TECHNICAL SUPPORT DOCUMENT
FOR PREVENTION OF SIGNIFICANT DETERIORATION
NO. PSD 05-04

Prepared by

Washington State Department of Ecology
Air Quality Program

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1. INTRODUCTION

1.1 The PSD Process

The Prevention of Significant Deterioration (PSD) procedure is established in Title 40, Code of Federal Regulations (CFR), Part 52.21 and in Washington Administrative Code 173-400-700. Federal rules require PSD review of all new or modified air pollution sources that meet certain overall size, and pollution rate criteria. The objective of the PSD program is to prevent serious adverse environmental impact from emissions into the atmosphere by a proposed new or modified source. PSD rules require that an applicant use the most effective air pollution control equipment and procedures after considering environmental, economic, and energy factors. The program sets up a mechanism for evaluating and controlling air emissions from a proposed source to minimize the impacts on air quality, visibility, soils, and vegetation.

The United States Environmental Protection Agency (EPA) delegated the authority to implement the PSD program described in title 40 C.F.R. 52.21 and its supporting guidance and procedures documents to the Science and Engineering Section staff of the Air Quality Program of the Washington State Department of Ecology (Ecology).[1]

On June 10, 2008, Sierra Pacific Industries–Skagit Lumber Manufacturing Facility (SPI-Burlington) submitted an application to amend PSD permit No. 05-04.[2] Ecology determined the application to be incomplete on July 8, 2008. Supplementary information was submitted on August 27, 2008, October 29, 2008, and November 11, 2008. Ecology determined the application to be complete on December 1, 2008.

1.2 The Project

1.2.1 The Existing Facility

SPI-Burlington started operation in the Fredonia Business Park in Skagit County, Washington in January 2007. The facility consists of a sawmill, a planer mill, lumber drying kilns, and a wood-fired cogeneration unit. The cogeneration unit provides low-grade steam to the drying kilns and includes a steam-driven turbine that can produce approximately 30 megawatts (MW) of electrical power.

The lumber manufacturing facility is located on the southern portion of a 144 acre site east of the Fredonia Grange, Skagit County, Washington (Township 34 North, Range 3 East, Section 9). The site is approximately bounded by State Road (SR) 20 on the south. It is northwest of the

[1] Agreement for the Delegation of the Federal Prevention of Significant Deterioration (PSD) Regulations by the United States Environmental Protection Agency, Region 10 to the State of Washington Department of Ecology (February 23, 2005).
[2] Notice of Construction and Prevention of Significant Deterioration Permit Application for Lumber Production Increase – Burlington, Washington; Prepared for Sierra Pacific Industries (Redding, CA) by GeoMatrix (Project No. 010796.003.0, June 2008).

intersection between SR 20 and SR 536, southwest of the Skagit Regional Airport, about three miles from the Skagit River, five miles from Mt. Vernon and Burlington, and two miles from Padilla Bay. The United States Geographical Survey coordinates are North 48^o 26' 56", West 122^o 25' 59". The Universal Transverse Mercator (NAD 27) coordinates are 5,366,150 meters northing, 541,950 meters easting, Zone 10. The site of the proposed project is within a Class II area that is in attainment or unclassified with regard to all pollutants regulated by the National Ambient Air Quality Standards (NAAQS) and state air quality standards.

Logs are delivered to the facility during daylight hours, and stacked in the log deck. SPI-Burlington de-barks the logs, sends the bark to the co-generation fuel house, and the logs to the sawmill. In the sawmill, SPI-Burlington cuts the logs into green lumber. SPI-Burlington chips off-sized lumber pieces for by-product sales. SPI-Burlington sends sawdust to the co-generation fuel house. SPI-Burlington either sells green lumber as-is or kiln-dried.[3] SPI-Burlington shaves kiln-dried lumber in the planer to commercial dimensions prior to sale, and conveys planer shavings to the co-generation fuel house. The facility was originally designed to produce about 300 million board feet[4] (MMBF) of lumber annually of which 200 MMBf was to be kiln-dried. SPI-Burlington plans to increase capacity to as much as 400 MMBF per year depending on the mix of wood species processed, all of which may be kiln-dried.

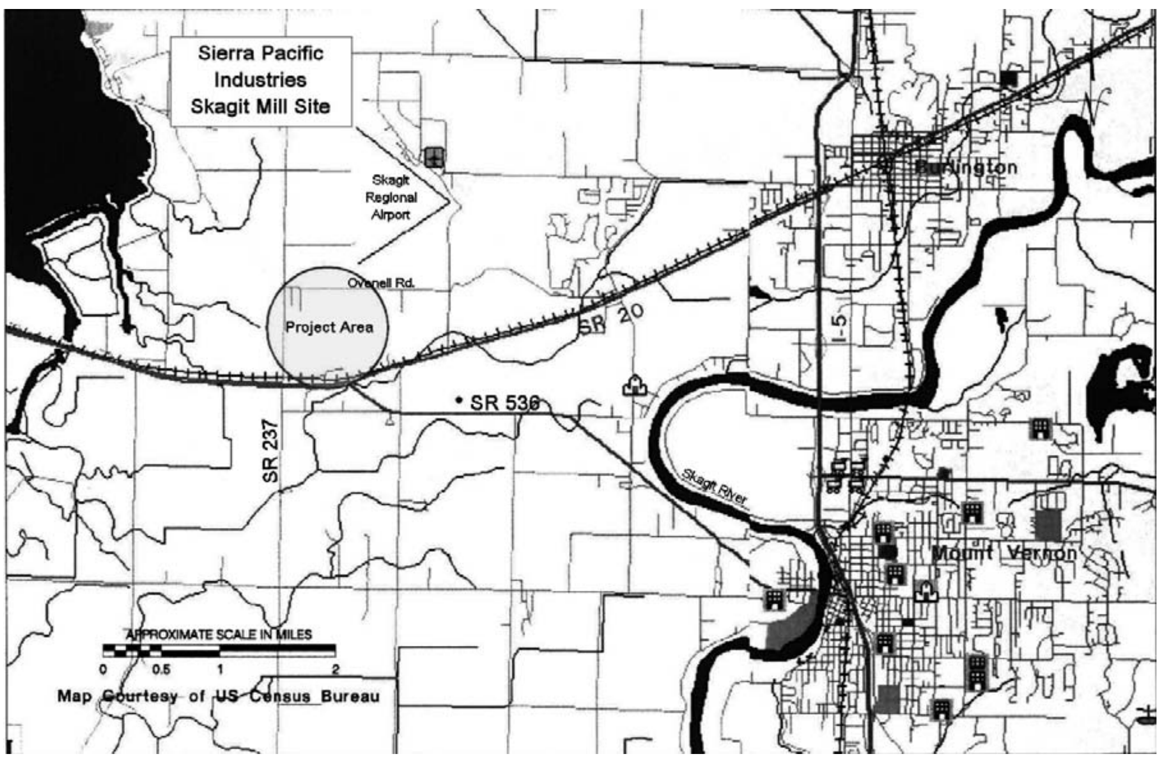

Figure 1. Site Location

[3] In the drying kilns, the moisture content of the lumber is reduced to about 15 percent.
[4] A "board-foot" is one-twelfth of a cubic foot of cut lumber.

The wood-fired cogeneration unit consists of 430 million British thermal units per hour (MMBtu/hr) wood-fired boiler and 30 MW steam-powered electrical generation turbine. Power generated from the steam turbine supplies electricity to the saw mill (about seven MW) and to the electricity power grid (about 23 MW). The wood burned in the SPI boiler is “hogged”[5] bark, sawdust, and planer shavings totaling about 380,000 green tons per year (TPY). The fuel is a mixture of wet and dry wood, though the majority of the fuel is wet. SPI expects the on-site sawmill to generate all the fuel burned in the boiler, though they can burn wood generated elsewhere as a contingency. The boiler has auxiliary natural gas burners (total: 125,000 MMBtu/hr) for startup and flame stabilization.

1.2.2 This Amendment Action

SPI-Burlington plans to increase capacity to 400 MMBF per year. The drying kilns were originally installed with this capacity. However, SPI-Burlington proposed that volatile organic compound (VOC) emissions from the drying kiln be restricted to 54 TPY. This assured that plant-wide VOC emissions would not trigger a requirement to perform ozone impact modeling. SPI-Burlington wished to avoid a delay in the permitting process that might have been caused by the ozone impact modeling. This 54 TPY VOC emissions limit effectively limited the use of SPI-Burlington’s drying kilns to 180 MMBF per year throughput. In order to operate the drying kilns at 400 MMBF per year, the related VOC emission limit must be relaxed to 120 TPY VOCs.

Ecology concluded that SPI-Burlington’s request for relief from the drying kiln permit limitation constituted a trigger of the provisions of 40 CFR 52.21(r)(4). Ecology required that an air quality impact analysis be done using all pollutant emissions (volatile organic compounds and particulate matter) from SPI-Burlington operating the dry kiln at 400 MMBF per year. The results are discussed in Section 3, Ambient Air Quality Analysis.

SPI-Burlington also requested that the 188 TPY limit on NO_X emissions from the wood-fired boiler in the existing PSD permit be relaxed to 245 TPY. This will allow SPI-Burlington greater flexibility in ammonia injection to the selective noncatalytic reduction system to control visible emissions. The visible emissions are caused by reaction of excess ammonia with hydrogen chloride in the boiler stack exhaust. The hydrogen chloride comes from salt in the bark of SPI-Burlington’s log supply. Ecology concluded that amending the relevant approval conditions for NO_X emissions do not constitute a trigger of the provisions of 40 CFR 52.21(r)(4). The original NO_X emissions limit was not set to avoid permitting or any element of the permitting process.

1.3 PSD Applicability

The proposed facility is a “major source,” as defined in PSD regulations (40 CFR 52.21) because it has the potential to emit more than 250 tons per year (TPY) of a regulated pollutant (659 TPY carbon monoxide). Therefore, potential emission increases of each regulated pollutant from the

[5] "Hogging" is a commonly used term in the forest products industry for the process of breaking wood into small pieces by passing it through a hammermill.

facility resulting from any major modification must be compared to the corresponding PSD significant emission rate (SER) threshold in order to determine if PSD review is required. Any criteria pollutant expected to have an emissions increase in excess of its SER threshold is subject to PSD permitting.

A major modification is defined in 40 CFR 52.21(b)(2)(i) as "any physical change in or change in the method of operation of a major stationary source…" Ordinarily, any increase in the production rate of an existing emissions unit is considered neither a physical change nor a change in the method of operation. However, this exemption does not apply if the increase in production rate necessitates relief from an existing permit condition.[6] As noted previously, that is the case for the drying kilns in this amendment request. Relieving SPI-Burlington of the NO_X emissions limit on the wood-fired boiler allows varying the ammonia injection rate in a manner different from what must be done to comply with the existing limit. This clearly constitutes a change in the method of operation. SPI-Burlington's increase in the production rate of the drying kilns and relaxation of the wood-fired boiler's NO_X emissions limit are major modifications if the related VOC and NO_X increases exceed the respective SERs.

The net emissions increases associated with this amendment as proposed by SPI and corresponding SER thresholds are shown in Table 1 below:

Table 1. NET EMISSIONS INCREASES FROM AMENDMENT

Pollutant	PTE after Amendment TPY	Increase by Amendment TPY	PSD Significant Emissions Rate (SER) TPY
NO_X	245	57	40
Carbon monoxide (CO)	659	0	100
PM_{10}	56.2[7]	56.2	15
$PM_{2.5}$	54.2	54.2	10
Oxides of sulfur measured as sulfur dioxide (SO_2)	47	0	40
VOCs	165	165	40

As shown in Table 1, SPI-Burlington's proposed NO_X, PM_{10}, $PM_{2.5}$, and VOC emissions increases are subject to new source review under PSD rules because net emissions increases for those air pollutants are greater than the respective SERs.

[6] 40 CFR 52.21(b)(2)(f).
[7] Includes one TPY PM_{10} from the cooling tower, permitted under the Northwest Clean Air Agency notice of construction approval OAC #938a and 2.2 TPY fugitive PM_{10} emissions not specifically limited in this permit. Both PM_{10} sources were considered in the PM_{10} impact analysis.

If approved by Ecology, the PSD permit will be enforced by Ecology until the Northwest Clean Air Agency (NWCAA) issues an Air Operating Permit for SPI-Burlington under the delegated authority of Title V of the federal Clean Air Act of 1990. SPI has 12 months after startup of the lumber manufacturing facility to submit a Title V permit application to the NWCAA. After issuance of the Title V permit, the conditions of this permit will be enforced by the NWCAA in conjunction with other applicable regulations.

1.4 New Source Performance Standards

EPA has established performance standards for a number of air pollution sources in 40 CFR Part 60. These "New Source Performance Standards" (NSPS) represent a minimum level of control that is required on a new source. NSPS Subpart Db addresses emissions from boilers that have a heat input of greater than 100 MMBtu/hr, and having commenced construction after June 19, 1984. Subpart Db applies to SPI because the heat input to the wood-fired boiler is expected to be approximately 430 MMBtu/hr. Specifically, the wood boiler in SPI's proposed project is subject to limits on particulate matter emissions expressed in 40 CFR 60.43b(c)(1). The wood boiler is also subject to limits on NO_X emissions expressed in 40 CFR 60.44b(l) because it may burn natural gas to assist with startup of and flame stabilization in the boiler.

The PM emissions limit from Subpart Db is 0.10 pounds PM per million British thermal units (lb/MMBtu). Approval Condition 5.3.2.1 for PM in No. PSD 05-04 is 0.02 lb/MMBtu (measured as PM_{10}). Obviously, this will satisfy the Subpart Db requirement. The Subpart Db emissions limit for PM is relaxed during startup and shutdown.

The NO_X emissions limit from Subpart Db is 0.20 lb/MMBtu on a 30-day average basis. Approval Condition 5.1.1.2 for NO_X in the original No. PSD 05-04 and Approval Condition 5.1.2 in the first amendment are 0.13 lb/MMBtu on a 24-hour average basis. Obviously, the latter will satisfy the Subpart Db requirement. Neither the Subpart Db nor the proposed permit emissions limits for NO_X are relaxed during startup or shutdown.

SPI is also subject to the provisions of NSPS Subpart D, Standards of Performance for Fossil-Fuel-Fired Steam Generators for which construction is commenced after August 17, 1971. However, the relevant requirements of Subpart D are superseded by more stringent conditions under Subpart Db and under the approval conditions of the proposed permit.

1.5 State Regulations

SPI is subject to Notice of Construction requirements under Ecology regulations, Chapters 173-400, and 173-460 WAC.

2. DETERMINATION OF BEST AVAILABLE CONTROL TECHNOLOGY

2.1 Definition and Policy Concerning BACT

All new sources and major modifications are required to use BACT, which is defined as an emissions limitation based on the maximum degree of reduction for each pollutant subject to regulation, emitted from any proposed major stationary source or major modification, on a case-by-case basis, taking into account cost effectiveness, economic, energy, environmental, and other impacts (40 CFR 52.21(b)(12)).

The "top down" BACT process starts by considering the most stringent form of emissions reduction technology possible, then analyzing all reasonably available information to determine whether the related control method is technically feasible and economically justifiable.[8] If proven technically infeasible or economically unjustifiable, then the next most stringent level of reduction is considered in the same manner. A determination that a candidate control technology is technically infeasible or economically unjustifiable applies **only** to the permit decision at hand. It is not a general conclusion that can be readily extended to any future permit decision.

The most stringent emission reduction (lowest emission level) that can be achieved by at least one control technology that is technically feasible and economically justifiable for the proposed project is determined to be BACT. The emission level and its related control technology are usually interchangeably referred to as the "BACT" of the permit decision. However, only the emission level is mandated in the permit. The source is generally free to apply any control technology with the requirement that it demonstrate BACT-level performance capability without creating significant negative side effects.

2.1.1 Technical Feasibility

PSD applicants often propose that a given emission control technology is infeasible for their facility unless it has been previously used in exactly the situation under consideration. This is insufficient evidence to conclude that the control technology is technically infeasible. On the other hand, "technically feasible" does not mean "anything possible in the eyes of science."

EPA's new source review guidance[9] suggests, "The control alternatives should include not only existing controls for the source category in question, but also (through technology transfer) controls applied to similar source categories and gas streams." EPA guidance also indicates that in order for such a "technology transfer" to be judged technically feasible, its application should be relatively seamless and free of technical speculation.[10] In the BACT determination for this permit, technical feasibility was judged subject to the following criteria:

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[8] Other factors are also subject to consideration (e.g., energy consumption (regardless of short-term unit cost of the energy source) and local/regional community values).

[9] USEPA New Source Review Workshop Manual, Chapter B §IIIA (October 1990).

[10] Court Decision on Steel Dynamics, Inc., PSD Appeals 99-04 and 99-05 before the USEPA Appeals Board (June 22, 2000).

- The control technology was previously applied to emission streams sufficiently similar to the one being proposed.[11] Any differences between the previous applications should not impact the control technology performance. The control technology and emission limit should not cause deterioration of the related process equipment, or irretrievably affect product quality.

- The emission limit associated with the BACT determination, including consideration for normal and reasonable control variability, was shown to be consistently achievable under normal and conscientious operating practices.[12]

It is not in the interests of the source, the regulatory agency, or the general public to set emission limits that will result in frequent violations even though the control technology was well-designed, installed, and conscientiously operated by the source. Such situations increase costs to the source and regulatory agency (and consequently the public) for investigation, litigation, and reconstruction without benefit to the environment.

2.1.2 Economic Justifiability

"Economic justifiability" does not mean "affordable by the source."[13] Nor does it mean the most any other source in the world has spent on air pollutant emissions control. In the BACT determination for this permit, economic justifiability was judged subject to the following criteria:[14]

- In order to eliminate a BACT candidate on the basis of cost effectiveness, the cost must generally be disproportionately high for the applicant when compared to the cost of control for the pollutant in recent BACT determinations in the applicant's source category.

- "The applicant's source category" is restricted in this permit decision to the forest products industry in the United States. EPA guidance directs that the search for potentially technically feasible pollutant emission control technologies should be worldwide. However, an applicant's source category is not necessarily international. Lumber and composite board[15] markets are international only to a limited extent.

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[11] USEPA NSR Workshop Manual (1990), §IV.A: "Add-on controls…should be considered based on the physical and chemical characteristics of the pollutant-bearing stream. Thus, candidate add-on controls [are those that] may have been applied to…emission unit types that are similar, insofar as emissions characteristics, to the emissions unit undergoing BACT review."

[12] USEPA NSR Workshop Manual (1990), §IV.A.1: "Technologies which have not yet been applied to (or permitted for) full scale operations need not be considered available…" and USEPA NSR Workshop Manual (1990), §IV.C.2: "…the applicant should use the most recent regulatory decisions and performance data for identifying the emissions performance level(s) to be evaluated…"

[13] USEPA NSR Workshop Manual (1990), §IV.D.2: "…applicants generally should not propose elimination of control alternatives on the basis of…affordability…"

[14] USEPA NSR Workshop Manual (1990), §IV.D.2.c

[15] Plywood, oriented strand board, and particle board.

- A BACT candidate may also be eligible for elimination if it has been applied as BACT in only a very limited number of cases and there is a clear demarcation between the cost of that technology and control costs accepted as BACT in recent determinations in the applicant's source category.

2.2 NO_X Control

In the technical analysis for the original No. PSD 05-04, Ecology found that the following were the leading control processes that have been applied to NO_X reduction in combustion processes:

- EMx^{TM} (formerly SCONO$_X$™): Passing the exhaust combustion gasses across a solid surface coated with a reactant, potassium carbonate (K_2CO_3). The NO_X in the exhaust gas reacts with the K_2CO_3, forming potassium nitrate (KNO_3). Once all the K_2CO_3 has been converted to KNO_3, the reactant surface is flushed with hydrogen to reduce the KNO_3 to nitrogen (and regenerate the K_2CO_3). EMx^{TM} has been applied commercially only to small, natural gas-fired combustion systems.

- Selective Catalytic Reduction (SCR): Passing the exhaust combustion gasses across a solid surface coated with a catalyst. This reduces the NO_X in the exhaust gas to nitrogen (N_2) by reaction with injected ammonia (NH_3). Without exhaust re-heating, only the low-temperature SCR technology is feasible.

- Regenerative SCR (RSCR): The wood-fired boiler exhaust is reheated to approximately 600°F for optimum system performance. The reheat energy is recaptured by heat exchangers and used to supplement the exhaust reheat energy.[16]

- Selective Non-Catalytic Reduction (SNCR): Mixing NH_3 directly into the hot combustion gasses. SNCR systems rely on high temperatures (about 1500°F to 1800°F) to promote the reaction of NO_X with the NH_3. In the case of solid fuel boilers, the NO_X-NH_3 reaction takes place in the furnace. Currently, SNCR systems are the most common add-on control device used to reduce NO_X emissions from large wood-waste fired boilers.

- Dry Lo-NO_X Burners (Coen burners): Lo-NO_X burners have been used when the waste wood source is finely pulverized saw dust, and is used in combination with natural gas. In this application, the saw dust is suspended in the natural gas, and passed through the burners.

- Good Combustion Practice (which may include water or steam injection, flue gas recirculation, and control of the relative amounts of over- or under-fire air).

[16] Boralex Stratton Energy, Inc., Stratton, Maine; Part 70 Air Emission License, A-368-70-E-A Amendment #4; Maine Department of Environmental Protection, Bureau of Air Quality Findings of Fact and Order.

Table 2Table 2 shows the control technologies that Ecology believes to be feasible and available for NO_X control from wood-fired boilers. SNCR, applied to various boiler designs, is the control technology having the lowest permitted emissions. Therefore, SNCR is "top-case." The remaining control technologies will not be discussed further in this document.

Table 2. FEASIBLE TECHNOLOGIES FOR NO_X CONTROL FROM WOOD-FIRED BOILERS

Technology	Typical NO_x Emission Limit Pounds per million Btus, (lb/MMBtu)	Comments	Number of Installations Since 1978 Reported to EPA's RACT/BACT/LAER Clearinghouse
Selective Non-Catalytic Reduction, SNCR	0.10 to 0.25 (including FBC installations)	Permit limits often adjusted to mitigate ammonia slip-caused visible emissions.	17
Selective Catalytic Reduction (SCR)	.09, 0.16, and 0.2 lb/MMBtu	20% opacity and 60 ppm NH_3 slip allowed in lowest permit limit.	3
Regenerative SCR	0.24 and 0.33 lb/MMBtu	Reheat energy is recuperated.	2 Permitted, but not yet installed
Good Combustion Practice	Greater than 0.25	This is a generally accepted requirement regardless of boiler design or other applied control strategies.	16

The EPA's BACT/LAER Clearinghouse lists 38 NO_X control technology entries for wood-fired boilers similar to SPI-Burlington's that were permitted, built, and operated since about 1978. With the exception of one boiler using SCR, the lowest NO_X emissions are achieved using SNCR. That one boiler using SCR, and having a lower NO_X emissions limit than proposed in this amendment also has a 60 ppm NH_3 limit and 20 percent opacity limit. SPI-Burlington has a 50 ppm NH_3 limit and applied for a 10 percent opacity limit in the notice of construction amendment application (to NWCAA, companion to this PSD amendment action). The sole purpose for SPI-Burlington's proposal to raise the annual NO_X emissions limit in No. PSD 05-04 is to solve its recurring visible emissions problems. Those visible emissions problems are a direct result of the quantity of NH_3 that SPI-Burlington must inject into the wood-fired boiler to keep NO_X emissions below 0.1 lb/MMBtu. Consequently, **Ecology concludes that applying SCR to control SPI-Burlington's NO_X emissions to below 0.09 lb/MMBtu is not feasible**.

Pittsylvania Power in Hurt, Virginia employs urea-injection SNCR systems to control NOx from three-374 MMBtu/hr wood-fired mass-burner boilers to 0.1 lb/MMBtu on a 30-day rolling average basis. It has no associated ammonia slip limit in the permit. It may be using enough ammonia to reach almost 500 ppmdv.[17] Such a high level of ammonia would raise nitrogenous deposition levels in Class I areas from this project above the "concern" level expressed in Federal Land Managers[18] (FLM) guidance.[19]

Using SNCR, there is one wood-fired boiler in Washington successfully keeping its NO_X emissions below its 0.1 lb/MMBtu permit limit. This is the SPI's lumber mill in Aberdeen (SPI-Aberdeen). The difference between SPI-Aberdeen and SPI-Burlington is that SPI-Burlington's timber source contains significant amounts of salt. The salt comes from the sea water in which the logs have been floating while in transit to the lumber mill. SPI-Aberdeen's timber comes down river. The salt in the bark of SPI-Burlington's timber ultimately is converted to hydrogen chloride in the boiler, and reacts with excess NH_3 in the boiler exhaust to form ammonium chloride. The ammonium chloride condenses as the exhaust plume cools causing a visible "detached plume." The opacity of the plume is sometimes above allowable levels, depending on weather conditions. SPI-Burlington has tried a variety of tactics to minimize this detached plume including relocating the NH_3 injector and using urea instead of NH_3. NWCAA agreed that raising the annual NO_X emissions limit appeared to be the only tactic likely to resolve the problem. This will allow SPI-Burlington greater flexibility in NO_X emissions control. **Ecology agrees that a short-term NO_X emission rate of 0.13 lb/MMBtu is BACT for SPI-Aberdeen's wood-fired boiler with an ammonia slip concentration of 50 parts per million dry volume basis (ppmdv).**

2.3 PM_{10} and $PM_{2.5}$ Control, Dry Kilns

Ecology found 33 entries in the EPA's BACT/LAER Clearinghouse for dry kilns and new source review determinations for several other minor source dry kilns in Washington. All concluded that there were no technically feasible $PM_{10}/PM_{2.5}$ controls for dry kilns other than proper operation and maintenance. $PM_{10}/PM_{2.5}$ emission limits varied from 0.06 pounds per thousand board feet (lb/Mbf) to 0.61 lb/Mbf. It appears these were all based on species-specific emissions factors. **SPI proposes BACT for their dry kilns to be application of species-specific emissions factors (lb $PM_{10}/PM_{2.5}$/Mbf) using proper operation and maintenance. Ecology agrees.**

2.4 VOC Control

The drying kilns are the only unit operation with VOC emissions subject to new source review in this PSD amendment action.

Ecology found over 36 examples of new source review determinations for drying kilns between 1994 and 2008 (none are in the database prior to 1994). All concluded there were no technically feasible VOC controls for drying kilns other than proper operation and maintenance. All the VOC emission limits appear to be based on species-specific emission factors. Except for the

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[17] Communication with Multitrade plant personnel.
[18] United States Forest Service and National Park Service.
[19] "Guidance on Nitrogen Deposition Analysis Thresholds," National Park Service (August, 2001).

original SPI-Burlington determination, all these lumber mills dry pine. Pine contains more VOC-laden pitch than do either Douglas fir or Western Hemlock. The lowest emission factor used to permit any of these drying kilns was 3.4 pounds VOC/thousand board feet (lb VOC/MBF). SPI proposes emissions factors of 0.6 lb VOC/MBF for Douglas fir[20] and 0.33 lb VOC/MBF for Western Hemlock.[21] SPI proposes **BACT** for their drying kilns to be **application of the species-specific emissions factors (lb VOC/Mbf) using proper operation and maintenance. Ecology agrees.**[22]

3. AMBIENT AIR QUALITY ANALYIS

3.1 Regulated Pollutants

PSD rules require an assessment of ambient air quality impacts from any facility emitting pollutants in significant quantities. Limiting increases in ambient pollutant concentrations to concentrations that do not exceed the maximum allowable increments prevents significant deterioration of air quality.

3.1.1 Modeling Methodology

SPI-Burlington submitted a modeling protocol to Ecology and the FLMs in early March 2005.[23] SPI-Burlington updated the protocol for the air quality impact analysis for this amendment action. Ecology accepted that update.[24] The modeling protocol describes the relevant source parameters, anticipated Class II radius of impact, dispersion modeling methodology, potentially impacted federal wilderness areas (see Table 4), and source of meteorological data.

The dispersion modeling techniques used in the air quality impact analysis follow a basic set of EPA regulatory guidelines (40 CFR Part 51, Appendix W). The analysis done for the original No. PSD 05-04 used the Industrial Source Complex Short Term, Version 99020 model with – Plume Rise Model Enhancements (ISC-PRIME). The analysis done for this amendment action used the latest update to the Appendix W guidelines, AERMOD Version 07026.

The modeling analysis used meteorological data from the 5-year period January 1995 until December 1999. The meteorological data are from a monitoring station located at the nearby

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[20] "Emissions Factors, Wood Products, AQ-EF02," Oregon Department of Environmental Quality: http://www.deq.state.or.us/aq/aqpermit/ACDP/emissionfactors.htm.

[21] Based on study by Michael Minolts (Oregon State University), "Emissions from Western Hemlock Lumber During Drying" (ca. 2001-2).

[22] SPI must obtain approval of an associated emissions factor from Ecology for any specie other than Douglas fir and Western Hemlock that constitutes more than 10% of SPI's drying kiln throughput.

[23] Modeling Protocol for the Sierra Pacific Industries Cogeneration Project (Everett, Washington) prepared by GeoMatrix, Project No. 010360.000.0 (March 2005). The original project, to be located in Everett, WA was cancelled for reasons in no way related to air quality permitting. The currently proposed site for the identical project is about 60 km north of the cancelled Everett site, and in similar terrain. Ecology accepted the original modeling protocol as applicable to the Skagit site.

[24] Electronic message, Clint Bowman to Bernard Brady (June 23, 2008).

Puget Sound Refinery[25] (Shell Oil Co.) and were supplemented by National Weather Service observations from nearby airports and upper air data from Quillayute, Washington.

3.1.2 Modeling Results

The NO_X emission rate used for the wood-fired boiler in the application for the original No. PSD 05-04 assumed 0.13 lb NO_X/MMBtu 8,760 hours per year. In other words, the air quality impact for the full 245 TPY NO_X requested in the amendment action was previously analyzed in the original permit action. Table 3 shows the highest ambient NO_X concentration. Because maximum anticipated NO_X concentrations attributable to the wood-fired boiler are less than both Class I and Class II Area modeling significance levels, cumulative impact analysis is not required.[26]

Table 3. AIR QUALITY IMPACT MODELING RESULTS SPI-BURLINGTON'S WOOD-FIRED BOILER

Pollutant	Modeling Results, micrograms per cubic meter (μgrams/m^3)		Modeling Significance Level μgrams/m^3		Class I Area Allowable Increment Consumption μgrams/m^3	Class II Area Allowable Increment Consumption μgrams/m^3	NAAQS μgrams/m^3
	Class I Area	Class II Area	Class I Area	Class II Area			
NO_2, annual average	0.003	0.466	0.1	1.0	2.5	25	100 Primary and secondary standards are the same.
PM_{10}, 24-hour average, new property line	0.079	28 SPI-Burlington alone 71.8 Including background	0.3	5	10	30	150
PM_{10}, annual average, new property line	0.003	9.8 SPI-Burlington alone 23.2 Including background	0.2	1	5	17	50
$PM_{2.5}$, 3-year average, 98th percentile, 24-hr average, original property line	N/A	28.2 Including background	N/A	5	N/A	N/A	35

[25] About five miles from the proposed project site.
[26] An extended analysis that includes all NO_X emission sources in the vicinity.

Pollutant	Modeling Results, micrograms per cubic meter (μgrams/m^3)		Modeling Significance Level μgrams/m^3		Class I Area Allowable Increment Consumption μgrams/m^3	Class II Area Allowable Increment Consumption μgrams/m^3	NAAQS μgrams/m^3
	Class I Area	Class II Area	Class I Area	Class II Area			
$PM_{2.5}$, 3-year average, 98th percentile, annual average, original property line	N/A	10.1 Including background	N/A	1	N/A	N/A	15

As noted in Section 1.2.2, Ecology concluded that SPI-Burlington's request for relief from the drying kiln permit limitation constituted a trigger of the provisions of 40 CFR 52.21(r)(4). Ecology concluded that relative to this amendment action, SPI-Burlington must consider both existing and the projected increase in PM and VOC emissions in ascertaining the related modeling requirements.

Dry kilns do not have stacks via which emissions would be dispersed. Emissions from the dry kiln are released through a system of vents essentially at roof level. This results in generally poor atmospheric dispersion of dry kiln emissions. In addition, SPI-Burlington built the dry kiln near the western boundary of the plant. These two factors result in high PM ambient air quality impacts immediately west of SPI-Burlington's property line even though the quantity of emissions from the dry kilns is relatively small. In order to avoid PM_{10} emission impacts that exceed allowable standards, SPI-Burlington will have to secure control over the excessively impacted property. This requirement is included in the approval conditions in this amendment. The modeled PM_{10} air quality impacts at the new property line are shown in Table 3.

VOCs are a surrogate pollutant for ozone in terms of NAAQS impact considerations. According to EPA guidance, modeling for ozone-impacts of VOC and NO_X emissions is not required unless VOC or NO_X emissions from a proposed source are 100 tons per year or greater.[27] The VOC-PTE for the drying kilns is 127 TPY. Consequently, ozone impact modeling is required.

SPI-Burlington performed the ozone impact analysis with modeling simulations based on those developed by Washington State University's Laboratory for Atmospheric Research. Details are in Appendix B of the application (op. cit.) for this amendment action. The simulation used the conditions for July 26-28, 1998. This episode had the highest observed ozone levels in recent years. The analysis simulated ozone levels with and without the NO_X and VOC emissions attributable to SPI-Burlington from Clark County, Washington to the Washington-Canadian border. The difference between the two scenarios shows the ozone impact attributable to SPI-Burlington.

[27] 40 CFR 52.21(i)(5)(i).

In general, the analysis shows the highest ozone concentrations due to regional ozone-related emissions to be just to the west of the Highway I-5 corridor from the northern border of Snohomish County to just south of the Lewis County border. SPI-Burlington's ozone impact is focused in the approximate center of Skagit County. The modeled total ozone concentration in that location was 69 parts per billion (ppb). SPI-Burlington's maximum contribution was 0.44 ppb. In other words, SPI-Burlington should contribute less than one percent to the ozone levels. Ecology concludes this is not significant.

3.2 Toxic Air Pollutants

Ecology's regulations (Chapter 173-460 WAC) require an ambient air quality analysis of TAP emissions. The analysis provided by SPI-Burlington indicated acetaldehyde, acrolein, and formaldehyde emissions from the drying kiln would result in increased concentrations in excess of the corresponding acceptable source impact levels (ASIL[28]). This triggers a requirement for a "second tier analysis" as described in WAC 173-460-090. SPI-Burlington submitted such an analysis with the application for this amendment action (Appendix D). The results of Ecology and NWCAA's joint determination regarding this analysis do not affect this PSD amendment because the related pollutants are not regulated under PSD. All TAP-related new source review requirements pursuant to WAC 173-400-110 are addressed in detail by NWCAA under notice of construction approval review.

4. AIR QUALITY RELATED VALUES

The PSD regulations require an evaluation of the effects of the anticipated emissions from the proposed source on visibility, soils, and vegetation in Class I and II areas, and the effect of increased air pollutant concentrations on flora and fauna in the Class I areas. As noted for the NO_X emissions from the wood-fired boiler, the air quality related values impacts related to SPI-Burlington were modeled at emissions levels at or above those proposed in the amendment action. Therefore, no further modeling is required here.

Impacts were evaluated for the seven Class I areas and one Class II wilderness areas within about 200 kilometers of SPI (see Table 4). SPI modeled its emissions impact on the Class I areas and Class II wilderness areas using the CALPUFF[29] system.

[28] WAC 173-460-020(2): ASIL is the concentration of a TAP in the outdoor atmosphere outside the source's control that is used to evaluate the air quality impact attributable to the source. Modeled pollutant concentrations above the respective ASIL trigger a requirement for intensified health risk analysis.

[29] CALPUFF modeling system, Phase 2 Summary Report and Recommendations for Modeling Long Range Transport and Impacts, EPA-454/R-98-019, Interagency Workgroup on Air Quality Modeling, USEPA Office of Air Quality Planning and Standards, Research Triangle Park, NC27711 (1998).

Table 4. POTENTIALLY IMPACTED WILDERNESS AND SCENIC AREAS

Class I Area	Approximate Distance from SPI (kilometers)
Alpine Lakes Wilderness	105
Glacier Peak Wilderness	72
Goat Rocks Wilderness	201
Mt. Rainier National Park	159
North Cascades National Park	66
Olympic National Park	75
Pasayten Wilderness	108
Class II Area	**Approximate Distance from SPI (kilometers)**
Mt. Baker Wilderness	42

4.1 Impacts on Visibility

According to guidance from the FLMs,[30] a five percent increase in visible haze will evoke a just noticeable change in most landscapes. The FLMs are concerned about situations in Class I areas where an increase in visible haze, compared against natural conditions, caused by new source growth is greater than five percent. Haze increases that are attributable to a single source that are greater than 10 percent are generally considered unacceptable by the FLMs and will likely raise objections to further pollutant loading without mitigation. For visibility impacts on Class I areas between the five percent concern, and 10 percent not-acceptable levels, the FLMs recommend a cumulative impact analysis to assure that the sum of the visibility impacts from all new sources is below 10 percent. For Class II wilderness and scenic areas, the FLMs acknowledge that the application of BACT to the proposed project is the mitigation remedy allowed in the regulations.[31]

The modeling results indicate that the visibility impact of SPI's pollutant emissions will not exceed the FLMs concern threshold at Class I or Class II wilderness areas. Table 5 shows the modeling results.

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[30] "Federal Land Managers Air Quality Related Values Workgroup (Flag), Phase I Report," page 26 (December 2000)
[31] ibid., Appendix C

Table 5. WILDERNESS AND SCENIC AREA VISIBILITY IMPACTS

Class I Area	Maximum Haze Increase	Time of Year
Alpine Lakes Wilderness	1.7%	October
Glacier Peak Wilderness	2.0%	June
Goat Rocks Wilderness	0.6%	February
Mt. Rainier National Park	1.1%	February
North Cascades National Park	4.8%	July
Olympic National Park	2.2%	June
Pasayten Wilderness	0.9%	April
Class II Area	**Maximum Haze Increase**	**Time of Year**
Mt. Baker Wilderness Area	3.4%	June

4.2 Other Air Quality Related Issues

4.2.1 Class I Area Air Pollutant Impact

Air concentrations of NO_X, SO_2, and PM_{10} and fallout from their derivatives have the potential to impact flora and fauna in the area surrounding an emissions source. SPI modeled the maximum increase in NO_X, SO_2, and PM_{10} concentrations for each Class I area caused by the proposed project. As shown in Table 3 above, 24-hour average PM_{10} shows the greatest increase in Class I area concentrations at 25 percent of the Class I area significant impact threshold of 0.3 $\mu g/m^3$.

4.2.2 Local Impacts on Soils, Vegetation, and Animals

According to the EPA's New Source Review guidance,[32] for most types of soils and vegetation, ambient concentrations of criteria pollutants below the secondary national ambient air quality standards will not result in harmful effects. As shown in Table 3, maximum ambient NO_X concentration attributable to the proposed project is below the secondary national ambient air quality standard. Exceptions exist where particular species are sensitive to particular pollutants. The Washington State Environmental Policy Act lead agency for the project, Skagit County Planning and Development Services, determined that the proposed project does not have a probable adverse impact on the environment, and that an environmental impact statement is not required under RCW 43.21C.030(2)(C).[33]

[32] op. cit., Chapter D, § IIC.
[33] Skagit Planning and Development Services Mitigated Determination of Nonsignificance (MDNS) Special Use Permit File #PL05-0672 (October 27, 2005).

The Biological Assessment submitted by SPI to EPA concluded that this project would have no adverse effect on endangered species in Skagit County or on any essential fish habitat.[34] Clearance from EPA, Region 10 that this project will not impact endangered and protected species subsequent to consultation with the U.S. Department of Fish and Wildlife and National Marine Fisheries is required prior to this PSD permit becoming final and effective.[35]

4.2.3 Class I Area Deposition

Similar to the FLAG guidance on the concern threshold for visibility impact in Class I areas, the National Park Service has suggested 0.005 kilograms per hectare per year (kg/ha-yr) as the concern threshold for increases in nitrogen deposition[36] due to a proposed project for Class I areas.

Table 6 shows that the highest modeled annual surface deposition rates of nitrogen (North Cascades National Park) in the potentially impacted Class I areas would be 54 percent of this concern threshold.

Table 6. DRY AND WET NITROGEN DEPOSITION

Class I Area	Maximum Nitrogen Deposition kg/ha-yr	Maximum Sulfur Deposition kg/ha-yr
Alpine Lakes Wilderness	0.0006	0.0003
Glacier Peak Wilderness	0.0016	0.0008
Goat Rocks Wilderness	0.0001	<0.0001
Mt. Rainier National Park	0.0003	0.0002
North Cascades National Park	0.0027	0.0014
Olympic National Park	0.0002	0.0002
Pasayten Wilderness	0.001	0.0004
Class II Area	**Maximum Nitrogen Deposition kg/ha-yr**	**Maximum Sulfur Deposition kg/ha-yr**
Mt. Baker Wilderness Area	0.0034	0.0019

[34] Jeff KenKnight (EPA, Region 10) to Tom McDowell (U.S. Fish and Wildlife Service) and Tom Sibley (National Oceanic and Atmospheric Agency), "Endangered Species Act Informal Consultation…Skagit Lumber Manufacturing Facility for Sierra Pacific Industries…," October 6, 2005.
[35] 50 CFR - CHAPTER IV - PART 402, Interagency Requirements and Procedures – Endangered Species Act; 50 CFR - CHAPTER VI - PART 600, Interagency requirements for National Marine Fisheries Endangered Fisheries Habitat Issues.
[36] "Guidance on Nitrogen Deposition Analysis Thresholds," National Park Service (August 2001).

4.3 Construction and Growth Impacts

SPI-Burlington employs about 200 people at the lumber mill. As noted in § 1.2, the proposed mill is about five miles from Burlington/Mt. Vernon. These communities have a population of about 35,000. Skagit County has a population of about 110,000. Skagit County's unemployment is slightly higher than the State of Washington overall at about six percent. SPI-Burlington hired essentially all of the lumber mill's employees from the nearby, existing population with the exception of some management staff. Therefore, no significant increase in emissions from residential growth or in commuting-related mobile source emissions is directly related to SPI-Burlington or will result from the proposed amendment action. SPI-Burlington does not expect to lead to industrial growth in the area that would subsequently cause an increase in emissions of air contaminants.

5. CONCLUSION

The amendment action will have no significant adverse impact on air quality or air quality related values. The Washington State Department of Ecology finds that the applicant, Sierra Pacific Industries, has satisfied all requirements for approval of the amendment to No. PSD 05-04.

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6. ACRONYMS AND ABBREVIATIONS

APCD	Air Pollution Control District
BACT	Best Available Control Technology
Btus	British thermal units
CALPUFF	An air quality impact model, Publication: EPA-454/R-98-019
CFR	Code of Federal Regulations
CO	Carbon Monoxide
dscft	dry standard cubic foot or feet
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ESP	Electrostatic Precipitator
F	Fahrenheit (as in "degrees Fahrenheit", °F, a measure of temperature)
FBC	Fluidized Bed Combustor
FLAG	Federal Land Managers Air Quality Related Values Workgroup, Phase I Report
FLM	Federal Land Manager
gr	grains
gr/dscft	grains per dry standard cubic foot
hr	hour
ISC-PRIME	Industrial Source Complex Short Term, Version 99020 model with – Plume Rise Model Enhancements
K_2CO_3	potassium carbonate
kg/ha-yr	kilograms per hectare per year
km	kilometer
KNO_3	potassium nitrate
LAER	Lowest Achievable Emission Rate
lb	pound
lb/Mbf	pounds per thousand board feet
lb/MMBtu	pounds per million British thermal units
m	meter
Mbf	thousand board feet
MMBtu/hr	Million British thermal units per hour
MW	Megawatt (millions of watts)
N_2	Nitrogen
NAAQS	National Ambient Air Quality Standards
NEET	EPA's New and Emerging Technology list
NH_3	Ammonia
NO_2	Nitrogen Dioxide (The family of nitrogen oxides, including N_2O, NO, and NO_2)
NO_X	Nitrogen Oxides
NSPS	New Source Performance Standards
NSR	New Source Review
NWCAA	Northwest Clean Air Agency
PM	Particulate Matter
PM_{10}	Particulate Matter Smaller Than 10 Microns in Diameter

ppmdv	parts per million dry volume basis
PTE	Potential to Emit
PSD	Prevention of Significant Deterioration
RBLC	RACT/BACT/LAER Clearinghouse
RSCR	Regenerative Selective Catalytic Reduction
SCR	Selective Catalytic Reduction
SER	Significant Emission Rate
SIL	Significant Impact Level
SNCR	Selective Non-Catalytic Reduction
SO_2	Sulfur dioxide
SO_3	Sulfur trioxide
SO_X	Sulfur Oxides
SPI	Sierra Pacific Industries
TAP	Toxic air pollutant
TPY	tons per Year
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WESP	Wet electrostatic precipitator
yr	year