REGIONAL HAZE – FOUR FACTOR ANALYSIS

Willamette Falls Paper Company
West Linn, Oregon

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Regional Haze – Four Factor Analysis

Prepared for:
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This document has been prepared by SLR International Corporation (SLR). The material and data in this report were prepared under the supervision and direction of the undersigned.

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ATTACHMENTS

ACRONYMS, ABBREVIATIONS AND TERMS

4FA	Four Factor Analysis
BACT	Best Available Control Technology
Btu	British thermal unit
CFR	Code of Federal Regulations
CO_2	Carbon dioxide
EU	Emission Unit
EPA	Environmental Protection Agency
ESP	Electrostatic precipitator
FGD	Flue gas desulfurization
FGR	Fuel gas recirculation
GHG	Greenhouse gas
HAP	Hazardous air pollutants
IMPROVE	Interagency Monitoring of Protected Visual Environments
LAER	Lowest Achievable Emission Rate
LNB	Low NO_X burner
NESHAP	National Emission Standards for Hazardous Air Pollutants
NO_X	Nitrogen Oxides
NSR	New Source Review
DEQ	Department of Environmental Quality
O&M	Operation and maintenance
PM	Particulate Matter
PM_{10}	Coarse Particle Matter or Particulate Matter; with an aerodynamic diameter of 10 microns or less
RACT	Reasonably Available Control Technology
RBLC	RACT/BACT/LAER Clearinghouse
SCR	Selective Catalytic Reduction
SNCR	Selective Non-catalytic Reduction
SO_2	Sulfur Dioxide
VOC	Volatile Organic Compound
WFPC	Willamette Falls Paper Company

1. INTRODUCTION

This Regional Haze Four Factor Analysis (4FA) was prepared on behalf of Willamette Falls Paper Company (WFPC) in response to the December 23, 2019 letter that WFPC received from the Oregon Department of Environmental Quality (DEQ). DEQ identified WFPC as a significant source of regional haze precursor emissions to a Class I area in Oregon, thus triggering the need for a 4FA under the regional haze program.

WFPC manufactures paper products under Title V operating permit number 03-2145-TV-01. The Facility was previously owned by West Linn Paper Company, which closed in October 2017. WFPC reopened the Facility in July 2019.

DEQ is required to develop and implement air quality protection plans to reduce the pollution that causes haze at national parks and wilderness areas, known as Federal Class I areas. This requirement can be found at 40 CFR 51.308 and 42 U.S.C. §7491(b) and is implemented under the authority of ORS 468A.025.

Data from the EPA and National Park Service Visibility (IMPROVE) Program monitoring sites for Oregon's 12 Class I areas indicate that sulfates, nitrates, and coarse mass continue to be significant contributors to visibility impairment in these areas. The primary precursors of sulfates, nitrates, and coarse mass are emissions of sulfur dioxide (SO_2), nitrogen oxides (NO_X), and particulate matter less than 10-micron in diameter (PM_{10}).

The two closest Class I areas to the WFPC facility are the Mount Hood Wilderness in Oregon and the Columbia River Gorge National Scenic Area, which extends into both the states of Washington and Oregon. The nearest Class I area is Mount Hood Wilderness, located 53.7 kilometers from the facility.

This 4FA provides a detailed evaluation of WFPC emission units that contribute to facility emissions of precursor compounds. The purpose of the analysis is to determine whether additional specific control measures are reasonable for the control of precursor compounds. The four factors considered in this analysis are:

1. The costs of compliance.
2. The time necessary for compliance.
3. The energy and non-air quality environmental impacts of compliance.
4. The remaining useful life of any potentially affected major or minor stationary source or group of sources.

1.1 FACILITY OVERVIEW

The WFPC is a paper mill (NAICS code 322121) located in West Linn, Oregon, on the west side of the Willamette River. WFPC operates under Title V operating permit number 03-2145-TV-01 issued by the Oregon DEQ on February 24, 2016. The current Title V permit was transferred to WFPC from the former owner, West Linn Paper Company, on July 3, 2019.

The WFPC operations are required to have a Title V air operating permit because it has potential to emit more than 100 tons per year of a criteria pollutant. WFPC has taken synthetic minor permit limits to limit their potential to emit hazardous air pollutants (HAP) to less than the major HAP source levels.

WFPC produces coated and uncoated paper on three paper machines. Pulp is supplied to the paper machines from market pulp as well as from agricultural fiber derived from wheat straw. The paper machines are equipped with natural gas fired infrared dryers. Steam is produced by three boilers, which are capable of firing both natural gas and residual oil (#6 fuel oil). The main emission sources at this facility are three boilers, three paper machine dryers, and a clay handling system.

The boilers are subject to 40 CPR Part 63, Subpart JJJJJJ, National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources. The boilers are in the 'existing liquid fuel' subcategory. Boilers in the 'existing liquid fuel' subcategory are not subject to emission limits under the National Emission Standards for Hazardous Air Pollutants (NESHAP) but are subject to two work practice requirements: conduct a one-time energy assessment and conduct a boiler tune-up every 5 years since the boilers are equipped with O_2 trim.

1.2 PRECURSOR COMPOUND EMISSIONS

WFPC emits three types of regional haze precursor compounds: nitrogen oxides, sulfur dioxide, and particulate matter less than 10-mircron in diameter. Facility-wide emissions of these compounds for 2017 are from the annual report. The facility's permitted emissions for each compound are from Review Report/Permit No. 03-2145-TV-01. The permitted emissions along with the actual emissions for 2017 are presented in Table 1-1. Emissions for 2017 are shown since this was the year used by DEQ in the letter dated December 23, 2019. However, this data year is not representative of the new owner operation of the facility as described below. The large difference between permitted and actual SO_2 emissions is due to the fact that, while the boilers are permitted to use residual fuel oil, this seldom occurs. The residual fuel oil has not been used at the facility for more than 5 years. The current owner has not used residual fuel oil.

Table 1-1. Actual and Permitted Facility-wide Emissions for WFPC

2017 Actual Emissions (tons per year)				Permitted Emissions (tons per year)			
NO_X	SO_2	PM_{10}	Total Quantity	NO_X	SO_2	PM_{10}	Total Quantity
186.1	2.1	15.0	203.8	396	743	84	1,223

The three boilers, three paper machines, and the clay handling system are responsible for precursor compound emissions at WFPC. The precursor compounds emitted from each emission unit, and the year the unit was installed, are summarized in Table 1-2.

Table 1-2. Summary of Precursor Compounds Emitted by Emission Unit

Emission Unit	Emission Unit ID	Precursor Compounds Emitted	Year of Installation	Existing Pollution Control Equipment
Boiler 1	B1	PM_{10}, SO_2, NO_X	1941	None
Boiler 2	B2	PM_{10}, SO_2, NO_X	1941	None
Boiler 3	B3	PM_{10}, SO_2, NO_X	1947	Low NO_X Burner
Paper Machine #1	PM1	PM_{10}, SO_2, NO_X	1906 (rebuilds in 1948, 1989 & 2006)	None
Paper Machine #2	PM2	PM_{10}, SO_2, NO_X	1906 (rebuilds in 1948, 1968 & 2016)	None
Paper Machine #3	PM3	PM_{10}, SO_2, NO_X	1921 (rebuilds in 1947 & 2002	None
Clay Handling	CH	PM_{10}	1950	Fabric Filter

A description of each emission unit from Table 1-2 is presented in the following sections.

1.2.1 BOILERS

The boilers are capable of firing residual oil (#6 fuel oil) or natural gas. Boilers 1 and 2 are identical units and exhaust through a common stack. Boiler 1 and Boiler 2 have maximum rated steam capacity of 120,000 pounds per hour each, which is equivalent to approximately 154 MMBtu per hour of heat input.

Boiler 3 exhausts through a separate stack. Boiler 3 has a maximum rated steam capacity of 170,000 pounds per hour, which is equivalent to approximately 205 MMBtu per hour of heat input.

Table 1-3 presents the potential emissions from the boilers. The potential emissions of these boilers are from the Emission Detail Sheet of Review Report/Permit No. 03-2145-TV-01. Projected actual emissions are based on the maximum of one month from August 2019 to March 2020 extrapolated to 12 months. The maximum of any of the three boilers is applied. Detailed emission calculations are provided in Attachment B.

Table 1-3. Boiler Emissions

Emission Unit	NO_X Emissions (tons/yr)		PM_{10} Emissions (tons/yr)		SO_2 Emissions (tons/yr)	
	Potential	Projected Actual	Potential	Projected Actual	Potential	Projected Actual
Boiler 1	110.51	78.48	19.35	2.62	247.29	1.18
Boiler 2	110.51	78.48	19.35	2.62	247.29	1.18
Boiler 3	163.39	146.30	18.8	1.91	247.29	1.18

1.2.2 PAPER MACHINES

Coated and uncoated paper products are made at the facility. The three paper machines operate with the use of natural gas-fired dryers. Paper coatings and other chemicals used in the process may contain VOC, which is emitted when used on the paper machines. The paper machine dryers are infrared emitters, which provide a compact, high-intensity heat source which transfers energy without any physical contact to the paper sheet.

Table 1-4 presents the emissions from the paper machines. The potential emissions of these paper machines are from the Emission Detail Sheet of Review Report/Permit No. 03-2145-TV-01. Projected actual emissions are based on maximum of one month from August 2019 to March 2020 extrapolated to 12 months. Detailed emission calculations are provided in Attachment B.

Table 1-4. Emissions – Paper Machines

Emission Unit	NO_X Emissions (tons/yr)		PM_{10} Emissions (tons/yr)		SO_2 Emissions (tons/yr)	
	Potential	Projected Actual	Potential	Projected Actual	Potential	Projected Actual
Paper Machine 1	4.61	1.05	0.07	0.02	0.08	0.02
Paper Machine 2	2.97	0.60	0.07	0.02	0.08	0.02
Paper Machine 3	2.97	0.58	0.07	0.01	0.08	0.01

1.2.3 CLAY HANDLING

Clay handling at the facility is a source of PM_{10} emissions. Dry clay is received via truck at the facility and transferred for storage to two clay silos. The clay is transferred to a slurry mix tank and then blended with other agents (pigments, binders, and lubricants) to achieve the desired paper coating composition.

Table 1-5 presents the emissions from the clay handling. The permitted emissions of clay handling are from the Emission Detail Sheet of Review Report/Permit No. 03-2145-TV-01. Projected actual emissions are based on 6,000 hours of annual operation. Detailed emissions calculations are provided in Attachment B.

Table 1-5. Maximum Emissions – Clay Handling

Emission Unit	PM_{10} Emissions (tons/yr)	
	Potential	Projected Actual
Clay Handling	25.71	15.42

1.3 FOUR FACTOR ANALYSIS METHODOLOGY

As discussed previously, the analysis requires the following steps to identify the technically feasible control options for each emission unit applicable to the four factor analysis:

- The cost of compliance;
- Time necessary for compliance;

- Energy and non-air environmental impacts; and
- Remaining useful life of the source.

The following steps must be followed in conducting the analysis:

- Identify all available control technologies;
- Eliminate technically infeasible options; and
- Rank the remaining options based on effectiveness.

1.3.1 FACTOR 1 – COST OF COMPLIANCE

The basis for comparison in the economic analysis of the control scenarios is the cost effectiveness; that is, the value obtained by dividing the total net annualized cost by the tons of pollutant removed per year for each control technology. Annualized costs include the annualized capital cost plus the financial requirements to operate the control system on an annual basis, including operating and maintenance labor, and such maintenance costs as replacement parts, overhead, raw materials, and utilities. Capital costs include both the direct cost of the control equipment and all necessary auxiliaries as well as both the direct and indirect costs to install the equipment. Direct installation costs include costs for foundations, erection, electrical, piping, insulation, painting, site preparation, and buildings. Indirect installation costs include costs for engineering and supervision, construction expenses, start-up costs and contingencies.

For each technically feasible control option, this analysis will summarize potential emission reductions, estimated capital cost, estimated annual cost, and cost-effectiveness (dollars per ton of pollutant). Per EPA guidance, SLR followed the methods in EPA's Air Pollution Control Cost Manual for this analysis.

1.3.2 FACTOR 2 – TIME NECESSARY FOR COMPLIANCE

Factor 2 involves the evaluation of the amount of time needed for full implementation of the different control strategies. The time for compliance will need to be defined and should include the time needed to develop and implement the regulations, as well as the time needed to install the necessary control equipment. The time required to install a retrofit control device includes time for capital procurement, device design, fabrication, and installation. The Factor 2 analysis should also include the time required for staging the installation of multiple control devices at a given facility if applicable.

1.3.3 FACTOR 3 – ENERGY AND OTHER IMPACTS

Energy and environmental impacts include the following but are not limited to and/or need to be included in the analysis:

Energy Impacts

- Electricity requirement for control equipment and associated fans
- Water required
- Fuel required

Environmental Impacts

- Waste generated

- Wastewater generated
- Additional carbon dioxide (CO_2) produced
- Reduced acid deposition
- Reduced nitrogen deposition
- Impacts to Regional Haze

Non-air environmental impacts (positive or negative) can include changes in water usage and waste disposal of spent catalyst or reagents. EPA recommends that the costs associated with non-air impacts be included in the Cost of Compliance (Factor 1). Other effects, such as deposition or climate change due to greenhouse gases (GHGs), do not have to be considered.

For this analysis SLR evaluated the direct energy consumption of the emission control device, solid waste generated, wastewater discharged, acid deposition, nitrogen deposition, any offsetting negative impacts on visibility from controls operation, and climate impacts (e.g., generation and mitigation of greenhouse gas emissions).
In general, the data needed to estimate these energy and other non-air pollution impacts were obtained from the cost studies which were evaluated under Factor 1. These analyses generally quantify electricity requirements, increased water requirements, increased fuel requirements, and other impacts as part of the analysis of annual operation and maintenance (O&M) costs.

Costs of disposal of solid waste or otherwise complying with regulations associated with waste streams were included under the cost estimates developed under Factor 1 and were evaluated as to whether they could be cost-prohibitive or otherwise negatively affect the facility.

1.3.4 FACTOR 4 – REMAINING EQUIPMENT LIFE

Factor 4 accounts for the impact of the remaining equipment life on the cost of control. Such an impact will occur when the remaining expected life of a specific emission source is less than the lifetime of the pollution control device that is being considered. An appropriate useful life is selected and used to calculate emission reductions, amortized costs, and cost per ton of pollutant.

2. EMISSIONS CONTROL TECHNOLOGY ASSESSMENT

The emission control technology feasibility assessments were performed for the applicable units and pollutants in Table 2-1. Technical feasibility is demonstrated based on physically, chemical, or engineering principles.

Table 2-1. Applicable Unit

Emission Units	Pollutant(s)
Boilers 1/2/3	PM_{10}, SO_2, NO_X
Paper Machines 1/2/3	PM_{10}, SO_2, NO_X
Clay Handlings	PM_{10}

As outlined in the New Source Review (NSR) Workshop Manual (Draft), control technologies are technically feasible if either (1) they have been installed and operated successfully for the type of source under review under similar conditions, or (2) the technology could be applied to the source under review.

2.1 BOILERS – NATURAL GAS/RESIDUAL OIL

The boilers are considered industrial boilers with a maximum heat input rate of greater than 100 MMBtu/hr and less than 250 MMBtu/hr. As part of this analysis, the retrofit control technologies for NO_X control were identified by researching the U.S. EPA Reasonably Available Control Technology/Best Available Control Technology/Lowest Achievable Emission Rate (RACT/BACT/LAER) Clearinghouse (RBLC) database, engineering and permitting experiences, and surveying available literature.

2.1.1 NO_X CONTROL TECHNOLOGIES FOR BOILERS

In industrial boilers, emissions of NO_X are formed in three ways: thermal, fuel bound, and prompt. Thermal NO_X is created by high flame temperature in the presence of oxygen. Fuel-bound NO_X is inherent in fuel. Prompt NO_X is formed when nitrogen molecules in the air react with fuel during combustion. NO_x emission control technologies identified which may be available for use on the boilers are shown in Table 2-2.

Table 2-2. NO_X Control Technologies - Boilers

Control Technology	Control Efficiency (%)	Technically Feasible
Good Combustion Practices	Base Case	Base Case – Feasible
Low NO_x Burners (LNB)*	30-60	Feasible
Flue Gas Recirculation	40-80	Infeasible
Selective Non-Catalytic Reduction	25-50	Infeasible
Selective Catalytic Reduction	70-90	Infeasible

*Boiler 3 is already equipment with LNB.

A description and evaluation of each of these control technologies is found in the following sections.

2.1.1.1 Good Combustion Practices

Good combustion practices can lower the emission of NO_X by using operational and design elements that optimize the amount and distribution of excess air in the combustion zone. Good combustion practices can be implemented by operating the boilers according to manufacturer's recommendation, periodic inspections and maintenance, and periodic tuning of boilers to maintain excess air at optimum levels. Good combustion practices are currently used for the boilers and considered technically feasible for this analysis.

2.1.1.2 Low NO_X Burners

Low NO_x burners (LNBs) are a pre-combustion control technology and are currently available for most boilers. This technology reduces combustion temperatures, thereby reducing NO_X. In a conventional combustor, the air and fuel are introduced at an approximate stoichiometric ratio, and air/fuel mixing occurs at the flame front where diffusion of fuel and air reaches the combustible limit.

A lean premixed combustor design premixes the fuel and air prior to combustion. Premixing results in a homogenous air/fuel mixture and minimizes localized fuel-rich pockets. Localized fuel-rich pockets can produce elevated combustion temperatures and higher NO_X emissions. A lean air-to-fuel ratio approaching the lean flammability limit is maintained, and the excess air serves as a heat sink to lower combustion temperatures, which lowers NO_X formation. A pilot flame is used to maintain combustion stability in this fuel-lean environment.

LNBs have demonstrated NO_X reduction efficiencies of approximately 30% to 60%. LNBs are technically feasible for the boilers. Boiler 3 is currently equipped with LNBs to control NO_X emissions. LNBs are assessed further for Boiler 1 and Boiler 2 in this report.

2.1.1.3 Flue Gas Recirculation

Flue gas recirculation (FGR) requires recirculating a portion of relatively cool exhaust gases back into the combustion zone in order to lower the flame temperature and reduce NO_X formation. FGR has demonstrated NO_X reduction efficiencies of approximately 45%.

Flue gas recirculation technology in the boilers will require installing additional ductwork, combustion air fans, and additional structures to recirculate the flue gases from the boiler exhaust stacks back into the combustion zone. Due to the extensive structural changes and addition of new equipment, FGR is difficult to retrofit on existing boilers. The boilers are more than 70 years old and the extensive structural changes required to install FGR are not feasible. Additionally, the boilers also have extremely limited space for any new installation due to the property boundary and location adjacent to the Willamette River. FGR is not considered technically feasible for the boilers.

2.1.1.4 Selective Non-Catalytic Reduction

Selective non-catalytic reduction (SNCR) is a post-combustion NO_X control technology in which a reagent (typically ammonia or urea) is injected into the exhaust gases to react chemically with NO_X, forming nitrogen and water. The success of this process in reducing NO_X emissions is highly dependent on the ability to uniformly mix the reagent into the flue gas at a zone in the exhaust stream at which the flue gas temperature is within a narrow range, typically from 1,700°F to 2,000°F. To achieve the necessary mixing and reaction, the residence time of the flue gas within this temperature window should be at least 0.5 to 1.0 seconds. The consequences of operating outside the optimum temperature range are severe. Outside the upper end of the temperature range, the reagent will be converted to NO_X. Below the lower end of the temperature range, the reagent will not react with the NO_X and discharge from the stack (ammonia slip). SNCR systems are capable of sustained NO_X removal efficiency in the range of approximately 25% to 50%.

The exhaust temperatures from the boilers range from 250°F to 350°F. However, as mentioned above, SNCR usually operates at gas temperatures ranging from 1,700°F to 2,000°F. Therefore, SNCR is considered technically infeasible for the boilers.

2.1.1.5 Selective Catalytic Reduction (SCR)

SCR is a post-combustion technology that employs ammonia in the presence of a catalyst to convert NO_X to nitrogen and water. The function of the catalyst is to lower the activation energy of the NO_X decomposition reaction. Therefore, the chemical reduction reaction between ammonia and NO_X occurs at much lower temperatures than those required for SNCR systems. The necessary temperature range for the SCR system depends on the type of catalysts. Most SCR systems operate in the range of 550°F to 750°F. However, high-temperature catalysts can operate above 750°F. Typical catalysts include vanadium pentoxide, titanium dioxide, noble metals, and tungsten trioxide.

Technical factors related to this technology include the catalyst reactor design, optimum operating temperature, sulfur content of the fuel, de-activation due to aging, ammonia slip emissions, and the design of the ammonia injection system. When properly designed and operated, SCR systems can achieve NO_X removal efficiencies in the range of approximately 70% to 90%.

The exhaust temperatures from the boilers range from 250°F to 350°F which is below the operating range of 550°F to 750°F for SCR. There are also site-specific limitations (e.g., space requirement, age of the boilers) associated with installing all the necessary equipment required for this control technology. Therefore, SCR is considered technically infeasible for the boilers.

2.1.2 PM_{10} CONTROL TECHNOLOGIES FOR BOILERS

Particulate matter (PM) emissions from industrial boilers are generally low and the emissions vary based on the fuel type. Natural gas generates relatively small amounts of PM when combusted, and the PM that is generated consists of very fine carbon particles. PM emissions from residual oil burning are related to the oil sulfur content.

There are no entries found in the RBLC that show post-combustion controls, such as a baghouse, electrostatic precipitator (ESP), or venturi scrubber, for PM_{10} from industrial boilers less than 250 MMBtu/hr with primary fuel of natural gas or residual oil. For industrial boilers, the most effective method is to utilize clean fuels such as natural gas. The emission levels of particulate matter can be lowered by switching from a residual to a low sulfur distillate oil. Additionally, PM_{10} emissions can be minimized through proper burner set-up, adjustment and maintenance.

Currently, the boilers use only natural gas as the primary fuel. The residual oil will only be used in case of any disruption to the natural gas supply. Therefore, the utilization of clean fuel (natural gas as primary fuel) and good combustion practice are considered as the only technically feasible option for the boilers.

Table 2-3. PM_{10} Control Technologies - Boilers

Control Technology	Control Efficiency (%)	Feasibility
Clean Fuel (natural gas as primary fuel)/Good Combustion Practices	Base Case	Base Case – Feasible

2.1.3 SO_2 CONTROL TECHNOLOGIES FOR BOILERS

SO_2 emissions are highly dependent on the sulfur content of the fuel. SO_2 reduction measures include switching to low sulfur fuel, desulfurizing the fuel, and utilizing a flue gas desulfurization (FGD) system. Fuel desulfurization, which primarily applies to coal, involves removing sulfur from the fuel prior to burning. FGD involves the utilization of scrubbers to remove SO_2 emissions from the flue gases.

FGD is a post-combustion technique that removes SO_2 formed during combustion by using an alkaline reagent to absorb SO_2 in the flue gas. Flue gas can be treated with wet, dry, or semi-dry desulfurization processes. The waste streams can either be discarded, or the reagent can be regenerated and reused. Although FGD can be applied to combustion sources, it is typically used for coal- and oil-fired utility boilers, coal-fired industrial boilers, and waste incinerators. FGD systems are capable of reduction efficiency in the range of 50% to 98%. The highest efficiencies are achieved by wet FGD, greater than 90%, and the lowest by dry FGD processes, typically less than 80%.

A review of the RBLC indicates that both FGD and fuel desulfurization have not been applied to natural gas or residual oil No. 6 industrial boilers less than 250 MMBtu/hr and greater than 100 MMBtu/hr. Therefore, FGD and fuel desulfurization are both considered technically infeasible for the boilers.

Currently, the boilers use only natural gas, which is considered a low sulfur fuel. The residual oil will only be used in case of any disruption to the natural gas supply. The utilization of clean fuel (natural gas as primary fuel) and good combustion practices are considered as the only technically feasible options for the boilers.

Table 2-4. SO_2 Control Technologies - Boilers

Control Technology	Control Efficiency (%)	Feasibility
Clean Fuel (natural gas as primary fuel) /Good Combustion Practices	Base Case	Base Case – Feasible
Flue Gas Desulfurization (FGD)	50 – 98	Infeasible

2.2 PAPER MACHINES – NATURAL GAS HEATERS/BURNERS

The emissions from paper machines are very low and primarily NO_x from the natural gas-fired heaters/burners. Potential emissions are approximately 10 tpy, and projected actual emissions approximately 2 tpy. These heaters/burners are less than 100 MMBtu/hr each. The search of the RBLC database did not identify any add-on control technologies for the natural gas-fired heaters/burners less than 100 MMBtu/hr. Because add-on control devices have not been demonstrated in practice for heaters/burners of this size, they are not considered technically feasible for this analysis. Furthermore, given the low emissions from the heater/burner and high cost of add-on control devices, they would not be cost effective to install.

Modifications of the existing burners to lower NO_X emissions are also not considered feasible due to the already very low emissions associated with these heaters/burners. The paper machines are equipped with gas-fired infrared heaters. The gas-fired infrared heaters "provide a compact, high-intensity heat source" and improve the drying performance of the paper machines[1]. Therefore, the utilization of natural gas and good combustion practices are considered as the only technically feasible option for the burners associated with the paper machines.

Table 2-5. Control Technology – Paper Machines

Control Technology	Control Efficiency (%)	Feasibility
Natural Gas/Good Combustion Practices	Base Case	Base Case – Feasible

2.3 CLAY HANDLING SYSTEM

The air pollution of concern from the clay handling system is particulate matter (PM). A search of the RBLC for clay handling system going back ten years did not yield any result. A search was also completed for clay processing operations and the database identified baghouses (fabric filters) for material handling. The clay handling system is already equipped with baghouses to control PM_{10} emissions from the system and therefore, no further analysis is required for this system.

[1] GRI-99/0135 – Topical Report – Gas IR Application in Paper Drying Process (May, 1999)

Table 2-6. PM_{10} Control Technologies – Clay Handling

Control Technology	Control Efficiency (%)	Feasibility
Fabric Filters	Base Case- 99%	Base Case – Feasible

3. FOUR FACTOR ANALYSIS

This section addresses the following four factors for the technically feasible control options identified in Section 2 as requested by Oregon DEQ.

- Cost of compliance
- Time necessary for compliance
- Energy and non-air environmental impacts
- Remaining useful life of the source

For these four factors, this analysis followed EPA guidance[2] as well as EPA's Air Pollution Cost Manual.

3.1 FACTOR 1 – COST OF COMPLIANCE

The cost of compliance analysis estimated the capital cost, annual cost, and cost-effectiveness of each control option identified as technically feasible according to the methods and recommendations in the EPA's Air Pollution Control Cost Manual. The capital cost includes the equipment cost and the installation costs (direct and indirect). The annual cost includes O&M costs. The cost-effectiveness (dollar per ton of pollutant removed) is calculated using the total net annualized cost of control, divided by the actual tons of pollutant removed per year, for each control technology. The current maximum emissions for each applicable emission unit in the Review Report of the permit was used as the baseline emission rate for each pollutant in this analysis. The capital recovery factor applied in this analysis is 0.0786, based on a 20 year equipment life and 4.75% interest rate as noted in Oregon DEQ's *Fact Sheet – Regional Haze: Four Factor Analysis (December 5, 2019)*. The costs are adjusted to 2020 dollar values due to inflation. The detailed cost calculations are provided in Attachment A.

3.1.1 LNB – BOILER 1 AND BOILER 2

The capital and O&M costs for LNBs are based on the average cost data provided in Table 14 of EPA's *Technical Bulletin – Nitrogen Oxides (NOx), Why and How They Are Controlled (EPA 456/F-99-006R, November 1999)* and the maximum heat rates of Boiler 1 and Boiler 2. Table 3-1 summarizes the costs of LNBs for both Boilers 1 and Boiler 2. The cost effectiveness value of approximately $11,400 per ton of NO_X removed per boiler is clearly excessive and indicates that the installation of LNBs is not cost effective for Boiler 1 or Boiler 2. Please note that the above cost effectiveness value is a conservative value since it is based on the potential emissions rather than projected actual emissions. Boiler 1 has not operated for the last five years. Based on the projected emissions of Boiler 2, the cost effectiveness value for installing LNBs in Boiler 2 would be approximately $16,000 per ton of NO_X removed.

[2] *Guidance on Regional Haze State Implementation Plans for the Second Implementation Period (August 2019)*

Table 3-1. Cost Effectiveness – LNB for Boiler 1/2

Parameter	Boiler 1 or Boiler 2
Maximum Heat Rate (MMBtu/hr)	154
Total Capital Cost Total O&M Cost Total Annualized Cost	$1,995,840 $410,256 $567,030
LNB Control Efficiency (%)	45
NO_X Reduction (tons/yr)	49.73
Cost Effectiveness ($/ton NO_x removed)	**11,402**

3.2 FACTOR 2 – TIME NECESSARY FOR COMPLIANCE

This factor addresses the estimated time needed for the design and installation of the technically feasible control options. Per EPA's Technical document[3], the installation of LNBs may require up to 8 months. Due to the site-specific constraints and age of the applicable units, installation of LNBs will be complex and may require additional time than provided by EPA guidance. The projected time for compliance is provided in Table 3-3. Although LNBs were already deemed as not cost effective, the following information is provided per EPA guideline.

Table 3-3. Time for Compliance

Control Options	Time Necessary for Compliance
LNBs (for Boiler 1 and Boiler 2)	12 Months (approx.)

3.3 FACTOR 3 – ENERGY AND NON-AIR ENVIRONMENTAL IMPACTS

This subsection addresses the energy and non-air environmental impacts associated with the installation and operation of the technically feasible control options. These impacts are based on the information from standard resources (e.g., EPA Technical documents) and professional experience and judgement.

3.3.1 LNB – BOILER 1 AND BOILER 2

The energy impacts from the application of LNBs are expected to be minimal. However, the lower flame temperature associated with LNBs will decrease the efficiency and the performance of the boiler in terms of steam production. Therefore, to maintain the same amount of steam production, the boiler will be required to burn more fuel.

LNBs are not expected to have any non-air environmental impacts.

[3] *Assessment of Non-EGU NOx Emission Controls, Cost of Controls, and Time for Compliance (November 2015)*

3.4 FACTOR 4 – REMAINING USEFUL LIFE OF SOURCE

Per EPA guidance, the useful life of the control equipment will be less than the useful life of the facility itself. Although most of the applicable units are more than 50 years old, WFPC has no plan of shutting down any of the equipment currently. Therefore, the remaining useful life of the sources is assumed to be 20 years.

4. CONCLUSIONS

At the request of the Oregon DEQ, a four factor analysis was prepared for WFPC. The analysis identified technically feasible control options for applicable emission units and evaluated the technology for the following four statutory factors:

1. The costs of compliance;
2. The time necessary for compliance;
3. The energy and non-air quality environmental impacts of compliance; and
4. The remaining useful life of any potentially affected major or minor stationary source or group of sources.

Based on the above evaluation, SLR has determined that it is not technically feasible or cost effective to implement additional emissions control for the emission units at WFPC.

5. REFERENCES

United States Environmental Protection Agency (USEPA). 2017. Office of Air Quality Planning and Standards Control Cost Manual. Office of Air Quality Planning and Standards, Economic Analysis Branch, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina. November. (Chapter 2, updated November, 2017)

USEPA. Guidance on Regional Haze State Implementation Plans for the Second Implementation Period (August 2019)

USEPA. Assessment of Non-EGU NOx Emission Controls, Cost of Controls, and Time for Compliance (November 2015)

USEPA. Technical Bulletin – Nitrogen Oxides (NOx), Why and How They Are Controlled (EPA 456/F-99-006R, November 1999)

Oregon Department of Environmental Quality (DEQ). Fact Sheet – Regional Haze: Four Factor Analysis (December 5, 2019)

ATTACHMENT A

COST ANALYSIS

Low NO_X Burner (LNB) Retrofit Cost Effectiveness - Boilers

Willamette Falls Paper Co.

West Linn, Oregon

Parameter	Boiler 1	Boiler 2	Reference
Maximum Heat Rate (MMBtu/hr)	154	154	Estimated based on maximum steam production
Capital Cost ($/MMBtu) in 1993 dollars	4475	4475	Table 14. EPA-456/F-99-00R (November 1999) - Average of Range (1)
O&M Cost ($/MMbtu) in 1993 dollars	920	920	Table 14. EPA-456/F-99-00R (November 1999) - Average of Range (1)
Capital Cost ($/MMBtu) in 2020 dollars	8100	8100	Adjusted for Inflation - CPI Inflation Calculator (2)
O&M Cost ($/MMBtu) in 2020 dollars	1665	1665	Adjusted for Inflation - CPI Inflation Calculator (2)
Total Capital Cost ($)	1,995,840	1,995,840	Design Rate (scfm) x 2020 Capital Cost ($/scfm) x Retrofit Factor (1.6) (3)
Total O&M Cost ($)	410,256	410,256	Design Rate (scfm) x 2020 O&M Cost ($/scfm) x Retrofit Factor (1.6) (3)
i, Interest Rate (%)	4.75	4.75	DEQ's Regional Haze; Four Factor Analysis - Fact Sheet (12/5/2019)
n, Equipment Life	20	20	EPA Cost Control Manual (4)
Capital Recovery Factor (CRF) =	0.08	0.08	i (1+ i)n/(1+ i)n - 1
Total Capital Investment (TCI) =	156,774	156,774	Total Capital Cost ($) x CRF
Total Annualized Cost ($) =	567,030	567,030	Total O&M Cost ($) + TCI ($)
Baseline NO_X Emissions (tons/yr)	110.51	110.51	WFPC Title V Permit Review Report
Control Efficiency (%)	45	45	Chemical Engineering Progress (CEP), Magazine, January 1994 (5)
NO_X Reduction (tons/yr)	49.73	49.73	Baseline emissions x Control Efficiency/100
Cost Effectiveness ($/ton)	**11,402**	**11,402**	**Total Annual Cost/NO_X Removed/year**

Notes:

O&M = Operations and Maintenance

1) U.S. EPA, Technical Bulletin on Nitrous Oxides (Nox), Why and How They are Controlled, EPA-465/F-99-00R, 1999
https://www3.epa.gov/ttncatc1/dir1/fnoxdoc.pdf
2) CPI Inflation Calculator - Bureau of Labor Statistics - https://data.bls.gov/cgi-bin/cpicalc.pl
3) Retrofit factor for LNBs is from U.S. EPA, Alternative Control Technologies Document - NOx Emissions From Utility Boilers , EPA-453/R-94-023, March 1994
4) U.S. EPA, Cost Control Manual, EPA/452/B-02-001, 2002. https://www3.epa.gov/ttncatc1/dir1/c_allchs.pdf
5) Chemical Engineering Progress (CEP) Magazine, January 1994; ClearSign Combustion Corporation, May 2013

ATTACHMENT B

SUPPORTING DOCUMENTS

Table 1. Boiler 1 Emissions
Willamette Falls Paper Co.
West Linn, Oregon

Throughput[1]	**2015**	**2016**	**2017**	**Projected**[2]	**PSEL**
Residual Oil (Mgal/yr)	0.00	0.00	0.00	0.00	1,793.4
Natural Gas (therms/yr)	0	0	0	9,291,600	--
Natural Gas (MMcf/yr)[a]	0.00	0.00	0.00	910.94	710.30
Emission Factors[1]					
Residual Oil - NO_X Emission Factor (lb/1000 gal)	55	55	55	55	55
Residual Oil - SO_2 Emission Factor (lb/1000 gal)	274.75	274.75	274.75	274.75	274.75
Residual Oil - PM Emission Factor (lb/1000 gal)	19.3	19.3	19.3	19.3	19.3
Natural Gas - NO_X Emission Factor (lb/MMcf)	550	172.3	172.3	172.3	172.3
Natural Gas - SO_2 Emission Factor (lb/MMcf)	2.6	2.6	2.6	2.6	2.6
Natural Gas - PM Emission Factor (lb/MMcf)	2.5	5.75	5.75	5.75	5.75
Emissions by Fuel Type[b]					
Residual Oil - NO_X Emissions (tons)	0.00	0.00	0.00	0.00	49.32
Residual Oil - SO_2 Emissions (tons)	0.00	0.00	0.00	0.00	246.37
Residual Oil - PM Emissions (tons)	0.00	0.00	0.00	0.00	17.31
Natural Gas - NO_X Emissions (tons)	0.00	0.00	0.00	78.48	61.19
Natural Gas - SO_2 Emissions (tons)	0.00	0.00	0.00	1.18	0.92
Natural Gas - PM Emissions (tons)	0.00	0.00	0.00	2.62	2.04
Total Emissions					
Total - NO_X Emissions (tons)	0.00	0.00	0.00	78.48	110.51
Total - SO_2 Emissions (tons)	0.00	0.00	0.00	1.18	247.29
Total - PM Emissions (tons)	0.00	0.00	0.00	2.62	19.35

Calculations:

(a) Natural Gas Throughput (MMcf/yr) = (throughput [therms/yr]) x 0.000098039

Therm = 9.8039E-05 MMcf (1)

(b) Residual Oil Emissions (tons) = (emission factor [lb/1000 gal]) x (throughput [Mgal/yr]) / 2,000

Natural Gas Emissions (tons) = (emission factor [lb/MMcf]) x (throughput [MMcf/yr]) / 2,000

Notes:

(1) Review Report/Permit No.: 03-2145-TV-01 and Annual Reports.

(2) Projected throughput numbers are based on maximum of one month from August 2019 to March 2020 extrapolated to 12 months. The maximum of any of the three (3) boilers is applied.

Table 2. Boiler 2 Emissions
Willamette Falls Paper Co.
West Linn, Oregon

Throughput[1]	2015	2016	2017	Projected[2]	PSEL
Residual Oil (Mgal/yr)	0.00	0.00	0.00	0.00	1,793.4
Natural Gas (therms/yr)	1,213,220	2,356,291	1,762,521	9,291,600	--
Natural Gas (MMcf/yr)[a]	118.94	231.01	172.80	910.94	710.30
Emission Factors[1]					
Residual Oil - NO_X Emission Factor (lb/1000 gal)	55	55	55	55	55
Residual Oil - SO_2 Emission Factor (lb/1000 gal)	274.75	274.75	274.75	274.75	274.75
Residual Oil - PM Emission Factor (lb/1000 gal)	19.3	19.3	19.3	19.3	19.3
Natural Gas - NO_X Emission Factor (lb/MMcf)	550	172.3	172.3	172.3	172.3
Natural Gas - SO_2 Emission Factor (lb/MMcf)	2.6	2.6	2.6	2.6	2.6
Natural Gas - PM Emission Factor (lb/MMcf)	2.5	5.75	5.75	5.75	5.75
Emissions by Fuel Type[b]					
Residual Oil - NO_X Emissions (tons)	0.00	0.00	0.00	0.00	49.32
Residual Oil - SO_2 Emissions (tons)	0.00	0.00	0.00	0.00	246.37
Residual Oil - PM Emissions (tons)	0.00	0.00	0.00	0.00	17.31
Natural Gas - NO_X Emissions (tons)	32.71	19.90	14.89	78.48	61.19
Natural Gas - SO_2 Emissions (tons)	0.15	0.30	0.22	1.18	0.92
Natural Gas - PM Emissions (tons)	0.15	0.66	0.50	2.62	2.04
Total Emissions					
Total - NO_X Emissions (tons)	32.71	19.90	14.89	78.48	110.51
Total - SO_2 Emissions (tons)	0.15	0.30	0.22	1.18	247.29
Total - PM Emissions (tons)	0.15	0.66	0.50	2.62	19.35

Calculations:

(a) Natural Gas Throughput (MMcf/yr) = (throughput [therms/yr]) x 0.000098039

Therm = 9.8039E-05 MMcf (1)

(b) Residual Oil Emissions (tons) = (emission factor [lb/1000 gal]) x (throughput [Mgal/yr]) / 2,000

Natural Gas Emissions (tons) = (emission factor [lb/MMcf]) x (throughput [MMcf/yr]) / 2,000

Notes:

(1) Review Report/Permit No.: 03-2145-TV-01 and Annual Reports.

(2) Projected throughput numbers are based on maximum of one month from August 2019 to March 2020 extrapolated to 12 months.

Table 3. Boiler 3 Emissions
Willamette Falls Paper Co.
West Linn, Oregon

Throughput[1]	2015	2016	2017	Projected[2]	PSEL
Residual Oil (Mgal/yr)	0.00	0.00	0.00	0.00	1,793.4
Natural Gas (therms/yr)	14,693,764	12,728,422	10,687,184	9,291,600	--
Natural Gas (MMcf/yr)[a]	1,440.56	1,247.88	1,047.76	910.94	710.30
Emission Factors[1]					
Residual Oil - NO_X Emission Factor (lb/1000 gal)	55	55	55	55	55
Residual Oil - SO_2 Emission Factor (lb/1000 gal)	274.75	274.75	274.75	274.75	274.75
Residual Oil - PM Emission Factor (lb/1000 gal)	19.3	19.3	19.3	19.3	19.3
Natural Gas - NO_X Emission Factor (lb/MMcf)	550	321.2	321.2	321.2	321.2
Natural Gas - SO_2 Emission Factor (lb/MMcf)	2.6	2.6	2.6	2.6	2.6
Natural Gas - PM Emission Factor (lb/MMcf)	2.5	4.2	4.2	4.2	4.2
Emissions by Fuel Type[b]					
Residual Oil - NO_X Emissions (tons)	0.00	0.00	0.00	0.00	49.32
Residual Oil - SO_2 Emissions (tons)	0.00	0.00	0.00	0.00	246.37
Residual Oil - PM Emissions (tons)	0.00	0.00	0.00	0.00	17.31
Natural Gas - NO_X Emissions (tons)	396.15	200.41	168.27	146.30	114.07
Natural Gas - SO_2 Emissions (tons)	1.87	1.62	1.36	1.18	0.92
Natural Gas - PM Emissions (tons)	1.80	2.62	2.20	1.91	1.49
Total Emissions					
Total - NO_X Emissions (tons)	396.15	200.41	168.27	146.30	163.39
Total - SO_2 Emissions (tons)	1.87	1.62	1.36	1.18	247.29
Total - PM Emissions (tons)	1.80	2.62	2.20	1.91	18.80

Calculations:

(a) Natural Gas Throughput (MMcf/yr) = (throughput [therms/yr]) x 0.000098039

Therm = 9.8039E-05 MMcf (1)

(b) Residual Oil Emissions (tons) = (emission factor [lb/1000 gal]) x (throughput [Mgal/yr]) / 2,000

Natural Gas Emissions (tons) = (emission factor [lb/MMcf]) x (throughput [MMcf/yr]) / 2,000

Notes:

(1) Review Report/Permit No.: 03-2145-TV-01 and Annual Reports.

(2) Projected throughput numbers are based on maximum of one month from August 2019 to March 2020 extrapolated to 12 months. The maximum of any of the three (3) boilers is applied.

Table 4. Paper Machine 1 Emissions
Willamette Falls Paper Co.
West Linn, Oregon

Throughput[1]	2015	2016	2017	Projected[2]	PSEL
Natural Gas (therms/yr)	339,546	364,114	288,290	137,784	--
Natural Gas (MMcf/yr)[a]	33.29	35.70	28.26	13.51	59.46
Natural Gas Emission Factors[1]					
NO_X Emission Factor (lb/MMcf)	155	155	155	155	155
SO_2 Emission Factor (lb/MMcf)	2.6	2.6	2.6	2.6	2.6
PM Emission Factor (lb/MMcf)	2.5	2.5	2.5	2.5	2.5
Natural Gas Emissions[b]					
NO_X Emissions (tons)	2.58	2.77	2.19	1.05	4.61
SO_2 Emissions (tons)	0.04	0.05	0.04	0.02	0.08
PM Emissions (tons)	0.04	0.04	0.04	0.02	0.07

Calculations:

(a) Natural Gas Throughput (MMcf/yr) = (throughput [therms/yr]) x 0.000098039

Therm = 9.8039E-05 MMcf (1)

(b) Natural Gas Emissions (tons) = (emission factor [lb/MMcf]) x (throughput [MMcf/yr]) / 2,000

Notes:

(1) Review Report/Permit No.: 03-2145-TV-01 and Annual Reports.

(2) Projected throughput numbers are based on maximum of one month from August 2019 to March 2020 extrapolated to 12 months.

Table 5. Paper Machine 2 Emissions
Willamette Falls Paper Co.
West Linn, Oregon

Throughput[1]	2015	2016	2017	Projected[2]	PSEL
Natural Gas (therms/yr)	122,384	128,673	118,984	123,036	--
Natural Gas (MMcf/yr)[a]	12.00	12.61	11.67	12.06	59.46
Natural Gas Emission Factors[1]					
NO_X Emission Factor (lb/MMcf)	100	100	100	100	100
SO_2 Emission Factor (lb/MMcf)	2.6	2.6	2.6	2.6	2.6
PM Emission Factor (lb/MMcf)	2.5	2.5	2.5	2.5	2.5
Natural Gas Emissions[b]					
NO_X Emissions (tons)	0.60	0.63	0.58	0.60	2.97
SO_2 Emissions (tons)	0.02	0.02	0.02	0.02	0.08
PM Emissions (tons)	0.01	0.02	0.01	0.02	0.07

Calculations:

(a) Natural Gas Throughput (MMcf/yr) = (throughput [therms/yr]) x 0.000098039

Therm = 9.8039E-05 MMcf (1)

(b) Natural Gas Emissions (tons) = (emission factor [lb/MMcf]) x (throughput [MMcf/yr]) / 2,000

Notes:

(1) Review Report/Permit No.: 03-2145-TV-01 and Annual Reports.

(2) Projected throughput numbers are based on maximum of one month from August 2019 to March 2020 extrapolated to 12 months.

Table 6. Paper Machine 3 Emissions
Willamette Falls Paper Co.
West Linn, Oregon

Throughput[1]	2015	2016	2017	Projected[2]	PSEL
Natural Gas (therms/yr)	1,272,412	1,249,992	1,061,213	117,372	--
Natural Gas (MMcf/yr)[a]	124.75	122.55	104.04	11.51	59.46
Natural Gas Emission Factors[1]					
NO_X Emission Factor (lb/MMcf)	100	100	100	100	100
SO_2 Emission Factor (lb/MMcf)	2.6	2.6	2.6	2.6	2.6
PM Emission Factor (lb/MMcf)	2.5	2.5	2.5	2.5	2.5
Natural Gas Emissions[b]					
NO_X Emissions (tons)	6.24	6.13	5.20	0.58	2.97
SO_2 Emissions (tons)	0.16	0.16	0.14	0.01	0.08
PM Emissions (tons)	0.16	0.15	0.13	0.01	0.07

Calculations:

(a) Natural Gas Throughput (MMcf/yr) = (throughput [therms/yr]) x 0.000098039

Therm = 9.8039E-05 MMcf (1)

(b) Natural Gas Emissions (tons) = (emission factor [lb/MMcf]) x (throughput [MMcf/yr]) / 2,000

Notes:

(1) Review Report/Permit No.: 03-2145-TV-01 and Annual Reports.

(2) Projected throughput numbers are based on maximum of one month from August 2019 to March 2020 extrapolated to 12 months.

Table 7. Clay Handling (CH1 and CH2) Emissions
Willamette Falls Paper Co.
West Linn, Oregon

Clay Handling	PM Emissions				
	Hours	Emission Factor			Emissions (tons)
2015	5,095	5.14	lb/hr	(1)	13.09
2016	5,197	5.14	lb/hr	(1)	13.36
2017	4,364	5.14	lb/hr	(1)	11.22
Projected	6,000	5.14	lb/hr	(2)	15.42
PSEL	1,800,000,000	0.2	gr/Dscf	(1)	25.71

Calculations:
(a) Emissions (tons/yr) = (hours of operation [hrs/yr]) x (Emission Rate [lb/hr]) x [tons/2,000 lbs]

Notes:
(1) Review Report/Permit No.: 03-2145-TV-01 and Annual Reports.
(2) Projected emissions are based on 6,000 hours of annual operation.

Table 1. RBLC Search - Natural Gas Industrial Boilers greater than 100 MMBtu/hr and less than 250 MMBtu/hr - PM_{10}
Permit Date Between 01/01/2010 And 04/20/2020

RBLCID	Facility Name	Facility State	Permit Number	Permit Issuance Date	Process Name	Throughput	Throughput Unit	PM10 Control Method Description	Emission Limit	Emission Limit Unit	Case-by-Case Basis
*LA-0352	PLAQUEMINE ETHYLENE PLANT 1	LA	PSD-LA-788(M3)	12/12/2019	Cracking Heater H (EP-8, EQT0426)	191.28	mm btu/hr	good combustion practices, use of natural gas and/or hydrogen rich fuel gas during startup	0.084	LB/MM BTU	BACT-PSD
*OH-0381	NORTHSTAR BLUESCOPE STEEL, LLC	OH	P0126431	9/27/2019	Tunnel Furnace (P001)	112	MMBTU/H	Use of natural gas, good combustion practices and design	1.12	LB/H	BACT-PSD
*VA-0332	CHICKAHOMINY POWER LLC	VA	52610-1	6/24/2019	Two (2) Auxiliary Boilers	721	MMCF/YR	Good combustion practices and the use of pipeline quality natural gas with a maximum sulfur content of 0.4 gr/100 scf on a 12-month rolling average.	0.6	LB/HR	BACT-PSD
OH-0379	PETMIN USA INCORPORATED	OH	P0125024	2/6/2019	Process gas heater (P001)	218.9	MMBTU/H	Good combustion practices and the use of natural gas	1.63	LB/H	BACT-PSD
IL-0126	NUCOR STEEL KANKAKEE, INC.	IL	18060014	11/1/2018	Gas-Fired Space Heaters	25	mmBtu/hr		0.0075	LB/MMBTU	BACT-PSD
LA-0331	CALCASIEU PASS LNG PROJECT	LA	PDS-LA-805	9/21/2018	Hot Oil Heaters (HOH1 to HOH6)	115	MM BTU/h	Exclusive Combustion of Fuel Gas and Good Combustion Practices	0.0075	LB/MM BTU	BACT-PSD
IN-0287	DUKE ENERGY INDIANA, LLC - EDWARDSPORT GENERATING STATION	IN	083-38023-00003	7/10/2018	Auxiliary Boiler	213	MMBtu/hr	good combustion practices	0.0075	LB/MMBTU	BACT-PSD
VA-0328	C4GT, LLC	VA	52588	4/26/2018	Auxiliary Boiler	902	mmcf/y	Good combustion practices and the use of pipeline quality natural gas with a maximum sulfur content of 0.4 gr/100 scf on a 12-mo rolling av.	0.8	LB/H	BACT-PSD
MI-0427	FILER CITY STATION	MI	66-17	11/17/2017	EUAUXBOILER (Auxiliary boiler)	182	MMBTU/H	Good combustion practices	0.0075	LB/MMBTU	BACT-PSD
OH-0374	GUERNSEY POWER STATION LLC	OH	P0122594	10/23/2017	Auxiliary Boiler (B001)	185	MMBTU/H	Gas combustion control	1.3	LB/H	BACT-PSD
IN-0263	MIDWEST FERTILIZER COMPANY LLC	IN	129-36943-00059	3/23/2017	NATURAL GAS AUXILIARY BOILERS (EU	218.6	MMBTU/H	PROPER DESIGN AND GOOD COMBUSTION PRACTICES AT ALL TIMES THE BOILERS ARE IN OPERATION.	7.6	LB/MMCF EAC	BACT-PSD
MI-0423	INDECK NILES, LLC	MI	75-16	1/4/2017	EUAUXBOILER (Auxiliary Boiler)	182	MMBTU/H	Good combustion practices.	1.36	LB/H	BACT-PSD
LA-0314	INDORAMA LAKE CHARLES FACILITY	LA	PSD-LA-813	8/3/2016	boiler A and B (010 and 011)	248	mm btu/hr (each	good combustion practices; fueled by natural gas or process fuel gas	0.007	LB/MM BTU	BACT-PSD
LA-0314	INDORAMA LAKE CHARLES FACILITY	LA	PSD-LA-813	8/3/2016	boiler B-201	229	mm btu	good combustion practices; fueled by natural gas or process fuel gas	0.007	LB/MM BTU	BACT-PSD
VA-0325	GREENSVILLE POWER STATION	VA	52525	6/17/2016	AUXILIARY BOILER (1) AND FUEL GAS	185	MMBTU/HR	Low sulfur/carbon fuel and good combustion practices	0.007	LB/MMBTU	N/A
LA-0275	LINEAR ALKYL BENZENE (LAB) UNIT	LA	PSD-LA-291(M4)	4/29/2016	Heaters (3 units)	0			0		BACT-PSD
LA-0307	MAGNOLIA LNG FACILITY	LA	PSD-LA-792	3/21/2016	Auxiliary boilers	171	mm btu/hr	good combustion practices	0		BACT-PSD
PA-0306	TENASKA PA PARTNERS/WESTMORELAND GEN FAC	PA	65-00990 C/E	2/12/2016	245 MMBtu natural gas fired Auxiliary	1052	MMscf/yr	Good combustion practice	0.0075	LB/MMBTU	LAER
*NE-0059	AGP SOY	NE	CP14-007	3/25/2015	Boiler #1	200	MMBTU/H		0.0074	LB/MMBTU	BACT-PSD
*NE-0059	AGP SOY	NE	CP14-007	3/25/2015	Boiler #2	200	MMBTU/H		0.0074	LB/MMBTU	BACT-PSD
AK-0083	KENAI NITROGEN OPERATIONS	AK	AQ0083CPT06	1/6/2015	Three (3) Package Boilers	243	MMBTU/H		0.0074	LB/MMBTU	BACT-PSD
AK-0083	KENAI NITROGEN OPERATIONS	AK	AQ0083CPT06	1/6/2015	Startup Heater	101	MMBTU/H		0.0074	LB/MMBTU	BACT-PSD
OH-0363	NTE OHIO, LLC	OH	P0116610	11/5/2014	Auxiliary Boiler (B001)	150	MMBTU/H	Exclusive Natural Gas	1.05	LB/H	BACT-PSD
IL-0114	CRONUS CHEMICALS, LLC	IL	13060007	9/5/2014	Startup Heater	104	MMBTU/H	good combustion practices	0.0075	LB/MMBTU	BACT-PSD
MS-0092	EMBERCLEAR GTL MS	MS	0040-00055	5/8/2014	Boiler, Nat Gas Fired	261	MMBTU/H		1.31	LB/H	BACT-PSD
NM-0052	ZIA II GAS PLANT	NM	PSD-5217	4/25/2014	Industrial Sized Boilers/Furnaces >	114	mmBtu/hr		0		BACT-PSD

Table 1. RBLC Search - Natural Gas Industrial Boilers greater than 100 MMBtu/hr and less than 250 MMBtu/hr - PM_{10}
Permit Date Between 01/01/2010 And 04/20/2020

RBLCID	Facility Name	Facility State	Permit Number	Permit Issuance Date	Process Name	Throughput	Throughput Unit	PM10 Control Method Description	Emission Limit	Emission Limit Unit	Case-by-Case Basis
IN-0179	OHIO VALLEY RESOURCES, LLC	IN	147-32322-00062	9/25/2013	FOUR (4) NATURAL GAS-FIRED BOILEF	218	MMBTU/HR, EAC	PROPER DESIGN AND GOOD COMBUSTION PRACTICES	7.6	LB/MMCF	BACT-PSD
LA-0272	AMMONIA PRODUCTION FACILITY	LA	PSD-LA-768	3/27/2013	COMMISSIONING BOILERS 1 & 2 (CB-1	217.5	MM BTU/HR	GOOD COMBUSTION PRACTICES: PROPER DESIGN OF BURNER AND FIREBOX COMPONENTS; MAINTAINING THE PROPER AIR-TO-FUEL RATIO, RESIDENCE TIME, AND COMBUSTION ZONE TEMPERATURE.	1.94	LB/H	BACT-PSD
OH-0354	KRATON POLYMERS U.S. LLC	OH	P0108853	1/15/2013	Two 249 MMBtu/H boilers	249	MMBtu/H		15.96	T/YR	N/A
IA-0105	IOWA FERTILIZER COMPANY	IA	12-219	10/26/2012	Startup Heater	110.12	MMBTU/H	good combustion practices	0.0024	LB/MMBTU	BACT-PSD
CA-1212	PALMDALE HYBRID POWER PROJECT	CA	SE 09-01	10/18/2011	AUXILIARY BOILER	110	MMBTU/H	USE PUC QUALITY NATURAL GAS	0.8	LB/H	BACT-PSD
AK-0071	INTERNATIONAL STATION POWER PLANT	AK	AQ0164CPT01	12/20/2010	Duct Burners (4)	140	MMBTU/H	Good Combustion Practices	7.6	LB/MMSCF	BACT-PSD
AK-0073	INTERNATIONAL STATION POWER PLANT	AK	AQ0164CPT01	12/20/2010	Fuel Combustion	140	MMBTU/H	Combustion Turbines EU IDs 9-12 use good combustion practices involve increasing the residence time and excess oxygen to ensure complete combustion which in turn minimize particulates without an add-on control technology.	7.6	LB/MMBTU	BACT-PSD
LA-0244	LAKE CHARLES CHEMICAL COMPLEX - LAB UNIT	LA	PSD-LA-291(M3)	11/29/2010	EQT0029 - Hot Oil Heater H-601	170	MMBTU/H	No additional control	1.71	LB/H	BACT-PSD
TX-0576	PIPE MANUFACTURING STEEL MINI MILL	TX	PSDTX1188 AND 8(	4/19/2010	vacuum degasser boiler	40	MMBTU/H	good combustion practice	0.0075	LB/MMBTU	BACT-PSD

Table 2. RBLC Search - Natural Gas Industrial Boilers greater than 100 MMBtu/hr and less than 250 MMBtu/hr - SO_2
Permit Date Between 01/01/2010 And 04/20/2020

RBLCID	Facility Name	Facility State	Permit Number	Permit Issuance Date	Process Name	Throughput	Throughput Unit	Control Method Description	Emission Limit	Emission Limit Unit	Case-by-Case Basis
*OH-0381	NORTHSTAR BLUESCOPE STEEL, LLC	OH	P0126431	9/27/2019	Tunnel Furnace (P001)	112	MMBTU/H	Use of natural gas, good combustion practices and design	0.07	LB/H	BACT-PSD
*VA-0332	CHICKAHOMINY POWER LLC	VA	52610-1	6/24/2019	Two (2) Auxiliary Boilers	721	MMCF/YR	the use of pipeline quality natural gas with a maximum sulfur content of 0.4 gr/100 scf on a 12-month rolling average.	0.0011	LB/MMBTU	BACT-PSD
LA-0331	CALCASIEU PASS LNG PROJECT	LA	PDS-LA-805	9/21/2018	Hot Oil Heaters (HOH1 to HOH6)	115	MM BTU/h	Exclusive Use Low Sulfur Fuel Gas and Proper Engineering Practices	0.0006	LB/MM BTU	BACT-PSD
OH-0374	GUERNSEY POWER STATION LLC	OH	P0122594	10/23/2017	Auxiliary Boiler (B001)	185	MMBTU/H	Pipeline natural gas fuel	0.28	LB/H	BACT-PSD
MI-0423	INDECK NILES, LLC	MI	75-16	1/4/2017	EUAUXBOILER (Auxiliary Boiler)	182	MMBTU/H	Good combustion practices and the use of pipeline quality natural gas.	0.6	LB/MMSCF	BACT-PSD
VA-0325	GREENSVILLE POWER STATION	VA	52525	6/17/2016	AUXILIARY BOILER (1) AND FUEL GA	185	MMBTU/HR	Low sulfur fuel	0.0011	LB/MMBTU	N/A
TX-0678	FREEPORT LNG PRETREATMENT FACILIT	TX	104840 N170 PSDTX13(	7/16/2014	Heating Medium Heaters	130	MMBTU/H		0.01	LB/H	BACT-PSD
NM-0052	ZIA II GAS PLANT	NM	PSD-5217	4/25/2014	Industrial Sized Boilers/Furnaces &(	114	mmBtu/hr		0		BACT-PSD
AR-0121	EL DORADO CHEMICAL COMPANY	AR	0573-AOP-R16	11/18/2013	AMMONIA PLANT START-UP HEATE	38	MMBTU/H	GOOD COMBUSTION PRACTICE	0.03	LB/H	BACT-PSD
AR-0121	EL DORADO CHEMICAL COMPANY	AR	0573-AOP-R16	11/18/2013	START-UP BOILER	240	MMBTU/H	GOOD AND EFFICIENT OPERATING PRACTICES	0.18	LB/H	BACT-PSD
AR-0140	BIG RIVER STEEL LLC	AR	2305-AOP-R0	9/18/2013	TUNNEL FURNACES SN-20 AND 21	234	MMBTU/H	NATURAL GAS AND GOOD COMBUSTION PRACTICE	5.88	X10^-4 LB/MMB	BACT-PSD
OH-0354	KRATON POLYMERS U.S. LLC	OH	P0108853	1/15/2013	Two 249 MMBtu/H boilers	249	MMBtu/H	Burning low sulfur fuels with less than 0.05 % sulfur.	11.24	T/YR	N/A
OH-0336	CAMPBELL SOUP COMPANY	OH	P0106678	12/14/2010	Boilers (3)	0			0.0006	LB/MMBTU	OTHER CASE-BY-CASE
TX-0576	PIPE MANUFACTURING STEEL MINI MIL	TX	PSDTX1188 AND 86860	4/19/2010	vacuum degasser boiler	40	MMBTU/H	good combustion practice	0.0006	LB/MMBTU	BACT-PSD

Table 3. RBLC Search - Natural Gas Industrial Boilers greater than 100 MMBtu/hr and less than 250 MMBtu/hr - NO_X
Permit Date Between 01/01/2010 And 04/20/2020

RBLCID	Facility Name	Facility State	Permit Number	Permit Issuance Date	Process Name	Throughput	Throughput Unit	Control Method Description	Emission Limit	Emission Limit Unit	Case-by-Case Basis
*TX-0886	MONT BELVIEU NGL FRACTIONATION U	TX	106921, N270	3/31/2020	HOT OIL HEATERS	150	MMBTU/H	Low-NOx burners and selective catalytic reduction (SCR)	0.01	LB/MMBTU	LAER
*TX-0886	MONT BELVIEU NGL FRACTIONATION U	TX	106921, N270	3/31/2020	HOT OIL HEATERS MSS	0		LIMITED MSS OPERATIONS	0.05	LB/MMBTU	LAER
*LA-0352	PLAQUEMINE ETHYLENE PLANT 1	LA	PSD-LA-788(M3)	12/12/2019	Cracking Heater H (EP-8, EQT0426)	191.28	mm btu/hr	LNB + SCR good combustion practices	0.01	LB/MM BTU	LAER
*LA-0352	PLAQUEMINE ETHYLENE PLANT 1	LA	PSD-LA-788(M3)	12/12/2019	BP Steam Boiler Packages (EU-2/EU-2, EQT0266/EQT0267)	180.13	mm btu/hr (eac	LNB + SCR and good combustion practices	0.021	LB/MM BTU	LAER
*OH-0381	NORTHSTAR BLUESCOPE STEEL, LLC	OH	P0126431	9/27/2019	Tunnel Furnace (P001)	112	MMBTU/H	Use of natural gas, use of low NOx burners, good combustion practices and design	7.84	LB/H	BACT-PSD
IN-0312	LEHIGH CEMENT COMPANY LLC	IN	093-40198-00002	6/27/2019	Finish Mill Air Heaters	16.7	MMBtu/hr (eac	Low NOx Burner (LNB), Flue Gas Recirculation and Good Combustion Practices (GCP)	50	LB/MMCF NATU	BACT-PSD
*VA-0332	CHICKAHOMINY POWER LLC	VA	52610-1	6/24/2019	Two (2) Auxiliary Boilers	721	MMCF/YR	Low NOx burners	0.011	LB/MMBTU	BACT-PSD
OH-0379	PETMIN USA INCORPORATED	OH	P0125024	2/6/2019	Process gas heater (P001)	218.9	MMBTU/H	Low NOX burners, use of natural gas and good combustion practices	14.01	LB/H	BACT-PSD
IL-0126	NUCOR STEEL KANKAKEE, INC.	IL	18060014	11/1/2018	Gas-Fired Space Heaters	25	mmBtu/hr	Good combustion practices	0.1	LB/MMBTU	BACT-PSD
LA-0331	CALCASIEU PASS LNG PROJECT	LA	PDS-LA-805	9/21/2018	Hot Oil Heaters (HOH1 to HOH6)	115	MM BTU/h	Ultra Low NOx Burners and Good Combustion Practices	0.038	LB/MM BTU	BACT-PSD
VA-0328	C4GT, LLC	VA	52588	4/26/2018	Auxiliary Boiler	902	mmcf/y	Low NOx burners	0.011	LB/MMBTU	BACT-PSD
MI-0427	FILER CITY STATION	MI	66-17	11/17/2017	EUAUXBOILER (Auxiliary boiler)	182	MMBTU/H	LNB that incorporate internal (within the burner) FGR and good combustion practices.	0.04	LB/MMBTU	BACT-PSD
OH-0374	GUERNSEY POWER STATION LLC	OH	P0122594	10/23/2017	Auxiliary Boiler (B001)	185	MMBTU/H	low-NOx burners and flue gas recirculation	3.7	LB/H	BACT-PSD
IN-0263	MIDWEST FERTILIZER COMPANY LLC	IN	129-36943-00059	3/23/2017	NATURAL GAS AUXILIARY BOILERS (EU-012A, EU-012B, EU-012C)	218.6	MMBTU/H	LOW NOX BURNERS WITH FLUE GAS RECIRCULATION AND GOOD COMBUSTION PRACTICES	20.4	LB/MMCF EACH	BACT-PSD
MI-0423	INDECK NILES, LLC	MI	75-16	1/4/2017	EUAUXBOILER (Auxiliary Boiler)	182	MMBTU/H	Low NOx burners/Flue gas recirculation and good combustion practices.	0.04	LB/MMBTU	BACT-PSD
TX-0811	LINEAR ALPHA OLEFINS PLANT	TX	136130 AND N250	11/3/2016	Industrial-Sized Furnaces, Natural Gas-fired	217	MM BTU / H	Low-NOX burners and Selective Catalytic Reduction (SCR). Ammonia slip limited to 10 ppmv (corrected to 3% O2) on a 1-hr block average.	0.006	LB / MM BTU	LAER
LA-0314	INDORAMA LAKE CHARLES FACILITY	LA	PSD-LA-813	8/3/2016	boiler A and B (010 and 011)	248	mm btu/hr (eac	good combustion practices; fueled by natural gas or process fuel gas; ULNB (FGR and economizer)	0.06	LB/MM BTU	BACT-PSD
LA-0314	INDORAMA LAKE CHARLES FACILITY	LA	PSD-LA-813	8/3/2016	boiler B-201	229	mm btu	good combustion practices; fueled by natural gas or process fuel gas; ULNB (FGR and economizer)	0.06	LB/MM BTU	BACT-PSD
VA-0325	GREENSVILLE POWER STATION	VA	52525	6/17/2016	AUXILIARY BOILER (1) AND FUEL GAS HEATERS (6)	185	MMBTU/HR	ultra low-NOx burners	0.011	LB/MMBTU	N/A
LA-0275	LINEAR ALKYL BENZENE (LAB) UNIT	LA	PSD-LA-291(M4)	4/29/2016	Heaters (3 units)	0		Low NOX burners	0		BACT-PSD
LA-0307	MAGNOLIA LNG FACILITY	LA	PSD-LA-792	3/21/2016	Auxiliary boilers	171	mm btu/hr	Low Nox burners	0		BACT-PSD
PA-0306	TENASKA PA PARTNERS/WESTMORELA	PA	65-00990 C/E	2/12/2016	245 MMBtu natural gas fired Auxiliary boiler	1052	MMscf/yr	Good combustion practices and ULNOx burners	0.011	LB/MMBTU	LAER
TX-0731	CORPUS CHRISTI TERMINAL CONDENSA	TX	118270 AND PSDT	4/10/2015	Industrial-Size Boilers/Furnaces	0		Selective catalytic reduction (SCR)	0.006	LB/MMBTU	BACT-PSD
AK-0083	KENAI NITROGEN OPERATIONS	AK	AQ0083CPT06	1/6/2015	Three (3) Package Boilers	243	MMBTU/H	Ultra Low NOx Burners	0.01	LB/MMBTU	BACT-PSD
AK-0083	KENAI NITROGEN OPERATIONS	AK	AQ0083CPT06	1/6/2015	Startup Heater	101	MMBTU/H	Limited Use (200 hr/yr)	0.098	LB/MMBTU	BACT-PSD

Table 3. RBLC Search - Natural Gas Industrial Boilers greater than 100 MMBtu/hr and less than 250 MMBtu/hr - NO_X
Permit Date Between 01/01/2010 And 04/20/2020

RBLCID	Facility Name	Facility State	Permit Number	Permit Issuance Date	Process Name	Throughput	Throughput Unit	Control Method Description	Emission Limit	Emission Limit Unit	Case-by-Case Basis
WV-0025	MOUNDSVILLE COMBINED CYCLE POW	WV	R14-0030	11/21/2014	Auxiliary Boiler	100	mmBtu/hr	Ultra Low-NOx Burners, Flue-Gas Recirculation, & Good Combustion Practices	2	LB/H	BACT-PSD
TX-0712	TRINIDAD GENERATING FACILITY	TX	111393 PSDTX136	11/20/2014	boiler	110	MMBTU/H	ultra-low NOx burners, limited use	9	PPMVD	BACT-PSD
OH-0363	NTE OHIO, LLC	OH	P0116610	11/5/2014	Auxiliary Boiler (B001)	150	MMBTU/H	Ultra low NOx burner	1.65	LB/H	BACT-PSD
IL-0114	CRONUS CHEMICALS, LLC	IL	13060007	9/5/2014	Startup Heater	104	MMBTU/H	low-nox burners	0.08	LB/MMBTU	BACT-PSD
TX-0678	FREEPORT LNG PRETREATMENT FACILI	TX	104840 N170 PSD	7/16/2014	Heating Medium Heaters	130	MMBTU/H	ultra-low NOx burners	5	PPMVD	LAER
NM-0052	ZIA II GAS PLANT	NM	PSD-5217	4/25/2014	Industrial Sized Boilers/Furnaces >100 mmBtu/hr	114	mmBtu/hr		0		BACT-PSD
AR-0121	EL DORADO CHEMICAL COMPANY	AR	0573-AOP-R16	11/18/2013	AMMONIA PLANT START-UP HEATER	38	MMBTU/H	GOOD COMBUSTION PRACTICE	2.28	LB/H	BACT-PSD
AR-0121	EL DORADO CHEMICAL COMPANY	AR	0573-AOP-R16	11/18/2013	START-UP BOILER	240	MMBTU/H	LOW NOX BURNERS AND FLUE GAS RECIRCULATION	4.32	LB/H	BACT-PSD
TX-0641	PINECREST ENERGY CENTER	TX	PSDTX1298	11/12/2013	Auxiliary boiler	150	MMBTU/H	low NOx burners	16	PPMVD	BACT-PSD
IN-0179	OHIO VALLEY RESOURCES, LLC	IN	147-32322-00062	9/25/2013	FOUR (4) NATURAL GAS-FIRED BOILERS	218	MMBTU/HR, EA	ULTRA LOW NOX BURNERS FLUE GAS RECIRCULATION	20.4	LB/MMCF	BACT-PSD
AR-0140	BIG RIVER STEEL LLC	AR	2305-AOP-R0	9/18/2013	TUNNEL FURNACES SN-20 AND 21	234	MMBTU/H	LOW NOX BURNERS COMBUSTION OF CLEAN FUEL GOOD COMBUSTION PRACTICES	0.1	LB/MMBTU	BACT-PSD
TX-0682	GALENA PARK TERMINAL	TX	101199 & N158	6/12/2013	Heaters	129	MMBTU/H	low-NOx burners and SCR	0.01	LB/MMBTU	LAER
LA-0272	AMMONIA PRODUCTION FACILITY	LA	PSD-LA-768	3/27/2013	COMMISSIONING BOILERS 1 & 2 (CB-1 & CB-2)	217.5	MM BTU/HR	FLUE GAS RECIRCULATION, LOW NOX BURNERS, AND GOOD COMBUSTION PRACTICES (I.E., PROPER DESIGN OF BURNER AND FIREBOX COMPONENTS; MAINTAINING THE PROPER AIR-TO-FUEL RATIO, RESIDENCE TIME, AND COMBUSTION ZONE TEMPERATURE).	11.92	LB/H	BACT-PSD
TX-0708	LA PALOMA ENERGY CENTER	TX	101542 PSDTX128	2/7/2013	boiler	150	MMBTU/H	low-NOx burners, limited use	0.02	LB/MMBTU	BACT-PSD
OH-0354	KRATON POLYMERS U.S. LLC	OH	P0108853	1/15/2013	Two 249 MMBtu/H boilers	249	MMBtu/H	Low-NOx burners	0.12	LB/MMBTU	N/A
IA-0105	IOWA FERTILIZER COMPANY	IA	12-219	10/26/2012	Startup Heater	110.12	MMBTU/H	good combustion practices	0.119	LB/MMBTU	BACT-PSD
CA-1212	PALMDALE HYBRID POWER PROJECT	CA	SE 09-01	10/18/2011	AUXILIARY BOILER	110	MMBTU/H		9	PPMVD	BACT-PSD
CA-1206	STOCKTON COGEN COMPANY	CA	SJ 85-04	9/16/2011	AUXILIARY BOILER	178	MMBTU/H		7	PPMVD	BACT-PSD
AK-0071	INTERNATIONAL STATION POWER PLA	AK	AQ0164CPT01	12/20/2010	Duct Burners (4)	140	MMBTU/H	Selective Catalytic Reduction	5	PPMDV	BACT-PSD
AK-0073	INTERNATIONAL STATION POWER PLA	AK	AQ0164CPT01	12/20/2010	Fuel Combustion	140	MMBTU/H	Duct Burners EU IDs 9 through 12 shall be equipped with Selective Catalytic Reduction (SCR). SCR is a post-combustion gas treatment technique for reduction of nitric oxide (NO) and nitrogen dioxide (NO2) in the turbine exhaust stream to molecular nitrogen, water, and oxygen. This process is accomplished by using ammonia (NH3) as a reducing agent, and is injected into the flue gas upstream of the catalyst bed. By lowering the activation energy of the NOx decomposition removal efficiency of 80 to 90 percent are achievable.	5	PPM	BACT-PSD
OH-0336	CAMPBELL SOUP COMPANY	OH	P0106678	12/14/2010	Boilers (3)	0			0.04	LB/MMBTU	OTHER CASE-BY
LA-0244	LAKE CHARLES CHEMICAL COMPLEX - L	LA	PSD-LA-291(M3)	11/29/2010	EQT0029 - Hot Oil Heater H-601	170	MMBTU/H	low nox burners	19.69	LB/H	BACT-PSD

Table 3. RBLC Search - Natural Gas Industrial Boilers greater than 100 MMBtu/hr and less than 250 MMBtu/hr - NO_X
Permit Date Between 01/01/2010 And 04/20/2020

RBLCID	Facility Name	Facility State	Permit Number	Permit Issuance Date	Process Name	Throughput	Throughput Unit	Control Method Description	Emission Limit	Emission Limit Unit	Case-by-Case Basis
TX-0576	PIPE MANUFACTURING STEEL MINI MI	TX	PSDTX1188 AND 8	4/19/2010	vacuum degasser boiler	40	MMBTU/H	good combustion practice	0.1	LB/MMBTU	BACT-PSD

Table 1. RBLC Search - Residual Oil Industrial Boilers greater than 100 MMBtu/hr and less than 250 MMBtu/hr - PM_{10}
Permit Date Between 1/1/2000 And 04/20/2020

RBLCID	Facility Name	Facility State	Permit Number	Permit Issuance Date	Process Name	Throughput	Throughput Unit	Control Method Description	Emission Limit 1	Emission Limit 1 Unit	Case-by-Case Basis
OH-0241	MILLER BREWING COMPANY - TRENTON	OH	14-05515	5/27/2004	BOILER (2), NO. 6 FUEL OIL	238	MMBTU/H	BAGHOUSE	0.01	GR/ACF	BACT-PSD
VA-0270	VCU EAST PLANT	VA	50126	3/31/2003	BOILER - NO 6 FUEL OIL	150	MMBTU/H	GOOD COMBUSTION PRACTICES.	8	LB/H	BACT-PSD
VA-0278	VCU EAST PLANT	VA	VA-50126	3/31/2003	BOILER, #6 FUEL OIL, (3)	150.6	MMBTU/H		8	LB/H	BACT-PSD

Table 2. RBLC Search - Residual Oil Industrial Boilers greater than 100 MMBtu/hr and less than 250 MMBtu/hr - SO_2
Permit Date Between 1/1/2000 And 04/20/2020

RBLCID	Facility Name	Facility State	Permit Number	Permit Issuance Date	Process Name	Throughput	Throughput Unit	Control Method Description	Emission Limit	Emission Limit Unit	Case-by-Case Basis
OH-0241	MILLER BREWING COMPANY - TRENTON	OH	14-05515	5/27/2004	BOILER (2), NO. 6 FUEL OIL	238	MMBTU/H		1.6	LB/MMBTU	BACT-PSD
VA-0270	VCU EAST PLANT	VA	50126	3/31/2003	BOILER - NO 6 FUEL OIL	150	MMBTU/H	GOOD COMBUSTION PRACTICES. LOW SULFUR FUELS.	78.5	LB/H	BACT-PSD
VA-0278	VCU EAST PLANT	VA	VA-50126	3/31/2003	BOILER, #6 FUEL OIL, (3)	150.6	MMBTU/H	FUEL SULFUR LIMIT: < 0.5% S BY WT	78.5	LB/H	BACT-PSD
NC-0092	RIEGELWOOD MILL	NC	03138R16	5/10/2001	BOILER, POWER, OIL-FIRED	249	MMBTU/H	MULTICLONE AND VARIABLE THROAT VENTURI-TYPE WET SCRUBBER	0.8	LB/MMBTU	BACT-PSD

Table 3. RBLC Search - Residual Oil Industrial Boilers greater than 100 MMBtu/hr and less than 250 MMBtu/hr - NO_X
Permit Date Between 1/1/2000 And 04/20/2020

RBLCID	Facility Name	Facility State	Permit Number	Permit Issuance Date	Process Name	Primary Fuel	Throughput	Throughput Unit	Control Method Description	Emission Limit	Emission Limit Unit	Case-by-Case Basis
PA-0246	NAVAL SURFACE WARFARE CENTER, CARDEROCK DIVISION	PA	AMS: 04108	10/28/2004	BOILERS, (5)	NO. 6 FUEL OIL	125	mmbtu/h		534	T/YR	RACT
OH-0241	MILLER BREWING COMPANY - TRENTON	OH	14-05515	5/27/2004	BOILER (2), NO. 6 FUEL OIL	NO. 6 FUEL OIL	238	MMBTU/H	OVERFIRE AND SIDE FIRE AIR TO REDUCE FLAME TEMERATURE	0.7	LB/MMBTU	BACT-PSD
VA-0270	VCU EAST PLANT	VA	50126	3/31/2003	BOILER - NO 6 FUEL OIL	FUEL OIL #6	150	MMBTU/H	GOOD COMBUSTION PRACTICES. LOW NOX COMBUSTION AND FGR. CEM SYSTEM.	0.4	LB/MMBTU	BACT-PSD
VA-0278	VCU EAST PLANT	VA	VA-50126	3/31/2003	BOILER, #6 FUEL OIL, (3)	# 6 FUEL OIL	150.6	MMBTU/H	LOW NOX BURNERS, FLUE GAS RECIRCULATION, AND GOOD OPERATING PROCEDURES.	57.5	LB/H	BACT-PSD
NC-0092	RIEGELWOOD MILL	NC	03138R16	5/10/2001	BOILER, POWER, OIL-FIRED	NO. 6 FUEL OIL	249	MMBTU/H	GOOD COMBUSTION PRACTICE	0.367	LB/MMBTU	BACT-PSD

Table 1. RBLC Search - Paper Machine - PM_{10}
Permit Date Between 1/1/2000 And 04/20/2020

RBLCID	Facility Name	Facility State	Permit Number	Permit Issuance Date	Process Name	Primary Fuel	Throughput	Throughput Unit	Control Method Description	Emission Limit 1	Emission Limit 1 Unit	Case-by-Case Basis
LA-0174	PORT HUDSON OPERATIONS	LA	PSD-LA-581 (M-2)	1/25/2002	TOWEL MACHINE NO. 6 FUGITIVE EMISSIONS		306	T/D		2.3	LB/H	BACT-PSD
LA-0174	PORT HUDSON OPERATIONS	LA	PSD-LA-581 (M-2)	1/25/2002	TOWEL MACHINE NO. 6 TAD EXHAUST 2	NATURAL GAS	306	T/D	FUELING BY NATURAL GAS	1.08	LB/H	BACT-PSD
LA-0174	PORT HUDSON OPERATIONS	LA	PSD-LA-581 (M-2)	1/25/2002	TOWEL MACHINE NO. 6 MIST ELIMINATION SYSTEM		306	T/D	FOR MIST ELIMINATION SYSTEM AND DUST SCRUBBER SYSTEM: WET SCRUBBERS	0.13	LB/H	BACT-PSD
LA-0174	PORT HUDSON OPERATIONS	LA	PSD-LA-581 (M-2)	1/25/2002	TOWEL MACHINE NO. 6 DUST COLLECTION SYSTEM		306	T/D	FOR MIST ELIMINATION SYSTEM AND DUST SCRUBBER SYSTEM: WET SCRUBBERS	3.12	LB/H	BACT-PSD
LA-0174	PORT HUDSON OPERATIONS	LA	PSD-LA-581 (M-2)	1/25/2002	TOWEL MACHINE NO. 6 YANKEE AIRCAP EXHAUST		306	T/D	DIRECT CONTACT WATER SPRAY	0.33	LB/H	BACT-PSD
LA-0174	PORT HUDSON OPERATIONS	LA	PSD-LA-581 (M-2)	1/25/2002	TOWEL MACHINE NO. 6 VACUUM PUMP EXHAUST	NATURAL GAS	306	T/D	FUELING BY NATURAL GAS	0.1	LB/H	BACT-PSD
LA-0174	PORT HUDSON OPERATIONS	LA	PSD-LA-581 (M-2)	1/25/2002	TOWEL MACHINE NO. 6 TAD EXHAUST 1	NATURAL GAS	306	T/D	FUELING BY NATURAL GAS	2.16	LB/H	BACT-PSD

Table 2. RBLC Search - Paper Machine - SO_2
Permit Date Between 1/1/2000 And 04/20/2020

RBLCID	Facility Name	Facility State	Permit Number	Permit Issuance Date	Process Name	Primary Fuel	Throughput	Throughput Unit	Control Method Description	Emission Limit 1	Emission Limit 1 Unit	Case-by-Case Basis
LA-0174	PORT HUDSON OPERATIONS	LA	PSD-LA-581 (M-2)	1/25/2002	TOWEL MACHINE NO. 6 TAD EXHAUST 2	NATURAL GAS	306	T/D	NATURAL GAS AS FUEL	0.04	LB/H	BACT-PSD
LA-0174	PORT HUDSON OPERATIONS	LA	PSD-LA-581 (M-2)	1/25/2002	TOWEL MACHINE NO. 6 YANKEE AIRCAP EXHAUST		306	T/D	NATURAL GAS AS FUEL	0.02	LB/H	BACT-PSD
LA-0174	PORT HUDSON OPERATIONS	LA	PSD-LA-581 (M-2)	1/25/2002	TOWEL MACHINE NO. 6 TAD EXHAUST 1	NATURAL GAS	306	T/D	NATURAL GAS AS FUEL	0.07	LB/H	BACT-PSD

Table 3. RBLC Search - Paper Machine - NO_X

Permit Date Between 1/1/2000 And 04/20/2020

RBLCID	Facility Name	Facility State	Permit Number	Permit Issuance Date	Process Name	Primary Fuel	Throughput	Throughput Unit	Control Method Description	Emission Limit 1	Emission Limit 1 Unit	Case-by-Case Basis
ME-0044	WOODLAND PULP LLC	ME	A-215-77-15-A	7/27/2018	Tissue Machine 1	Nat Gas	187.4	ADTFP/D	Low NOx Burners	4.52	LB/H	BACT-PSD
ME-0044	WOODLAND PULP LLC	ME	A-215-77-15-A	7/27/2018	Tissue Machine 2	Nat Gas	187.4	ADTFP/D	Low NOx Burners	4.52	LB/H	BACT-PSD
ME-0044	WOODLAND PULP LLC	ME	A-215-77-15-A	7/27/2018	Tissue Machine 3	Nat Gas	276	ADTFP/D	Low NOx Burners	8.97	LB/H	BACT-PSD
ME-0044	WOODLAND PULP LLC	ME	A-215-77-15-A	7/27/2018	Tissue Machine 4	Nat Gas	187.4	ADTFP/D	Low NOx Burners	4.52	LB/H	BACT-PSD
AL-0270	GEORGIA PACIFIC BRETON LLC	AL	502-0001-X048	6/11/2014	No. 1 Paper Machine Coating Section - Paper Machines	Natural Gas	10.5	MMBTU/H		0.0365	LB/MMBTU	BACT-PSD