DEPARTMENT OF
ECOLOGY
State of Washington

TECHNICAL SUPPORT DOCUMENT FOR PREVENTION OF SIGNIFICANT DETERIORATION (PSD) PERMIT

PERMIT NO: PSD 05-04, Amendment 2

Sierra Pacific Industries
Skagit Lumber Manufacturing Facility

Prepared by

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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 (WAC) 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, CFR 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 April 5, 2013, Sierra Pacific Industries–Skagit Lumber Manufacturing Facility (SPI-Burlington) submitted an application to amend PSD permit No. 05-04, Amendment 1.[2] Supplementary information was submitted on March 28, 2013, July 9, 2013, July 22, 2013, and August 14, 2013. Ecology determined the application to be complete on July 30, 2013.

Amendment 2 is a non-administrative, non-major permit revision and listed on the permit application as "all other permit revisions," which requires public notice per WAC 173-400-740(1)(c). Amendment 2 involves revising the dry kiln emission factor for western hemlock (Section 23.3.2 of this order), from 0.04 lb $PM/PM_{10}/PM_{2.5}$ per thousand board feet (Mbf) to 0.02 lb $PM/PM_{10}/PM_{2.5}$/Mbf.

The basis for making the changes in Amendment 2 is described in Section 1.2.2.

[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 (November 17, 2011).
[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 ENVIRON, April 2013).

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 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° 26' 56", West 122° 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.

[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.

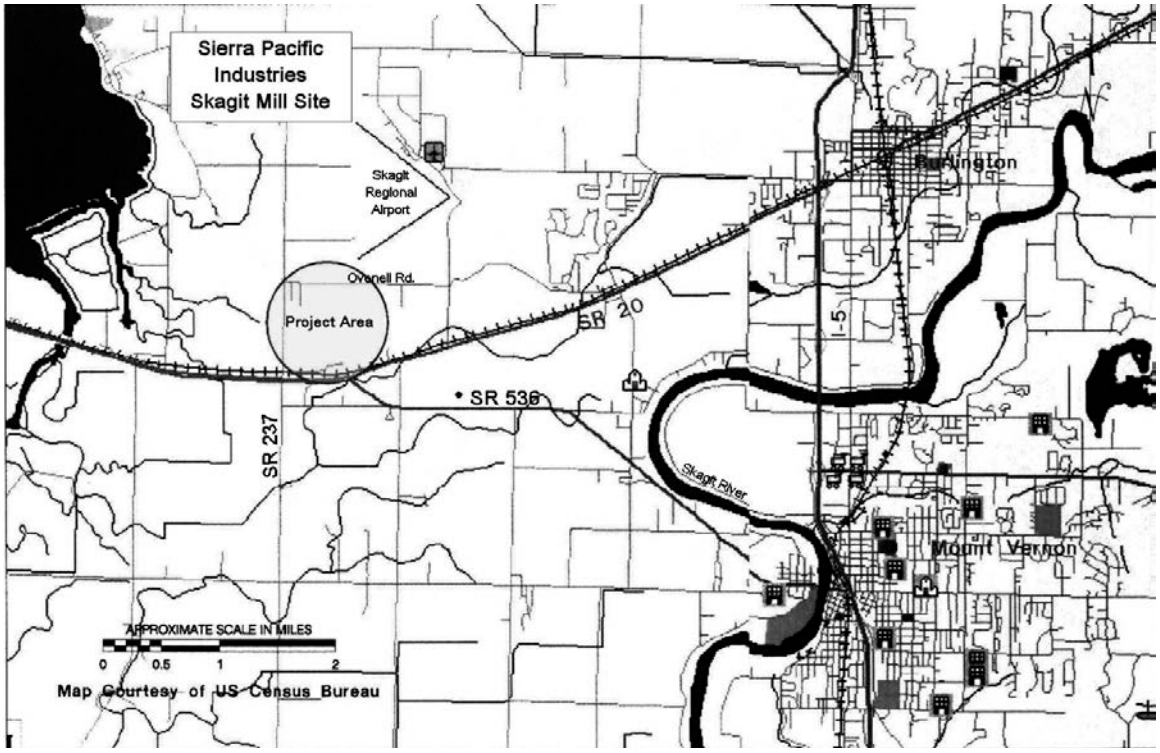

Figure 1. Site Location

The wood-fired cogeneration unit consists of a 430 million British thermal units per hour (MMBtu/hr) wood-fired boiler and a 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-Burlington 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-Burlington 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 start-up and flame stabilization.

1.2.2 Basis for Amendment 2

SPI submitted to Ecology source test results for two sample events performed on the CHEMCO facility pilot dry kiln in Ferndale, Washington, which simulated the process of the dry kilns at SPI's Mt. Vernon facility for western hemlock. Emission Technologies, Inc., (ETI) performed the source tests on the CHEMCO pilot kiln, which is approximately 10 feet by 6 feet and 9 feet tall with a stack diameter of 12 inches. The first source test was performed on February 21-23, 2013. On May 2, 2013, SPI proposed to Ecology a source test protocol prepared by ETI, dated

[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.

April 30, 2013, for a second source test. Ecology and the Northwest Clean Air Agency (NWCAA) provided comments on the proposed protocol and a final protocol was agreed to on May 15, 2013. The second sampling event lasted from May 29 to June 1, 2013. Portions of the source test methodology used by ETI and the source test results are summarized in the following subsections.

1.2.2.1 Source Test Methodology

EPA Methods 1-5 were used to perform the filterable (front-half fraction) particulate matter test. EPA Method 202, along with the Method 5 sampling train, was used to perform the condensable (back-half fraction) particulate matter test. The entire pilot kiln was encapsulated in an enclosure made of new polyethylene sheeting. The exhaust stack was made of sheet metal extended above the enclosure. ETI attempted to sample isokinetically, which means the sample probe velocity flow is within 90%-110% of the velocity flow in the stack. The pilot kiln was sampled while processing green wood (no yard aging), which represents the worst case scenario (maximum concentrations) of particulates emissions. For the second test, two concurrent samples were collected at the same sample location, in two different sample ports, located at least two diameters downstream of the last disturbance, and at least one-half diameters upstream of the stack outlet. The sample probe nozzles were placed at least two inches from the duct walls at 90 degrees from each other. Filters were placed over the two ambient air inlets of the enclosure.

1.2.2.2 Results of Pilot Kiln Source Test for Western Hemlock

Results for both pilot kiln tests as well as details regarding the tests are included in Table 1.

Table 1. Pilot Kiln Source Test Results for Western Hemlock

Date	Filterable PM (lb/Mbf)	Condensable PM (lb/Mbf)	Filterable PM as % of Total PM[(a)]	Total PM (lb/Mbf)
February 21-23, 2013[(a)]	0.0018	0.0140	11%	0.0158 (Test 1)
May 29-June 1, 2013	0.0030	0.0164	15%	0.0194
May 29-June 1, 2013	0.0018	0.0180	9%	0.0198
May 29-June 1, 2013 (avg)	0.0024	0.0172	12%	0.0196 (Test 2 avg)

(a) Due to low and erratic gas velocity during sampling, isokinetic sampling was not achieved for the February test. The February test was sub-isokinetic, which provided a conservative sample, resulting in more particulate being collected than would have been during an isokinetic sampling event. In addition, filterable particulate is a small fraction of the total particulate collected in the exhaust gas, and therefore isokinetic sampling was not considered to be critical for these tests.

Based on the results of the two source tests, Ecology has agreed to lower the dry kiln particulate emission factor from 0.04 lb/Mbf to 0.02 lb/Mbf for western hemlock. Amendment 2 affects only the western hemlock emission factor for the dry kilns. The conditions for Amendment 1 as described in the following section remain unchanged. The maximum allowed emissions of $PM/PM_{10}/PM_{2.5}$ from the dry kilns remains at 5.86 TPY (no change from Amendment 1).

VOC emissions from the dry kilns are still limited to 120 tons in any consecutive 12-month period (no change from Amendment 1). The monthly production of western hemlock drying, and potential increases in VOCs from any additional western hemlock dried from what was dried under the Amendment 1 permit timeframe, will continue to be accounted for according to Sections 8.2 and 25.2 of Amendment 2. SPI will continue to show compliance with the 120 tons VOC 12-month limit by recording species-specific dry kiln production for all wood species processed on a monthly basis.

1.2.3 Amendment 1

Under Amendment 1, SPI-Burlington requested that their emissions and production caps be removed in order to produce additional dimensional lumber. The original PSD permit (PSD 05-04) was issued on December 14, 2005. That permit, along with its companion minor New Source Review (NSR) permit (OAC 938) issued by the NWCAA on December 12, 2005, were based upon a facility design lumber throughput of 300 MMBF per year. At the 300 MMBF per year production rate, the emissions of VOC emissions would have exceeded the 100 TPY threshold requiring SPI-Burlington to perform ozone impact modeling. SPI-Burlington was anxious to obtain their permit and desired to begin constructing and operating their facility as soon as possible. SPI-Burlington chose to show compliance with the ozone impacts analysis by taking federally enforceable limit that would keep emissions of VOC below the 100-ton ozone impact analysis threshold.

SPI-Burlington sent Ecology an e-mail stating: “There have been no physical or operational changes (as those terms are defined in 40 CFR 52.21(b)) since the initial construction that was installed and in accordance with the findings and conditions of PSD Permit 05-04 and the representations made in its supporting August 22, 2005 application.”

Ecology and the NWCAA utilized two different approaches to limit the VOC emissions from the lumber kilns. Ecology placed a federally enforceable limit on the emissions of VOC and the NWCAA limited the throughput (150 MMBF later changed to 188 MMBF) of lumber through the kilns. Ecology’s approach was to place a 54 TPY limit on VOC emissions applied to the lumber drying kilns in the permit in order to keep the facility below the 100 ton per threshold. Table 2 reproduces the allowable emissions included in the original PSD permit. Please note that emission factors for $PM_{2.5}$ were not available or used for this estimate. The source proposed and Ecology accepted to assume all PM_{10} was $PM_{2.5}$. It is likely that this assumption will overestimate the $PM_{2.5}$ emissions.

Table 2. Emissions Allowed in Original Permit (PSD 05-04)							
Pollutant	**Boiler (TPY)**	**Plainer Mill Baghouse (TPY)**	**Cooling Tower (TPY)**	**Kiln Vents (TPY)**	**Anti-mold Spray (TPY)**	**Fugitive Emissions (TPY)[6]**	**Total (TPY)**
PM	37.7	9.4	0.9	4.0	-	2.0	54
PM_{10}	37.7	9.4	0.9	4.0	-	2.0	54
$PM_{2.5}$	37.7	9.4	0.9	4.0	-	-	52
VOC	35.8	-	-	54	9	-	99
NO_X	188	-	-	-	-	-	188
SO_X	47	-	-	-	-	-	47
CO	659	-	-	-	-	-	659
H_2SO_4	3.8	-	-	-	-	-	3.8

SPI-Burlington requested that the limit on lumber throughput to the drying kilns (188 MMBF or 54 TPY of VOCs) be lifted so that they could dry all the lumber produced by the facility (400 MMBF per year). This resulted in emissions in excess of 100 TPY and the ozone impacts analysis was required.

In addition, SPI-Burlington requested that the 180 TPY limit on NO_X emissions from the wood-fired boiler in the existing PSD permit be relaxed to 245 TPY. This allowed 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.

Operating the lumber drying kilns at the 400 MMBF per year rate instead of the 188 MMBF per year rate resulted in the following new emissions estimates listed in Table 3 (new per Amendment 1; unchanged per Amendment 2):

Table 3. Emissions With Federally Enforceable Limitations Relaxed							
Pollutant	**Boiler (TPY)**	**Planer Mill Baghouse (TPY)**	**Cooling Tower (TPY)**	**Kiln Vents (TPY)**	**Anti-mold Spray (TPY)**	**Fugitive Emissions (TPY)[7]**	**Total (TPY)**
PM	38	9.4	0.99	5.9	-	2.2	56.1
PM_{10}	38	9.4	0.99	5.9	-	2.2	56.1
$PM_{2.5}$	38	9.4	0.99	5.9	-	-	54
VOC	36	-	-	120	9	-	165
NO_X	245	-	-	-	-	-	245.3
SO_X	47	-	-	-	-	-	47
CO	659	-	-	-	-	-	659
H_2SO_4	3.8	-	-	-	-	-	3.8

[6] Fugitive emissions include mostly vehicle traffic and debarking operations.
[7] Fugitive emissions include mostly vehicle traffic and debarking operations.

It is not necessary to compare the emissions from PSD 05-04 and PSD 05-04, Amendment 1. Nevertheless, that comparison is shown in Table 4:

Table 4. Project Comparison

Pollutant	Boiler (TPY)	Planer Mill Baghouse (TPY)	Cooling Tower (TPY)	Kiln Vents (TPY)	Anti-mold Spray (TPY)	Fugitive Emissions (TPY)	Total Increase (TPY)
PM	-	-	-	1.9	-	0.2	2.1
PM_{10}	-	-	-	1.9	-	0.2	2.1
$PM_{2.5}$	-	-	-	1.9	-	-	1.9
VOC	-	-	-	66	-	-	66
NO_X	57.3	-	-	-	-	-	57.3
SO_X	-	-	-	-	-	-	-
CO	-	-	-	-	-	-	-
H_2SO_4	-	-	-	-	-	-	-

1.3 PSD Applicability

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

As stated above, under Amendment 1, SPI-Burlington proposed to remove the federally enforceable limit of 54 TPY associated with the lumber kilns and increase the NO_X emissions from the boiler. Ecology determined that the relaxation of this federally enforceable limitation resulted in the project becoming a major modification. A major modification is defined in 40 CFR 52.21(b)(2). Normally, a change that does not include a physical change or a change in the method of operation would not be considered a major modification. Since SPI-Burlington relaxed a federally enforceable limitation, the rule requires that the change be treated as a major modification (see 40 CFR 52.21(b)(2)(iii)(f)).

The PSD program uses an actual-to-projected actual test to determine if the project results in a significant emissions increase. The actual or baseline emissions are the average of the highest consecutive 24-month period in the last 10 years. SPI-Burlington began operation in January 2007. At the time this permit application was determined to be complete, 24 months of baseline emissions data were not available. Therefore, Ecology chose the conservative approach, set the actual emissions to zero, and required SPI-Burlington to perform the ozone modeling they would have normally performed prior to receiving the original permit.

Another rationale for setting the actual or baseline emissions at zero is because SPI-Burlington is relaxing a federally enforceable limit. There is a provision in the PSD rules that is similar but not exactly the same as this situation. That provision is 40 CFR 52.21(r)(4) Source obligation. (r)(4) states: *"At such time that particular source or modification becomes a major stationary source or major modification solely by virtue of a relaxation in any enforceable limitation which was established after August 7, 1980, on the capacity of a source or modification otherwise to emit a pollutant, such as a restriction on hours of operation, then the requirements of paragraphs (J) through (s) of this section shall apply to the source or modification as though construction had not het commenced on the source or modification.*" The 54 TPY VOC limit was a federally enforceable limit that SPI-Burlington relaxed under Amendment 1.

SPI-Burlington requested Ecology use the potential minus actual calculation instead of the actual-to-projected actual calculation. This method is allowed and almost always results in higher estimated emissions (a more conservative estimate of emissions). There is no need to consider the contemporaneous increases and decreases because Ecology evaluated the emissions as a new source (under Amendment 1), utilizing the potential minus actual approach where the actual emissions were equal to zero.

A comparison of the emissions from the major modification to the PSD SERs is shown in Table 5:

Table 5. Emissions Compared to PSD SERs

Pollutant	Proposed Emissions as of 06/05/09 (TPY)	PSD SER (TPY)	Emissions above SER (Y or N)
PM	56	25	Y
PM_{10}	56	15	Y
$PM_{2.5}$	54	10	Y
VOC	165	40	Y
NO_X	245	40	Y
SO_X	47	40	Y
CO	659	100	Y
H_2SO_4	3.8	7	N

As discussed above, Amendment 1 was permitted as a major modification. Emissions of particulate matter (PM), PM smaller than 10 microns in diameter (PM_{10}), PM smaller than 2.5 microns in diameter ($PM_{2.5}$), VOC, nitrogen oxides (NO_X), sulfur oxides (SO_X), and carbon monoxide (CO) will be subject to PSD review.

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-Burlington because the heat input to the wood-fired boiler is expected to be approximately 430 MMBtu/hr. Specifically, the wood boiler in SPI-Burlington's proposed project is subject to limits on PM 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 start-up 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 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 start-up 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 PSD 05-04 and Approval Condition 5.1.2 in Amendment 1 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 emission limits for NO_X are relaxed during start-up or shutdown.

SPI-Burlington 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-Burlington is subject to Notice of Construction (NOC) 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:

- 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.

[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).
[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."

- 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 U.S. 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.

- 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.

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[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.

2.2 NO_X Control

In the technical analysis for the original 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™ (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™ 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 reheating, 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).

Table 6 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.

[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 6. Feasible Technologies for NO_X Control from Wood-Fired Boilers			
Technology	**Typical NO_X Emission Limit (lb/MMBtu)**	**Comments**	**Number of Installations Since 1978 Reported to EPA's RACT/BACT/LAER Clearinghouse**
SNCR	0.10 to 0.25 (including FBC installations)	Permit limits often adjusted to mitigate ammonia slip-caused visible emissions.	17
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 RACT/BACT/LAER Clearinghouse (RBLC)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 NOC amendment application (to the NWCAA, companion to this PSD amendment action). The sole purpose for SPI-Burlington's proposal in Amendment 1 was to raise the annual NO_X emissions limit in PSD 05-04 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 NO_X 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]

[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).

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-Burlington'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. The 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-Burlington's wood-fired boiler with an ammonia slip concentration of 50 parts per million dry volume basis (ppmdv).**

2.3 PM, PM_{10}, and $PM_{2.5}$ Control

The wood-fired boiler, the planer mill, and the lumber kilns have emissions of PM, PM_{10}, and $PM_{2.5}$. SPI-Burlington proposed, and Ecology agreed, to assume that all of the calculated PM_{10} emissions were $PM_{2.5}$. This is a conservative assumption and likely over estimates the emissions of $PM_{2.5}$. Nevertheless, one BACT analysis was performed that addresses emissions of all three pollutants.

2.3.1 Wood-fired Boiler

BACT for particulate emissions were evaluated in the original permit. Table 7 shows the leading control processes that have been applied to particulate reduction in combustion processes. All have been successfully applied to wood-fired boilers.

Table 7. Feasible Technologies for Particulate Control from Hog Fuel Boilers

Technology	Typical PM_{10} Emission Limit (lb/MMBtu)	Typical PM_{10} Emission Limit (gr/dscf)	# of Installations Listed in EPA's RBLC
Electrostatisic Precipitator	0.01 to 0.25 Average: 0.04	0.004 to 0.09 Average: 0.015	29 Only one facility has a permit limit below 0.02 lb/MMBtu, only front end PM was considered.
Fabric Filters (baghouse)	0.017 to 0.1 Average: 0.05	0.008 to 0.04 Average: 0.018	6 Two facilities below 0.02 lb/MMBtu, only front end PM was considered.
Wet Scrubber	0.04 to 0.15 Average: 0.1	0.015 to 1.35 Average: 0.04	8

Table 7. Feasible Technologies for Particulate Control from Hog Fuel Boilers			
Technology	Typical PM_{10} Emission Limit (lb/MMBtu)	Typical PM_{10} Emission Limit (gr/dscf)	# of Installations Listed in EPA's RBLC
Multiclones	0.02 to 0.24 Average: 0.12	0.007 to 0.09 Average: 0.04	4
No control	-	-	8

The top case identified was an ESP. There are two basic designs for wood-fired boilers: wet and dry. The effectiveness of an ESP depends on the particle electrical resistance and particle size distribution in the gas stream. In a wet ESP (WESP), water is sprayed into the electrode chamber to coalesce the suspended particles. Of the 29 permits citing ESPs as PM_{10} control for wood-fired boilers, in the RBLC over the last 20 years, only one is specified as a WESP.

SPI-Burlington proposed that BACT for controlling PM, PM_{10}, and $PM_{2.5}$ emissions for the wood-fired boiler is the use of a dry ESP with an emission factor of 0.02 lb/MMBtu. This was justified with an investment cost of $308,000, and an annual operating cost of $60,000. The cost to control PM, PM_{10}, and $PM_{2.5}$ emissions was estimated to be less than $5,000 per ton of pollutant removed. **Ecology agrees with SPI-Burlington that BACT for controlling PM, PM_{10}, and $PM_{2.5}$ emissions from the wood-fired boiler are a dry ESP.**

2.3.2 Planer Mill

Ecology found 11 entries in the RBLC for planer mill exhaust and NSR determinations for several other minor source planer mills in Washington. Seven of those used a baghouse to control PM emissions with permitted limits ranging from 0.00144 gr/dscf to 0.01 gr/dscf. Because of the differences in wood species and exhaust vent flow rate, direct comparisons with SPI-Burlington's proposed planer mill operation are difficult. A recently permitted planer mill in Washington limited emissions to 0.005 gr/dscf. **SPI-Burlington proposes that a baghouse with a 0.005 gr/dscf is BACT for controlling PM, PM_{10}, and $PM_{2.5}$ emissions from the planer mill. Ecology agrees.**

2.3.3 Lumber Kilns

Ecology found 33 entries in the EPA's BACT/LAER Clearinghouse for dry kilns and NSR 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.

This proposed PSD revision (Amendment 2) lowers the Amendment 1 dry kiln emission factor (EF) for western hemlock from 0.04 lb $PM/PM_{10}/PM_{2.5}$/Mbf to 0.02 lb $PM/PM_{10}/PM_{2.5}$/Mbf.

The maximum allowed emissions of $PM/PM_{10}/PM_{2.5}$ from the facility's six double-track, steam-heated lumber dry kilns will remain unchanged at 5.86 TPY.

In support of this request, SPI submitted to Ecology two sets of source test results as described in Section 1.2.2.

SPI-Burlington 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 wood-fired boiler, the lumber kilns, and the anti-mold spray system.

2.4.1 Wood-fired Boiler

Ecology found six entries in the RBLC. Emission limits varied from 0.02 lb/MMBtu to 0.1 lb/MMBtu. None used anything other than good combustion practices. **SPI-Burlington proposes BACT for controlling emissions of VOC from the wood-fired boiler to be good combustion practices with a limit of 0.019 lb/MMBtu. Ecology agrees.**

2.4.2 Lumber Kilns

Ecology found over 36 examples of NSR determinations for drying kilns between 1994 and 2008 (none is 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 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-Burlington proposes emissions factors of 0.6 lb VOC/MBF for Douglas fir[20] and 0.33 lb VOC/MBF for western hemlock.[21] **SPI-Burlington proposes BACT for their drying kilns to be the application of these species-specific emissions factors (lb VOC/Mbf) when calculating emissions and using proper operation and maintenance. Because SPI proposes no increases in VOC emissions from Amendment 1 to Amendment 2, Ecology agrees with this BACT assessment and proposes no changes to this section.**

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[20] "Wood Products Manufacturing (Sawmills & Millwork), Form AQGP-110" Oregon Department of Environmental Quality: <http://www.deq.state.or.us/aq/permit/acdp/general/aqgp110.pdf> .

[21] Based on study by Michael Minolts (Oregon State University), "Emissions from Western Hemlock Lumber During Drying" (ca. 2001-2); and "Wood Products Manufacturing (Sawmills & Millwork), Form AQGP-110," Oregon Department of Environmental Quality: <http://www.deq.state.or.us/aq/permit/acdp/general/aqgp110.pdf>.

2.4.3 Anti-mold Spray System

Ecology was unable to find any NSR determinations for anti-mold spray systems for lumber. SPI-Burlington offered to vent the overspray through a mist eliminator, perform drip-free lumber exiting, and to recycle the condensed fluid. **SPI-Burlington proposes BACT for controlling VOC emissions from the anti-mold system to be proper operation. Ecology agrees.**

2.5 SO_X Control

All of the SO_X emitted from the wood-fired boiler originate from organically bound sulfur in the wood fiber. It cannot be practically removed prior to burning the wood. Ecology found no wood-fired boilers required to apply post combustion treatment to remove SO_X from the exhaust gas. **SPI-Burlington proposes BACT for controlling emissions of SO_X from the wood-fired boiler to be good combustion practices with a limit of 0.025 lb/MMBtu. Ecology agrees.**

2.6 CO Control

According the RBLC, permitted CO emission limits for wood-fired boilers range from 0.2 lb/MMBtu to 1.6 lb/MMBtu with an average of about 0.43 lb/MMBtu. Thirty-seven of the 48 entries have CO emission limits of 0.35 lb/MMBtu or higher. It seems that the limits are a case-by-case determination but may be related to fuel type, condition of the wood, wood species, and perhaps a local preference related to a tradeoff between CO and NO_X control. The lowest emission limits are for those facilities intending to burn clean dry fuels. SPI-Burlington's fuel source will consist of wood having a high bark and fines content and a high moisture level (50% to 60%). **SPI-Burlington proposes BACT for controlling emissions of CO from the wood-fired boiler to be good combustion practices with a limit of 0.35 lb/MMBtu. Ecology agrees.**

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.[22] On July 15, 2008, the PSD rules changed and $PM_{2.5}$ could no longer be addressed using EPA's

[22] 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

PM_{10} surrogate policy. Ecology notified SPI-Burlington and they modeled the $PM_{2.5}$ emissions and transmitted them to the NWCAA and Ecology on August 27, 2008. SPI-Burlington updated the protocol for the air quality impact analysis for this amendment action. Ecology accepted that update.[23] 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. It is important to point out that for this project $PM_{2.5}$ emissions were based upon PM_{10} emission factors. All of the PM_{10} emissions were assumed to be $PM_{2.5}$. Ecology recognizes that this approach may slightly overestimate the $PM_{2.5}$ emissions but because there are no established $PM_{2.5}$ emission factors, Ecology believes that this conservative approach satisfies the requirement for $PM_{2.5}$ compliance. This approach is not in conflict with EPA's surrogate policy because emission limits, monitoring, recordkeeping, and reporting requirements for $PM_{2.5}$ are included in the permit.

Ecology has required $PM_{2.5}$ back-half or condensable quantification since 2002, even though it is not required by federal law. Our requirement to use the condensable fraction in air quality analyses dates back to the paper by Corio and Sherwell[24] and was reinforced by the National Park Service memo.[25] Others involved in reaching a decision were Phil Allen of the Oregon Department of Environmental Quality, and Ken Richmond, then of the consulting firm MFG. Ecology began addressing condensables for a project that included natural gas-fired combustion turbines in 2002, and have applied this approach to all subsequent modeling protocols received.

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 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 Puget Sound Refinery[26] (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 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

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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.

[23] Clint Bowman, e-mail message, addressed to Bernard Brady, June 23, 2008.

[24] Corio, L.A.; Sherwell, J, In-Stack Condensable Particulate Matter Measurement and Issues; Air & Waste Management Association, 2000, 50, 207-218.

[25] Don Shepherd, "Particle Speciation for NG-fired Combustion Turbines," e-mail message, addressed to Rob Wilson, September 5, 2002.

[26] About five miles from the proposed project site.

original permit action. Table 8 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.[27]

Table 8. Air Quality Impact Modeling Results for SPI-Burlington's Wood-Fired Boiler

Pollutant	Modeling Results micrograms per cubic meter ($\mu g/m^3$)		Modeling Significance Level ($\mu g/m^3$)		Class I Area Allowable Increment Consumption ($\mu g/m^3$)	Class II Area Allowable Increment Consumption ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
	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

[27] An extended analysis that includes all NO_X emission sources in the vicinity.

Table 8. Air Quality Impact Modeling Results for SPI-Burlington's Wood-Fired Boiler							
Pollutant	**Modeling Results micrograms per cubic meter ($\mu g/m^3$)**		**Modeling Significance Level ($\mu g/m^3$)**		**Class I Area Allowable Increment Consumption ($\mu g/m^3$)**	**Class II Area Allowable Increment Consumption ($\mu g/m^3$)**	**NAAQS ($\mu g/m^3$)**
	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	12

As noted in Section 1.3, 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, PM_{10}, $PM_{2.5}$, and VOC emissions in ascertaining the related modeling requirements.

Dry kilns do not have stacks by 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.

3.1.3 New Property

SPI-Burlington has purchased the rights to two pieces of property adjacent to their facility. There are multiple owners of this property. A legal description of the property is provided below:

That portion of New Lot 2 of that certain Boundary Line Adjustment as shown on Record of Survey recorded under Auditor's file number 200905290102, records of Skagit County, Washington, more particularly described as follows:

> Commencing at the Northeast corner of Lot 1, SP No. 94-035 and Southeast corner of Lot 3, SP No. 7-89 of said Boundary Line Adjustment;
> Thence South 0°05'32" West along the East line thereof, a distance of 346.07 feet to the Northeast corner of said Lot 2 and the TRUE POINT OF BEGINNING;

Thence South 64°44’57” West a distance of 106.24 feet;
Thence South 32°07’06” West a distance of 76.28 feet;
Thence South 02°55’39” East a distance of 64.91 feet;
Thence South 36°39’48” East a distance of 80.70 feet;
Thence South 78°46’53” East a distance of 86.39 feet to a point on the East line of said Lot 2, which bears South 00°05’32” West from the TRUE POINT OF BEGINNING;
Thence North 00°05’32” East a distance of 256.37 feet to the TRUE POINT OF BEGINNING.

Situated in Skagit County, Washington

AND ALSO INCLUDING

That portion of vacated Swinomish Avenue contiguous to the South line of Block 9, Plan of Fredonia according to the plat there of recorded in Volume 2 of Plats, page 25, records of Skagit County, said portion lying Northerly of the following described line:

Beginning at the Northwest corner of Block 10 of said Plan of Fredonia as shown on that certain Record of Survey map recorded under Skagit County Auditor’s File No. 200006020092;
Thence South 0°05’33” West 521.96 feet along the West line of said Plan of Fredonia to the Southwest corner of said Block 9;
Thence continue South 0°05’33” West 1.8 feet, more or less , along said West line, to an existing wire fence and the TRUE POINT OF BEGINNING of said line;
Thence South 86°23’42” West 29.4 feet from the Northeast corner of the Quit Claim Deed for Boundary Line Adjustment as recorded under Auditor’s File number 200009250093, records of Skagit County, Washington;
Thence South 45°29’47” East 40.29 feet to the East line of said Quit Claim Deed for Boundary Line Adjustment as recorded under Auditor’s File Number 200009250093, records of Skagit County, Washington, at a point that is South 1°18’59” West 26.4 feet from said Northeast corner of the Quit Claim Deed for boundary Line Adjustment, said point being the terminus of said line.

Situated in Skagit County, Washington

A drawing of the property is shown below:

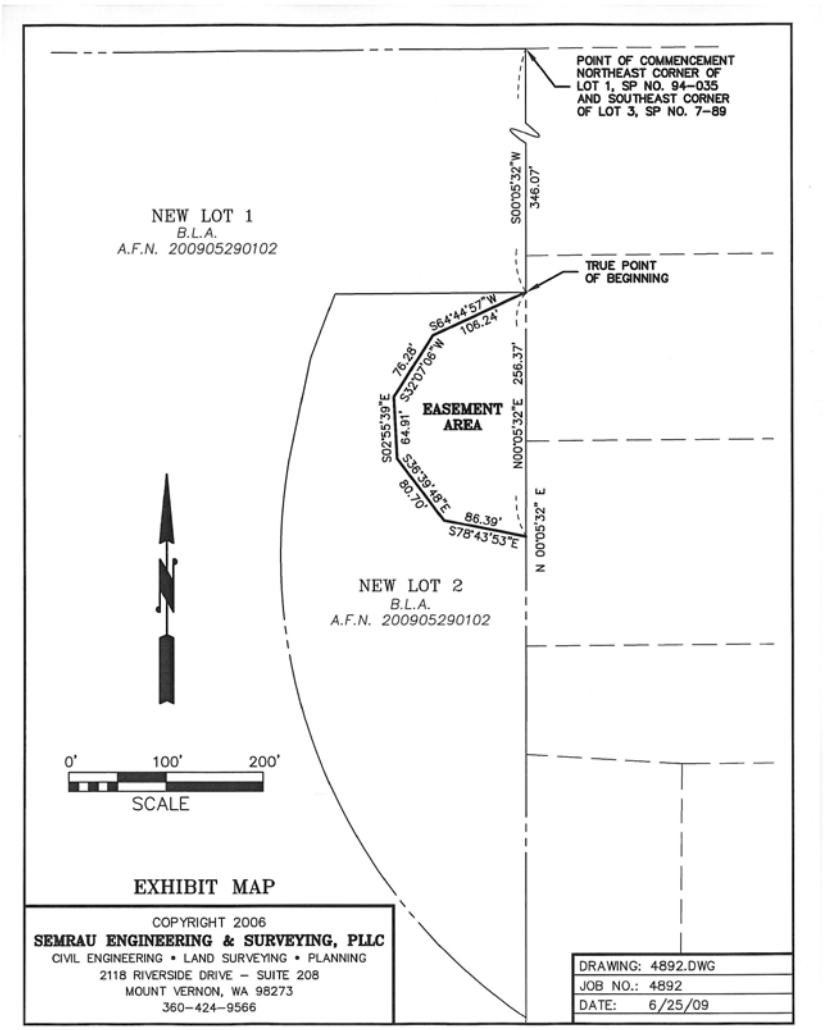

Figure 2. New Lots

As stated above, SPI-Burlington arranged to control this property before they submitted a complete application for this project. A fence will be constructed in such a manner that restricts public access to that property. This property is not ambient air. Even though the dispersion models use a very conservative algorithm, without SPI-Burlington controlling this property, there could have been a slight possibility that the 24-hour PM_{10} NAAQS and a 24-hour $PM_{2.5}$ Class II increment could have been exceeded. The PSD permit contains an approval condition for SPI-Burlington to maintain control of and restrict public access to the new property. The modeled PM_{10} air quality impacts at the new property line are shown in Table 8.

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 TPY or greater.[28] 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 the 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.

In general, the analysis shows the highest ozone concentrations due to regional ozone-related emissions to be just 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.

3.1.4 $PM_{2.5}$

EPA promulgated revised $PM_{2.5}$ ambient standards in September 2006. Consequently, SPI-Burlington's consultant, ENVIRON, consulted with Herman Wong (EPA Region10) and Clint Bowman (Ecology). Mr. Wong advised ENVIRON that the NAAQS must be addressed, but PSD increments for $PM_{2.5}$ have not been promulgated.

$PM_{2.5}$ concentrations were computed using the same air quality modeling analysis that was done for PM_{10}. There is no increment so the analysis was restricted to demonstrating compliance with the NAAQS of 35 $\mu g/m^3$ for the 24-hour $PM_{2.5}$ concentrations and 12 $\mu g/m^3$ for the annual $PM_{2.5}$ concentrations. The only difference between the PM_{10} and $PM_{2.5}$ analysis is the selection of emission rates. For PM_{10}, the lumber kilns, the boiler, the cooling tower, and the baghouse were assumed to be 100 percent $PM_{2.5}$.

Compliance with the $PM_{2.5}$ standard is determined by the 8th highest (98th percentile) value for each year, then taking a 3-year average of those yearly 8th highs. Since five years of meteorological data were processed here, there were three average 8th highest values calculated for each receptor. The peak value from all of this analysis was 18.43 $\mu g/m^3$, well below the ambient standard of 35 $\mu g/m^3$. Similarly, the peak annual concentration at any receptor was 6 $\mu g/m^3$, well below the annual standard of 12 $\mu g/m^3$.

[28] 40 CFR 52.21(i)(5)(i).

PM_{10} emissions from regional industrial sources were evaluated in the 2005 permit application. The only industrial source having a concentration exceeding the 24-hour PM_{10} SIL (5 µg/m^3) within SPI-Burlington's radius of significance was Washington Alder. SPI-Burlington included Washington Alder in this $PM_{2.5}$ evaluation. However, they did not repeat the regional modeling for other industrial sources because their $PM_{2.5}$ emissions would be less than the PM_{10} emissions, resulting in lower concentrations of $PM_{2.5}$ than PM_{10}.

SPI-Burlington investigated background $PM_{2.5}$ concentrations by examining hourly monitoring data provided by the NWCAA for stations in Mt. Vernon. Table 9 summarizes those results.

Table 9. Summary Ambient $PM_{2.5}$ Concentrations Measurements

Averaging Period	2004 (µg/m^3)	2005 (µg/m^3)	2006 (µg/m^3)	2007 (µg/m^3)	2004–2006 3-year Average (µg/m^3)	2005–2007 3-year Average (µg/m^3)
98th Percentile 24-hr	8.2	8.5	8.9	11.9	8.5	9.8
Annual Mean	3.3	3.7	3.6	4.9	3.5	4.1

$PM_{2.5}$ is compared against the NAAQS in Table 8 above. Neither the 24-hr nor the annual NAAQS have been exceeded.

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 (ASILs[29]). 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 the 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 NSR requirements pursuant to WAC 173-400-110 are addressed in detail by the NWCAA under NOC 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

[29] 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.

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 value 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 area within about 200 kilometers of SPI-Burlington (see Table 10). SPI-Burlington modeled its emissions impact on the Class I areas and Class II wilderness areas using the CALPUFF[30] system.

Table 10. 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,[31] a five percent increase in visible haze will evoke "a just perceptible" 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

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

acknowledge that the application of BACT to the proposed project is the mitigation remedy allowed in the regulations.[32]

The modeling results indicate that the visibility impact of SPI-Burlington's pollutant emissions will not exceed the FLMs concern threshold at Class I or Class II wilderness areas. Table 11 shows the modeling results.

Table 11. 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, PM, PM_{10}, $PM_{2.5}$, and fallout from their derivatives have the potential to impact flora and fauna in the area surrounding an emissions source. SPI-Burlington modeled the maximum increase in NO_X, SO_2, PM, PM_{10}, and $PM_{2.5}$ concentrations for each Class I area caused by the proposed project. As shown in Table 11 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,[33] for most types of soils and vegetation, ambient concentrations of criteria pollutants below the secondary NAAQS will not result in harmful effects. As shown in Table 8, maximum ambient NO_X concentration attributable to the proposed project is below the secondary NAAQS. Exceptions exist where particular species are sensitive to particular pollutants.

[32] ibid., Appendix C.
[33] op. cit., Chapter D, § IIC.

The Washington State Environmental Policy Act lead agency for the project was the Skagit County Planning and Development Services. They 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).[34]

The Biological Assessment submitted by SPI-Burlington to EPA concluded that this project would have no adverse effect on endangered species in Skagit County or on any essential fish habitat.[35] 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.[36]

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 suggested 0.005 kilograms per hectare per year (kg/ha-yr) as the concern threshold for increases in nitrogen deposition[37] due to a proposed project for Class I areas.

Table 12. 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	0.0001	0.0004
Class II Area	**Maximum Nitrogen Deposition kg/ha-yr**	**Maximum Sulfur Deposition kg/ha-yr**
Mt. Baker Wilderness Area	0.0034	0.0119

[34] Skagit Planning and Development Services Mitigated Determination of Nonsignificance (MDNS) Special Use Permit File #PL05-0672, October 27, 2005.
[35] 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.
[36] 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.
[37] "Guidance on Nitrogen Deposition Analysis Thresholds," National Park Service, August 2001.

Table 12 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 12. 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	0.0001	0.0004
Class II Area	**Maximum Nitrogen Deposition kg/ha-yr**	**Maximum Sulfur Deposition kg/ha-yr**
Mt. Baker Wilderness Area	0.0034	0.0119

4.3 Construction and Growth Impacts

SPI-Burlington employs about 200 people at the lumber mill. As noted in Section 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 this permit revision 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 PSD 05-04, Amendment 1.

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6. ACRONYMS AND ABBREVIATIONS

$\mu g/m^3$	micrograms per cubic meter
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
MMBF	million 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)
NOC	Notice of Construction
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