STATEMENT OF BASIS

For the issuance of Air Permit # 0189-AOP-R8   AFIN: 55-00017

1. PERMITTING AUTHORITY:

Arkansas Department of Environmental Quality
5301 Northshore Drive
North Little Rock, Arkansas 72118-5317

2. APPLICANT:

Caddo River LLC
229 South Spur 8
Glenwood, Arkansas 71943

3. PERMIT WRITER:

Joseph Hurt

4. NAICS DESCRIPTION AND CODE:

NAICS Description: Sawmills
NAICS Code: 321113

5. ALL SUBMITTALS:

The following is a list of ALL permit applications included in this permit revision.

Date of Application	Type of Application (New, Renewal, Modification, Deminimis/Minor Mod, or Administrative Amendment)	Short Description of Any Changes That Would Be Considered New or Modified Emissions
9/27/2017	PSD Modification	Convert an existing Dry Kiln to a direct fired dual path kiln (SN-04)

6. REVIEWER'S NOTES:

With this permitting action, Caddo proposes to convert the existing Dry Kiln # 3 from a steam heated batch kiln to a direct fired dual path kiln, DPK # 3 (SN-04). The project also includes a new Kiln # 3 Fuel Bin as an insignificant activity, and adding a baghouse to the Planer Mill Shavings operation (SN-05). The facility also requested to remove the existing Wood Waste Boiler (SN-01), Dry Kiln # 1 (SN-02), Dry Kiln # 2 (SN-03), and Bark Bin (Insignificant activity A-13). The total permitted emission increases include 7.7 tpy of VOC, 0.0153 tpy of Lead, 8.92 tpy of total chargeable NCAPs, and 28.03 tpy of total other NCAPs. The total permitted emission decreases include 116.0 tpy of PM, 69.3 tpy of PM_{10}, 25.3 tpy of SO_2, 190.4 tpy of CO, 252.7 tpy of NO_x, and 19.03 tpy of Methanol.

7. COMPLIANCE STATUS:

The following summarizes the current compliance of the facility including active/pending enforcement actions and recent compliance activities and issues.

The facility was last inspected June 6, 2016. At the time of the inspection the facility was not in operation. A review of ECHO indicates that there are no formal/informal enforcement actions against the facility for the past five (5) years.

8. PSD/GHG APPLICABILITY:

a) Did the facility undergo PSD review in this permit (i.e., BACT, Modeling, etc.)? Y
If yes, were GHG emission increases significant? N

b) Is the facility categorized as a major source for PSD? Y

- *Single pollutant ≥ 100 tpy and on the list of 28 or single pollutant ≥ 250 tpy and not on list*

If yes for 8(b), explain why this permit modification is not PSD.

This submission addresses the Dry Kiln #4 (SN-04A) conversion project, the Planer Mill Shavings Bin Cyclone (SN-05) replacement project, and the Dry Kiln #3 (SN-04) conversion project. These proposed projects constitute physical changes and thus require review to determine if a major modification will occur as defined by 40 CFR §52.21(b)(2) as incorporated by §19.903(B) of ADEQ Regulation 19.

All three of the projects are independent projects as each project is financially and technically feasible without the other two. However, given the proximity in timing of the projects, Caddo River has conservatively evaluated all three projects as a single project in the analysis below.

Dry Kiln #4 (SN-04A) Conversion Project

In September 2016, Caddo River submitted an application to modify the existing Dry Kiln #3 (SN-04A) from a steam heated batch kiln to a direct fired dual path kiln (DPK) (SN-04A) and to add two new Group A-13 Insignificant Activities, the Kiln Fuel Shed (A-13), and the Kiln Fuel Bin (A-13).

This project was determined to be major modification pursuant to PSD for VOC only and ADEQ authorized construction for this project with air permit #0189-AOP-R6.

Planer Mill Shavings Bin Cyclone (SN-05) Replacement Project

The existing planer mill shaving bin cyclone was installed at the facility in 1981 and has not obtained the reliability required for the existing planer mill operations. The facility proposes to replace the existing planer mill shavings bin cyclone with a new cyclone followed by a baghouse. The new Planer Mill Shavings Bin Cyclone/Baghouse (SN-05) will better capture the transferred shaving emissions, resulting in a 5 tpy permitted decrease in PM and PM_{10} emissions.

Dry Kiln #3 (SN-04) Conversion Project
This project proposes to convert the existing Dry Kiln #3 from a steam heated batch kiln to a direct fired DPK, DPK #3 (SN-04). The proposed kiln conversion will increase the kiln's production capacity from 8 MBf/hr to 14 MBf/hr. The converted kiln will utilize green sawdust as fuel in a 36 MMBtu/hr burner. The project will also include a new Group A-13 Insignificant Activity, Kiln #3 Fuel Bin (A-13).

Projects Summary

As currently permitted, the mill's total annual permitted capacity of 185,000,000 board feet of lumber through the drying kilns (SN-02, SN-03, SN-04, and SN-04A) at Specific Condition 18 of Permit 0189-AOP-R7 is a "bottleneck" and constrains other unmodified emissions units at the mill. The facility requests to keep the mill's current federally enforceable permit limit of 185,000,000 board feet per 12 months for (SN-04 and SN-04A). The proposed project does not increase the full design capacity or maximum output rating of any unmodified emission units. Therefore, the ancillary sources (SN-05A, SN-17, A-13) are not included in this analysis.

Significant Emission Increase

According to 40 CFR §52.21 (a)(2)(iv)(b), the procedure for calculating whether a significant emission increase will occur depends on the type of emission units being modified. These procedures are outlined in §52.21 (a)(2)(iv)(c)-(f). As a change to an existing facility involving both new and modified emission units, the hybrid applicability test of §52.21 (a)(2)(iv)(f) is the relevant method for calculating the emission increase associated with the project. The hybrid test requires the addition of emission increases using the actual-to-projected-actual applicability test for existing emission units: DPK #4 (SN-04A) and abort stack (SN-19), the Planer Mill Shavings Bin Cyclone/Baghouse (SN-05), DPK #3 (SN-04) and abort stack (SN-18) and emission increases using the actual-to-potential test for the new emission units: Kiln No. 4 Fuel Bin (IA A-13), Kiln Fuel Shed (IA A-13), Kiln No. 3 Fuel Bin (IA A-13).

Actual-to-Projected-Actual Test
To determine the Baseline Actual Emissions (BAE), a facility is allowed to select any consecutive 24-month period over the ten years preceding commencement of construction or the date a complete permit application is received for the project, whichever date is earlier. For the purposes of this review, the period of July 2008 through June 2010 was selected as the baseline period for each NSR pollutant. The facility wide kiln production (bf/mo) and planer mill shavings bin throughput ($ton_{shavings}$/mo) are based on the information from the semi-annual

monitoring reports submitted to ADEQ during the lookback period. The baseline production through Dry Kiln #3 and Dry Kiln #4 is calculated based on production capacity of the kilns during the baseline period. Detailed PTE calculations can be found in the calculations section of the application.

Actual-to-Projected-actual test (ATPA): Modified and Debottlenecked Sources									
Source	PM	PM_{10}	$PM_{2.5}$	VOC	SO_2	NOx	CO	Lead	CO_2e
DPK#3 (SN-04) BAE	0	0	0	0	--	--	--	--	--
DPK#4 (SN-04A) BAE	0	0	0	0	--	--	--	--	--
DPK #3 and #4 Abort stacks BAE	0	0	0	0	0	0	0	0	0
Planer Mill Shavings Bin Cyclone (SN-05) BAE	0.45	0.45	0.45	--	--	--	--	--	--
Total ATPA BAE	0.45	0.45	0.45	0	0	0	0	0	0
DPKs #3 (SN-04) and #4 (SN-04A) PTE	12.95	9.62	9.16	351.50	7.88	25.90	80.42	0.02	66,085
DPK #3, #4 Abort Stacks PTE	0.72	0.63	0.54	0.04	0.06	0.50	0.374	0.0001	103
Planer Mill Shavings Bin Cyclone/Baghouse (SN-05) PTE	0.45	0.45	0.45	--	--	--	--	--	--
Total PAE	14.12	10.70	10.15	351.54	7.95	26.40	80.79	0.02	66,188
Total ATPA Debottlenecked Sources Emission Increase	**13.67**	**10.25**	**9.70**	**351.54**	**7.95**	**26.40**	**80.79**	**0.02**	**66,188**

Actual-to-Potential Test
For the initial permitting of a new emission source, the facility is required to set the BAE equal to 0 tpy. Detailed PTE calculations can be found in the calculations section of the application.

Actual-to-Potential test (ATP): New Sources									
Source	PM	PM_{10}	$PM_{2.5}$	VOC	SO_2	NOx	CO	Lead	CO_2e
Kiln Fuel Shed (IA A-13) BAE	0	0	0	0	--	--	--	--	--
Kiln #4 Fuel Bin (IA A-13) BAE	0	0	0	0	--	--	--	--	--
Kiln #3 Fuel Bin (IA A-13) BAE	0	0	0	0	--	--	--	--	--
Total ATP BAE	0	0	0	0	0	0	0	0	0

Actual-to-Potential test (ATP): New Sources									
Source	PM	PM_{10}	$PM_{2.5}$	VOC	SO_2	NOx	CO	Lead	CO_2e
Kiln Fuel Shed (IA A-13) PTE	0.116	0.009	0.009	--	--	--	--	--	--
Kiln #4 Fuel Bin (IA A-13) PTE	0.058	0.005	0.005	--	--	--	--	--	--
Kiln #3 Fuel Bin (IA A-13) PTE	0.058	0.005	0.005	--	--	--	--	--	--
Total PTE	0.232	0.019	0.019	0	0	0	0	0	0
Total ATP Debottlenecked Sources Emission Increase	**0.232**	**0.019**	**0.019**	**0**	**0**	**0**	**0**	**0**	**0**

Hybrid Test
The total increases from both the actual-to-projected-actual test and the actual-to-potential test are summed together to determine the total project increases. These increases are compared against the SER for each NSR pollutant.

Hybrid Test: Summary									
Source	PM	PM_{10}	$PM_{2.5}$	VOC	SO_2	NOx	CO	Lead	CO_2e
Total ATPA Test Emission Increase	13.67	10.25	9.70	351.54	7.95	26.40	80.79	0.02	66,188
Total ATP New Source Emission Increase	0.232	0.019	0.019	0	0	0	0	0	0
Hybrid Test Total Emission Increase	13.902	10.269	9.719	351.54	7.95	26.40	80.79	0.02	66,188
PSD Significant Emission Rate (SER)	25	15	10	40	40	40	100	0.6	75,000
Total ATP New Sources Emission Increase	**55.6%**	**68.5%**	**97.2%**	**879%**	**20%**	**66%**	**80.8%**	**2.5%**	**88.3%**

As shown above, the proposed project exceeds the SER and has a significant emission increase for Volatile Organic Compounds (VOC) only. If contemporaneous emissions decreases are available, emission netting can be performed to determine if the overall net emission increase for the pollutant is below their respective SERs (considering both contemporaneous and creditable increases and decreases). However, Caddo River has elected not perform an emission netting review. Therefore, the evaluation of the significant emission increase as outlined above is sufficient.

As Caddo River is subject to PSD for VOC, review of the Best Available Control Technology (BACT) for the control of VOC was completed as required by Federal PSD regulation, 40 CFR

§52.21(j). The BACT summary outlines the control technology analysis completed to ensure the application of BACT for VOC.

Ambient Air Impact Analysis

Additionally, the PSD required impact analysis of the ambient air impacts associated with the project was completed. The purpose of the analysis is to demonstrate that the emissions from the proposed project, in conjunction with applicable emissions increases and decreases from existing and "proposed" new off-site sources, will neither cause nor contribute to a violation of the National Ambient Air Quality Standard (NAAQS). There are separate increment standards for Class I areas (federally protected lands) and Class II areas (all other areas). A PSD impact analysis for this project is required only for ozone of which VOC is a precursor, not for VOC.

Ozone Impact Analysis

VOC and NO_x are recognized as a precursors to ozone, which has an established NAAQS. Since the project has a significant emissions increase of VOC, an evaluation in terms of VOC effect on attainment status of ozone is required. Pursuant to 40 CFR §52.21(m), air quality monitoring must be conducted for each pollutant potentially emitted at a significant emission rate by the proposed source or modification. Therefore, a pre-construction ambient monitoring analysis would be required for ozone emissions, and monitoring data would be required to be submitted as part of the application. As demonstrated below, the pre-construction monitoring is fulfilled with the existing monitoring stations operated by the Arkansas Department of Environmental Quality (ADEQ), as the monitoring is representative of the conditions at the facility.

The two ozone monitoring sites that best represent the ozone concentration in the region surrounding the Caddo River facility are the Caddo Valley station (05-019-9991) and the Eagle Mountain station (05-113-0003). These monitors were identified based on the proximity to the facility and the similarity of the surrounding air shed in the region of the monitoring station to Caddo River. Note that both Little Rock (126 - 130 km) and Shreveport (187 - 200 km) metropolitan areas have multiple monitors, but these monitors' ozone concentrations are driven by their urban air shed and are not representative of the rural nature of Caddo River. The 4th high daily maximum 8-hour concentration averaged over 3 years (2014-2016) design value for each monitor location and the NAAQS primary standard are shown in the following table as obtained from EPA Air Data Ozone Design Values, (https://www.epa.gov/air-trends/air-qualitydesign-values#report).

Location	County	Distance (km)	2014 – 2016 Design Value (ppm)	NAAQS Primary Standard (ppm)
Caddo Valley	Clark County, AR	46	0.058	0.070
Eagle Mountain	Polk County, AR	54	0.062	

The increase in ozone formation from the proposed kiln conversion at the Caddo River facility is expected to be insignificant. The total potential emission increases associated with the project is 351.54 tpy VOC and 26.4 tpy NO_x. This represents a total emitted VOC increase of 1.7% over a

2014 baseline (20,616 tpy) and a NO_x increase of 5.1% over a 2014 baseline (522 tpy) from Pike County as obtained from EPA Air Data County Emissions Map, 2014 (http://www.epa.gov/air/emissions/). Only accounting for the baseline emissions from Pike County, the ratio of VOC to NO_x is 39.5:1. This approach is a conservative estimation of the VOC to NO_x ratio as it does not account for the less industrially developed surrounding counties and other regional impacts. The proposed project will have a negligible impact on this ratio. Based on the Pike County area's low concentration of ozone, attainment status, and continued declining background concentration (in decline from 2006 to 2016), along with the Caddo River projected VOC emissions presenting a minor increase in total VOC emissions, there is no expected effect on the attainment status of the region.

Additional Impacts Analysis

The potential impact of the proposed project's air pollutant emissions associated with construction and related growth are presented in this section as well as assessment of the impact on soil, vegetation, and visibility. A qualitative approach has been taken to these analyses for areas which do not have well established analytical techniques.

Construction and Growth Impacts

The proposed project has little effect on construction and growth impacts. During construction, Caddo River will minimize the impact on the surrounding environment primarily focusing on reduction of the formation of fugitive particles.

The construction and operation from the project at Caddo River should not result in any noticeable residential growth in the area. There is expected gradual commercial growth in the area; however, this growth is not expected to be directly due to the proposed project at the Caddo River facility.

Impact on Soil and Vegetation

The effects of air pollution on vegetation can be classified into three distinct categories: acute, chronic, and long-term. Acute effects are those resulting from a short exposure (< 1 month) to high concentrations. Chronic effects refer to those developed from exposure to a threshold level of pollutant over months or years. Long-term effects refer to abnormal changes in ecosystems and subtle physiological alterations in organisms. Both acute and chronic effects can be the result of an air borne pollutant acting directly on an organism while long-term effects can be indirectly caused by secondary effects such as changes in soil pH.

The secondary NAAQS are intended to protect the public welfare from adverse effects of airborne pollutants. This protection extends to soil and vegetation. Predicted concentrations of VOC resulting from the kiln project will not significantly impact ozone concentration and will not cause or contribute to violation of the NAAQS. Because the NAAQS were established to protect soil and vegetation, no significant impacts on the soil and vegetation are expected due to the proposed project.

In addition to BACT, Caddo River will utilize good working practices for equipment associated with the proposed kiln project. The combination of BACT, good work practices, and minimal air quality impacts will result in minimal impact on the soil and vegetation in and around the site. Analysis of Endangered Species

An air quality impact analysis has been performed for VOC. The proposed project will result in potential impacts below the secondary NAAQS. It is possible that some endangered species may be present in Pike County; however, through compliance with the NAAQS, Caddo River does not expect to have an impact on any endangered species. According to the U.S. Fish and Wildlife Service, the currently endangered species possibly located in Pike County are two species of clams, the Pink Mucket and Pondberry.

In addition to BACT, Caddo River will utilize good working practices for equipment associated with the proposed project. The combination of BACT, good work practices, and minimal air quality impacts will result in the proposed project having minimal impact on endangered species potentially near the site.

Impact on Visibility (Regional Haze Analysis)

One component of the PSD regulations includes the protection of air quality and air quality related values (AQRV) at potentially affected nearby Class I areas. Assessment of the potential impact to visibility is required within 300 km of a Class I area. The nearest Class I areas to Caddo River are the Caney Creek Wilderness Area at about 40 km and the Upper Buffalo Wilderness area at about 160 km. Based on the Federal Land Managers Air Quality Related Values Work Group (FLAG) 2010 Report, Class I evaluations for visibility are not required for a facility if the Q/D ratio for the project is less than or equal to 10 (as long as the Class I area is beyond 50 km from the site). The Q in the Q/D equation is equal to 47.37 tpy and is based on the increase in all visibility affecting pollutants (NO_x, SO_2, PM, and H_2SO_4) calculated on the basis of maximum 24-hr emissions in tons/yr resulting from the project. The D in the equation is based on the distance (km) from the site to the Class I area. The following table shows that none of the Class I areas are above the screening value of 10.

Class I Area	Distance from Facility (km)	Q/D
Upper Buffalo Wilderness Area	164	0.3
Caney Creek Wilderness Area	42	1.2
Mingo Wilderness Area	417	0.2
Hercules-Glades Wilderness Area	263	0.2

The Q/D equation is not valid for sites within 50 km, which includes the Caney Creek Wilderness Area. Therefore, a Visibility analysis is required. EPA prescribes the use of its *Workbook for Plume Visual Impact Screening and Analysis* for conducting a visibility impairment analysis. EPA outlines three levels of screening procedures. If the criteria for the first, most conservative, screening level are met, no further analysis is required.

The VISCREEN model is recommended for the first level (Level 1) screen. If predicted values from the VISCREEN model are greater than the standardized screening values, the emissions are judged to have the potential for visibility impairment. If the potential for visibility impairment is indicated, the next level analysis, Level 2 analysis, is required.

The VISCREEN model primarily considers NO_2 and particulate matter emission increases associated with a modification.

Modeled Inputs

Emission rates entered into VISCREEN should reflect the maximum short-term rates expected during the course of a year. Therefore, the modeled emissions rates were based on the requested hourly emission rates for the project permitted sources (SN-04, SN-04A, SN-05, SN-18, and SN-19). The hourly rates for the insignificant activities (Fuel Shed, #3 Kiln Fuel Bin, and #4 Kiln Fuel Bin) were estimated assuming annual emissions divided by 8,760 hours per a year. Emissions of SO_2 are not required as input to VISCREEN and the emission rates of the three species (primary NO_2, soot, and sulfate) are assumed as zero.

Level-1 Screening Results

The following section shows the summary results of the Visual Effects Screening (VISCREEN) analysis for the proposed project at Caddo River Lumber to demonstrate compliance with the Impact on Visibility (Regional Haze Analysis) required for PSD projects within 300 miles of a Class I area. The Caddo River Lumber project passes the Level-1 test with a plum ΔE ranging between 0.047 and 0.362, or approximately 2.4% to 14.8% of the screening criteria of 2.00. The Level-1 test resulted in a maximum contrast of 0.004, which is approximately 8% of the criteria of 0.05. Since the visibility impacts are below the screening criteria, it is concluded that the project will have an insignificant effect on visibility in any Class I area. Therefore, no further analysis is required.

Best Available Control Technology (BACT) Analysis

Under PSD rules contained in 40 CFR §52.21(j), the facility must apply Best Available Control Technology (BACT) on each new or modified emissions unit for each pollutant that would emit in a significant net emissions increase. BACT is defined in 40 CFR §52.21(b)(12) as follows:

> Best Available Control Technology means an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under 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. 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 has been provided for each new or modified emission unit for each pollutant exceeding an applicable Prevention of Significant Deterioration (PSD) Significant Emission Rate (SER), which is volatile organic compounds (VOC) for the proposed project.

BACT Methodology

In a memorandum dated December 1, 1987, the EPA stated its preference for a "top-down" analysis. After determining if any New Source Performance Standards (NSPS) is applicable, the first step in this approach is to determine, for the emission unit in question, the most stringent control available for a similar or identical source or source category. If it can be shown that this level of control is technically, environmentally, or economically infeasible for the unit in question, then the next most stringent level of control is determined and similarly evaluated. This process continues until the BACT level under consideration cannot be eliminated by any substantial or unique technical, environmental, or economical objections. Presented below are the five basic steps of a top-down BACT review as identified by the EPA.

Step 1 - Identify All Control Technologies

Available control technologies are identified for each emission unit in question. The following methods are used to identify potential technologies:

1. Researching the Reasonable Available Control Technology (RACT)/BACT/Lowest, Achievable Emission Rate (LAER) Clearinghouse (RBLC) database,
2. Surveying regulatory agencies,
3. Drawing from previous engineering experience,
4. Surveying air pollution control equipment vendors, and
5. Surveying available literature.

Step 2 - Eliminate Technically Infeasible Options

After the identification of control options, an analysis is conducted to eliminate technically infeasible options. A control option is eliminated from consideration if there are process-specific conditions that prohibit the implementation of the control technology or if the highest control efficiency of the option would result in an emission level that is higher than any applicable regulatory limits, such as NSPS.

Step 3 - Rank Remaining 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 offer equivalent control, ranking based on control efficiency is not required.

Step 4 - Evaluate Most Effective Controls and Document Results

Beginning with the most efficient control option in the ranking, detailed economic, energy, and environmental impact evaluations are performed. If a control option is determined to be economically feasible without adverse energy or environmental impacts, it is not necessary to evaluate the remaining options with lower control efficiencies.

The economic evaluation centers on the cost effectiveness of the control option. Cost of installing and operating control technologies are estimated and annualized following the methodologies outlined in EPA's OAQPS Control Cost Manual (CCM) and other industry resources.

Step 5 - Select BACT

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.

The EPA has consistently interpreted the statutory and regulatory BACT definitions as containing two core requirements that the agency believes must be met by any BACT determinations, regardless of whether the "top-down" approach is used. First, the BACT analysis must include consideration of the most stringent available control technologies, i.e. those which provide the "maximum degree of emission reduction". Second, any decision to require a lesser degree of emission reduction must be justified by an objective analysis of "energy, environmental, and economic impacts".

The potential increase in VOC emissions resulting from the Caddo River LLC (Caddo River) project will exceed the PSD SER. Therefore, VOC emissions from the modified emitting sources (SN-04, SN-04A, SN-18, and SN-19) are subject to a BACT analysis. The other emission units associated with the project do not emit VOC.

BACT Volatile Organic Compound Emissions Analysis: DPK #3 (SN-04, SN-18) & DPK #4 (SN-04A, SN-19)

During the lumber drying process, organic compounds present in the wood will be released. These are organic compounds that are in gaseous form at the elevated temperature of the wood, and are comprised largely of lower molecular weight volatiles, higher molecular weight resin and fatty acids. The type and amounts of compounds released will depend on several factors related to the drying process, including the kiln temperature, the surface area of the wood material relative to its mass, initial moisture content, and the amount of moisture removed from the material. It also varies depending on the wood species. An abort stack for DPK #3 (SN-18) and DPK #4 (SN-19), is necessary during startup or for unplanned shutdown of the gasifier/burner.

Step 1: The first of the five steps in the top-down BACT analysis procedure is to identify control technologies for each pollutant. The EPA RACT/BACT/LAER Clearinghouse (RBLC) was searched for lumber drying kilns (process type 30.8) permitted after January 1, 2006. The search was further refined to address only VOC for this analysis. The search of lumber drying kilns was then narrowed to match units similar to Caddo River's kilns (i.e. direct fired kilns). The results of this search are included as RBLC results. The range of VOC limits based on throughput was between 2.49 lb/MBF and 4.7 lb/MBF. In cases where BACT was specified, it was determined to be proper maintenance & operations such as "work practice standards", "proper maintenance and operation", and "proper temperature and process management; drying to appropriate moisture content" with no additional/add-on control.

A search was also completed of VOC control technologies for other processes that may be applied to a dry lumber kiln. Based on the research described above and other engineering experience, control technologies evaluated are:

- Regenerative Thermal Oxidation
- Regenerative Catalytic Oxidation
- Carbon Adsorption
- Condensation
- Biofiltration
- Wet Scrubbing
- Proper Maintenance & Operation

Regenerative Thermal Oxidation: Regenerative Thermal Oxidizer (RTO) units use beds of ceramic pieces to recover and store heat. A VOC-laden air stream passes through a heated ceramic bed before entering a combustion chamber. In the combustion chamber, the VOC laden gas stream is heated by auxiliary fuel (natural gas) combustion to a final oxidation temperature typically between 1,400°F to 1,500°F and maintained at this temperature to achieve maximum VOC destruction. The exhaust gases from the combustion chamber are used to heat another ceramic bed. Periodically, the flow is reversed so the bed that was being heated is now used to preheat the VOC-laden gas stream. Usually, there are three or more beds that are continually cycled. Destruction efficiency of VOC depends upon the design criteria (i.e. chamber temperature, residence time, inlet VOC concentration, compound type, and degree of mixing). Typical VOC destructive efficiency ranges from 95 to 99% for RTO systems depending on system requirements and characteristics of the contaminated stream. Lower control efficiencies are generally associated with lower concentration flows.

Regenerative Catalytic Oxidation: Regenerative catalytic oxidizer (RCO) units function similar to RTOs, except that the heat recovery beds in RCOs contain catalytic media. The catalyst accelerates the rate of VOC oxidation and allows for VOC destruction at lower temperatures than in an RTO, typically 600°F to 1,000°F, which reduces auxiliary fuel usage. Typical VOC destructive efficiency ranges from 90 to 99% for RCO systems. However, this also depends on system requirements and characteristics of the contaminated stream.

Carbon Adsorption: The core component of a carbon adsorption system is an activated carbon bed contained in a steel vessel. The VOC-laden gases pass through the carbon bed and the VOCs are adsorbed on the activated carbon. The cleaned gas is discharged to the atmosphere. The spent carbon is regenerated either with an onsite regeneration facility or by an off-site activated carbon supplier. Steam is used to replace adsorbed organic compounds at high temperatures to regenerate the spent carbon. At proper operating conditions, carbon adsorption systems have demonstrated VOC reduction efficiencies of approximately 90 to 95%.

Condensation: Condensation removes vaporous contaminants from the gas stream by cooling it and converting the vapor into a liquid. In some instances, control of VOC can be satisfactorily achieved entirely by condensation. However, most applications require additional control methods. In such cases, the use of a condensation process reduces the concentration load on downstream control equipment. The two most common type of condensation devices are contact or barometric condensers and surface condensers.

Biofiltration: Biofiltration is an air pollution control technology in which off-gases containing biodegradable organic compounds are vented, under controlled temperature and humidity through a special filter material containing microorganisms. As exhaust gases pass through the biofilter, VOC is absorbed on the filter material, and the microorganisms break down the compounds and transform them into CO_2 and H_2O with varying efficiency.

Wet Scrubbing: Scrubbing of gas or vapor pollutants from a gas stream is usually accomplished in a packed column (or other type of column) where pollutants are absorbed by counter-current flow of a scrubbing liquid. A VOC gas stream with relatively high water solubility is required in order for the wet scrubber to be effective.

Proper Maintenance and Operation: Proper maintenance and operation of lumber drying kilns can effectively reduce VOC emissions. Proper drying schedule and temperature should be selected based on moisture content and manufacturer’s specifications. Routine maintenance should also be completed on all kilns based on manufacturer’s recommendations.

Step 2: The second of the five steps in the top-down BACT analysis procedure is to eliminate technically infeasible control technologies. The table below provides a summary of the feasibility of the control technologies identified in Step 1.

Pollutant	Control Technology	Feasibility
VOC	Carbon Adsorption	Infeasible
	Regenerative Thermal Oxidation	Infeasible
	Regenerative Catalytic Oxidation	Infeasible
	Condensation	Infeasible
	Biofiltration	Infeasible
	Wet Scrubbing	Infeasible
	Proper Maintenance and Operation	Feasible

The following sections provide brief explanations on the further infeasibility of the VOC control technologies for the kilns.

Regenerative Thermal Oxidation: Due to the high moisture content and low exit temperature in the exhaust stream, RTO would be technically infeasible for the kilns.

Regenerative Catalytic Oxidation: Although regenerative catalytic oxidizers can operate at a lower temperature than thermal oxidizers, the temperature of the exit stream from lumber drying kilns is still not high enough for optimal function of the catalytic oxidizer. Furthermore, loss of catalytic activity occurs due to fouling by particulate matter or suppression or poisoning from other contaminants in the waste gas stream. In order to effectively use catalytic oxidation, the contaminants must be removed from the waste gas stream. Removing these contaminants would require additional control equipment which adds greatly to the cost of the system. Catalysts must periodically be replaced due to thermal aging, adding significantly to the cost of operating the unit in addition to creating solid waste. Catalytic oxidation has never been applied to a lumber drying kiln. Regenerative catalytic oxidation is not considered feasible for the kilns.

Carbon Adsorption: Carbon adsorption is not practical because of the high moisture content of the exhaust stream from lumber drying kilns. At high moisture content, water molecules begin to compete with the hydrocarbon molecules for active adsorption sites. This reduces the capacity and the efficiency of the adsorption system. For the reason stated above and because there are currently no known lumber drying kilns that are equipped with carbon adsorption system, the use of carbon adsorption systems for the kilns is not considered technically feasible.

Condensation: Condensation is only effective when the gas steam can be cooled to a temperature where VOC constituent condenses as a liquid out of the gas stream. To condense terpenes, the primary constituent of lumber kiln VOC emissions, the temperature would need to be reduced to -40°F. At this temperature, freezing of the water vapor would generate ice, causing unacceptable plugging of the unit. Condensation is not technically feasible for the kilns.

Biofiltration: The most important variable affecting bioreactor operations is temperature. Most microorganisms can survive and flourish in a temperature range of 60 to 105°F (30 to 41°C). The exiting exhaust temperature of the lumber kilns are approximately 140 - 200°F. Furthermore, the VOC emissions from the kilns is primarily terpenes. Terpenes are highly viscous and would foul the biofilter. Biofiltration is not technically feasible for the kilns.

Wet Scrubbing: The VOC emissions from the kiln are primarily terpenes. Terpenes are not highly soluble. Moreover, they are highly viscous and would foul the absorption media of a wet scrubber. Wet scrubbing is not technically feasible for the kilns.

Step 3: The only control technology considered technically feasible and identified in the RBLC is proper maintenance and operation; ranking is not necessary.

Step 4: Proper maintenance and operation is the only remaining technology/method for this application. No control technology is currently feasible for lumber drying kilns beyond proper maintenance and operation. The RBLC search shows other emission factors utilized in permitting emission limits of VOC; there is no information to determine that these factors can be routinely "achieved in practice".

Step 5: The fifth and final step in the top-down BACT analysis procedure is the selection of the BACT level of control for each pollutant. Per EPA guidance, BACT is the most effective control technology not eliminated by the previous four steps of the analysis. Proper maintenance and operation is the only remaining technology for the reduction of VOC emissions from DPK #3 (SN-04) and DPK #4 (SN-04A) and their respective abort stacks (SN-18 and SN-19). The species of wood dried within a kiln has a distinct impact on the resulting VOC emissions. The emission factor proposed for the VOC as C emission limits (3.8 lb/MBf) is accepted by the Arkansas Department of Environmental Quality (ADEQ) for permitting similarly designed direct fired continuous kilns drying similar wood species. Therefore Caddo River proposes it as BACT. Furthermore, startup and shutdown events will be minimized as much as practical.

9. SOURCE AND POLLUTANT SPECIFIC REGULATORY APPLICABILITY:

Source	Pollutant	Regulation (NSPS, NESHAP or PSD)
04 & 04A	VOC HAPs	40 C.F.R. § 52.21 (PSD) 40 C.F.R. § 63, Subpart DDDD*

* Initial notification only.

10. PERMIT SHIELD – TITLE V PERMITS ONLY:

Did the facility request a permit shield in this application? N
(Note - permit shields are not allowed to be added, but existing ones can remain, for minor modification applications or any Regulation 18 requirement.)

If yes, are applicable requirements included and specifically identified in the permit? N/A
If not, explain why.

For any requested inapplicable regulation in the permit shield, explain the reason why it is not applicable in the table below.

Source	Inapplicable Regulation	Reason
N/A		

11. EMISSION CHANGES AND FEE CALCULATION:

See emission change and fee calculation spreadsheet in Appendix A.

12. AMBIENT AIR EVALUATIONS:

Include the results for any ambient air evaluations or modeling. Include NSR/PSD permits and permits that require an evaluation in accordance with revisions to the

Arkansas State Implementation Plan, National Ambient Air Quality Standards, Infrastructure SIPs and NAAQS SIP per Ark Code Ann. § 8-4-318, dated March 2017 and the ADEQ Air Permit Screening Modeling Instructions.

a) Criteria Pollutants

VOC was the only pollutant which triggered PSD review. There is currently no recommended or regulatory approved model for evaluating the offsite impacts from VOC. A qualitative evaluation of the offsite impacts is included in the permit.

b) Non-Criteria Pollutants:

The non-criteria pollutants listed below were evaluated. Based on Department procedures for review of non-criteria pollutants, emissions of all other non-criteria pollutants are below thresholds of concern.

1st Tier Screening (PAER)

Estimated hourly emissions from the following sources were compared to the Presumptively Acceptable Emission Rate (PAER) for each compound. The Department has deemed the PAER to be the product, in lb/hr, of 0.11 and the Threshold Limit Value (mg/m^3), as listed by the American Conference of Governmental Industrial Hygienists (ACGIH).

Pollutant	TLV (mg/m^3)	PAER (lb/hr) = 0.11 × TLV	Proposed lb/hr	Pass?
Beryllium	5.00E-05	5.5E-06	9.93E-05	N
Manganese	0.2	2.2E-02	1.44E-01	N

2nd Tier Screening (PAIL)

AERMOD air dispersion modeling was performed on the estimated hourly emissions from the following sources, in order to predict ambient concentrations beyond the property boundary. The Presumptively Acceptable Impact Level (PAIL) for each compound has been deemed by the Department to be one one-hundredth of the Threshold Limit Value as listed by the ACGIH.

Pollutant	PAIL ($\mu g/m^3$) = 1/100 of Threshold Limit Value	Modeled Concentration ($\mu g/m^3$)	Pass?
Beryllium	5.0E-04	3.8E-04	YES
Manganese	2.0	0.54675	YES

13. CALCULATIONS:

SN	Emission Factor Source	Emission Factor (lb/ton, lb/hr, etc.)	Control Equipment	Control Equipment Efficiency	Comments
04 & 04A	Wood Drying NCASI and NCDENR Wood Kiln Memo	0.14 lb_{PM}/MBF 3.8 lb_{VOC}/MBF	None	N/A	
	EPA memo, "Development of a Provisional Emissions Calculations Tool for Inclusion in the PCWP ICR" dated June 30, 2017	0.18 $lb_{Methanol}$/MBF 0.01 lb_{Phenol}/MBF 0.065 $lb_{Formaldehyde}$/MBF 0.04 $lb_{Acetaldehyde}$/MBF 0.004 $lb_{Acrolein}$/MBF			
	Combustion AP-42 Tables 1.6-3 and 1.6-4	0.03 lb_{SO2}/MMBtu 0.22 lb_{NOX}/MMBtu 0.255 lb_{CO}/MMBtu	None	N/A	
05	AP-42, 10.4	PM/PM_{10}: 0.03 gr/ft^3	Baghouse	99%	
05A	ADEQ memo	0.0022 $lb_{PM/PM10}$/ton	None	N/A	
17	AP-42, 13.2	sL=2.98 g/m^3 W= 27.5 tons P=105 N=365	None	N/A	*Paved and gravel roads*
18 & 19	AP-42, Section 1.6 (biomass) AP-42, Table 1.3-1 (diesel)	lb/MMBtu: 0.33 PM 0.29 PM_{10} 0.03 SO_2 0.22 NO_x 0.17 CO 0.017 VOC lb/1000 gal: 3.3 PM 1.0 PM_{10} 7.1 SO_2 20 NO_x 5 CO 0.252 VOC	None	N/A	Each abort stack: 240 hours of operation annually 1,200 gallons of diesel annual 2,000 lb of wood per hour

14. TESTING REQUIREMENTS:

The permit requires testing of the following sources.

SN	Pollutants	Test Method	Test Interval	Justification*
04	PM	5 with 202	Initial Test	Department Guidance
	CO	10	Initial Test	

* After reviewing the emission factors for particulate matter and carbon monoxide, the Department has concerns about the level of emissions that may be emitted by the gasifier associated with the dual path kiln. The carbon monoxide emission factor 0.255 lb/MMBtu was derived by adding a 50% safety factor to an AP-42 emission factor (0.17 lb/MMBtu) for fluidized bed combustion (FBC) boiler. A review of the AP-42 data indicates that the maximum emissions observed from a FBC are 0.943 lb/MMBtu. If the maximum CO emission factor was used, then this project would be a major project for carbon monoxide. The particulate matter emission factor of 0.14 lb/MBF is an average of three (3) test runs. The highest run indicates that a kiln could emit 0.267 lb/MBF, which would make this project a major project for particulate matter.

15. MONITORING OR CEMS:

The permittee must monitor the following parameters with CEMS or other monitoring equipment (temperature, pressure differential, etc.)

SN	Parameter or Pollutant to be Monitored	Method (CEM, Pressure Gauge, etc.)	Frequency	Report (Y/N)
N/A				

16. RECORDKEEPING REQUIREMENTS:

The following are items (such as throughput, fuel usage, VOC content, etc.) that must be tracked and recorded.

SN	Recorded Item	Permit Limit	Frequency	Report (Y/N)
04, 04A, 18, & 19	Lumber Dried	185,000,000 board feet per rolling 12-months	Monthly	Y
18	Diesel usage	1,200 gallons per rolling 12-months	Monthly	Y
	Wood usage	2000 lb of wood per hour	Monthly	Y
	Hours of operation	240 hours per rolling 12-months	Monthly	Y
19	Diesel usage	1,200 gallons per rolling 12-months	Monthly	Y

SN	Recorded Item	Permit Limit	Frequency	Report (Y/N)
	Wood usage	2000 lb of wood per hour	Monthly	Y
	Hours of operation	240 hours per rolling 12-months	Monthly	Y
05A	Wood residue loadout	50,000 tons per rolling 12-months	Monthly	Y
05A	Opacity	20%	Each load	N

17. OPACITY:

SN	Opacity	Justification for limit	Compliance Mechanism
04 & 04A	20%	Reg.19.503	Weekly observations
05	5%	Reg.18.501	Weekly observations
05A	20%	Reg.19.503	Observations during loadout
18 & 19	20%	Reg.19.503	Observations during startup

18. DELETED CONDITIONS:

Former SC	Justification for removal
1 - 15	Wood waste boiler (SN-01) has been removed.
16, 16a, 17, 19	The existing dry kilns will be removed or converted to the new DPK # 3.

19. GROUP A INSIGNIFICANT ACTIVITIES:

The following is a list of Insignificant Activities including revisions by this permit.

Source Name	Group A Category	Emissions (tpy)		
		PM/PM_{10}	PM_{10}	$PM_{2.5}$
Chip Bin	A-13	0.18	0.18	0.18
Sawdust Bin	A-13	0.05	0.05	0.05
Bark Pile	A-13	0.39	0.20	0.03
Kiln Fuel Shed	A-13	0.12	0.01	0.01
Kiln # 3 Fuel Bin	A-13	0.06	0.005	0.005
Kiln # 4 Fuel Bin	A-13	0.06	0.005	0.005
Chip Conveyance	A-13	0.054	0.025	0.004
Bark Conveyance	A-13	0.134	0.064	0.010
Sawdust Conveyance	A-13	0.011	0.005	0.001

Source Name	Group A Category	Emissions (tpy)		
		PM/PM_{10}	PM_{10}	$PM_{2.5}$
Shavings Conveyance	A-13	0.054	0.025	0.004
Total		1.113	0.569	0.299

20. VOIDED, SUPERSEDED, OR SUBSUMED PERMITS:

The following is a list of all active permits voided/superseded/subsumed by the issuance of this permit.

Permit #
0189-AOP-R7

APPENDIX A – EMISSION CHANGES AND FEE CALCULATION

Fee Calculation for Major Source

Revised 03-11-16

Facility Name: Caddo River LLC
Permit Number: 0189-AOP-R8
AFIN: 55-00017

$/ton factor	23.93	Annual Chargeable Emissions (tpy)	450.92
Permit Type	Modification	Permit Fee $	1000

Minor Modification Fee $	500
Minimum Modification Fee $	1000
Renewal with Minor Modification $	500
Check if Facility Holds an Active Minor Source or Minor Source General Permit	☐
If Hold Active Permit, Amt of Last Annual Air Permit Invoice $	0
Total Permit Fee Chargeable Emissions (tpy)	-377.38
Initial Title V Permit Fee Chargeable Emissions (tpy)	

HAPs not included in VOC or PM: *Chlorine, Hydrazine, HCl, HF, Methyl Chloroform, Methylene Chloride, Phosphine, Tetrachloroethylene, Titanium Tetrachloride*

Air Contaminants: *All air contaminants are chargeable unless they are included in other totals (e.g., H2SO4 in condensible PM, H2S in TRS, etc.)*

Pollutant (tpy)	Check if Chargeable Emission	Old Permit	New Permit	Change in Emissions	Permit Fee Chargeable Emissions	Annual Chargeable Emissions
PM		171.7	55.7	-116	-116	55.7
PM_{10}		88.8	19.5	-69.3		
$PM_{2.5}$		0	0	0		
SO_2		33.4	8.1	-25.3	-25.3	8.1
VOC		344	351.7	7.7	7.7	351.7
CO		271.3	80.9	-190.4		
NO_X		279.2	26.5	-252.7	-252.7	26.5
Hydrogen Chloride	☐	25.1	0	-25.1		
Methanol	☐	35.68	16.65	-19.03		
Total chargeable NCAPs	☐	7.96	0	-7.96		
Total other NCAPs	☐	42.69	0	-42.69		
Lead	☐	0	1.53E-02	0.0153		
Total chargeable NCAPs	☑	0	8.92	8.92	8.92	8.92
Total other NCAPs	☐	0	28.03	28.03		