57,600	tph

Notes:
1. Number of logs calculated from log throughput (tpy) / density (lb/ft^3) / area
2. Note - Projected hours of operation are used to calculate worst-case short term emissions below and not meant to limit operations below 8760.

Table 2. Debarker Potential Emission Calculations

Unit	Potential Throughput (tph)	Potential Throughput (tpy)	Emission Factor (lb/ton) PM	Emission Factor (lb/ton) PM_{10}	Emission Factor (lb/ton) $PM_{2.5}$	PM Emissions (lb/hr)	PM Emissions (tpy)	PM_{10} Emissions (lb/hr)	PM_{10} Emissions (tpy)	$PM_{2.5}$ Emissions (lb/hr)	$PM_{2.5}$ Emissions (tpy)
Debarker (102S)	188.0	1,128,000	2.00E-02	1.10E-02	7.50E-05	1.88	3.38	1.03	1.86	0.01	0.04

1. Debarker PM and PM_{10} emission factors from EPA FIRE database, SCC 30700801 (Log Debarking). Applied a 70% control factor for partial enclosure around debarker.
2. Debarker PM2.5 emission rate based on information from NCASI July 2014 memo for PM2.5 Emissions from Drum Debarking. Emission factor presented was 4.5 E-05 lb/ton log processed. Subtracted a out a 90% control for Drum debarker and added a 50% saftey factor to the test data point since the data was for drum debarker and this is a ring debarker.
3. Annual emissions calculated from emission factor (lb/ton) * throughput (tpy) / 2000 (lb/ton)
4. Short term emissions calculated from emission factor (lb/ton) * throughput (tph)

Table 3. Saw Potential Emissions

Saw	Maximum No. Cuts	Kerf (inches)	Sawdust Generated (tph)	Sawdust Generated (tpy)	Emission Factor (lb/ton) PM	Emission Factor (lb/ton) PM_{10}	Emission Factor (lb/ton) $PM_{2.5}$	Potential Emissions PM (lb/hr)	Potential Emissions PM (tpy)	Potential Emissions PM_{10} (lb/hr)	Potential Emissions PM_{10} (tpy)	Potential Emissions $PM_{2.5}$ (lb/hr)	Potential Emissions $PM_{2.5}$ (tpy)
VSA Saw	3	0.12	0.45	2,707	1.00	0.36	0.11	0.14	0.41	0.05	0.15	0.015	0.04
Slasher Saw	4	0.38	0.02	113	1.00	0.36	0.11	5.64E-03	1.69E-02	2.03E-03	6.09E-03	6.20E-04	1.86E-03
Planer Trim Saw	7	0.25	2.19	13,160	-	-	-	Included in Planer Mill Cyclone Emissions					

1. Sawdust calculated from No. logs per year * No. cuts * log area (ft^2) * kerf width (ft) * density (lb/ft^3)/2000.
Slasher saw processes 1% of total logs.
2. Annual emissions calculated from emission factor (lb/ton) * sawdust (tpy) / 2000 (lb/ton)
3. Throughput of planer saw is conversvatively assumed as the same as lumber. Actual will be lower.
4. Short term emissions calculated from emission factor (lb/ton) * sawdust (tph)
5. A control efficiency was assumed for the saws based on partial enclosure of the individual saws. The level of control claimed is conservative (as the sawdust generated contains 50% moisture) and consistent with Air Pollution Engineering Manual, 2nd Ed., AWMA, c2000, Ch 15, p. 694.
Control efficiency = 70%
6. Planer trim saw has a misting system as a primary control system for dust from the saw. The trim saw also has a drop point from the planer mill cyclone, therefore emissions not controlled by the misting system are captured by the planer cyclone and accounted for with that system.

GP Warrenton Chip-N-Saw
Phase II New Equipment Potential Emissions

Table 3. Drop Point Emission Factor Calculations for Bark, Chip and Sawdust Handling Systems

Material	Moisture Content[1]	Emission Factor (lb/ton)[2,3] PM	PM_{10}	$PM_{2.5}$
Bark	4.8	9.60E-04	4.54E-04	6.88E-05
Chips	4.8	9.60E-04	4.54E-04	6.88E-05
Sawdust	4.8	9.60E-04	4.54E-04	6.88E-05
Shavings	4.8	9.60E-04	4.54E-04	6.88E-05

1. Ash moisture content assumed. For all other materials, moisture content (M) for f set equal to the maximum value for which the equation is appropriate. Actual moisture content is higher.

2. Emission factor calculated from

$$E\ (\text{lb/ton}) = k \times 0.0032 \times \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

where:

k: Particle size multiplier 0.74 PM
0.35 PM_{10}
0.053 $PM_{2.5}$
U: Mean wind speed 6.41 mph

3. Emission factor per AP-42, Section 13.2.4, *Aggregate Handling and Storage Piles* , drop equation.
Mean wind speed for Augusta, GA per EPA TANKS meteorological database.
Assumes one drop point each.

Table 4. Bark Chip and Sawdust Potential Emissions Calculation

Equipment/Material	Throughput (tph)	Throughput (tpy)	No. Drop Points	PM Emissions (lb/hr)	PM Emissions (tpy)	PM_{10} Emissions (lb/hr)	PM_{10} Emissions (tpy)	$PM_{2.5}$ Emissions (lb/hr)	$PM_{2.5}$ Emissions (tpy)
Bark Handling System	18.8	112,800	6	1.08E-01	3.25E-01	5.12E-02	1.54E-01	7.76E-03	2.33E-02
Chip Handling System	45.6	273,600	8	3.50E-01	1.05E+00	1.66E-01	4.97E-01	2.51E-02	7.53E-02
Sawdust Handling System	8.0	48,000	8	6.14E-02	1.84E-01	2.91E-02	8.72E-02	4.40E-03	1.32E-02
Shavings Handling System	12.0	57,600	1	1.15E-02	2.77E-02	5.45E-03	1.31E-02	8.25E-04	1.98E-03

1. Bark Handling system consists of new Bark Screen, Bark Hog, and Bark Truck Loadout.
2. Chip Handling System includes drop points to conveyors from saws, chippers, screens and truck loadouts. A new saw egder and small chipper and shaker screen will be added to the system in Phase I. The trim saw chipper will also be replaced in Phase I.
3. Sawdust Handling System includes drop points to conveyors from saws, chippers, screens and truck loadouts. A new saw egder and small chipper and shaker screen will be added to the system in Phase I. The trim saw chipper will also be replaced in Phase I.
4. Annual emissions calculated from emission factor (lb/ton) * throughput (tpy) / 2000 (lb/ton) * # of drop points
5. Short term emissions calculated from emission factor (lb/ton) * throughput (tph) * # of drop points

Table 5. New Planer Mill Cyclone Emissions

Unit	Airflow (dscfm)	Operating Hours	Emission Factor PM (gr/dscf)	Emission Factor PM_{10} (gr/dscf)	Emission Factor $PM_{2.5}$ (gr/dscf)	Projected Actual Emissions PM (lb/hr)	PM (tpy)	PM_{10} (lb/hr)	PM_{10} (tpy)	$PM_{2.5}$ (lb/hr)	$PM_{2.5}$ (tpy)
Planer Mill (PMC1)	59,000	8,760	3.68E-03	2.60E-03	1.35E-03	1.86	8.15	1.32	5.76	0.68	3.00

Note that the planer mill and planer mill trim hog exhaust to the cyclone.
PM/PM10/PM2.5 Emission data based on 2013 testing of existing Warrenton Planer Mill Cyclone + 20% safety factor.

GP Warrenton Chip-N-Saw
Phase II Bark and Chip Handling Potential Emissions

Table 1. Process Information for Potential Production

Logs Processed	1,128,000	tpy
Chip Generation	273,600	tpy
Typical Bark and Chip Moisture Content	50%	
Hours of Operation:	8760	hr/yr

Table 2. Big Chipper Potential Emission Calculations

	Potential Throughput		Emission Factor			PM Emissions		PM_{10} Emissions		$PM_{2.5}$ Emissions	
			PM	PM_{10}	$PM_{2.5}$						
	(tph)	(tpy)		lb/ODT		(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Big Chipper (103S)	0.9	5,472	1.50E-01	7.42E-02	2.70E-02	0.07	0.21	0.03	0.10	0.01	0.04

1. Big chipper throughput assumed to be equal to 2% of total facility chip generation. Short term throughput based on max hourly sawmill capacity of 40 MBF/hr * 1.14 tons chips/MBF * 2%.
2. PM Emission factor based on NCASI 2013 Wood Products database for green end material handling (all green chippers with cyclones). Used max test value plus 20% safety factor for PM.
3. PM_{10} emission factor was developed by calculating uncontrolled PM assuming 99% control in PM rate referenced above. The PM10/PM ratio for wood chips from NCASI's Special Report, "Estimating the Potential for PM2.5 Emissions from Wood and Bark Handling" of 0.0099 was applied. An assumed 50% control from the cyclone of PM10 emissions was then applied per AP-42 Appendix B.2 Table B.2-3 for low efficiency cyclones.
4. $PM_{2.5}$ emission factor was developed by calculating uncontrolled PM assuming 99% control in PM rate referenced above. The PM10/PM ratio for wood chips from NCASI's Special Report, "Estimating the Potential for PM2.5 Emissions from Wood and Bark Handling" of 0.0018 was applied.
5. Emission factors are provided as pound emissions per oven dried ton of material processed. Chips contain 50% moisture on average. The moisture content is removed from the weight of the material throughput.
6. Annual emissions calculated from emission factor (lb/ODT ton) * chips (tpy)* (100 - 50% moisture)/ 2000 (lb/ton).

Table 3. Log and Saw Parameters

Log Length - prior to sizing saw	40	ft/log
Log Length	12.50	ft/log
Log Diameter	0.60	ft
Density	58.00	lb/ft^3
Throughput - Potential	1,128,000	tpy
Hours of Operation	8760	hours
Throughput - Potential	129	tph
No. Logs - prior to sizing - Potential	3,468,050	annual
No. Logs - prior to sizing - Potential	396	hourly

Notes:
1. Number of logs calculated from log throughput (tpy) / density (lb/ft^3) / area (ft^2) * 2000 lb/ton / individual log length (ft).
2. Note - Projected hours of operation are used to calculate worst-case short term emissions below and not meant to limit operations below 8760.

Table 4. Sizing Saw Potential Emissions

								Potential Emissions					
	Maximum	Kerf	Sawdust Generated		Emission Factor (lb/ton)			PM		PM_{10}		$PM_{2.5}$	
Saw	No. Cuts	(inches)	(tph)	(tpy)	PM	PM_{10}	$PM_{2.5}$	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Sizing Saws	4	0.5	0.5	4,700	1.00	0.36	0.11	0.54	2.35	0.06	0.85	0.018	0.26

1. Sawdust calculated from No. logs per year * No. cuts * log area (ft^2) * kerf width (ft) * density (lb/ft^3)/2000.
   Slasher saw processes 1% of total logs.
2. Throughput of planer saw is conversvatively assumed as the same as lumber. Actual will be lower.
3. PM (TSP)/PM10 emission factors per FIRE database for SCC 30700803 for sawdust storage pile handling. PM2.5 obtained from EPA's PMCALC database sawdust handling
4. A control efficiency of 70% for PM and PM10 was assumed for the VSA and Slasher saws based on partial enclosure of the sawmill building. The level of control claimed is conservative and consistent with Air Pollution Engineering Manual, 2nd Ed., AWMA, c2000, Ch 15, p. 694.
5. Planer trim saw has a misting system as a primary control system for dust from the saw. The trim saw also has a drop point from the planer mill cyclone, therefore emissions not controlled by the misting system are captured by the planer cyclone and accounted for with that system.
6. Sizing Sawdust calculated from No. logs per year * No. cuts * log area (ft^2) * kerf width (ft) * density (lb/ft^3)/2000.
7. Annual emissions calculated from emission factor (lb/ton) * sawdust (tpy) / 2000 (lb/ton)*(1-control efficiency)
8. Short term emissions calculated from emission factor (lb/ton) * sawdust (tph) *(1-control efficiency)

GP Warrenton Chip-N-Saw
Phase II Road Emissions

Table 1. Road Information

Road Segment	BAE Paved/Unpaved	Length (mi)
A	Paved	0.086
B	Paved	0.182
C	Paved	0.101
D-1	Paved	0.11
D-2	Unpaved	0.08
E	Paved	0.06
F	Paved	0.201
G	Paved	0.27

Sample Location	sL	
P-6	0.25	g/m^2
P-6	0.25	g/m^2
Not sampled	0.4	g/m^2 (used average for paved roads)
P-5	1.08	g/m^2
UP-2	1.6	%
Not sampled	0.4	g/m^2 (used average for paved roads)
P-4	0.24	g/m^2
Not sampled	0.4	g/m^2 (used average for paved roads)

Information based on review of site layout and truck traffic.
Road Segments C and G will be paved during Phase II of the Project.

Table 2. Truck Traffic Details

Truck	PAE Material Throughput (tpy)	Truck Weight[1] (tons) Unloaded	Loaded	Average Truck Weight (tons)	Number of Trucks[2]	Routes Traveled (# = No of trips) A	B	C	D1	D2	E	F	G
Shavings	57600	15	40	27.5	2304	2	2				2		
Chips	273600	15	40	27.5	5472	2	2						2
Logs	1128000	15	40	27.5	45120	2	2	2					
Bark	112800	15	40	27.5	4512	2	2						2
Green Sawdust	NA	15	40	27.5	25	2	2						2
Finished Lumber	240,000 Mbf/yr	15	40	27.5	12000	2	2					2	

1. Truck weight based on engineering estimates.
2. Number trucks based on material throughput divided by haul weight.
3. Estimate half of the chips produced are shipped by truck and half by rail.
4. Assumes 25 loads of sawdust to be trucked, the rest burned in the kiln.
5. Lumber trucks based on 20 Mbf per truck.

Table 3. Emission Factor Calculation

Segment	Fleet Mean Weight (tons)	Emission Factor[1, 2] PM - Maximum (lb/VMT)	PM_{10} - Maximum (lb/VMT)	$PM_{2.5}$ - Maximum (lb/VMT)
Paved				
A	27.5	0.08	0.02	4.16E-03
B	27.5	0.08	0.02	4.16E-03
C	27.5	0.13	0.03	6.37E-03
D1	27.5	0.32	0.06	1.57E-02
E	27.5	0.13	0.03	6.37E-03
F	27.5	0.08	0.02	4.00E-03
G	27.5	0.13	0.03	6.37E-03
Unpaved				
D2	27.5	2.26	0.46	4.63E-02

GP Warrenton Chip-N-Saw
Phase II Road Emissions Continued

1. Long term average paved route emission factor is based on Equation 2 of AP-42 Section 13.2.1 (January 2011):

$$E = \left[k \times (sL)^{0.91} \times (W)^{1.02}\right] \times \left(1 - \frac{P}{4N}\right)$$

E =		size specific emission factor (lb/VMT)
k =	0.011	particle size multiplier for particle size range and units of interest, AP-42, Section 13.2.1, Table 13.2.1-1.
	0.0022	
	0.00054	
sL =	*see data above*	road surface silt loading (g/m^2), based on silt content testing conducted on paved roads at the Warrenton mill.
W =		mean vehicle weight (tons)
P =	110	number of days in the averaging period with at least 0.254 mm (0.01 in) of precipitation, AP-42 Section 13.2.1, Figure 13.2.1-2.
N =	365	number of days in the averaging period (e.g., 365 for annual)

2. Unpaved route emission factor is based on Equations 1a and 2 of AP-42 Section 13.2.2 (November 2006):
Equations 1a and 2 (combined):

$$E = k \times \left(\frac{s}{12}\right)^a \times \left(\frac{W}{3}\right)^b \times \left(\frac{365 - P}{365}\right)$$

E =		size specific emission factor (lb/VMT)
s =		surface material silt content (%), based on silt content testing conducted on unpaved roads at the Warrenton mill.
W =		mean vehicle weight (tons)
k =	4.9	particle size multiplier, AP-42 Section 13.2.2, Table 13.2.2-2.
	1.5	
	0.15	
a =	0.7	empirical constant, AP-42 Section 13.2.2, Table 13.2.2-2.
	0.9	
b =	0.45	empirical constant, AP-42 Section 13.2.2, Table 13.2.2-2.
P =	110	number of days in a year with at least 0.254 mm (0.01 in) of precipitation, AP-42 Section 13.2.2, Figure 13.2.2-1

Table 4. Emission Calculations

Road Segment	Vehicle Miles Traveled [1] Maximum	Potential Emissions PM (lb/hr)	PM (tpy)	PM_{10} (lb/hr)	PM_{10} (tpy)	PM_{25} (lb/hr)	$PM_{2.5}$ (tpy)
A	11942.5	0.12	0.51	0.02	0.10	0.01	0.02
B	25273.6	0.24	1.07	0.05	0.21	0.01	0.05
C	9114.2	0.14	0.59	0.03	0.12	0.01	0.03
D1	0.0	0.00	0.00	0.00	0.00	0.00	0.00
D2	0.0	0.00	0.00	0.00	0.00	0.00	0.00
E	276.5	0.00	0.02	0.00	0.00	0.00	0.00
F	4824.0	0.04	0.20	0.01	0.04	0.00	0.01
G	5421.5	0.08	0.35	0.02	0.07	0.00	0.02
Total		0.62	2.73	0.12	0.55	0.03	0.13

1. VMT calculated from segment length times number of trips.
2. Emissions Calculated from emission factor (lb/VMT) * VMT / 2000 lb/ton.
3. D1 and D2 routes will no longer be used for normal truck traffic in Phase II.

GP Warrenton Chip-N-Saw
Ph II - Paint and Fuel Tank Emissions

Table 1. Ink/Logo Emissions

Material	Specific Gravity	Use (gallons)	Use (tons)	VOC Content	Methanol Content	Vinyl Acetate Content	Emissions (tpy) VOC	Emissions (tpy) Methanol	Emissions (tpy) Vinyl Acetate
Logo Paint	1.07	977	4.4	2.7%	2.5%	0.001%	1.19E-01	1.08E-01	4.36E-05
Reject Paint	1.09	28	0.13	5.0%	-	-	6.33E-03	-	-
Total							1.26E-01	1.08E-01	4.36E-05

1. Specific gravity per MSDS.
2. VOC/HAP content for logo paint per May 20, 2010 and June 14, 2010 letters from Danielle Paradis (Williamette Valley Company).
3. Note that the stamp ink does not contain any VOC or HAP and emissions are not calculated.

Table 2. Tank Emission Calculations

Tank ID	Tank Contents	Size (gallons)	Horizontal or Vertical?	Height/Length (ft)	Diameter (ft)	Throughput (gal)	No. Turnovers[2]	VOC Emissions (lb/yr)	VOC Emissions (tpy)
T-01	Diesel	10,000	H	16.0	10.0	190,560	19.1	10.6	5.31E-03
T-02	Gasoline	1,000	H	6.1	5.3	7,392	7.4	1448.1	7.24E-01
Total								1458.7	7.29E-01

The facility has a number of other small (<2,000 gallon) tanks storing materials with vapor pressures similar to or below that of diesel. Based on diesel emissions for much larger tanks, it is assumed that emissions from the other tanks are negligible.

APPENDIX C

BACT SUPPORTING DOCUMENTATION

Table 5-1. Emission Units Subject to BACT

Unit	Max. Production Capacity
New CDKs (2)	240.0 MMBF/yr
Package Boiler	39.0 MMBtu/hr

Table 5-2. Potential Control Scenario Summary

Emission Unit	Pollutant	Control Basis	Emissions [1]	Capture Efficiency [2]	Through the Stacks
New CDK (Wood-Fired)	VOC	RTO	4.28 lb/MBF	80.0%	0.171 lb/MBF
Package Boiler	VOC	Oxidation Catalyst	5.36E-03 lb/mmbtu	100.0%	5.36E-03 lb/mmbtu

1. VOC as C (Method 25A) per Manny Patel of GA EPD

2. Engineering estimate based design characteristics of continuous kiln and package boiler.

Table 5-3. Cost Summary

Emission Unit	Pollutant	Technology	Control Efficiency (%)	Baseline Emissions (tpy)	Capture Efficiency (%)	Pollutant Removed (tpy)	Operating Cost ($/ton removed)
New CDK (Wood-Fired)	VOC	RTO	95%	513.60	80.0%	390.34	$ 10,359
Package Boiler	VOC	Oxidation Catalyst	75%	0.91	100.0%	0.69	$ 256,425

1. RTO control efficiency per Air Pollution Control Technology Fact Sheet - EPA-452/F-03-021.

Table 5-4. Cost Analysis Supporting Information for WESP

Parameter	New CDK (Wood-Fired)	Units	Note(s)
Maximum Production Capacity	240	MMBF/yr	
Airflow Capture Efficiency	80	%	1
PM Control Efficiency	95	%	
Airflow	88,000	acfm	1
Pressure Drop	1.5	inches of H_2O	1
Fan Motor Efficiency	65	%	2
Fan Electricity Usage	29.4	kW-hr	3
Water Requirement	10.0	gal/min	4
	600	gal/hr	
Solid Material to be Disposed (PM Collected)	14.0	ton/yr	9
Landfill Fees	30	$/ton	5
Operating Labor Cost	26.2	$/hr	5
Maintenance Labor Cost	47.4	$/hr	5
Electricity Cost	0.08	$/kW-hr	6
WESP Equipment Life	20	years	7
Interest Rate	7.0	%	7
2002 Chemical Engineering Index	394.3	n/a	8
2014 Chemical Engineering Index	576.9	n/a	8

1. Engineering estimate based on design characteristics of a continuous lumber kiln.
2. Per OAQPS Manual, Section 3.2, Chapter 2, page 2-41, efficiency ranges from 40 to 70%. 65% was chosen.
3. Total Fan Electricity Usage based on Equation 2.42 of OAQPS Manual, Section 3.2, Chapter 2, page 2-41.
Excludes pump power and operating power for WESPs identified in Section 3.4.1.4 on Page 3-48.
4. Correspondence betwenn Joe Sullivan of URS and Rodney Pennington of Nestec, Inc 11/24/2014
5. Average costs at GP's Rome mill.
6. Actual electricity rate for Rome mill.
7. Based on example problem in OAQPS Manual, Section 3.2, Chapter 2, page 2-45.
8. Values based on Chemical Engineering plant cost index. September 2014
9. PM Collected = (PM (filt) + CPM)*80% Capture * 95% Control on captured PM
10. GP engineering estimate - assuming half of moisture condensing out of the gas stream.

Table 5-5. Capital Cost Evaluation for Wet ESP Prior to Oxidizer for the New CDK

Capital Cost	New CDK (Wood-Fired)	OAQPS Notation[1]
Purchased Equipment Costs		
Total Equipment Cost[2]	3,602,857	A
Instrumentation[2]	---	
Freight	180,143	0.05 × A
Total Purchased Equipment Costs	*3,782,999*	B
Direct Installation Costs		
Foundations and Supports	151,320	0.04 × B
Handling and Erection	1,891,500	0.50 × B
Electrical	302,640	0.08 × B
Piping	37,830	0.01 × B
Insulation	75,660	0.02 × B
Painting	75,660	0.02 × B
Site Preparation & Buildings	-	-
Total Direct Installation Costs	*2,534,610*	
Indirect Installation Costs		
Engineering[2]	---	---
Construction and Field Expense	756,600	0.20 × B
Contractor Fees	378,300	0.10 × B
Start-up	37,830	0.01 × B
Performance Test	37,830	0.01 × B
Process Contingencies	113,490	0.03 × B
Total Indirect Installation Costs	*1,324,050*	
Total Capital Investment ($)	**7,641,659**	**TCI = B + C + D**

1. U.S. EPA OAQPS, *EPA Air Pollution Control Cost Manual (6th Edition)* , January 2002, Section 6 (Particulate Matter Controls), Chapter 3 (Electrostatic Precipitators).

2. Capital Costs are based the budgetary quote from TurboSonic for a SonicKleen WESP (the pricing is for design, engineering and supply of equipment, drawings and flow sheets). 95% efficiency.

3. Cost of 36" stainless steel ductwork per Gordon Hopper, URS Engineer, and Chad Delaune, URS estimator, May 2013.

Turbosonic Cost Estimate for 170,000 acfm flow	**$3,639,200**
Conversion from 2002 to 2014 dollars	1.46
Cost for 44,330 acfm CDK in 2014 $	$3,602,857

Table 5-6. Annualized Cost Evaluation for Wet ESP for the New CDK

Operating Cost	New CDK (Wood-Fired)	OAQPS Notation[1]
Direct Annual Costs, $		
Operating Labor (0.5 hr, per 8-hr shift)	14,354	E
Supervisory Labor	2,153	F = 0.15 × E
Maintenance Labor (0.5 hr, per 8-hr shift)	25,969	G
Maintenance Materials	25,969	H = G
Electricity	72,154	I
Water	52,560	
Water Treatment	1971	
Waste Disposal (solid material)	421	
Total Direct Annual Costs, $	*195,552*	*DAC = E + F + G + H + I + J*
Indirect Annual Costs, $		
Overhead	41,067	K = 0.60 × (E + F + G + H)
Administrative Charges	152,833	L = 0.02 × TCI
Property Tax	76,417	M = 0.01 × TCI
Insurance	76,417	N = 0.01 × TCI
Capital Recovery Factor	0.0944	Based on 7% interest rate and 20 yr control equip. life
Capital Recovery[2]	721,319	O
Total Indirect Annual Costs, $	*1,068,052*	*IDAC = K + L + M + N + O*
Total Annual Cost, $	**1,263,604**	*TAC = DAC + IDAC*

1. U.S. EPA OAQPS, *EPA Air Pollution Control Cost Manual (6th Edition)* , January 2002, Section 3.2 (VOC Destruction Controls), Chapter 2 (Incinerators).

2. Capital Recovery factor calculated based on Equation 2.8a (Section 1, Chapter 2, page 2-21) and Table 1.13 (Section 2, Chapter 1, page 1-52) of U.S. EPA OAQPS, EPA Air Pollution Control Cost Manual (6th Edition), January 2002.

3. Pollutant Removed and Cost per ton of Pollutant Removed represent control of VOC.

Table 5-7. Cost Analysis Supporting Information for RTO

Parameter	New CDK (Wood-Fired)	Units	Note(s)
Maximum Production Capacity	240	MMBF/yr	
Uncontrolled Stack Inlet Emissions (VOC)	513.60	tpy	1
Airflow Capture Efficiency	80	%	5
Removal Efficiency	95	%	2
VOC Removed	390.34	tpy	3
Combustion Chamber Temperature (^oF)	1500	° F	4
Control Equip. Outlet Temperature	265	° F	4
Reference Temperature-standard conditions	70	° F	
Airflow at stack conditions	88,000	acfm	5
Dry standard airflow	64,151	scfm	
Exhaust Temperature (post-WESP)	200	° F	5
Exhaust Gas Moisture Content	28.0%	%	7
Specific Heat of Combustion Exhaust Gas-actual conditions	0.369	Btu/lb-m-°F	6
Density of air at outlet temp.	0.062	lb/ft^3	18
Specific Heat of Water	1.00	Btu/lb-m·°F	6
Density of water vapor at 180 ^oF	0.30	lb/ft^3	18
Pressure Drop	6	inches of H_2O	5
RTO Fan Motor Efficiency	60	%	8
RTO Fan Electricity Usage	103.0	kW-hr	9
Duct Fan Electricity Usage	68.6	kW-hr	
Pressure drop of fan in additional ductwork	4.0	inches of H_2O	5
VOC Emissions	93.81	lb/hr	
CO Emissions	14.5	lb/hr	17
Heating value VOC (a-pinene)	18,464	Btu/lb	19
Heating value CO	4,368	Btu/lb	18
Heat from VOC and CO	1.8	MMBtu/hr	
RO Heating Requirement	7.85	MMBtu/hr	10, 18
Energy Required From Fuel	6.05	MMBtu/hr	
Operating Labor Cost	26.2	$/hr	12
Maintenance Labor Cost	47.4	$/hr	12
Electricity Cost	0.080	$/kW-hr	13
Natural Gas	4.00	$/mmbtu	14
RTO Equipment Life	20	years	15
Interest Rate	7.0	%	15
2008 Chemical Engineering Index	575.4	n/a	16
2014 Chemical Engineering Index	576.9	n/a	16

1. Potential inlet emissions based on maximum capacity and emissions. VOC as C per Manny Patel of GA EPD.
2. Per OAQPS Manual, Section 3.2, Chapter 2.
3. VOC Removed (tpy) = Removal Efficiency (%) × Uncontrolled Stack Inlet Emissions (tpy).
4. Based on design specifications for similar unit. Assumes 1,500 oF combustion chamber temperature and 200 ^oF exhaust temperature
5. Engineering estimate based on design characteristics of the capture system including heated ductwork.
6. Heat capacity for dry air (0.24 Btu/lb-oF)+ heat capacity of water vapor or 28% of 0.46 = 0.1288
7. Conservative estimate based on design characteristics of a continuous lumber kiln.
8. Per OAQPS Manual, Section 3.2, Chapter 2, page 2-41, efficiency ranges from 40 to 70%. 60% is conservatively chosen.
9. Cost Control Manual-Power Cost for Incinerators Section 3 Page 2-43

10. Estimated as Exhaust Gas Flow Rate, acfm *60, min/hr * Density Air @actual conditions, lb/ft3 * Specific Heat @ actual conditions, Btu/lb-m·°F * (Outlet Temp - Inlet Temp, °F) / 10^6, based on the sensible heat integral, $Q = m\,Cp\,(T_1 - T_2)$, where Q is the heat required, m is the mass flow rate of the air, Cp is the specific heat of air, T_1 is the outlet temperature of the RTO, and T_2 is the exhaust temperature from the equipment. Also incorporates energy required to heat water vapor.
11. EPA Mandatory Reporting Rule for GHGs Table Nos. C-1, C-2
12. Labor costs are average costs at Warrenton CNS.
13. Actual electricity rate for Warrenton CNS.
14. Based on communication with Warrenton 4/6/15
15. Based on example problem in OAQPS Manual, Section 3.2, Chapter 2, page 2-45.
16. Values based on Chemical Engineering plant cost index. November 2014
17. Assumed 80% capture efficiency
18. Engineering Toolbox Tables
19. http://pubchem.ncbi.nlm.nih.gov/compound/alpha-pinene#section=Top

Table 5-8. Cost Evaluation for Thermal Oxidation for the New CDK

Capital Cost	New CDK (Wood-Fired)	OAQPS Notation[1]
Purchased Equipment Costs		
Total RTO Equipment Cost[1]	$1,891,418	A
Duct Fire Protection (400 ft @ $350/ft)[4]	140,000	
Total Purchased Equipment Costs	*2,031,418*	B
Direct Installation Costs		
Foundations and Supports	162,513	3
Handling and Erection	284,399	3
Electrical	81,257	3
Insulation	20,314	3
Painting	20,314	3
Instrumentation, including Control Devices, Parametric Monitoring, Communication, Spare Parts	203,142	3
Site Development	162,513	
Buildings	101,571	
Total Direct Installation Costs	*1,036,023*	C
Indirect Installation Costs [2]		
Engineering	203,142	0.10 × B
Construction and Field Expense	101,571	0.05 × B
Contractor Fees	203,142	0.10 × B
Start-up	40,628	0.02 × B
Performance Test	20,314	0.01 × B
Process Contingencies	60,943	0.03 × B
Total Indirect Installation Costs	*629,740*	
Additional Scoped Equipment Costs[3]		
Ductwork	2,784,000	
Ductwork Heater	6,564,568	
Total Capital Investment ($)	**13,045,749**	**TCI = B + C + D**

1. RTO & Media Cost from Quote submitted to GP Thorsby by Pro-Environmental, Inc, for a 40,000 acfm plywood veneer dryer , provided January 31, 2008.
Total RTO Cost Converted from 2008 to July 2014 dollars using the following ratio: 1.00
2. U.S. EPA OAQPS, *EPA Air Pollution Control Cost Manual (6th Edition)* , January 2002, Section 3.2 (VOC Destruction Controls), Chapter 2 (Incinerators), Table 2.8.
3. +/- 50% Cost estimate of design, equipment and installation of 36" stainless steel ductwork for 400 feet with insulation, heat tracing, and duct heaters to prevent condensation within ductwork for one kiln. Heater estimate provided for one kiln ~40,000 cfm flow. Provided by AECOM estimator, February 2015. Ratioed flow rate of quoted system to project flow and utilized "rule of six tenths" to estimate cost of this system.
4. Cost estimate based on spark detection and suppression system at GP Hosford Plant.

Table 5-9. Cost Evaluation for Thermal Oxidation for the New CDK

Operating Cost	New CDK (Wood-Fired)	OAQPS Notation[1]
Direct Annual Costs, $		
Replacement of Media every 6 years	43,137	Based on experience at other Bldg Product facilities
Operating Labor (0.5 hr, per 8-hr shift)	14,354	E
Supervisory Labor	2,153	F = 0.15 × E
Maintenance Labor (0.5 hr, per 8-hr shift)	25,969	G
Maintenance-burn out of stickies	4,553	1/mo for 8 hours
Maintenance-washouts	27,321	1/mo for 48 hours
Maintenance Materials	25,969	H = G
Electricity - RTO fan	72,154	I
Electricity - Duct fan	48,103	
Natural Gas - RTO	212,069	J
Natural Gas - Duct Heater	490,560	2 duct heaters at 7 mmbtu/hr
Total Direct Annual Costs, $	*966,342*	*DAC = E + F + G + H + I + J*
Indirect Annual Costs, $		
Overhead	60,192	K = 0.60 × (E + F + G + H)
Administrative Charges	260,915	L = 0.02 × TCI
Property Tax	130,457	M = 0.01 × TCI
Insurance	130,457	N = 0.01 × TCI
Capital Recovery Factor	0.0944	Based on 7% interest and 20-yr control equipment life
Capital Recovery[2]	1,231,426	O
Total Indirect Annual Costs, $	*1,813,448*	*IDAC = K + L + M + N + O*
Total Annual Cost RTO($/yr)	**2,779,791**	*TAC = DAC + IDAC*
Total Annual Cost WESP ($/yr)	**1,263,604**	*TAC = DAC + IDAC*
Pollutant Removed from Wood-Fired Kiln (tpy)	390.34	
Cost per ton of Pollutant Removed from Wood-Fired Kiln ($/ton)	**10,359**	*$/ton = TAC / Pollutant Removed*

1. U.S. EPA OAQPS, *EPA Air Pollution Control Cost Manual (6th Edition)* , January 2002, Section 3.2 (VOC Destruction Controls), Chapter 2 (Incinerators).
2. Capital Recovery factor calculated based on Equation 2.8a (Section 1, Chapter 2, page 2-21) and Table 1.13 (Section 2, Chapter 1, page 1-52) of U.S. EPA OAQPS, EPA Air Pollution Control Cost Manual (6th Edition), January 2002.
3. Pollutant Removed and Cost per ton of Pollutant Removed represent control of VOC.

Table 5-10. Capital Cost Evaluation for Oxidation Catalyst for 30,000 Pound Steam NG Package Boiler

Capital Cost	$	OAQPS Notation[1]
Purchased Equipment Costs		
Total Equipment Cost[2]	333,191	A
Instrumentation[2]	---	
Freight	16,660	0.05 × A
Total Purchased Equipment Costs	*349,851*	B
Direct Installation Costs		
Foundations and Supports	---	
Handling and Erection	---	
Electrical	---	
Piping	---	
Insulation	---	
Painting	---	
Site Preparation & Buildings	---	-
Total Direct Installation Costs	*Included in equipment cost listed above*	
Indirect Installation Costs		
Engineering[2]	---	
Construction and Field Expense	---	
Contractor Fees	---	
Start-up & Performance Testing	15,000	GP Engineering Estimate
Performance Test		0.01 × B
Process Contingencies	17,493	0.05 × B
Total Indirect Installation Costs	*32,493*	
Total Capital Investment ($)	**382,344**	**TCI = B + C + D**

1. U.S. EPA OAQPS, *EPA Air Pollution Control Cost Manual (6th Edition)* , January 2002.

2. Capital Costs are based the budgetary quote from Fuel-Tech Quote for No. 4 Power Boiler at Brewton AL Mill

Fuel-Tech Quote for No. 4 Power Boiler at Brewton AL Mill 75,547 ft3/min airflow	$910,000
Proposed 30,000 pound Steam Package Boiler 14,157 ft^3/min	
Cost for 30,000 pound Package Boiler using "Rule of 0.6"	$333,191

Table 5-11. Annualized Cost Evaluation for Oxidation Catalyst for 30,000 pound Steam Package Boiler

Operating Cost	$	OAQPS Notation[1]
Direct Annual Costs, $		
Operating Labor (0.25 hr, per 8-hr shift); $26.22/hr labor	7,177	E
Supervisory Labor	1,077	F = 0.15 × E
Maintenance Labor (52 hr/yr); $47.43/hr labor	2,466	G
Maintenance Materials	--	H = G
Natural Gas ($4/mmbtu at 3.066 mmbtu/hr	107,433	I
Total Direct Annual Costs, $	*118,152*	*DAC = E + F + G + H + I + J*
Indirect Annual Costs, $		
Overhead	6,432	K = 0.60 × (E + F + G + H)
Administrative Charges	7,647	L = 0.02 × TCI
Property Tax	3,823	M = 0.01 × TCI
Insurance	3,823	N = 0.01 × TCI
Capital Recovery Factor	0.0944	Based on 7% interest rate and 20 yr control equip. life
Capital Recovery[2]	36,093	O
Total Indirect Annual Costs, $	*57,819*	*IDAC = K + L + M + N + O*
Total Annual Cost, $	**175,971**	*TAC = DAC + IDAC*

1. U.S. EPA OAQPS, *EPA Air Pollution Control Cost Manual (6th Edition)* , January 2002, Section 3.2 (VOC Destruction Controls), Chapter 2 (Incinerators).

2. Capital Recovery factor calculated based on Equation 2.8a (Section 1, Chapter 2, page 2-21) and Table 1.13 (Section 2, Chapter 1, page 1-52) of U.S. EPA OAQPS, EPA Air Pollution Control Cost Manual (6th Edition), January 2002.

3. Pollutant Removed and Cost per ton of Pollutant Removed represent control of VOC.

Table 5-12. Oxidation Catalyst for 30,000 pound Steam Package Boiler NG usage

To determine the amount of energy (H) it takes to heat the flue gas from 550 °F to 800 °F:

$H = m C_p (t_2 - t_1)$ Where: H = heat input, Btu/hr

m = mass flow rate of flue gas, lbs/hr = 33,640 lbs/hr
C_p = specific heat of flue gas, Btu/lb-°F
t_2-t_1 = 800-550 = 250 °F

Determine Cp for flue gas from Figure 3-12 of Perry's Chemical Engineers Handbook, 4^{th} Edition, assume flue gas similar to air:

C_p = 0.25 Btu/lb-°F @ 800 °F

H = 33,640 lbs/hr x 0.25 Btu/lb- °F x 250 °F = 2,102,500 btu/hr

Natural gas-fired burners have a combustion efficiency of approximately 85%. Therefore, it will actually take a 3.0 MM Btu/hr burner to heat the flue gas up to 800 °F (2.102 MM Btu/hr/0.85 = 2.5 ~ 3.0 MM Btu/hr)

At a cost of $4.00/MM Btu for natural gas at the facility, the hourly cost to raise the flue gas temperature from 550 °F to to 800 °F is equal to 3 MM Btu/hr x $4.00/MM Btu = $12.00/hr,
or an annual cost of $105,120 per year ($12/hr x 8,760 hrs/yr = $105,120/yr)

Added VOC emissions from heating the flue gas to 800 °F are calculated as follows:

3.0 MM Btu/hr x 0.0054 lb/MM Btu (from vendor and assuming heat content of gas = 1,026 Btu/ft^3) = 0.0162 lb/hr (~ 0.07 tons/yr).

These VOC emissions are generated in addition to those from the combustion of gas in the Package Boiler, which are equal to 0.91 tons/yr.
Total VOC emissions, with the use of an oxidation catalyst system and a duct burner would be equal to 0.91 tons/yr + 0.07 tons/yr = .98 ton/yr).

Table 5-13
RBLC Search Results of Natural Gas-Fired Boiler VOC Controls

Company Name	Permit Number	Permit Issue Date	Process Description	Throughput	Throughput Units	Control Device Description	Emission Rate	Emission Rate Units
THE GOODYEAR TIRE & RUBBER COMPANY	PSD-TX-801	1/6/1999	BOILER B108	264	MMBTU/HR	NONE INDICATED	0.007	LB/MMBTU
CABOT POWER CORPORATION	MBR-97-COM-014	5/7/2000	AUXILIARY BOILER	26.6	MMBTU/H	COMBUSTION CONTROLS, OXIDATION CATALYST.	0.4	LB/HR (0.015 LB/MM BTU)
Mobile Energy LLC	503-8066-X003	6/7/2000	BOILER, NAT GAS	378	MMBTU/H	EFFICIENT COMBUSTION.	0.004	LB/MMBTU
CHARTER STEEL	00DCF040	8/2/2000	BOILER	10	MMBTU/H	NATURAL GAS TO FUEL BOILER.		NO EMISSION RATE LIMIT.
TRIFINERY PETROLEUM SERVICE	PSD-TX-963	8/7/2000	BOILER A, STACK 1A	UNKNOWN		NONE INDICATED	0.28	LB/HR
TRIFINERY PETROLEUM SERVICE	PSD-TX-963	8/7/2000	BOILER B, STACK 1B	UNKNOWN		NONE INDICATED	0.25	LB/HR
Duke Energy Luna	PSD-NM-2450	12/29/2000	AUX-1 AUXILARY BOILER	44.1	MMBTU/H	GOOD COMBUSTION DESIGN	0.7	LB/HR (0.016 LB/MM BTU)
DUKE ENERGY HOT SPRINGS	1936-AOP-R0	12/29/2000	BOILERS, AUXILIARY 2	44.1	MMBTU/H	CLEAN FUELS, PROPER COMBUSTION.	0.016	LB/MMBTU
GENPOWER KELLEY LLC	414-0014-X001 AND X002	1/12/2001	BOILER	83	MMBTU/H	EFFICIENT COMBUSTION	0.006	LB/MMBTU
DUKE ENERGY NORTH AMERICA	06-06792	1/18/2001	BOILER	46.6	MMBTU/H	NONE INDICATED	0.71	LB/HR (0.015 LB/MM BTU)
BLOUNT COUNTY ENERGY LLC	402-0010-X001 AND X002	2/5/2001	AUXILIARY BOILER	40	MMBTU/H	GOOD COMBUSTION PRACTICES	0.02	LB/MMBTU
USS GALVANIZING, INC.	03-10957	2/15/2001	BOILERS (4)	20.9	MMBTU/H	NONE INDICATED	0.11	LB/HR (0.0053 LB/MM BTU)
POPE & TALBOT, INC	22-0027	3/2/2001	POWER BOILER #1, PB1EU, NAT GAS	229	MMBTU/H	NOT IN PERMIT	1.4	LB/MMCF (0.0014 LB/MM BTU)
POPE & TALBOT, INC	22-0027	3/2/2001	POWER BOILER #2, PB2EU, NAT GAS	229	MMBTU	NONE INDICATED	1.4	LB/MMCF (0.0014 LB/MM BTU)
PROCTOR & GAMBLE MANUFACTURING COMPANY	9252983P (SEE NOTES)	3/5/2001	UTILITY BOILER #2 (NAT GAS)	183	MMBTU/H	NONE INDICATED	4.4	LB/HR (0.024 LB/MM BTU)
PROCTOR & GAMBLE MANUFACTURING COMPANY	9252983P (SEE NOTES)	3/5/2001	UTILITY BOILER #50-1 (NAT GAS)	225	MMBTU/H	NONE INDICATED	5.4	LB/HR (0.024 LB/MM BTU)
GRAYS FERRY COGEN PARTNERSHIP	97019	3/21/2001	AUXILIARY BOILER, NATURAL GAS	1119	MMBTU/H	GOOD COMBUSTION PRACTICE	0.005	LB/MMBTU
PSEG WATERFORD ENERGY LLC	06-06739	3/29/2001	BOILER, NATURAL GAS	85.2	MMBTU/H	NONE INDICATED	0.35	LB/HR (0.0041 LB/MM BTU)
COLUMBIA ENERGY CENTER	0460-0024	4/9/2001	2 AUXILIARY BOILERS	350	MMBTU/HR	GOOD COMBUSTION PRACTICES	1.75	LB/HR (0.005 LB/MM BTU)
COLUMBIA ENERGY LLC	0460-0024-CA THRU CD	4/9/2001	BOILERS, NATURAL GAS (2)	350	MMBTU/H (EA.)	GOOD COMBUSTION CONTROLS, CLEAN BURNING FUELS	1.75	LB/HR (0.005 LB/MM BTU)
KIOWA POWER PARTNERS LLC	2000-103-C M-1 PSD	5/1/2001	AUXILIARY BOILER	27.5	MMBTU/H	GOOD COMBUSTION PRACTICES AND DESIGN	0.0055	LB/MMBTU
MIRANT SUGAR CREEK, LLC	167-12208-00123	5/9/2001	AUXILARY BOILER, NATURAL GAS (2)	35	MMBTU/H	GOOD COMBUSTION. LB/H LIMIT IS FOR EACH BOILER.	0.0054	LB/MMBTU
THUNDERBIRD GENERATION LLC	2000-116-C PSD	5/17/2001	AUXILIARY BOILER	20	MMBTU/H	NONE INDICATED	0.005	LB/MMBTU
DUKE ENERGY, VIGO LLC	167-12481-00125	6/6/2001	AUXILARY BOILER, NATURAL GAS (2)	46	MMBTU/H	GOOD COMBUSTION. LIMIT IS FOR EACH BOILER.	0.0054	LB/MMBTU
PSEG LAWRENCEBURG ENERGY FACILITY	029-12517-00033	6/7/2001	AUXILIARY BOILER, NATURAL GAS	124.6	MMBTU/H	GOOD COMBUSTION. NATURAL GAS ONLY	0.0054	LB/MMBTU
DUKE ENERGY BELL L.P.	PSD-TX-944	6/26/2001	AUXILIARY BOILER	25	MMBTU/H	GOOD COMBUSTION CONTROL	0.4	LB/HR (0.016 LB/MM BTU)
CALPINE CORPORATION	03-13549	8/9/2001	AUXILIARY BOILER	80	MMBTU/H	NONE INDICATED	0.44	LB/HR (0.0055 LB/MM BTU)
REDBUD ENERGY LP	2000-090-C PSD	8/15/2001	BOILER, AUXILIARY	20	MMBTU/H	GOOD OPERATING PRACTICES	0.005	LB/MMBTU
SMITH COGENERATION OK INC	2000-115-C PSD	8/16/2001	AUXILIARY BOILERS, (2)	48	MMBTU/H	COMBUSTION CONTROL	0.52	LB/HR (0.011 LB/MM BTU)
QUAD GRAPHICS INC	2000-306-C PSD	8/21/2001	BOILERS	62.77	MMBTU/H	GOOD COMBUSTION/MAINTENANCE	4.38	TON/YR
GAYLORD CONTAINER CORPORATION	PSD-LA-657	9/18/2001	BOILER NO. 10C	797.6	MMBTU/H	GOOD EQUIPMENT DESIGN, PROPER COMBUSTION TECHNIQUES	14.24	LB/HR (0.018 LB/MM BTU)
TENASKA ALABAMA IV PARTNERS, LP	309-0052-X001	10/3/2001	AUXILIARY BOILER	30	MMBTU/H	EFFICIENT COMBUSTION	0.004	LB/MMBTU
TENASKA ARKANSAS PARTNERS, LP	1959-AOP-R0 (43-00202)	10/9/2001	BOILER, NATURAL GAS, (2)	122	MMBTU/H	GOOD COMBUSTION PRACTICES.	0.004	LB/MMBTU
Dresden Energy	06-06238	10/16/2001	BOILER, NATURAL GAS	49	MMBTU/H	NONE INDICATED	0.29	LB/HR (0.006 LB/MM BTU)
ENERGETIX	2000-278-C PSD	10/22/2001	AUXILIARY BOILER	30	MMBTU/H	NONE INDICATED	0.016	LB/MMBTU
DUKE ENERGY AUTAUGA, LLC	201-0012-X001, X002	10/23/2001	NATURAL GAS FIRED BOILER	31.4	MMBTU/H	EFFICIENT COMBUSTION.	0.0104	LB/MMBTU
AES RED OAK LLC	10001	10/24/2001	AUXILIARY BOILER	120	MMBTU/H	GOOD COMBUSTION PRACTICES	0.48	LB/HR (0.004 LB/MM BTU)
CENTRAL SOYA COMPANY INC.	03-13369	11/29/2001	BOILER, NATURAL GAS	91.2	MMBTU/H	NONE INDICATED	0.65	LB/HR (0.0071 LB/MM BTU)
ALLEGHENY ENERGY SUPPLY CO. LLC (ACADIA BAY ENERGY	141-14198-00543	12/7/2001	AUXILLIARY BOILER	21	MMBTU/H	GOOD COMBUSTION PRACTICES	0.0054	LB/MMBTU
DUKE ENERGY DALE, LLC	604-0023-X001, X002	12/11/2001	NAT. GAS FIRED AUXILIARY BOILER	35	MMBTU/H	GOOD COMBUSTION	0.014	LB/MMBTU
DUKE ENERGY HANGING ROCK, LLC	07-00503	12/13/2001	BOILERS (2)	36.6	MMBTU/H	NONE INDICATED	0.59	LB/HR (0.016 LB/MM BTU)
JACKSON COUNTY POWER, LLC	06-06313	12/27/2001	AUXILIARY BOILER	76	MMBTU/H	NONE INDICATED	0.92	LB/HR (0.012 LB/MM BTU)
MUSTANG POWER LLC	2001-132-C PSD	2/12/2002	AUXILIARY BOILER	31	MMBTU/H	COMBUSTION CONTROL	0.0055	LB/MMBTU
MUSTANG POWER LLC	2001-156-C PSD	2/12/2002	AUXILIARY BOILERS	UNKNOWN		GOOD COMBUSTION PRACTICES AND DESIGN	0.0055	LB/MMBTU
LIBERTY GENERATING STATION	BOP990001	3/28/2002	AUXILIARY BOILER	200	MMBTU/H	CO CATALYST	50	PPMVD @ 7% O2
DUKE ENERGY	1998-AOP-R0 (34-0259)	4/1/2002	BOILER, AUXILIARY	33	MMBTU/H	GOOD OPERATING PRACTICE	0.016	LB/MMBTU
REDBUD ENERGY LP	2000-090-C M-1 PSD	5/6/2002	AUXILIARY BOILER	93	MMBUT/H	BOILER DESIGN AND GOOD OPERATING PRACTICES	0.0075	LB/MMBTU
GENOVA OKLAHOMA LLC	2001-223-C PSD	6/13/2002	AUXILIARY BOILER	33	MMBTU/H	BOILER DESIGN AND GOOD COMBUSTION PRACTICES	0.016	LB/MMBTU
DUKE ENERGY CURRY LLC	PSD-NM-2605	6/27/2002	AUXILIARY BOILERS (AUX-1 AND AUX-2)	33	MM BTU/HR	NONE INDICATED	0.5	LB/HR (0.015 LB/MM BTU)
BARTON SHOALS ENERGY, LLC	X001, X002	7/12/2002	TWO (2) 40 MMBTU/H AUXILIARY BOILERS	40	MMBTU/H	GOOD COMBUSTION PRACTICES	0.0054	LB/MMBTU
ENTERGY	01-687	7/23/2002	AUXILIARY BOILER (48.5 MMBTU/H)	48.69	MILLION CF/YR	GCP	0.005	LB/MMBTU
GENOVA ARKANSAS I, LLC	2009-AOP-R0	8/23/2002	AUXILIARY BOILER	33	MMBTU/H	GOOD COMBUSTION PRACTICE	0.018	LB/MMBTU
COMPETITIVE POWER VENTURE	81382	9/6/2002	AUXILIARY BOILER	80	MMBTU/H	GOOD COMBUSTION PRACTICES.	0.42	LB/HR (0.0053 LB/MM BTU)
Sunoco	07-00451	9/12/2002	BOILER (1)	281	MMBTU/H	NONE INDICATED	33.6	LB/DAY (0.005 LB/MM BTU)
CALPINE CORPORATION	07-00505	9/24/2002	BOILER	99	MMBTU/H	NONE INDICATED	0.545	LB/HR (0.0055 LB/MM BTU)
WEYERHAEUSER COMPANY	109-0001-X017, X018, X019	11/15/2002	BOILER, 300 MMBTU/H, NATURAL GAS	300	MMBTU/H	NONE INDICATED	0.01	LB/MMBTU
Virginia Power	70225	11/18/2002	BOILER, AUXILIARY	99	MMBTU/H	GOOD COMBUSTION PRACTICES.	0.4	LB/HR (0.004 LB/MM BTU)
Virginia Power	70225	11/18/2002	BOILER, TANGENTIALLY-FIRED, UNIT 3	1150	MMBTU/H	GOOD COMBUSTION PRACTICES.	83	TON/YR
Virginia Power	70225	11/18/2002	BOILER, TANGENTIALLY-FIRED, UNIT 4	2350	MMBTU/H	GOOD COMBUSTION PRACTICES.	83	TON/YR
INTERSTATE POWER & LIGHT (IPL)	02-357	12/20/2002	AUXILIARY BOILER	68	MMBTU/H	CATALYTIC OXIDATION	0.0054	LB/MMBTU
DUKE ENERGY	2001-157-C M-1 PSD	3/21/2003	BOILER, AUXILIARY	33	MMBTU/H	BOILER DESIGN AND GOOD OPERATING PRACTICES	0.016	LB/MMBTU
VIRGINIA COMMONWEALTH UNIVERSITY	50126	3/31/2003	BOILER NATUAL GAS	150	MMBTU/H	GOOD COMBUSTION PRACTICES.	2.1	LB/HR (0.014 LB/MM BTU)
MIDAMERICAN ENERGY COMPANY	PROJECT 02-528	6/17/2003	AUXILIARY BOILER	429.4	MMBTU/HR	GOOD COMBUSTION PRACTICES	0.0055	LB/MMBTU
COLUMBIA ENERGY CENTER	0460-0024-CE	7/3/2003	BOILER, NATURAL GAS	550	MMBTU/HR	GOOD COMBUSTION PRACTICES	0.004	LB/MMBTU
SUNOCO INC.	07-00451	7/27/2004	BOILER	281	MMBTU/HR	NONE LISTED	0.005	LB/MMBTU
CONOCOPHILLIPS COMPANY	23-0003I	2/6/2007	BOILER 9	349600	CF/H	CO CATALYST	0.46	LB/Hr
CONOCOPHILLIPS COMPANY	23-0003I	2/6/2007	BOILER 10	349600	CF/H	CO CATALYST	0.46	LB/Hr
ARCHER DANIELS MIDLAND	57-01-080	6/29/2007	NATURAL GAS BOILER (292.5 MMBTU/H)	292.5	MMBTU/H	GOOD COMBUSTION PRACTICES	0.0054	LB/MMBTU
AVENTINE RENEWABLE ENERGY - AURORA WEST, LLC	CP06-0048	9/27/2007	GAS-FIRED BOILERS	0.09	MMSCF/H		0.01	LB/MMBTU
SOUTHWEST ELECTRIC POWER COMPANY	2123-AOP-R0	11/5/2008	AUXILIARY BOILER	555	MMBTU/H		0.0055	LB/MMBTU
HARRAH'S OPERATING COMPANY, INC.	257	8/20/2009	BOILER - UNIT HA08	8.37	MMBTU/H	OPERATING IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATION	0.0054	LB/MMBTU
HARRAH'S OPERATING COMPANY, INC.	257	8/20/2009	BOILER - UNIT IP04	16.7	MMBTU/H	OPERATING IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATION	0.0053	LB/MMBTU
MGM MIRAGE	825	11/30/2009	BOILERS - UNITS CC001, CC002, AND CC003 AT CITY CENTER	41.64	MMBTU/H	LIMITING THE FUEL TO NATURAL GAS ONLY AND GOOD COMBUSTION PRACTICES	0.0024	LB/MMBTU
MGM MIRAGE	825	11/30/2009	BOILERS - UNITS CC004, CC005, AND CC006 AT CITY CENTER	4.2	MMBTU/H	LIMITING THE FUEL TO NATURAL GAS ONLY AND GOOD COMBUSTION PRACTICES	0.0048	LB/MMBTU
MGM MIRAGE	825	11/30/2009	BOILER - UNIT MB090 AT MANDALAY BAY	4.3	MMBTU/H	FLUE GAS RECIRCULATION AND GOOD COMBUSTION PRACTICES	0.0054	LB/MMBTU
MGM MIRAGE	825	11/30/2009	BOILERS - UNITS BE102 THRU BE105 AT BELLAGIO	2	MMBTU/H	LIMITING THE FUEL TO NATURAL GAS ONLY AND GOOD COMBUSTION PRACTICES	0.0054	LB/MMBTU
MGM MIRAGE	825	11/30/2009	BOILER - UNIT BE111 AT BELLAGIO	2.1	MMBTU/H	LIMITING THE FUEL TO NATURAL GAS ONLY AND GOOD COMBUSTION PRACTICES	0.0048	LB/MMBTU
MGM MIRAGE	825	11/30/2009	BOILERS - UNITS NY42, NY43, AND NY44 AT NEW YORK - NEW YORK	2	MMBTU/H	GOOD COMBUSTION PRACTICES	0.005	LB/MMBTU
NRG ENERGY	107-0056	4/6/2010	82 MW Utility Boiler	995	MMBTU/H	Oxidation Catalyst	5.5	LB/Hr or 0.0055 lb/MM Btu
CONSOLIDATED ENVIRONMENTAL MANAGEMENT INC - NUCOR	PSD-LA-751	1/27/2011	DRI-109 - DRI Unit #1 Package Boiler Flue Stack	1760	Billion Btu/yr	good combustion practices	1.56	LB/Hr or 0.0009 lb/MM Btu
CONSOLIDATED ENVIRONMENTAL MANAGEMENT INC - NUCOR	PSD-LA-751	1/27/2011	DRI-209 - DRI Unit #2 Package Boiler Flue Stack	1760	Billion Btu/yr	good combustion practices	1.19	LB/Hr or 0.0007 lb/MM Btu

ENTERGY LOUISIANA LLC	PSD-LA-752	8/16/2011	AUXILIARY BOILER (AUX-1)	338	MMBTU/Hr	USE OF PIPELINE QUALITY NATURAL GAS AND GOOD COMBUSTION PRACTICES	5.5	LB/MMSCF
PORT DOLPHIN ENERGY LLC	DPA-EPA-R4001	12/1/2011	Boilers (4 - 278 MMBtu/hr each)	0		Good Combustion Practices	0.0054	LB/MMBTU
IOWA FERTILIZER COMPANY	12-219	10/26/2012	Auxiliary Boiler	472.4	MMBTU/hr	good combustion practices	0.0014	LB/MMBTU
CELANESE ACETATE LLC	20304-025	12/6/2012	NATURAL GAS FIRED BOILERS, (6)	400	MMBTU/H	Good combusion practices	2.2	LB/H
CF INDUSTRIES NITROGEN, LLC	PN 13-037	7/12/2013	Boilers	456	MMBTU/hr	good operating practices and use of natural gas	0.0014	LB/MMBTU

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AL-0235	ALBERTVILLE SAWMILL	AL	2421	4/9/2008	SOUTHERN YELLOW PINE SAWMILL. IT MANUFACTURES FINISHED, DRIED DIMENSIONAL LUMBER FROM LOGS. EMISSION UNITS INCLUDED A 99MMBTU /HR WWB, TWO LUMBER DRY KILN, AND SEVERAL PNEUMATIC WOOD WASTE TRANSFER SYSTEMS WITH CYCLONES.	TWO 182.14 MBF, STEAM-HEADED LUMBER DRY KILNS (NORTH & SOUTH - K100/K101)	30.8		182.14	MBF	PROPOSED 182.14 MBF / CHARGE (EA.); EXISTING 150 MBF / CHARGE (EA.)	P	OPERATE W/ WET BULB SET POINT DRYING SCHEDULE OF LESS THAN OR EQUAL TO 185F; DAILY AND MONTHLY KILN I/M PROCEDURES	7	LB/MBF	KILN CHARGE CYCLONE (PINENE)	0		
AL-0257	WEST FRASER-OPELIKA LUMBER MILL	AL	2421	9/11/2013	Sawmill	Two(2) 87.5 MMBF/YR Continuous kilns with a 35 MMBtu/hr direct-fired wood burner	30.8	Wood Shavings	175	MMBF/YR		N		3.76	LB/MBF		175	K/12 MONTHS	
AL-0258	WEST FRASER, INC. - MAPLESWILE MILL	AL	2421	1/14/2013	Sawmill	Two(2) 100 MMBF/Y Continuous direct fired kiln	30.8	Wood Residuals	200	MMBF/YR		N		3.76	LB/MBF		0		
AL-0259	THE WESTERVELT COMPANY	AL	2421	4/15/2013	Sawmill	Three (3) 93 MMBF/Y Continous, Dual path, indirect fired kilns	30.8	Steam (Indirect heat)	0			N		4.57	LB/MMBF		0		
AL-0260	THE WESTERVELT COMPANY	AL	2421	1/4/2011	Sawmill	Two (2) 125 MMBtu/Hr. Wood-fired Boilers	30.8	Wood Residuals	125	MMBTU/H each		N		0.5	LB/MMBTU		0.5	LB/MMBTU	
AR-0080	WALDO	AR	2421	1/12/2005		STEAM HEATED LUMBER DRYING KILNS	30.8				4 IDENTICAL KILNS AT 44.2 MMBF/YR AND ONE (1) KILN AT 48.3 MMBF/YR	N		3.5	LB/MBF		0		
AR-0083	POTLATCH CORPORATION - OZAN UNIT	AR	83	7/26/2005	SAWMILL	KILNS 1-4	30.8	STEAM HEATED	265	MMBF ANNUALLY		P	PROPER OPERATION	3.5	LB/MMBF		119	LB/H	
AR-0084	POTLATCH CORPORATION - OZAN UNIT	AR	83	7/26/2005	SAWMILL	KILNS 1-4	30.8	STEAM HEATED	265	MMBF ANNUALLY		P	PROPER OPERATION	3.5	LB/MMBF		119	LB/H	
AR-0101	BIBLER BROTHERS LUMBER COMPANY	AR	242	8/25/2008	LUMBER MILL	SN-07G AND SN-13G CONTINOUS OPERATING KILNS	30.8	WOOD RESIDUE	25	MMBTU/H	TWO DIRECT FIRED KILNS EACH PROCESS LUMBER AT A RATE OF 12.1 THOUSAND BOARD FEET/HR.	N		3.8	LB/MBF VOC		46.5	LB VOC/H/KILN	
*AR-0102	ANTHONY TIMBERLANDS, INC.	AR	242	9/16/2009	SAWMILL WITH FOUR WOOD FIRED BOILERS, FIVE INDIRECT HEATED KILNS, AND TWO PLANNER MILLS. THIS FACILITY IS PERMITTED TO PRODUCE A MAXIMUM 200 MILLION BOARD FEET PER YEAR OF DRIED LUMBER.	KILN #3 INDIRECT-FIRED	30.8	NONE	200	MMBF/YR	TOTAL THROUGHPUT FOR THE KILNS IS 200 MMBF/YR.	N		3.5	LB/MBF		350	T/YR	

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*AR-0102	ANTHONY TIMBERLANDS, INC.	AR	242	9/16/2009	SAWMILL WITH FOUR WOOD FIRED BOILERS, FIVE INDIRECT HEATED KILNS, AND TWO PLANNER MILLS. THIS FACILITY IS PERMITTED TO PRODUCE A MAXIMUM 200 MILLION BOARD FEET PER YEAR OF DRIED LUMBER.	KILN #4 INDIRECT-FIRED	30.8	NONE	200	MMBF/YR	TOTAL THROUGHPUT FOR THE KILNS IS 200 MMBF/YR.	N		3.5	LB/MBF		350	T/YR	
*AR-0102	ANTHONY TIMBERLANDS, INC.	AR	242	9/16/2009	SAWMILL WITH FOUR WOOD FIRED BOILERS, FIVE INDIRECT HEATED KILNS, AND TWO PLANNER MILLS. THIS FACILITY IS PERMITTED TO PRODUCE A MAXIMUM 200 MILLION BOARD FEET PER YEAR OF DRIED LUMBER.	KILN #5 INDIRECT-FIRED	30.8	NONE	200	MMBF/YR	TOTAL THROUGHPUT FOR THE KILNS IS 200 MMBR/YR.	N		3.5	LB/MBF		350	T/YR	
FL-0315	NORTH FLORIDA LUMBER/BRISTOL SAW MILL	FL	2421	8/4/2009	The existing facility consists of: a log debarker; saw mill; planer mill; four steam heated lumber drying kiln; three waste wood-fired boilers; and waste wood handling and storage operations.	Wood lumber kiln	30.8	steam heated	92000000	board-f lumber/yr		P	Best operating practices: 1) minimize over-drying lumber; 2) maintain consistent moisture content for processed lumber charge; and 3) dry at the minimum temperature.	116.93	T/YR		0		
FL-0340	PERRY MILL	FL	242	4/1/2014	Processes southern pine logs into chips, bark, and lumber. Includes two direct-fired drying kilns. Total capacity is 150 MBF/yr. This includes the capacity of the new unit, which is 90 MBF/yr.	Direct-fired lumber drying kiln	30.8	Waste wood	90	million board ft/yr	Drying capacity of new kiln is 90 million board feet of lumber per year.	P	At a minimum, the permittee shall operate the kiln in accordance with the following best operating practices (BMP). a.Minimize over-drying the lumber; b.Maintain consistent moisture content for the processing lumber charge; and c.Dry at the minimum temperature. The permittee shall develop and operate in accordance with a written plan to implement the above BMP and any others required by the kiln manufacturer. Ninety days before the initial startup of the kiln, the permitted shall submit to the Compliance Authority the BMP plan. The Title V air operation permit shall include the submitted BMP plan.	3.5	LB/THOUSAND BOARD FT		0		

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GA-0146	SIMPSON LUMBER CO, LLC MELDRIM OPERATIONS	GA	2421	4/25/2012	LUMBER MILL	KILN 3	30.8	WASTE WOOD	65000000	BF/YR	CONTINUOUS LUMBER KILN - DIRECT FIRED	P	PROPER MAINTENANCE AND OPERATION	3.83	LB/MBF	DAILY	0		
GA-0146	SIMPSON LUMBER CO, LLC MELDRIM OPERATIONS	GA	2421	4/25/2012	LUMBER MILL	KILN 4	30.8	WASTE WOOD	73000000	BF/YR	BATCH LUMBER KILN - DIRECT FIRED	P	PROPER MAINTENANCE AND OPERATION	3.93	LB/MBF	DAILY	0		
LA-0181	COUSHATTA SAWMILL	LA	2421	7/13/2005	140 MM BD-FT/YR LUMBER MILL	WOOD LUMBER KILNS (INDIRECT FIRED)	30.8	N/A				N		28	LB/H	HOURLY MAXIMUM	122.6	T/YR	ANNUAL MAXIMUM
LA-0252	JOYCE MILL	LA	2421	8/16/2011	PSD modification/consolidation for a sawmill. Convert 3 batch kilns to continuous dual path kilns. Revise VOC BACT from as-carbon to as-VOC. Consolidate PSD-LA-679 and PSD-LA-701	Lumber kilns	30.8		300	million board feet/yr		P	properly design and operation	930	T/YR		0		
OK-0113	WRIGHT CITY COMPLEX	OK	242	7/21/2006	LUMBER SAWMILL	LUMBER KILNS	30.8					N		4.8	LB/MBF		0		
OR-0049	GILCHRIST FACILITY	OR	2421	5/22/2006	SAWMILL REPLACING OLD LUMBER DYRING KILNS WITH NEW LUMBER DRYING KILNS	LUMBER DRY KILNS	30.8		0		REPLACING OLD KILNS WITH 3 NEW DOUBLE TRACK AND 4 SINGLE TRACK KILNS	P	PROPER WORK PRACTICES	1.69	LB/MBF		0		
*SC-0135	NEW SOUTH COMPANIES, INC. - CONWAY PLANT	SC	2421	9/24/2012	LUMBER MILL THAT PRODUCES STRUCTURAL LUMBER FROM PINE LOGS.	LUMBER KILNS	30.8		380.56	MMBD-FT/YR	FACILITY IS GOING TO INSTALL TWO STEAM HEATED CONTINUOUS KILNS (EACH RATED AT 85 MILLION BD-FT/YR), MODIFY TWO EXISTING KILNS. THIS PROJECT WILL ALLOW FACILITY TO INCREASE DRYING CAPACITY FROM 173.2 MILLION BD-FT/YR TO 380.56 MILLION BD-FT/YR.	P	PROPER MAINTENANCE AND OPERATION	799.18	T/YR		4.2	LB/MBF	AS TOTAL VOC

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SC-0136	SIMPSON LUMBER COMPANY, LLC	SC	2421	8/29/2012	SIMPSON LUMBER OPERATES A LUMBER MILL OUTSIDE OF GEORGETOWN, SC AND PRODUCES FINISHED LUMBER OUT OF LOGGED SOUTHERN YELLOW PINE. THE FOLLOWING OPERATIONS TAKE PLACE AT THE FACILITY: SAWMILL OPERATIONS, STEAM GENERATION, LUMBER DRYING AND PLANER MILL OPERATIONS. INSTALLATION OF A NEW DIRECT-FIRED LUMBER DRYING KILN, NEW SHAVINGS HOG AND INCREASES IN OPERATION FROM THE SAWMILL AND PLANER MILL.	DIRECT-FIRED LUMBER DRYING KILN NO. 4	30.8	DRY WOOD WASTE	34	MMBTU/H	MAXIMUM THROUGHPUT OF THE KILN IS 54.7 MMBF/YR	P	WORK PRACTICE STANDARDS	104	T/YR		3.8	LB/MBF	
SC-0137	ELLIOTT SAWMILLING COMPANY	SC	2421	3/6/2006	MANUFACTURES ROUGH AND DRESSED YELLOW PINE LUMBER. LUMBER PRODUCTION CONSISTS OF FOUR BASIC STEPS; 1) DEBARKING, 2) SAWING, 3) DRYING, AND 4) PLANNING. EXPANSION OF THE LUMBER PRODUCTION OF KILN NO.4 FROM 16.6 MILLION BD-FT/YR TO ITS CAPACITY OF 53 MILLION BD-FT/YR.	DIRECT-FIRED LUMBER-DRYING KILN NO. 4	30.8	SAWDUST	35	MMBTU/H	MAXIMUM THROUGHPUT OF KILN IS 53 MMBF/YR	P	WORK PRACTICE STANDARDS	122	T/YR		4.5	LB/MBF	
SC-0138	ELLIOTT SAWMILLING COMPANY	SC	2421	4/14/2009	MANUFACTURES ROUGH AND DRESSED YELLOW PINE LUMBER. LUMBER PRODUCTION CONSISTS OF FOUR BASIC STEPS; 1) DEBARKING, 2) SAWING, 3) DRYING, AND 4) PLANNING. INSTALLATION OF A FIFTH DRYING KILN WITH A DRYING CAPACITY OF 53 MM BD FT/YR RESULTING IN INCREASED THROUGHPUT FOR THE DEBARKERS, GREEN LOG CUTTERS, GREEN SAWMILL, CHIPPER/CYCLONE, CHIPPER MILL, AND PLANER MILL.	DIRECT FIRED LUMBER DRYING KILN NO.5	30.8	SAWDUST	35	MMBTU/H	MAXIMUM THROUGHPUT OF 53 MMBF/YR	P	WORK PRACTICE STANDARDS	119	T/YR		4.5	LB/MBF	
SC-0149	KLAUSNER HOLDING USA, INC	SC	2421	1/3/2013	700 MILLION BOARD FOOT PER YEAR LUMBER MILL	LUMBER DRYING KILNS EU007	30.8		700	MILLION BOARD FOOT PER YEAR		N		3.5	LB/MBF		0		

TABLE 5-14: RESULTS OF RBLC SEARCH FOR LUMBER KILN VOC BACT

RBLCID	FACILITY NAME	ST	SIC	PERMIT ISSUANCE DATE	FACILITY DESCRIPTION	PROCESS NAME	PROCCESS TYPE	PRIMARY FUEL	THROUGH-PUT	THROUGH-PUT UNIT	PROCESS NOTES	CONTROL METHOD CODE	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	EMISSION LIMIT 1 AVG TIME CONDITION	EMISSION LIMIT 2	EMISSION LIMIT 2 UNIT	EMISSION LIMIT 2 AVGERAGE TIME CONDITION
SC-0155	NEW SOUTH LUMBER, INC. - CAMDEN PLANT	SC	2421	11/1/2006	NEW SOUTH-CAMDEN PROCESSES RAW SOUTHERN PINE LOGS INTO PLANED PINE LUMBER, TREATED PINE LUMBER, AND WOOD CHIPS/PINE SHAVINGS. PINE LOGS ARE DELIVERED TO THE PLANT AND STORED OUTSIDE. THE SAWMILL TRANSFORMS, THROUGH DEBARKING AND ROUGH SAWING, THE PINE LOGS INTO GREEN ROUGH-CUT LUMBER. SCRAPS FROM THIS PROCESS, WHICH INCLUDE BARK, SAWDUST, AND PARTIAL LUMBER PIECES, ARE SENT EITHER TO THE WOOD WASTE BOILER FUEL HOUSE OR TO CHIPPERS. THE CHIPPERS TRANSFORM SCRAP WOOD INTO SALEABLE WOOD CHIPS.	WOOD PRODUCTS INDUSTRIES	30.8	VIRGIN WOOD WASTE	0		THE FACILITY PLANS TO MODIFY THE BOILER (CG-01, UNIT ID 01) AND STEAM DELIVERY SYSTEM TO THE KILNS (CG-02, UNIT ID 02) IN ORDER TO IMPROVE STEAM UTILIZATION AND EFFICIENCY. THE WOOD WASTE BOILER AND THE LUMBER DRYING KILNS ARE SUBJECT TO PSD REVIEW FOR VOCS.	N		0			0		
TX-0584	TEMPLE INLAND PINELAND MANUFACTURING COMPLEX	TX	2421	8/12/2011	lumber mill	Dry studmill kilns 1 and 2	30.8	wood	156000	boardfeet per charge	Studmill dry kiln no. 1 being replaced	N	good operating practice and maintenance	2.49	LB VOC/1000 BOARDFEE		0		
TX-0607	LUMBER MILL	TX	5211	12/15/2011	Two new continuous kilns and new saw line	Continuous lumber kilns (2)	30.8	wood	275	MMBF/YR	Proper operation of the kilns (e.g., drying to the appropriate moisture content)	P	proper temperature and process management; drying to appropriate moisture content	3.5	LB/MBF		0		
WA-0327	SKAGIT COUNTY LUMBER MILL	WA	831	1/25/2006	FACILITY IS DESIGNED TO PRODUCE ABOUT 300 MILLION BOARD FEET OF LUMBER ANNUALLY AND RUN A 430 MMBTU/HR WASTE-WOOD-FIRED BOILER AS A 30 MW COGENERATION UNIT.	7.DRY KILNS	30.8		300	MM BOARD F/YR		P	COMPUTERIZED STEAM MANAGEMENT SYSTEM	54	T/YR	12 MONTH ROLLING AVERAGE	0		

APPENDIX D

PERMIT APPLICATION FORMS

State of Georgia
Department of Natural Resources
Environmental Protection Division
Air Protection Branch

Stationary Source Permitting Program
4244 International Parkway, Suite 120
Atlanta, Georgia 30354
404/363-7000
Fax: 404/363-7100

EXPEDITED PERMITTING PROGRAM – APPLICATION FOR ENTRY TO PROGRAM FOR AIR PERMITS

EPD Use Only

Date Received: ____________ Application No. ____________

To be eligible for expedited review, this application form must be accompanied by the complete permit application for the type of air permit being requested.

1. Contact Information

Facility Name: Georgia-Pacific Wood Products LLC - Warrenton CNS

AIRS No. (if known): 04-13- 301 - 00003

Contact Person: Forrest Denney Title: Business Environmental Manager

Telephone No.: 404-652-4831 Alternate Phone No.: ____________

Email Address: fddenney@gapac.com

If EPD is unable to contact me, please contact the alternate contact person:

Contact Person: Cathy Hawk Title: GP Environmental Affairs

Telephone No.: 404-782-2766 Alternate Phone No.: ____________

Email Address: cathy.hawk@gapac.com

On Page 2 of this form, please check the appropriate box for which type of air permit you are requesting expedited review.

I have read the Expedited Review Program Standard Operating Procedures and accept all of the terms and conditions within. I have participated in the required pre-application meeting with EPD. I understand that it is my responsibility to ensure an application of the highest quality is submitted and to address any requests for additional information by the deadline specified. I understand that submittal of this request form is not a guarantee that expedited review will be granted.

Signature: ____________________ Date: ____________

2. **Applying For Which Type Of Permit: (Please Check Appropriate Box)**

Expedited Review Fees for Air Permits	
Permit Type – Please Check One	**Expedited Review Fee***
☐ Generic Permit: Concrete Batch Plant – Minor Source	$1,000
☐ Generic Permit: Concrete Batch Plant – Synthetic Minor Source	$1,500
☐ Generic Permit: Hot Mix Asphalt Plant – Synthetic Minor Source	$2,000
☐ Minor Source Permit (or Amendment)	$3,000
☐ Synthetic Minor Permit (or Amendment)	$4,000
☐ Major Source SIP Permit not subject to PSD or 112(g)	$6,000
☐ Title V 502(b)(10) Permit Amendment	$4,000
☐ Title V Minor Modification with Construction	$4,000
☐ Title V Significant Modification	$6,000
☐ Major Source SIP Permit subject to 112(g) but not subject to PSD	$15,000
☑ PSD Permit (or Amendment) not subject to NAAQS and/or PSD Increment Modeling	$15,000
☐ PSD Permit (or Amendment) subject to NAAQS and/or PSD Increment Modeling but not subject to Modeling for $PM_{2.5}$, NO_2, or SO_2	$20,000
☐ PSD Permit (or Amendment) subject to NAAQS and/or PSD Increment Modeling for $PM_{2.5}$, NO_2, or SO_2	$25,000
☐ PSD Permit (or Amendment) subject to NAAQS and/or PSD Increment Modeling for $PM_{2.5}$, NO_2, or SO_2 and also impacting a Class I Area	$30,000
☐ Nonattainment NSR Review Permit (or Amendment)	$40,000
* Do not send fee payment with this form. Upon acceptance of application for the expedited permit program, EPD will notify you by phone. Fees must be paid via check to “Georgia Department of Natural Resources” within ten (10) business days of acceptance.	

3. **Comments.**

This section is optional. Applicants may use this field to include specific comments or requests for EPD consideration. For example, the applicant may use this field to request a public hearing or to remind EPD of review time needs and/or expectations that may differ from the time frames in the procedures.

State of Georgia
Department of Natural Resources
Environmental Protection Division
Air Protection Branch

Stationary Source Permitting Program
4244 International Parkway, Suite 120
Atlanta, Georgia 30354
404/363-7000
Fax: 404/363-7100

SIP AIR PERMIT APPLICATION

EPD Use Only

Date Received: ______________ Application No. ______________

FORM 1.00: GENERAL INFORMATION

1. Facility Information

Facility Name: Georgia- Pacific Wood Products LLC - Warrenton Chip-N-Saw Facility

AIRS No. (if known): 04-13- 301 - 00003

Facility Location: Street: 331 Thomson Highway, NE

City: Warrenton Georgia Zip: 30828 County: Warren

Is this facility a "small business" as defined in the instructions? Yes: ☐ No: ☒

2. Facility Coordinates

Latitude: 33° 24' 38" **NORTH** Longitude: 82° 38' 46" **WEST**

UTM Coordinates: ______ **EAST** ______ **NORTH** **ZONE** ______

3. Facility Owner

Name of Owner: Georgia-Pacific Building Products, LLC

Owner Address Street: 133 Peachtree St. NE

City: Atlanta State: GA Zip: 30303

4. Permitting Contact and Mailing Address

Contact Person: Forrest Denney Title: Business Environmental Manager

Telephone No.: (404) 652-4831 Ext. ______ Fax No.: ______

Email Address: fddenney@gapac.com

Mailing Address: Same as: Facility Location: ☐ Owner Address: ☒ Other: ☐

If Other: Street Address: ______

City: ______ State: ______ Zip: ______

5. Authorized Official

Name: David Manley Title: Area Manager

Address of Official Street: 133 Peachtree St. NE

City: Atlanta State: GA Zip: 30303

This application is submitted in accordance with the provisions of the Georgia Rules for Air Quality Control and, to the best of my knowledge, is complete and correct.

Signature: ______________ Date: ______________

6. **Reason for Application: (Check all that apply)**

☐ New Facility (to be constructed)

☒ Existing Facility (initial or modification application)

☒ Permit to Construct

☒ Permit to Operate

☐ Change of Location

☒ Permit to Modify Existing Equipment: Affected Permit No.: 2421-301-0003-V-03-0

☐ Revision of Data Submitted in an Earlier Application

Application No.: ______

Date of Original Submittal: ______

7. **Permitting Exemption Activities (for permitted facilities only):**

Have any exempt modifications based on emission level per Georgia Rule 391-3-1-.03(6)(i)(3) been performed at the facility that have not been previously incorporated in a permit?

☒ **No** ☐ **Yes, please fill out the SIP Exemption Attachment** (See Instructions for the attachment download)

8. **Has assistance been provided to you for any part of this application?**

☒ **No** ☐ **Yes, SBAP** ☐ **Yes, a consultant has been employed or will be employed.**

If yes, please provide the following information:

Name of Consulting Company: ______

Name of Contact: ______

Telephone No.: ______ Fax No.: ______

Email Address: ______

Mailing Address: Street: ______

City: ______ State: ______ Zip: ______

Describe the Consultant's Involvement:

9. **Submitted Application Forms:** Select only the necessary forms for the facility application that will be submitted.

No. of Forms	Form
1	2.00 Emission Unit List
1	2.01 Boilers and Fuel Burning Equipment
	2.02 Storage Tank Physical Data
	2.03 Printing Operations
	2.04 Surface Coating Operations
	2.05 Waste Incinerators (solid/liquid waste destruction)
1	2.06 Manufacturing and Operational Data
1	3.00 Air Pollution Control Devices (APCD)
	3.01 Scrubbers
	3.02 Baghouses & Other Filter Collectors
	3.03 Electrostatic Precipitators
1	4.00 Emissions Data
	5.00 Monitoring Information
1	6.00 Fugitive Emission Sources
1	7.00 Air Modeling Information

10. **Construction or Modification Date**

Estimated Start Date: November 2015

11. If confidential information is being submitted in this application, were the guidelines followed in the "Procedures for Requesting that Submitted Information be treated as Confidential"?

☒ No ☐ Yes

12. New Facility Emissions Summary

Criteria Pollutant	New Facility	
	Potential (tpy)	Actual (tpy)
Carbon monoxide (CO)		
Nitrogen oxides (NOx)		
Particulate Matter (PM) (filterable only)		
PM <10 microns (PM10)		
PM <2.5 microns (PM2.5)		
Sulfur dioxide (SO_2)		
Volatile Organic Compounds (VOC)		
Greenhouse Gases (GHGs) (in CO2e)		
Total Hazardous Air Pollutants (HAPs)		
Individual HAPs Listed Below:		

13. Existing Facility Emissions Summary

Criteria Pollutant	Current Facility		After Modification	
	Potential (tpy)	Actual (tpy)	Potential (tpy)	Actual (tpy)
Carbon monoxide (CO)	270.26	107.15	164.45	164.45
Nitrogen oxides (NOx)	99.10	39.29	29.88	29.88
Particulate Matter (PM) (filterable only)	196.92	23.21	38.58	38.58
PM <10 microns (PM10)	90.57	22.61	33.26	33.26
PM <2.5 microns (PM2.5)	63.19	21.74	20.02	20.02
Sulfur dioxide (SO_2)	11.34	4.46	3.29	3.29
Volatile Organic Compounds (VOC)	351.22	187.24	659.66	659.66
Greenhouse Gases (GHGs) (in CO2e)			71,430	71,430
Total Hazardous Air Pollutants (HAPs)	41.27		50.4	50.4
Individual HAPs Listed Below:				
See Appendix B Calculations				

14. 4-Digit Facility Identification Code:

SIC Code: 2421 SIC Description: Sawmills and Planning Mills, General

NAICS Code: 321113 NAICS Description: Sawmills

15. Description of general production process and operation for which a permit is being requested. If necessary, attach additional sheets to give an adequate description. Include layout drawings, as necessary, to describe each process. References should be made to source codes used in the application.

Georgia-Pacific Wood Products LLC (GP) owns and operates the Warrenton, Georgia Chip-N-Saw (Warrenton CNS) facility. The facility produces dimensional southern yellow pine (SYP) lumber and is categorized under North American Industrial Classification System (NAICS) code 321113 for sawmills.

This permit application requests authorization to construct and operate a phased expansion at the Warrenton CNS. GP also requests the permit application be processed as an expedited application. The first phase will include the shutting down of the Wood-fired Boiler (400B) and ancillary sources (Boiler Ash Handling) along with Batch Kiln 201. A NG-Fired Boiler will be brought onsite to continue to operate Batch Kilns 202 and 203 until the second phase of the project. Batch Kiln 203 will have steam coils raised within the kiln to accommodate taller charges (stacks) of lumber. Batch Kiln 202 is will have minor efficiency upgrades (full scope yet to be determined). Phase I will also include the addition of a 120 million board foot per year (MMBF/yr) direct-fired continuous dual-path kiln (CDK), a sawdust fuel silo, bark screen, bark hog, bark truck loadout, two additional sizing saws, second small chipper and autograder in the planer mill. Phase I will also include the replacement of the existing trim saw, chipping edger, planer trim saw, existing small chipper, and drum screen with more efficient and/or larger capacity units. Phase II of the project will include the removal of the NG-fired Package Boiler and Batch Kilns 202 and 203, the addition of a second 120 MMBF/yr direct-fired CDK and the replacement of the debarker, several interior sawmill saws, planer, planer mill cyclone and various material handling systems with more efficient and/or larger capacity units.

16. Additional information provided in attachments as listed below:

Attachment A - Facility Map and Process Diagrams

Attachment B - Emission Calculations

Attachment C - BACT Supporting Documentation

Attachment D - Permit Application Forms

Attachment E - Toxic Modeling Supporting Documentation

Attachment F -

17. Additional Information: Unless previously submitted, include the following two items:

☒ Plot plan/map of facility location or date of previous submittal:

☒ Flow Diagram or date of previous submittal:

18. Other Environmental Permitting Needs:

Will this facility/modification trigger the need for environmental permits/approvals (other than air) such as Hazardous Waste Generation, Solid Waste Handling, Water withdrawal, water discharge, SWPPP, mining, landfill, etc.?

☐ **No** ☒ **Yes, please list below:**

Stormwater Construction Permit

Facility Name: Georgia- Pacific Wood Products LLC (Warrenton Chip-N-Saw Facility)

Date of Application: May 2015

FORM 2.00 – EMISSION UNIT LIST

Emission Unit ID	Name	Manufacturer and Model Number	Description
Phase I			
205C	Sawdust Fuel Silo	TBD	Saw Dust Silo and Cyclone
204	Continuous Lumber Drying Kiln	TBD	Continuous direct fired lumber drying kiln with 35 MMBtu/hr sawdust gasifier burner and /or natural gas burner or 42 MMBtu/hr Sawdust/NG combination burner
400C	Natural Gas Boiler	TBD	Natural Gas Fired Boiler
300	Planer Mill Trim Saw (301)	TBD	Planer Mill Trim Saw
Phase II			
205	Continuous Lumber Drying Kiln	TBD	Continuous direct fired lumber drying kiln with 35 MMBtu/hr sawdust gasifier burner and /or natural gas burner or 42 MMBtu/hr Sawdust/NG combination burner
300	Planer (301) and Trim Hog (302)	TBD	Planer and Planer Trim Hog and Cyclones

Facility Name: Georgia- Pacific Wood Products LLC (Warrenton Chip-N-Saw Facility) **Date of Application:** May 2015

FORM 2.01 – BOILERS AND FUEL BURNING EQUIPMENT

Emission Unit ID	Type of Burner	Type of Draft[1]	Design Capacity of Unit (MMBtu/hr Input)	Percent Excess Air	Dates		Date & Description of Last Modification
					Construction	Installation	
Phase I							
204[1]	Sawdust Gasifier	N/A	35		2015/2016	2015/2016	N/A
	AND/OR Natural Gas Burner	N/A	35		2015/2016	2015/2016	N/A
	OR Combination Sawdust/Natural Gas Burner	N/A	42 (35/7)		2015/2016	2015/2016	N/A
400C[2]	Natural Gas Boiler	N/A	20-39		2015/2016	2015/2016	N/A
Phase II							
205	Sawdust Gasifier	N/A	35		2017/2018	2017/2018	N/A
	AND/OR Natural Gas Burner	N/A	35		2017/2018	2017/2018	N/A
	OR Combination Sawdust/Natural Gas Burner	N/A	42 (35/7)		2017/2018	2017/2018	N/A
1	Burner type is still being evaluated. Warrenton CNS may choose Sawdust or Natural Gas or the capability to have both and utilize only one at a time OR to have a combination Sawdust/Natural Gas Burner only						
2	Boiler size is still being evaluated. Boiler will be removed in Phase II.						

[1] This column does not have to be completed for natural gas only fired equipment.

Facility Name: Georgia- Pacific Wood Products LLC (Warrenton Chip-N-Saw Facility) **Date of Application:** May 2015

FUEL DATA

Emission Unit ID	Fuel Type	Potential Annual Consumption				Hourly Consumption		Heat Content		Percent Sulfur		Percent Ash in Solid Fuel	
		Total Quantity		Percent Use by Season									
		Amount	Units	Ozone Season May 1 - Sept 30	Non-ozone Season Oct 1 - Apr 30	Max.	Avg.	Min.	Avg.	Max.	Avg.	Max.	Avg.
Phase I													
204	Sawdust	34,067	ton/yr	42	58	3.89 ton/hr	3.89 ton/hr	4,500 Btu/lb	4,500 Btu/lb				
	And/OR Natural Gas	298.83	MMscf/yr	42	58	34.11 Mscf/hr	34.11 Mscf/hr	1,026 Btu/scf	1,026 Btu/scf				
	OR Combination Sawdust/ Natural Gas	34,067	ton/yr	42	58	3.89 ton/hr	3.89 ton/hr	4,500 Btu/lb	4,500 Btu/lb				
		60	MMscf/yr	42	58	6.82 Mscf/hr	6.82 Mscf/hr	1,026 Btu/scf	1,026 Btu/scf				
400C	Natural Gas	333	MMscf/yr	42	58	38 Mscf/hr	38 Mscf/hr	1,026 Btu/scf	1,026 Btu/scf				
Phase II													
205	Sawdust	34,067	ton/yr	42	58	3.89 ton/hr	3.89 ton/hr	4,500 Btu/lb	4,500 Btu/lb				
	And/OR Natural Gas	298.83	MMscf/yr	42	58	34.11 Mscf/hr	34.11 Mscf/hr	1,026 Btu/scf	1,026 Btu/scf				
	OR Combination Sawdust/ Natural Gas	34,067	ton/yr	42	58	3.89 ton/hr	3.89 ton/hr	4,500 Btu/lb	4,500 Btu/lb				
		60	MMscf/yr	42	58	6.82 Mscf/hr	6.82 Mscf/hr	1,026 Btu/scf	1,026 Btu/scf				

Fuel Supplier Information

Fuel Type	Name of Supplier	Phone Number	Supplier Location			
			Address	City	State	Zip
N/A						

Facility Name: Georgia- Pacific Wood Products LLC (Warrenton Chip-N-Saw Facility) **Date of Application:** May 2015

FORM 2.06 – MANUFACTURING AND OPERATIONAL DATA

Normal Operating Schedule: 24 hours/day 7 days/week 52 weeks/yr

Additional Data Attached? ☒ - No ☐ - Yes, please include the attachment in list on Form 1.00, Item 16.

Seasonal and/or Peak Operating Periods: N/A

Dates of Annually Occurring Shutdowns:

PRODUCTION INPUT FACTORS

Emission Unit ID	Emission Unit Name	Const. Date	Input Raw Material(s)	Annual Input	Hourly Process Input Rate		
					Design	Normal	Maximum
Phase I							
205C	Sawdust Fuel Silo	2015/ 2016	Sawdust	34,067 tpy	3.89 ton/hr	3.89 ton/hr	3.89 ton/hr
204	Continuous Lumber Drying Kiln	2015/ 2016	Green Lumber	120,000 MBF/yr	15.1 MBF/hr	15.1 MBF/hr	15.1 MBF/hr
300	Planer Trim Saw (301)	2017/ 2018	Shaving/Sawdust	51,000 tpy	5.82 ton/hr	5.82 ton/hr	5.82 ton/hr
Phase II							
205	Continuous Lumber Drying Kiln	2017/ 2018	Green Lumber	120,000 MBF/yr	15.1 MBF/hr	15.1 MBF/hr	15.1 MBF/hr
300	Planer Mill (301) and Planer Hog (302)	2017/ 2018	Shaving/Sawdust	57,600 tpy	12 ton/hr	12 ton/hr	12 ton/hr

PRODUCTS OF MANUFACTURING

Emission Unit ID	Description of Product	Production Schedule		Hourly Production Rate (Give units: e.g. lb/hr, ton/hr)			
		Tons/yr	Hr/yr	Design	Normal	Maximum	Units
Phase I							
204	Dried Lumber	120,000 MBF/yr	8,760 hr/yr	15.1	15.1	15.1	MBF/hr
Phase II							
205	Dried Lumber	120,000 MBF/yr	8,760 hr/yr	15.1	15.1	15.1	MBF/hr

Facility Name: Georgia- Pacific Wood Products LLC (Warrenton Chip-N-Saw Facility) **Date of Application:** May 2015

Form 3.00 – AIR POLLUTION CONTROL DEVICES - PART A: GENERAL EQUIPMENT INFORMATION

APCD Unit ID	Emission Unit ID	APCD Type (Baghouse, ESP, Scrubber etc)	Date Installed	Make & Model Number (Attach Mfg. Specifications & Literature)	Unit Modified from Mfg Specifications?	Gas Temp. °F		Inlet Gas Flow Rate (acfm)
						Inlet	Outlet	
SC3	205C	Cyclone	2015	Fisher-Klosterman	No	Amb	Amb	4,867 dscfm
PMC1	301 & 302	Cyclone	2017/2018	TBD	No	Amb	Amb	59,000 dscfm

Facility Name: Georgia- Pacific Wood Products LLC (Warrenton Chip-N-Saw Facility) **Date of Application:** May 2015

Form 3.00 – AIR POLLUTION CONTROL DEVICES – PART B: EMISSION INFORMATION

APCD Unit ID	Pollutants Controlled	Percent Control Efficiency		Inlet Stream To APCD		Exit Stream From APCD		Pressure Drop Across Unit (Inches of water)
		Design	Actual	lb/hr	Method of Determination	lb/hr	Method of Determination	
SC3	PM					0.44	Vendor Guarantee	
	PM10					0.44	Vendor Guarantee	
	PM2.5					0.21	Vendor Guarantee	
PMC1	PM					1.86	Stack Test + 20% safety factor	
	PM10					1.32	Stack Test + 20% safety factor	
	PM2.5					0.68	Stack Test + 20% safety factor	

Facility Name: Georgia- Pacific Wood Products LLC (Warrenton Chip-N-Saw Facility) **Date of Application:** May 2015

FORM 4.00 – EMISSION INFORMATION

Emission Unit ID	Air Pollution Control Device ID	Stack ID	Pollutant Emitted	Emission Rates				
				Hourly Actual Emissions (lb/hr)	**Hourly Potential Emissions** (lb/hr)	**Actual Annual Emission** (tpy)	**Potential Annual Emission** (tpy)	**Method of Determination**
See Appendix B Calculations								

Facility Name: Georgia- Pacific Wood Products LLC (Warrenton Chip-N-Saw Facility) **Date of Application:** May 2015

FORM 6.00 – FUGITIVE EMISSION SOURCES

Fugitive Emission Source ID	Description of Source	Emission Reduction Precautions	Pot. Fugitive Emissions	
			Amount (tpy)	Pollutant
Phase I				
101	Trim Saw		1.97/0.71/0.22	PM/PM10/PM2.5
102S	Sizing Saws		1.66/0.60/0.16	PM/PM10/PM2.5
104S	Small Chippers (2)		1.24/0.58/.09[1]	PM/PM10/PM2.5
105	Shaker Screen		1.24/0.58/.09[1]	PM/PM10/PM2.5
106	Saw Edger		1.63/0.59/0.18	PM/PM10/PM2.5
107	Bark Screen/ Bark Hog/ Bark Truck Loadout		0.32/0.15/0.02	PM/PM10/PM2.5
500	Roads		11.22/2.20/0.26	PM/PM10/PM2.5
Phase II				
101	Chip-N-Saw/VSA Saw/ Slasher Saw		4.02/1.45/0.44	PM/PM10/PM2.5
102	Debarker		3.38/1.86/0.04	PM/PM10/PM2.5
500	Roads		2.73/0.55/0.13	PM/PM10/PM2.5
1	These sources are grouped with chip and sawdust handling for emission calculation purposes. These emissions represent all chip and sawdust handling.			

Facility Name: Georgia- Pacific Wood Products LLC (Warrenton Chip-N-Saw Facility) **Date of Application:** May 2015

FORM 7.00 – AIR MODELING INFORMATION: Stack Data

Stack ID	Emission Unit ID(s)	Stack Information			Dimensions of largest Structure Near Stack		Exit Gas Conditions at Maximum Emission Rate			
		Height Above Grade (ft)	**Inside Diameter** (ft)	**Exhaust Direction**	**Height** (ft)	**Longest Side** (ft)	**Velocity** (ft/sec)	**Temperature** (°F)	**Flow Rate** (acfm)	
									Average	**Maximum**
See the attached modeling report in Appendix E for the modeled stack parameters										

NOTE: If emissions are not vented through a stack, describe point of discharge below and, if necessary, include an attachment. List the attachment in Form 1.00 *General Information*, Item 16.

Facility Name: Georgia- Pacific Wood Products LLC (Warrenton Chip-N-Saw Facility) **Date of Application:** May 2015

FORM 7.00 AIR MODELING INFORMATION: Chemicals Data

Chemical	Potential Emission Rate (lb/hr)	Toxicity	Reference	MSDS Attached
See attached modeling report				☐
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APPENDIX E

TOXICS MODELING SUPPORTING DOCUMENTATION

Toxic Air Pollutant	CDK Stack Emissions (g/s)	CDK Fugitive Emissions (g/s)	Stencil/Logo Emissions (g/s)	CDK Stack Model Concentration ($\mu g/m^3$)	CDK Fugitive Model Concentration ($\mu g/m^3$)	Stencil/Logo Model Concentration ($\mu g/m^3$)	Total Screening Concentration ($\mu g/m^3$)	15-min AAC ($\mu g/m^3$)	Is Model Concentration < AAC?
Acetaldehyde	1.53E-01	3.84E-02	0.00E+00	20.71	97.81	0.00E+00	118.52580	4,500	YES
Acetophenone	1.30E-05	3.25E-06	0.00E+00	1.75E-03	8.28E-03	0.00E+00	0.01003	--	YES
Acrolein	1.93E-02	4.83E-03	0.00E+00	2.6108	12.330	0.00E+00	14.94094	23.0	YES
Benzene	1.66E-03	4.15E-04	0.00E+00	0.224	1.059	0.00E+00	1.28321	1,600	YES
Bis(2-Ethylhexyl)phthalate (also di-)	3.28E-07	8.20E-08	0.00E+00	4.43E-05	2.09E-04	0.00E+00	0.00025	1,000	YES
Bromomethane (Methyl bromide)	2.59E-05	6.47E-06	0.00E+00	3.50E-03	1.65E-02	0.00E+00	0.02001	8,000	YES
Butane	1.44E-02	3.61E-03	0.00E+00	1.95E+00	9.21E+00	0.00E+00	11.15695	NA	NA
Carbon Disulfide	8.82E-04	2.20E-04	0.00E+00	0.1191	0.562	0.00E+00	0.68137	5,400	YES
Carbon Tetrachloride	8.18E-05	2.05E-05	0.00E+00	1.10E-02	0.0522	0.00E+00	0.06323	15,670	YES
Chlorobenzene	1.17E-04	2.93E-05	0.00E+00	0.0158	0.0747	0.00E+00	0.09049	--	YES
Chloroform	1.80E-05	4.50E-06	0.00E+00	2.43E-03	1.15E-02	0.00E+00	0.01390	24,000	YES
Chloromethane (Methyl Chloride)	1.88E-04	4.69E-05	0.00E+00	0.0253	0.1197	0.00E+00	0.14500	41,400	YES
Cumene	1.25E-04	3.12E-05	0.00E+00	0.0169	0.0796	0.00E+00	0.09648	--	YES
Dichlorobenzene	8.25E-06	2.06E-06	0.00E+00	0.0011	0.0053	0.00E+00	0.00638	30,000	YES
Dichloroethane, 1,2- (Ethylene dichloride)	2.06E-04	5.15E-05	0.00E+00	0.0278	0.1314	0.00E+00	0.15917	40,500	YES
Dichloromethane (Methylene chloride)	1.99E-04	4.97E-05	0.00E+00	0.0269	0.1269	0.00E+00	0.15372	43,460	YES
Dichloropropane, 1,2- (Propylene dichloride)	1.19E-04	2.96E-05	0.00E+00	0.0160	0.0756	0.00E+00	0.09158	51,700	YES
Di-n-butyl Phthalate	2.35E-04	5.87E-05	0.00E+00	0.0317	0.1498	0.00E+00	0.18152	--	YES
Dinitrophenol, 2,4-	9.24E-07	2.31E-07	0.00E+00	1.25E-04	5.89E-04	0.00E+00	0.00071	--	YES
Dinitrotoluene, 2,4-	6.65E-06	1.66E-06	0.00E+00	8.97E-04	4.24E-03	0.00E+00	0.00513	--	YES
Ethane	2.13E-02	5.33E-03	0.00E+00	2.88E+00	1.36E+01	0.00E+00	16.46978	--	YES
Ethylbenzene	2.21E-04	5.52E-05	0.00E+00	0.0298	0.1408	0.00E+00	0.17062	43,500	YES
Formaldehyde	2.59E-01	6.47E-02	0.00E+00	34.93	165.0	0.00E+00	199.92156	245	YES
Hexachlorobenzene	7.27E-06	1.82E-06	0.00E+00	9.81E-04	4.63E-03	0.00E+00	0.00561	--	YES
Hexane	1.24E-02	3.09E-03	0.00E+00	1.671	7.892	0.00E+00	9.56310	17,600	YES
Hydrogen Chloride	2.73E-03	6.83E-04	0.00E+00	0.369	1.741	0.00E+00	2.10952	700	YES
Methanol	7.63E-01	1.91E-01	3.10E-03	102.98	486.35	13.07	602.40360	32,800	YES
MIBK	6.79E-03	1.70E-03	0.00E+00	0.917	4.331	0.00E+00	5.24772	30,700	YES
Naphthalene	5.82E-05	1.46E-05	0.00E+00	7.86E-03	3.71E-02	0.00E+00	0.04496	5,000	YES
4-Nitrophenol	6.58E-07	1.64E-07	0.00E+00	8.88E-05	4.19E-04	0.00E+00	0.00051	--	YES
Pentachlorophenol	3.16E-07	7.90E-08	0.00E+00	4.27E-05	2.02E-04	0.00E+00	0.00024	--	YES
Pentane	1.79E-02	4.47E-03	0.00E+00	2.41E+00	1.14E+01	0.00E+00	13.81336	180,000	YES
Phenol	3.76E-02	9.41E-03	0.00E+00	5.08	24.0	0.00E+00	29.06704	6,000	YES
POM	1.07E-03	2.68E-04	0.00E+00	0.1449	0.684	0.00E+00	0.82925	NA	NA
Propane	1.10E-02	2.75E-03	0.00E+00	1.4854	7.015	0.00E+00	8.50053	NA	NA
Propionaldehyde	3.80E-03	9.51E-04	0.00E+00	0.5135	2.4252	0.00E+00	2.93869	--	YES
Styrene	1.09E-04	2.72E-05	0.00E+00	0.0147	0.0693	0.00E+00	0.08394	85,200	YES
Tetrachloroethene (Tetrachloroethylene, Perchloroethylene)	1.74E-04	4.34E-05	0.00E+00	0.0234	0.1107	0.00E+00	0.13409	135,600	YES
Titanium Dioxide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00	0.00000	--	YES
Toluene	3.96E-04	9.90E-05	0.00E+00	5.34E-02	2.52E-01	0.00E+00	0.30582	113,000	YES
Trichloroethane, 1,1,1- (Methyl Chloroform)	2.77E-04	6.93E-05	0.00E+00	0.0374	0.1768	0.00E+00	0.21422	245,000	YES
Trichloroethene (Trichloroethylene)	1.40E-04	3.51E-05	0.00E+00	0.0190	0.0895	0.00E+00	0.10847	107,500	YES
Trichlorophenol, 2,4,6-	1.93E-06	4.82E-07	0.00E+00	2.60E-04	1.23E-03	0.00E+00	0.00149	--	YES
Vinyl Acetate	0.00E+00	0.00E+00	1.25E-06	0.00E+00	0.00E+00	5.29E-03	0.00529	5,280	YES
Vinyl Chloride	1.30E-04	3.25E-05	0.00E+00	0.0175	0.0828	0.00E+00	0.10030	1,280	YES
Xylene	7.67E-04	1.92E-04	0.00E+00	1.04E-01	4.89E-01	0.00E+00	0.59286	65,500	YES
Acenaphthene	7.27E-07	1.82E-07	0.00E+00	9.81E-05	4.63E-04	0.00E+00	0.00056	--	YES
Acenaphthylene	4.10E-06	1.02E-06	0.00E+00	5.53E-04	2.61E-03	0.00E+00	0.00317	--	YES
Anthracene	1.24E-06	3.10E-07	0.00E+00	1.68E-04	7.92E-04	0.00E+00	0.00096	--	YES
Benzo(a)anthracene	8.89E-08	2.22E-08	0.00E+00	1.20E-05	5.67E-05	0.00E+00	0.00007	--	YES
Benzo(a)pyrene	1.07E-07	2.68E-08	0.00E+00	1.45E-05	6.84E-05	0.00E+00	0.00008	--	YES
Benzo(b)fluoranthene	8.89E-08	2.22E-08	0.00E+00	1.20E-05	5.67E-05	0.00E+00	0.00007	--	YES
Benzo(e)pyrene	5.61E-07	1.40E-07	0.00E+00	7.57E-05	3.58E-04	0.00E+00	0.00043	--	YES
Benzo(k)fluoranthene	1.29E-07	3.23E-08	0.00E+00	1.74E-05	8.23E-05	0.00E+00	0.00010	--	YES
2-Chloronapthalene	8.47E-08	2.12E-08	0.00E+00	1.14E-05	5.40E-05	0.00E+00	0.00007	--	YES
Chrysene	2.68E-07	6.70E-08	0.00E+00	3.62E-05	1.71E-04	0.00E+00	0.00021	--	YES
Dioxins	1.99E-10	4.98E-11	0.00E+00	2.69E-08	1.27E-07	0.00E+00	0.00000	--	YES
Dibenzo(a,h)anthracene	6.27E-08	1.57E-08	0.00E+00	8.46E-06	3.99E-05	0.00E+00	0.00005	--	YES
Fluorene	1.33E-06	3.33E-07	0.00E+00	1.80E-04	8.50E-04	0.00E+00	0.00103	--	YES
Fluoranthene	3.22E-06	8.06E-07	0.00E+00	4.35E-04	2.06E-03	0.00E+00	0.00249	--	YES
Furan	1.38E-10	3.45E-11	0.00E+00	1.86E-08	8.80E-08	0.00E+00	0.00000	--	YES
Indeno(1,2,3,c,d)pyrene	6.44E-08	1.61E-08	0.00E+00	8.70E-06	4.11E-05	0.00E+00	0.00005	--	YES
2-Methylnaphthalene	9.10E-06	2.28E-06	0.00E+00	1.23E-03	5.80E-03	0.00E+00	0.00703	--	YES
Perylene	4.64E-08	1.16E-08	0.00E+00	6.27E-06	2.96E-05	0.00E+00	0.00004	--	YES
Phenanthrene	1.86E-05	4.66E-06	0.00E+00	2.51E-03	1.19E-02	0.00E+00	0.01439	--	YES
Pyrene	6.97E-06	1.74E-06	0.00E+00	9.41E-04	4.44E-03	0.00E+00	0.00539	--	YES
2,3,7,8-Tetrachlorodibenzo-p-dioxin	4.47E-12	1.12E-12	0.00E+00	6.03E-10	2.85E-09	0.00E+00	0.00000	--	YES
Antimony	5.17E-06	1.29E-06	0.00E+00	6.98E-04	3.30E-03	0.00E+00	0.00400	--	YES
Arsenic	3.57E-05	8.94E-06	0.00E+00	0.0048	0.0228	0.00E+00	0.02761	--	YES
Barium	1.51E-05	3.78E-06	0.00E+00	0.0020	0.0096	0.00E+00	0.01169	NA	NA
Beryllium	1.49E-07	3.73E-08	0.00E+00	2.01E-05	9.51E-05	0.00E+00	0.00012	0.50	YES
Cadmium	1.17E-05	2.91E-06	0.00E+00	1.57E-03	7.43E-03	0.00E+00	0.00901	30	YES
Chromium	4.81E-06	1.20E-06	0.00E+00	6.50E-04	3.07E-03	0.00E+00	0.00372	--	YES
Chromium total	3.54E-05	8.85E-06	0.00E+00	0.0048	0.0226	0.00E+00	0.02734	--	YES
Chromium VI	9.95E-07	2.49E-07	0.00E+00	1.34E-04	6.34E-04	0.00E+00	0.00077	10.0	YES
Cobalt	2.21E-06	5.53E-07	0.00E+00	2.99E-04	1.41E-03	0.00E+00	0.00171	--	YES
Copper	2.92E-06	7.31E-07	0.00E+00	3.95E-04	1.86E-03	0.00E+00	0.00226	NA	NA
Manganese	4.48E-04	1.12E-04	0.00E+00	0.0604	0.285	0.00E+00	0.34584	500	YES
Mercury	3.09E-06	7.73E-07	0.00E+00	4.18E-04	1.97E-03	0.00E+00	0.00239	10.0	YES
Molybdenum	3.78E-06	9.46E-07	0.00E+00	5.11E-04	2.41E-03	0.00E+00	0.00292	NA	NA
Nickel	3.26E-05	8.15E-06	0.00E+00	4.40E-03	0.0208	0.00E+00	0.02520	--	YES
Phosphorus	3.48E-04	8.69E-05	0.00E+00	0.0469	0.222	0.00E+00	0.26846	--	YES
Selenium	3.65E-06	9.12E-07	0.00E+00	4.92E-04	2.33E-03	0.00E+00	0.00282	--	YES
Vanadium	7.91E-06	1.98E-06	0.00E+00	1.07E-03	5.04E-03	0.00E+00	0.00611	10.0	YES
Zinc	9.97E-05	2.49E-05	0.00E+00	1.35E-02	6.36E-02	0.00E+00	0.07704	1,000	YES

Toxic Air Pollutant	CDK Stack Emissions (g/s)	CDK Fugitive Emissions (g/s)	Stencil/Logo Emissions (g/s)	CDK Stack Model Concentration ($\mu g/m^3$)	CDK Fugitive Model Concentration ($\mu g/m^3$)	Stencil/Logo Model Concentration ($\mu g/m^3$)	Total Screening Concentration ($\mu g/m^3$)	24-hr AAC ($\mu g/m^3$)	Is Model Concentration < AAC?
Acetaldehyde	1.53E-01	3.84E-02	0.00E+00	3.569	11.667	0.00E+00	15.23570	--	YES
Acetophenone	1.30E-05	3.25E-06	0.00E+00	3.02E-04	9.87E-04	0.00E+00	0.00129	117	YES
Acrolein	1.93E-02	4.83E-03	0.00E+00	0.4498	1.4707	0.00E+00	1.92056	--	YES
Benzene	1.66E-03	4.15E-04	0.00E+00	0.0386	0.1263	0.00E+00	0.16495	--	YES
Bis(2-Ethylhexyl)phthalate (also di-)	3.28E-07	8.20E-08	0.00E+00	7.63E-06	2.50E-05	0.00E+00	0.00003	11.9	YES
Bromomethane (Methyl bromide)	2.59E-05	6.47E-06	0.00E+00	6.02E-04	1.97E-03	0.00E+00	0.00257	--	YES
Butane	1.44E-02	3.61E-03	0.00E+00	3.36E-01	1.10E+00	0.00E+00	1.43415	4,524	YES
Carbon Disulfide	8.82E-04	2.20E-04	0.00E+00	0.0205	0.0671	0.00E+00	0.08759	--	YES
Carbon Tetrachloride	8.18E-05	2.05E-05	0.00E+00	1.90E-03	6.22E-03	0.00E+00	0.00813	--	YES
Chlorobenzene	1.17E-04	2.93E-05	0.00E+00	2.72E-03	8.91E-03	0.00E+00	0.01163	833	YES
Chloroform	1.80E-05	4.50E-06	0.00E+00	4.19E-04	1.37E-03	0.00E+00	0.00179	--	YES
Chloromethane (Methyl Chloride)	1.88E-04	4.69E-05	0.00E+00	4.37E-03	1.43E-02	0.00E+00	0.01864	--	YES
Cumene	1.25E-04	3.12E-05	0.00E+00	2.90E-03	9.50E-03	0.00E+00	0.01240	--	YES
Dichlorobenzene	8.25E-06	2.06E-06	0.00E+00	1.92E-04	6.28E-04	0.00E+00	0.00082	357	YES
Dichloroethane, 1,2- (Ethylene dichloride)	2.06E-04	5.15E-05	0.00E+00	4.79E-03	1.57E-02	0.00E+00	0.02046	--	YES
Dichloromethane (Methylene chloride)	1.99E-04	4.97E-05	0.00E+00	4.63E-03	1.51E-02	0.00E+00	0.01976	--	YES
Dichloropropane, 1,2- (Propylene dichloride)	1.19E-04	2.96E-05	0.00E+00	2.76E-03	9.01E-03	0.00E+00	0.01177	--	YES
Di-n-butyl Phthalate	2.35E-04	5.87E-05	0.00E+00	5.47E-03	1.79E-02	0.00E+00	0.02333	11.9	YES
Dinitrophenol, 2,4-	9.24E-07	2.31E-07	0.00E+00	2.15E-05	7.03E-05	0.00E+00	0.00009	--	YES
Dinitrotoluene, 2,4-	6.65E-06	1.66E-06	0.00E+00	1.55E-04	5.05E-04	0.00E+00	0.00066	3.60	YES
Ethane	2.13E-02	5.33E-03	0.00E+00	4.96E-01	1.62E+00	0.00E+00	2.11708	--	YES
Ethylbenzene	2.21E-04	5.52E-05	0.00E+00	5.14E-03	1.68E-02	0.00E+00	0.02193	--	YES
Formaldehyde	0.259	0.0647	0.00E+00	6.02	19.68	0.00E+00	25.69858	--	YES
Hexachlorobenzene	7.27E-06	1.82E-06	0.00E+00	1.69E-04	5.53E-04	0.00E+00	0.00072	--	YES
Hexane	1.24E-02	3.09E-03	0.00E+00	0.2879	0.9413	0.00E+00	1.22927	--	YES
Hydrogen Chloride	2.73E-03	6.83E-04	0.00E+00	0.0635	0.2077	0.00E+00	0.27117	--	YES
Methanol	0.763	0.1907	3.10E-03	17.74	58.01	1.055	76.80985	619	YES
MIBK	6.79E-03	1.70E-03	0.00E+00	0.1580	0.5166	0.00E+00	0.67456	--	YES
Naphthalene	5.82E-05	1.46E-05	0.00E+00	1.35E-03	4.43E-03	0.00E+00	0.00578	--	YES
4-Nitrophenol	6.58E-07	1.64E-07	0.00E+00	1.53E-05	5.00E-05	0.00E+00	0.00007	--	YES
Pentachlorophenol	3.16E-07	7.90E-08	0.00E+00	7.35E-06	2.40E-05	0.00E+00	0.00003	1.20	YES
Pentane	1.79E-02	4.47E-03	0.00E+00	4.16E-01	1.36E+00	0.00E+00	1.77562	7,024	YES
Phenol	0.0376	0.0094	0.00E+00	0.88	2.861	0.00E+00	3.73637	45.2	YES
POM	1.07E-03	2.68E-04	0.00E+00	0.0250	0.0816	0.00E+00	0.10659	NA	NA
Propane	1.10E-02	2.75E-03	0.00E+00	0.2559	0.8367	0.00E+00	1.09269	4,286	YES
Propionaldehyde	3.80E-03	9.51E-04	0.00E+00	8.85E-02	2.89E-01	0.00E+00	0.37775	--	YES
Styrene	1.09E-04	2.72E-05	0.00E+00	2.53E-03	8.26E-03	0.00E+00	0.01079	--	YES
Tetrachloroethene (Tetrachloroethylene, Perchloroethylene)	1.74E-04	4.34E-05	0.00E+00	4.04E-03	1.32E-02	0.00E+00	0.01724	1,614	YES
Titanium Dioxide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.000	0.00000	35.7	YES
Toluene	3.96E-04	9.90E-05	0.00E+00	9.21E-03	3.01E-02	0.00E+00	0.03931	--	YES
Trichloroethane, 1,1,1- (Methyl Chloroform)	2.77E-04	6.93E-05	0.00E+00	6.45E-03	2.11E-02	0.00E+00	0.02754	4,524	YES
Trichloroethene (Trichloroethylene)	1.40E-04	3.51E-05	0.00E+00	3.27E-03	1.07E-02	0.00E+00	0.01394	1,280	YES
Trichlorophenol, 2,4,6-	1.93E-06	4.82E-07	0.00E+00	4.48E-05	1.46E-04	0.00E+00	0.00019	--	YES
Vinyl Acetate	0.00E+00	0.00E+00	1.25E-06	0.00E+00	0.00E+00	4.27E-04	0.00043	NA	NA
Vinyl Chloride	1.30E-04	3.25E-05	0.00E+00	3.02E-03	9.87E-03	0.00E+00	0.01289	--	YES
Xylene	7.67E-04	1.92E-04	0.00E+00	1.79E-02	5.84E-02	0.00E+00	0.07621	--	YES
Acenaphthene	7.27E-07	1.82E-07	0.00E+00	1.69E-05	5.53E-05	0.00E+00	0.00007	41.4	YES
Acenaphthylene	4.10E-06	1.02E-06	0.00E+00	9.54E-05	3.12E-04	0.00E+00	0.00041	117	YES
Anthracene	1.24E-06	3.10E-07	0.00E+00	2.89E-05	9.44E-05	0.00E+00	0.00012	0.48	YES
Benzo(a)anthracene	8.89E-08	2.22E-08	0.00E+00	2.07E-06	6.76E-06	0.00E+00	0.00001	13.8	YES
Benzo(a)pyrene	1.07E-07	2.68E-08	0.00E+00	2.49E-06	8.16E-06	0.00E+00	0.00001	0.48	YES
Benzo(b)fluoranthene	8.89E-08	2.22E-08	0.00E+00	2.07E-06	6.76E-06	0.00E+00	0.00001	0.48	YES
Benzo(e)pyrene	5.61E-07	1.40E-07	0.00E+00	1.30E-05	4.27E-05	0.00E+00	0.00006	NA	NA
Benzo(k)fluoranthene	1.29E-07	3.23E-08	0.00E+00	3.00E-06	9.82E-06	0.00E+00	0.00001	0.48	YES
2-Chloronapthalene	8.47E-08	2.12E-08	0.00E+00	1.97E-06	6.44E-06	0.00E+00	0.00001	--	YES
Chrysene	2.68E-07	6.70E-08	0.00E+00	6.24E-06	2.04E-05	0.00E+00	0.00003	0.48	YES
Dioxins	1.99E-10	4.98E-11	0.00E+00	4.63E-09	1.51E-08	0.00E+00	0.00000	NA	NA
Dibenzo(a,h)anthracene	6.27E-08	1.57E-08	0.00E+00	1.46E-06	4.76E-06	0.00E+00	0.00001	--	YES
Fluorene	1.33E-06	3.33E-07	0.00E+00	3.10E-05	1.01E-04	0.00E+00	0.00013	--	YES
Fluoranthene	3.22E-06	8.06E-07	0.00E+00	7.50E-05	2.45E-04	0.00E+00	0.00032	0.48	YES
Furan	1.38E-10	3.45E-11	0.00E+00	3.21E-09	1.05E-08	0.00E+00	0.00000	NA	NA
Indeno(1,2,3,c,d)pyrene	6.44E-08	1.61E-08	0.00E+00	1.50E-06	4.90E-06	0.00E+00	0.00001	0.48	YES
2-Methylnaphthalene	9.10E-06	2.28E-06	0.00E+00	2.12E-04	6.92E-04	0.00E+00	0.00090	7.14	YES
Perylene	4.64E-08	1.16E-08	0.00E+00	1.08E-06	3.53E-06	0.00E+00	0.00000	NA	NA
Phenanthrene	1.86E-05	4.66E-06	0.00E+00	4.33E-04	1.42E-03	0.00E+00	0.00185	0.48	YES
Pyrene	6.97E-06	1.74E-06	0.00E+00	1.62E-04	5.30E-04	0.00E+00	0.00069	--	YES
2,3,7,8-Tetrachlorodibenzo-p-dioxin	4.47E-12	1.12E-12	0.00E+00	1.04E-10	3.40E-10	0.00E+00	0.00000	0.0015	YES
Antimony	5.17E-06	1.29E-06	0.00E+00	1.20E-04	3.93E-04	0.00E+00	0.00051	1.20	YES
Arsenic	3.57E-05	8.94E-06	0.00E+00	8.31E-04	2.72E-03	0.00E+00	0.00355	0.40	YES
Barium	1.51E-05	3.78E-06	0.00E+00	3.52E-04	1.15E-03	0.00E+00	0.00150	1.19	YES
Beryllium	1.49E-07	3.73E-08	0.00E+00	3.47E-06	1.13E-05	0.00E+00	0.00001	--	YES
Cadmium	1.17E-05	2.91E-06	0.00E+00	2.71E-04	8.86E-04	0.00E+00	0.00116	--	YES
Chromium	4.81E-06	1.20E-06	0.00E+00	1.12E-04	3.66E-04	0.00E+00	0.00048	1.20	YES
Chromium total	3.54E-05	8.85E-06	0.00E+00	8.23E-04	2.69E-03	0.00E+00	0.00351	1.20	YES
Chromium VI	9.95E-07	2.49E-07	0.00E+00	2.31E-05	7.57E-05	0.00E+00	0.00010	--	YES
Cobalt	2.21E-06	5.53E-07	0.00E+00	5.15E-05	1.68E-04	0.00E+00	0.00022	0.24	YES
Copper	2.92E-06	7.31E-07	0.00E+00	6.80E-05	2.22E-04	0.00E+00	0.00029	0.24	YES
Manganese	4.48E-04	1.12E-04	0.00E+00	0.0104	0.0340	0.00E+00	0.04446	--	YES
Mercury	3.09E-06	7.73E-07	0.00E+00	7.20E-05	2.35E-04	0.00E+00	0.00031	--	YES
Molybdenum	3.78E-06	9.46E-07	0.00E+00	8.80E-05	2.88E-04	0.00E+00	0.00038	12.0	YES
Nickel	3.26E-05	8.15E-06	0.00E+00	7.59E-04	2.48E-03	0.00E+00	0.00324	0.79	YES
Phosphorus	3.48E-04	8.69E-05	0.00E+00	0.0081	2.64E-02	0.00E+00	0.03451	0.24	YES
Selenium	3.65E-06	9.12E-07	0.00E+00	8.49E-05	2.77E-04	0.00E+00	0.00036	0.48	YES
Vanadium	7.91E-06	1.98E-06	0.00E+00	1.84E-04	6.01E-04	0.00E+00	0.00079	0.12	YES
Zinc	9.97E-05	2.49E-05	0.00E+00	2.32E-03	7.58E-03	0.00E+00	0.00990	12.0	YES

Toxic Air Pollutant	CDK Stack Emissions (g/s)	CDK Fugitive Emissions (g/s)	Stencil/Logo Emissions (g/s)	CDK Stack Model Concentration ($\mu g/m^3$)	CDK Fugitive Model Concentration ($\mu g/m^3$)	Stencil/Logo Model Concentration ($\mu g/m^3$)	Total Screening Concentration ($\mu g/m^3$)	Annual AAC ($\mu g/m^3$)	Is Model Concentration < AAC?
Acetaldehyde	0.1392	3.48E-02	0.00E+00	0.234	0.9094	0.00E+00	1.14329	4.55	YES
Acetophenone	1.30E-05	3.25E-06	0.00E+00	2.18E-05	8.48E-05	0.00E+00	0.00011	--	YES
Acrolein	1.76E-02	4.41E-03	0.00E+00	2.97E-02	1.15E-01	0.00E+00	0.14494	0.15	YES
Benzene	1.66E-03	4.15E-04	0.00E+00	2.79E-03	1.09E-02	0.00E+00	0.01364	0.13	YES
Bis(2-Ethylhexyl)phthalate (also di-)	3.28E-07	8.20E-08	0.00E+00	5.51E-07	2.14E-06	0.00E+00	0.00000	--	YES
Bromomethane (Methyl bromide)	2.59E-05	6.47E-06	0.00E+00	4.35E-05	1.69E-04	0.00E+00	0.00021	5.00	YES
Butane	3.30E-03	8.24E-04	0.00E+00	5.54E-03	2.15E-02	0.00E+00	0.02708	NA	NA
Carbon Disulfide	8.82E-04	2.21E-04	0.00E+00	1.48E-03	5.76E-03	0.00E+00	0.00724	700	YES
Carbon Tetrachloride	8.19E-05	2.05E-05	0.00E+00	1.38E-04	5.35E-04	0.00E+00	0.00067	0.67	YES
Chlorobenzene	1.17E-04	2.93E-05	0.00E+00	1.97E-04	7.65E-04	0.00E+00	0.00096	--	YES
Chloroform	1.80E-05	4.50E-06	0.00E+00	3.02E-05	1.18E-04	0.00E+00	0.00015	0.44	YES
Chloromethane (Methyl Chloride)	1.88E-04	4.69E-05	0.00E+00	3.15E-04	1.23E-03	0.00E+00	0.00154	90.0	YES
Cumene	1.25E-04	3.12E-05	0.00E+00	2.10E-04	8.16E-04	0.00E+00	0.00103	400	YES
Dichlorobenzene	1.88E-06	4.71E-07	0.00E+00	3.17E-06	1.23E-05	0.00E+00	0.00002	NA	NA
Dichloroethane, 1,2- (Ethylene dichloride)	2.06E-04	5.15E-05	0.00E+00	3.46E-04	1.35E-03	0.00E+00	0.00169	0.39	YES
Dichloromethane (Methylene chloride)	1.99E-04	4.97E-05	0.00E+00	3.34E-04	1.30E-03	0.00E+00	0.00163	21.3	YES
Dichloropropane, 1,2- (Propylene dichloride)	1.19E-04	2.96E-05	0.00E+00	1.99E-04	7.74E-04	0.00E+00	0.00097	4.00	YES
Di-n-butyl Phthalate	2.35E-04	5.87E-05	0.00E+00	3.95E-04	1.54E-03	0.00E+00	0.00193	--	YES
Dinitrophenol, 2,4-	9.24E-07	2.31E-07	0.00E+00	1.55E-06	6.04E-06	0.00E+00	0.00001	--	YES
Dinitrotoluene, 2,4-	6.65E-06	1.66E-06	0.00E+00	1.12E-05	4.34E-05	0.00E+00	0.00005	--	YES
Ethane	4.87E-03	1.22E-03	0.00E+00	8.18E-03	3.18E-02	0.00E+00	0.03998	--	YES
Ethylbenzene	2.21E-04	5.52E-05	0.00E+00	3.71E-04	1.44E-03	0.00E+00	0.00181	1,000	YES
Formaldehyde	0.235	0.0587	0.00E+00	0.395	1.534	0.00E+00	1.92845	3.30	YES
Hexachlorobenzene	7.27E-06	1.82E-06	0.00E+00	1.22E-05	4.75E-05	0.00E+00	0.00006	0.020	YES
Hexane	4.51E-03	1.13E-03	0.00E+00	7.58E-03	2.95E-02	0.00E+00	0.03703	700	YES
Hydrogen Chloride	2.73E-03	6.83E-04	0.00E+00	4.59E-03	1.78E-02	0.00E+00	0.02243	20.0	YES
Methanol	0.692	0.1730	3.10E-03	1.16	4.522	0.0753	5.75993	--	YES
MIBK	6.45E-03	1.61E-03	0.00E+00	1.08E-02	4.22E-02	0.00E+00	0.05301	3,000	YES
Naphthalene	5.82E-05	1.46E-05	0.00E+00	9.78E-05	3.80E-04	0.00E+00	0.00048	3.00	YES
4-Nitrophenol	6.58E-07	1.64E-07	0.00E+00	1.11E-06	4.30E-06	0.00E+00	0.00001	--	YES
Pentachlorophenol	3.16E-07	7.90E-08	0.00E+00	5.31E-07	2.07E-06	0.00E+00	0.00000	--	YES
Pentane	4.08E-03	1.02E-03	0.00E+00	6.86E-03	2.67E-02	0.00E+00	0.03353	NA	NA
Phenol	0.034	0.0085	0.00E+00	0.057	0.2230	0.00E+00	0.28038	--	YES
POM	1.07E-03	2.68E-04	0.00E+00	1.80E-03	7.01E-03	0.00E+00	0.00882	NA	NA
Propane	2.51E-03	6.28E-04	0.00E+00	4.22E-03	1.64E-02	0.00E+00	0.02064	NA	NA
Propionaldehyde	3.47E-03	8.66E-04	0.00E+00	5.82E-03	2.26E-02	0.00E+00	0.02846	8.00	YES
Styrene	1.09E-04	2.72E-05	0.00E+00	1.83E-04	7.10E-04	0.00E+00	0.00089	1,000	YES
Tetrachloroethene (Tetrachloroethylene, Perchloroethylene)	1.74E-04	4.34E-05	0.00E+00	2.92E-04	1.13E-03	0.00E+00	0.00143	--	YES
Titanium Dioxide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.0000	0.00000	--	YES
Toluene	3.62E-04	9.05E-05	0.00E+00	6.08E-04	2.36E-03	0.00E+00	0.00297	5,000	YES
Trichloroethane, 1,1,1- (Methyl Chloroform)	2.77E-04	6.93E-05	0.00E+00	4.66E-04	1.81E-03	0.00E+00	0.00228	--	YES
Trichloroethene (Trichloroethylene)	1.40E-04	3.51E-05	0.00E+00	2.36E-04	9.17E-04	0.00E+00	0.00115	--	YES
Trichlorophenol, 2,4,6-	1.93E-06	4.82E-07	0.00E+00	3.24E-06	1.26E-05	0.00E+00	0.00002	3.00	YES
Vinyl Acetate	0.00E+00	0.00E+00	1.25E-06	0.00E+00	0.00E+00	3.05E-05	0.00003	200	YES
Vinyl Chloride	1.30E-04	3.25E-05	0.00E+00	2.18E-04	8.48E-04	0.00E+00	0.00107	100	YES
Xylene	7.00E-04	1.75E-04	0.00E+00	1.18E-03	4.57E-03	0.00E+00	0.00575	100	YES
Acenaphthene	7.27E-07	1.82E-07	0.00E+00	1.22E-06	4.75E-06	0.00E+00	0.00001	--	YES
Acenaphthylene	4.10E-06	1.02E-06	0.00E+00	6.89E-06	2.68E-05	0.00E+00	0.00003	--	YES
Anthracene	1.24E-06	3.10E-07	0.00E+00	2.09E-06	8.11E-06	0.00E+00	0.00001	--	YES
Benzo(a)anthracene	8.89E-08	2.22E-08	0.00E+00	1.49E-07	5.81E-07	0.00E+00	0.00000	--	YES
Benzo(a)pyrene	1.07E-07	2.68E-08	0.00E+00	1.80E-07	7.01E-07	0.00E+00	0.00000	--	YES
Benzo(b)fluoranthene	8.89E-08	2.22E-08	0.00E+00	1.49E-07	5.81E-07	0.00E+00	0.00000	--	YES
Benzo(e)pyrene	5.61E-07	1.40E-07	0.00E+00	9.43E-07	3.67E-06	0.00E+00	0.00000	--	YES
Benzo(k)fluoranthene	1.29E-07	3.23E-08	0.00E+00	2.17E-07	8.44E-07	0.00E+00	0.00000	--	YES
2-Chloronapthalene	8.47E-08	2.12E-08	0.00E+00	1.42E-07	5.53E-07	0.00E+00	0.00000	--	YES
Chrysene	2.68E-07	6.70E-08	0.00E+00	4.51E-07	1.75E-06	0.00E+00	0.00000	--	YES
Dioxins	1.99E-10	4.98E-11	0.00E+00	3.35E-10	1.30E-09	0.00E+00	0.00000	--	YES
Dibenzo(a,h)anthracene	6.27E-08	1.57E-08	0.00E+00	1.05E-07	4.09E-07	0.00E+00	0.00000	--	YES
Fluorene	1.33E-06	3.33E-07	0.00E+00	2.24E-06	8.71E-06	0.00E+00	0.00001	--	YES
Fluoranthene	3.22E-06	8.06E-07	0.00E+00	5.42E-06	2.11E-05	0.00E+00	0.00003	--	YES
Furan	1.38E-10	3.45E-11	0.00E+00	2.32E-10	9.02E-10	0.00E+00	0.00000	--	YES
Indeno(1,2,3,c,d)pyrene	6.44E-08	1.61E-08	0.00E+00	1.08E-07	4.21E-07	0.00E+00	0.00000	--	YES
2-Methylnaphthalene	9.10E-06	2.28E-06	0.00E+00	1.53E-05	5.95E-05	0.00E+00	0.00007	--	YES
Perylene	4.64E-08	1.16E-08	0.00E+00	7.80E-08	3.03E-07	0.00E+00	0.00000	--	YES
Phenanthrene	1.86E-05	4.66E-06	0.00E+00	3.13E-05	1.22E-04	0.00E+00	0.00015	--	YES
Pyrene	6.97E-06	1.74E-06	0.00E+00	1.17E-05	4.55E-05	0.00E+00	0.00006	--	YES
2,3,7,8-Tetrachlorodibenzo-p-dioxin	4.47E-12	1.12E-12	0.00E+00	7.51E-12	2.92E-11	0.00E+00	0.00000	--	YES
Antimony	5.17E-06	1.29E-06	0.00E+00	8.69E-06	3.38E-05	0.00E+00	0.00004	--	YES
Arsenic	3.57E-05	8.94E-06	0.00E+00	6.01E-05	2.34E-04	0.00E+00	0.00029	--	YES
Barium	3.45E-06	8.64E-07	0.00E+00	5.80E-06	2.26E-05	0.00E+00	0.00003	NA	NA
Beryllium	1.49E-07	3.73E-08	0.00E+00	2.51E-07	9.75E-07	0.00E+00	0.00000	4.00E-03	YES
Cadmium	1.17E-05	2.91E-06	0.00E+00	1.96E-05	7.62E-05	0.00E+00	0.00010	5.56E-03	YES
Chromium	1.10E-06	2.75E-07	0.00E+00	1.85E-06	7.18E-06	0.00E+00	0.00001	--	YES
Chromium total	3.54E-05	8.85E-06	0.00E+00	5.95E-05	2.31E-04	0.00E+00	0.00029	--	YES
Chromium VI	9.95E-07	2.49E-07	0.00E+00	1.67E-06	6.50E-06	0.00E+00	0.00001	8.30E-05	YES
Cobalt	2.21E-06	5.53E-07	0.00E+00	3.72E-06	1.45E-05	0.00E+00	0.00002	--	YES
Copper	6.67E-07	1.67E-07	0.00E+00	1.12E-06	4.36E-06	0.00E+00	0.00001	NA	NA
Manganese	4.48E-04	1.12E-04	0.00E+00	7.52E-04	2.92E-03	0.00E+00	0.00368	0.050	YES
Mercury	3.09E-06	7.74E-07	0.00E+00	5.20E-06	2.02E-05	0.00E+00	0.00003	0.30	YES
Molybdenum	8.64E-07	2.16E-07	0.00E+00	1.45E-06	5.64E-06	0.00E+00	0.00001	NA	NA
Nickel	3.26E-05	8.15E-06	0.00E+00	5.48E-05	2.13E-04	0.00E+00	0.00027	--	YES
Phosphorus	3.48E-04	8.69E-05	0.00E+00	5.84E-04	2.27E-03	0.00E+00	0.00285	--	YES
Selenium	3.65E-06	9.12E-07	0.00E+00	6.13E-06	2.38E-05	0.00E+00	0.00003	--	YES
Vanadium	1.81E-06	4.51E-07	0.00E+00	3.03E-06	1.18E-05	0.00E+00	0.00001	NA	NA
Zinc	2.28E-05	5.69E-06	0.00E+00	3.83E-05	1.49E-04	0.00E+00	0.00019	NA	NA