

**STATE OF WASHINGTON**

**TECHNICAL SUPPORT DOCUMENT**  
**FOR PREVENTION OF SIGNIFICANT DETERIORATION PERMIT**

**PERMIT NO: PSD-11-02**

**The Boeing Company**  
**Boeing Commercial Airplanes**  
**737 Production Capacity Increase Project**  
**Renton (King County), Washington**

**Prepared by**

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## EXECUTIVE SUMMARY

The Boeing Company (Boeing) proposes to make changes to their airplane manufacturing facility in Renton, Washington, to enable an increase in the production rate of the 737 model airplane. The proposed project is intended to increase 737 production capacity at the Renton facility from a maximum production capacity of about 376 airplanes per year to a projected maximum production capacity of about 504 airplanes per year (based on a nominal 250 manufacturing days per year schedule).

The project proponent, herein referred to as “Boeing Renton” proposes to replace four existing wing panel spray booths in Building 4-20 with four new booths at another location in Building 4-20, and in Building 4-86 to add a new wing booth and increase the exhaust rate on one existing inspar (vertical) wing booth to improve the quality of the paint finish. Other changes related to this project include adding a new wing horizontal build line in Building 4-20 (some of which will occupy the space that the four current wing panel spray booths occupy), installing a new wing riveter, and installing other miscellaneous assembly tooling in Building 4-20. None of these other changes involve the modification of VOC emission units. There are no other physical changes or changes in method of operation anticipated at the Renton facility as a result of this project.

The proposed project will result in a significant net emissions increase of approximately 97 tons per year (tpy) of volatile organic compounds (VOC). Other pollutants that are regulated under state and federal Prevention of Significant Deterioration (PSD) rules will not experience a significant emissions increase.

The Washington State Department of Ecology (Ecology) received the PSD application for the project on **June 7, 2011**. Additional information was received on June 23, July 8, July 12, August 2, August 11, August 25, and September 8, 2011. Ecology determined the application to be complete on **September 8, 2011**.

## **1. INTRODUCTION**

### **1.1. PSD Permitting Requirements**

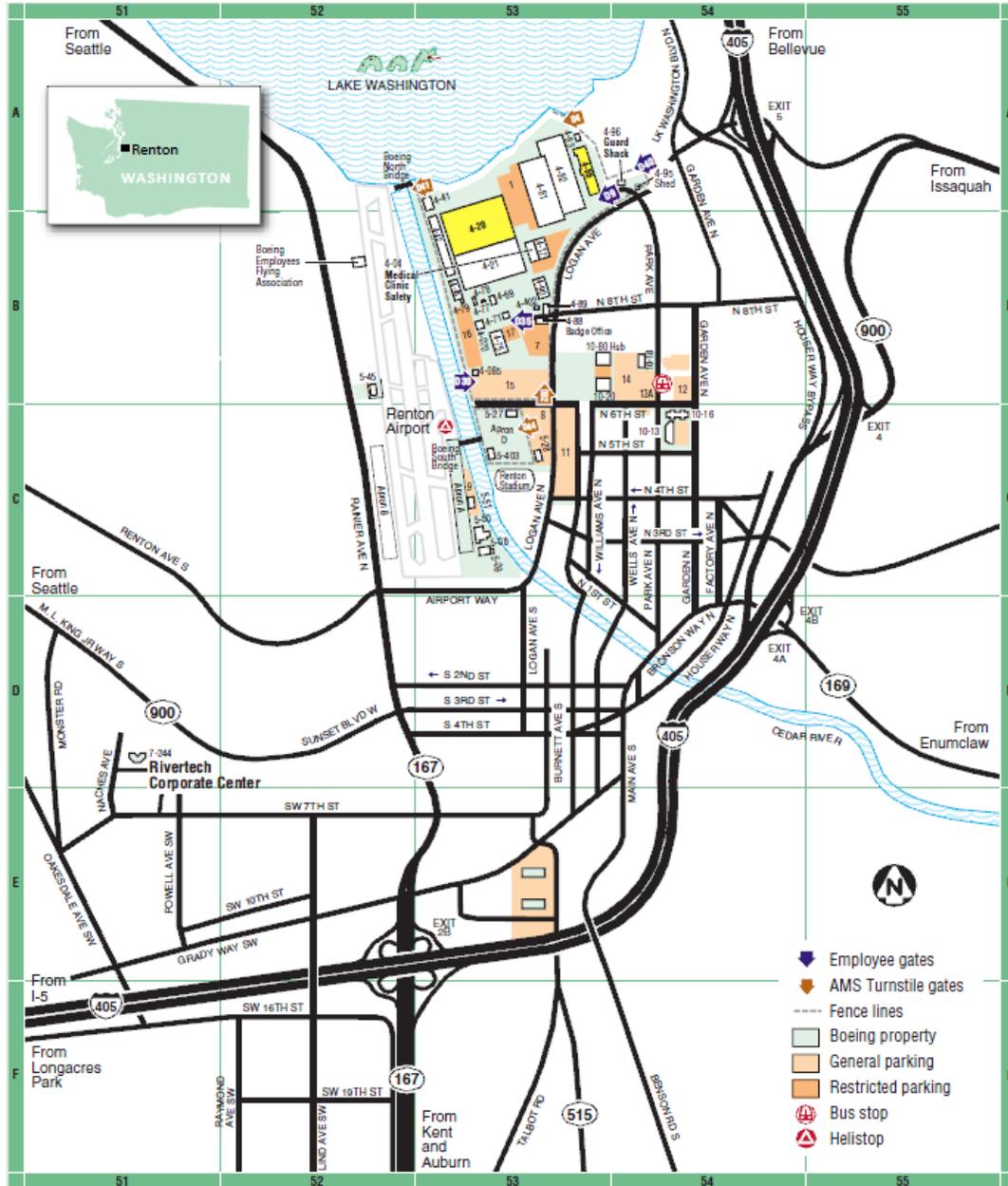
PSD permitting requirements in Washington State are established in Title 40, Code of Federal Regulations (C.F.R.) § 52.21; Washington Administrative Code (WAC) 173-400-700 through 750; and the agreement for the delegation of the federal PSD regulations by the United States Environmental Protection Agency (EPA) to Ecology, dated February 23, 2005. Federal and state rules require PSD review of all new or modified air pollution sources that meet certain criteria. The objective of the PSD program is to prevent significant adverse environmental impact from emissions into the atmosphere by a proposed new major source or major modification to an existing major source. The program limits degradation of air quality to that which is not considered "significant." It also sets up a mechanism for evaluating the effect that the proposed emissions might have on visibility, soils, and vegetation. PSD rules also require the utilization of Best Available Control Technology (BACT) for certain new or modified emission units, which is the most effective air pollution control equipment and procedures that are determined to be available after considering environmental, economic, and energy factors.

The PSD rules must be addressed when a company is adding a new emission unit or modifying an existing emission unit in an attainment or unclassifiable area. PSD rules apply to pollutants for which the area is classified as attainment with the National Ambient Air Quality Standards (NAAQS). PSD rules are designed to keep an area with "good" air in compliance with the NAAQS. The distinctive requirements of PSD are BACT, air quality analysis (allowable increments and comparison with the NAAQS), and analysis of impacts of the project on visibility, vegetations, and soils.

### **1.2. Site and Project Description**

#### **1.2.1. Site Description**

The Boeing airplane manufacturing facility located in the city of Renton in King County, Washington (Boeing Renton) began operation in 1942. It occupies 339 acres, and currently manufactures and assembles parts for the 737 series airplane model. Boeing Renton is located in the south half of Section 18, Township 23N, Range 5, Willamette Meridian. It is bounded to the north by Lake Washington, to the south by Airport Way, to the east by Logan Avenue, and to the west by the Renton Airport. Figure 1 shows a plant layout of the Renton facility.



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**Figure 1.** Boeing Renton plant layout

(Source: Boeing’s PSD application, Fig. 1-1, received August 25, 2011)

Model 737 assembly operations primarily occur in Buildings 4-20, 4-21, 4-42, 4-81, 4-82, and 4-86, and can be grouped as follows:

- Wing Assembly Operations include assembling the upper and lower wing panels. These operations primarily occur in Buildings 4-20 and 4-21.
- Wing Clean, Seal, Test, and Paint Operations include cleaning the complete wing assemblies, sealing them—including the interior surfaces of the fuel tank, applying corrosion inhibiting compounds, testing the fuel tank for leaks, correcting any leaks, and painting the exterior surfaces. These activities only occur in Building 4-86.
- Final Assembly Operations include joining the wings and tail assemblies to the fuselage and adding the necessary electrical systems, hydraulic systems, and interiors. These operations occur in Buildings 4-81 and 4-82.
- Delivery Operations include final painting, any necessary depainting, and preparing the airplane for delivery. These operations occur in Building 4-42 and the paint hangars in Buildings 4-41 and 5-50. Some airplanes are flown off-site for painting because Boeing Renton does not have the capacity to apply the final exterior coating to all the airplanes produced at the Renton facility.
- Combustion Operations include the boilers and heaters and backup diesel generators. The boilers are located in Buildings 4-89 and 5-50.

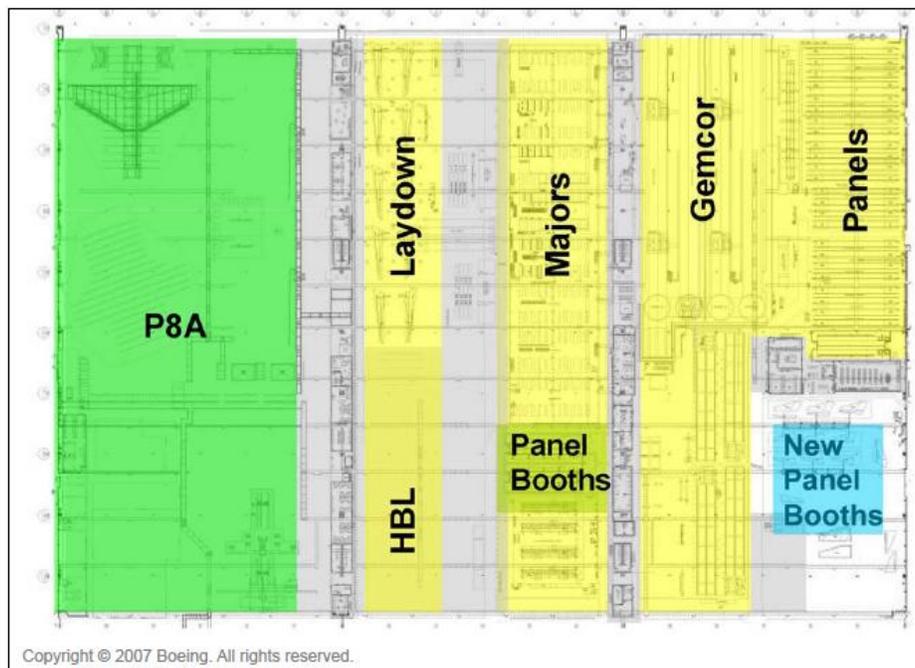
These operations include the assembly of various sub-assemblies (e.g., wing spars and wings) from their component parts; the installation of various airplane systems (e.g., hydraulic, fuel, electrical) in the sub-assemblies; final assembly of a complete airplane structure and integration of the airplane systems; the installation of landing gear, engines, and interior components (e.g., seats, sidewalls, partitions); and functional testing. The main body sections (fuselages) are assembled in Wichita, Kansas, and are delivered to Boeing Renton by rail. Air emissions primarily occur from activities such as spray coating, sealing, hand-wipe and flush cleaning, and the use of miscellaneous adhesives, resins, and other products that contain VOC.

Boeing Renton is located in a Class II area that is designated as “attainment or unclassifiable” for the purpose of PSD permitting for all pollutants.

### **1.2.2. Project Description**

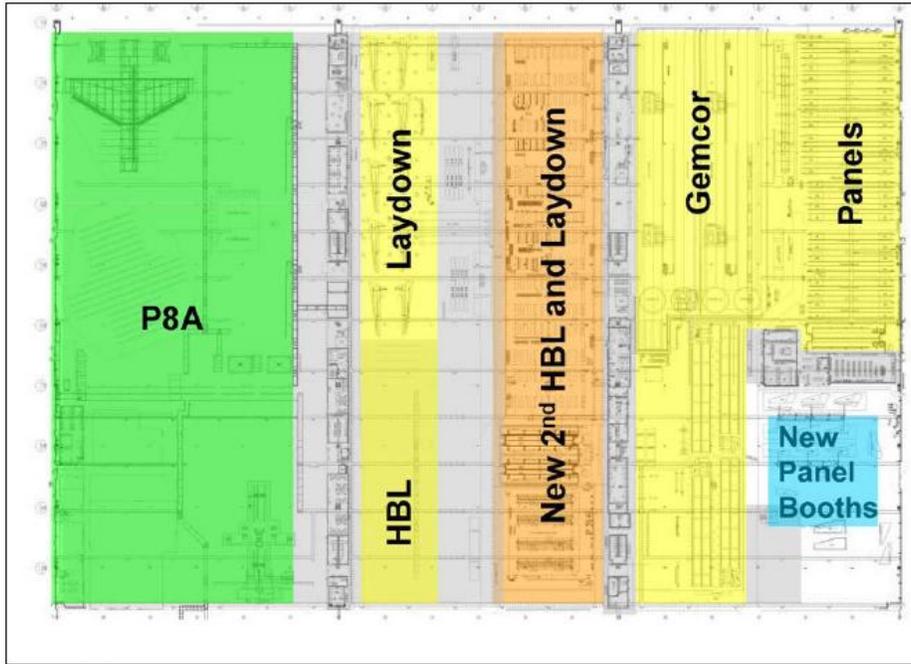
Boeing Renton proposes to make changes to the Renton airplane manufacturing facility that will enable it to increase the maximum production capacity from the current rate of about 376 airplanes per year to a projected maximum production capacity of about 504 airplanes per year (based on a nominal 250 manufacturing days per year schedule). To enable a 737 production rate of approximately 504 airplanes per year, certain changes to the 737 wing assembly and painting operations will be made.

Model 737 wings have two major wing panels, the upper and lower surfaces of the wing. Before assembling the two panels together, the wing panels are cleaned, sealed, and coated with protective coatings. As part of this project, Boeing intends to replace four existing wing panel spray booths (covered under the existing Permit No. PSD-08-01) in Building 4-20 with four new booths at another location in Building 4-20 (Figures 2 and 3). This will allow replacement of the vertical wing build line with a new horizontal wing build line (HBL). No other new or modified spray booths are planned, and no other emission units would be added or modified in Building 4-20 as part of this project.

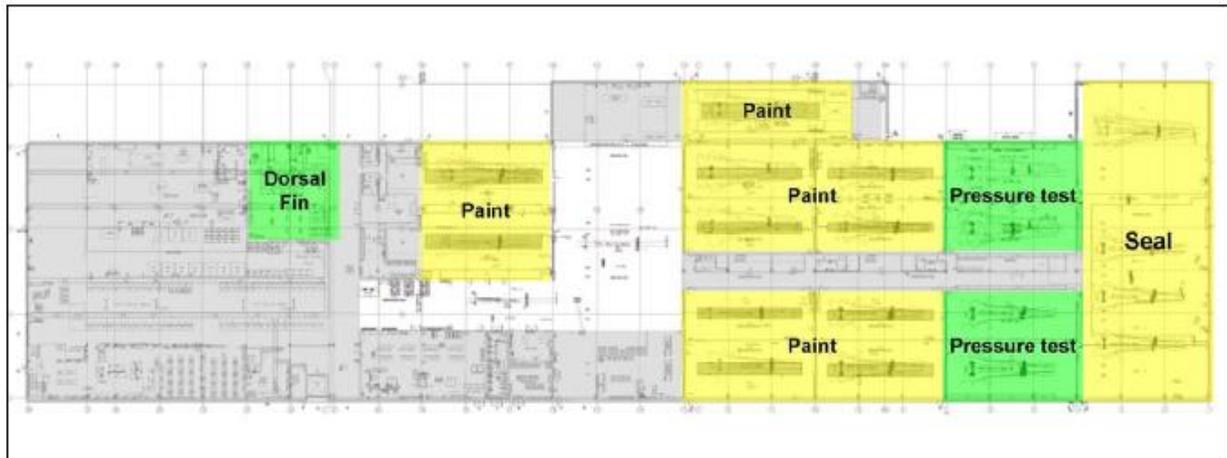


**Figure 2.** Current Building 4-20 layout

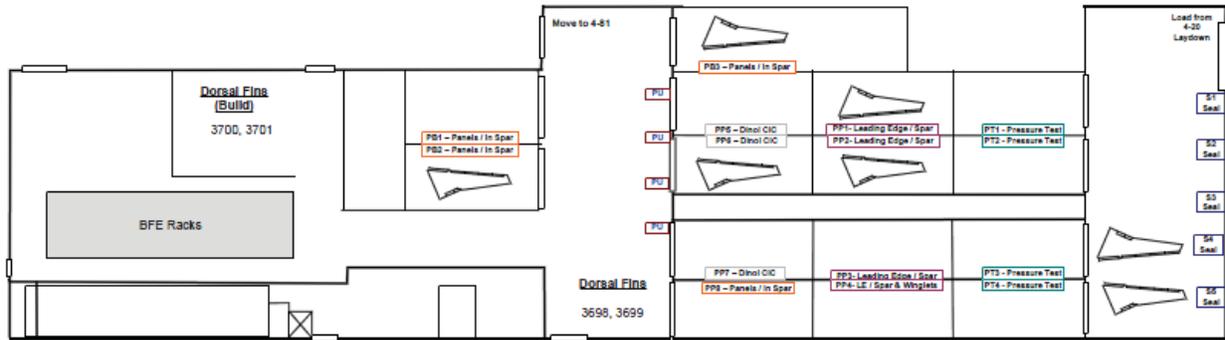
In Building 4-86 (Figures 4 and 5), Boeing paints wings that are mostly assembled. Boeing intends to add one new inspar booth (PB-4) that will paint the upper and lower sections of the wing with the wing in a vertical position. To improve the quality of the paint finish, the exhaust rate on one existing inspar wing booth (PP-8) would be increased; this would also increase the capacity of the booth.



**Figure 3.** Future Building 4-20 layout



**Figure 4.** Building 4-86 layout



**Figure 5.** Building 4-86 layout detail

In addition to the changes described above, Boeing intends to make other changes to 737 assembly operations that are not expected to involve changes to spray booths or other emission units. These changes include, but are not necessarily limited to, installing a new wing-riveter, a second HBL, and other miscellaneous assembly tooling. Table 1 summarizes the proposed actions for each building.

**Table 1. Summary of the Proposed Project**

Building	Proposed Changes
4-20	<ul style="list-style-type: none"> <li>• Four replacement wing panel booths</li> <li>• Decommissioning of four existing wing panel booths</li> <li>• New wing horizontal build line</li> <li>• New wing-riveter</li> <li>• Miscellaneous assembly tooling</li> </ul>
4-86	<ul style="list-style-type: none"> <li>• One new inspar (vertical) wing booth</li> <li>• Install new fan(s) in an existing inspar wing booth</li> </ul>

The cleaning and coating operations that are planned for the modified wing booths are as follows:

- **Wing cleaning and conversion coating** – Before the exterior of the wing can be coated, it first must be cleaned and prepped for priming.
- **Wing priming** – Priming provides corrosion protection and ensures the necessary bond between the surface of the wing and the topcoat.

- **Wing topcoat** – The topcoat is the final coating of the normally visible surfaces of the wing, top and bottom. The topcoat not only provides the final protection of the wing surface but also provides the decorative color to the top and bottom of the wing.
- **Wing corrosion-inhibiting compound** – Portions of the wing that are not normally visible often need a special coating to further protect them from corrosion. This corrosion-inhibiting compound is applied to the wing assembly before the wing is transported to the main assembly line for attaching to the fuselage of the airplane.
- **Spray equipment cleaning** – The spray equipment used to perform the operations above is cleaned after each use. A small amount of solvent evaporates while cleaning the spray equipment.

Increased 737 production enabled by the project is expected to result in increased emissions from the 737 assembly operations, Building 4-41 paint hangar,<sup>1</sup> and related combustion from boilers and heaters. The increased emissions are primarily due to debottlenecking of the assembly operations through the increased capacity of the wing assembly operations in Building 4-20 and Building 4-86. Details of the emission estimates are shown later in this document.

VOC emissions from all 737 assembly operations at Boeing Renton, excluding painting of completed aircraft, average about 0.46 ton per airplane. Of the 0.46 ton per airplane, the projected potential VOC emissions from each of the wing panel booths in Building 4-20 are about 22 pounds per airplane, or about 2.08 tpy per booth. The new and modified booths in Building 4-86 would each emit 130 pounds of VOC per airplane for a potential VOC emission rate of 11.86 tpy per booth.

## 2. PSD APPLICABILITY REVIEW

### 2.1. Overview and Permitting History

Boeing Renton is an existing major stationary source under the PSD permitting program because it has the potential to emit (PTE) greater than 250 tpy of VOC. Under WAC 173-400-720 through 750, a project proposed at an existing major stationary source is subject to PSD review if the project either is a “major modification” to an existing “major stationary source,” or is a major stationary source unto itself.

The Renton facility currently operates under multiple PSD permits issued by Ecology, including the following permits:

- PSD-08-01 Amendment 1, for the Boeing Renton site, Building 5-50 Paint Hangar, and Buildings 4-20, 4-21, 4-81, and 4-82. PSD-08-01 Amendment 1 limits the VOC emissions from Buildings 4-20, 4-21, 4-81, and 4-82 to 118 tpy.

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<sup>1</sup>The Building 5-50 paint hangar modification was permitted under Permit No. PSD-08-01 Amendment 1. The

- PSD-97-02 for the Boeing Renton site, Building 4-86. Condition 2 of PSD-97-02 limits VOC emissions from Building 4-86 to 242 tpy.
- PSD-88-4 for the Boeing Renton site, Building 4-41 Paint Hangar. Condition 1 of PSD-88-4 limits VOC emissions from Building 4-41 to 124 tpy.

Boeing Renton is not seeking to change any of these existing PSD emission limits.

Unless otherwise exempted by applicable regulation, a change to an existing major stationary source is a major modification if the change results in both a significant emissions increase and a significant net emissions increase at the source. “Significant emissions increase” means that the emissions increase for any regulated PSD pollutant is greater than the PSD Significant Emission Rate (SER) threshold for that regulated pollutant.

The changes being made to increase 737 production capacity will require a PSD permit if both the project’s emissions increase and the net contemporaneous emissions increase caused by the project exceed the PSD significance level for VOC of 40 tpy. This PSD applicability review examines both the project’s emissions increase and the net emissions increase. The emissions increase obtained through the PSD applicability review is used in the BACT and air quality analyses described in later sections.

### **2.1.1. Emissions Calculation Procedure**

To determine whether the project is a major modification, Boeing Renton used the procedure described in 40 C.F.R. § 52.21 and associated guidance to calculate emissions. That procedure can be summarized as follows:

1. Calculate project emission increases.
  - a. For existing emissions units, the increase in emissions is calculated as the difference between projected actual emissions and baseline actual emissions.
  - b. For new emissions units, the increase in emissions is equal to the PTE of the unit.
  - c. Boeing Renton calculated the increase in emissions for:
    - i. New emissions units;
    - ii. Existing emissions units that will be physically or operationally modified;
    - iii. Existing emissions units that will not be physically or operationally modified but will have an associated increase in emissions as a result of the project; and

- iv. Existing emissions units from any past or future projects that must be aggregated with the current project.
2. Calculate net contemporaneous and creditable emission increases and decreases.
    - a. For all pollutants that will have a project emissions increase from Step 1 that is greater than the SER, a further analysis is used to determine the creditable emissions increases and decreases that occurred during the contemporaneous period for purposes of determining the “net emissions increase” of that pollutant associated with the project. Only VOC emissions exceeded the SER in Step 1.
    - b. An increase or decrease in actual emissions is contemporaneous with the increase from the project only if it occurs between:
      - i. The date five years before construction on the project commences; and
      - ii. The date that the increase from the project occurs.<sup>2</sup>
    - c. An increase or decrease in actual emissions is creditable only if:<sup>3</sup>
      - i. EPA or Ecology has not relied on it in issuing a PSD permit for the source, which permit is in effect when the increase in actual emissions from the project occurs; and
      - ii. As it pertains to an increase or decrease in fugitive emissions (to the extent quantifiable), it occurs at an emissions unit that is part of one of the source categories listed in 40 C.F.R. § 52.21(b)(1)(iii), or it occurs at an emissions unit that is located at a major stationary source that belongs to one of the listed source categories.
    - d. A decrease in actual emissions is creditable only to the extent that it is enforceable as a practical matter at and after the time that actual construction on the particular change begins.
  3. Determine the net emissions increase.
    - a. The emissions increase from the project alone is added to the net contemporaneous emissions change to determine the net emissions increase of a pollutant.

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<sup>2</sup> See 40 C.F.R. § 52.21(b)(3)(ii).

<sup>3</sup> See 40 C.F.R. § 52.21(b)(3) for a detailed list of creditability criteria. 40 C.F.R. § 52.21(b)(3)(iii)(b) also states that the increase or decrease should not have occurred at a Clean Unit. However, that requirement does not apply because EPA removed the Clean Unit provisions from 40 C.F.R. § 52.21 through rulemaking at 72 FR 32526, June 13, 2007.

- b. If the net emissions increase is less than the respective SER, PSD permitting is not triggered for that particular pollutant.

### **2.1.2. Aggregation and Debottlenecking Analysis**

#### **2.1.2.1. Project Aggregation Analysis**

To better understand the relatively complex issue of “project aggregation,” it is important to provide verbatim a summary of EPA’s explanation of the issue. The following paragraphs are quoted from 75 FR 19567 (April 15, 2010), with footnotes omitted:

When undergoing a physical or operational change, a source determines major NSR applicability through a two-step analysis that first considers whether the increased emissions from a particular proposed change alone are significant, followed by a calculation of the change’s net emissions increase considering all contemporaneous increases and decreases at the source (i.e., source-wide netting calculation) to determine if a major modification has occurred. See, for example, 40 C.F.R. § 52.21(b)(2)(i). The term “aggregation” comes into play in the first step (Step 1), and describes the process of grouping together multiple, nominally-separate but related physical changes or changes in the method of operation (“nominally-separate changes”) into one physical or operational change, or “project.” The emission increases of the nominally-separate but related changes must be combined in Step 1 for purposes of determining whether a significant emissions increase has occurred from the project. See, for example, 40 C.F.R. § 52.21(b)(40). When undertaking multiple nominally-separate changes, the source must consider whether NSR applicability should be determined collectively (i.e., “aggregated”) or whether the emissions from each of these changes should separately undergo a Step 1 analysis.

Neither the CAA nor current EPA rules specifically address the basis upon which to aggregate nominally-separate changes for the purpose of making NSR applicability determinations. Instead, our aggregation policy developed over time through statutory and regulatory interpretation and applicability determinations in response to a need to deter sources from attempting to expedite construction by permitting several changes separately as minor modifications. When related changes are evaluated separately, the source may circumvent the purpose of the NSR program by showing a less than significant emission increase for Step 1 of the applicability analysis, that could result in avoiding major NSR permitting requirements. This, in turn, could result in increases of emissions of air pollutants from the facility that would be higher than the increases would be had the changes been subject to NSR control requirements. The associated emissions increases could endanger the air quality health standard and adversely affect public health.

As explained above, the intent of EPA's aggregation policy is to deter sources from attempting to expedite construction by permitting several changes separately as minor modifications. In the case of a new project that is undergoing PSD permitting, the aggregation analysis is used to determine all of the pollutants and emissions units that are subject to PSD review (including an evaluation of projects that have previously been permitted as minor modifications yet they should be considered part of the present project).

To identify those emissions units and activities that should be reviewed as part of the 737 production capacity increase project, Ecology directed Boeing Renton to carefully review past, current, and planned projects to determine whether any should be considered and aggregated with the proposed 737 production capacity increase project.

Boeing Renton summarized the results of their review in an e-mail to Ecology dated June 23, 2011, which included the following discussion:

Boeing uses an internal company document called a Program Directive to authorize and change both "protection" rates and actual production rates for all of its commercial airplane models looking ahead several years. Protection rates are the maximum production rates for which tools, facility support, capital equipment, and raw materials are to be acquired or maintained to achieve. Boeing Renton is not authorized by The Boeing Company to expend resources for the purpose of securing production capacity above the protection rate.

The protection rate established in Program Directives for the 737 model in 1998 was 31.5 airplanes per month. The actual 737 production rate has been at 31.5 per month from September 2009 until Present.

A decision to increase the 737 protection rate and production rate to 35 per month was made in June, 2010. The increase in production to 35 per month is scheduled for January 2012. A decision to increase the 737 production rate to 38 per month (beginning April 2013) and to increase the protection rate [to] 42 per month was made in September, 2010. It is the increase in the protection rate to 42 per month which necessitates the second horizontal wing build line, the replacement/relocation of the four wing panel booths, and the construction of the additional wing paint booth which are the subject of the present PSD application.

Prior to these decisions, any changes made to the 737 factory had been governed by the requirement to "protect" a 737 production rate capacity of 31.5 airplanes per month. Any changes prior to these decisions to increase the production capacity above 31.5 airplanes per month would not have been authorized and therefore not undertaken. The 5-50 paint hangar refurbishment authorized by PSD 08-01 was necessary to [sustainably] maintain the 31.5 production rate while being able to properly maintain the paint hangars serving the 737 program. The additional ASATs and AWFIS authorized by Amendment 1 to [PSD Permit No.

PSD-08-01] were necessary to achieve the 35 per month production rate. Therefore, there are no previous changes to the 737 factory that should be aggregated with the current project to increase the 737 production rate capacity to 42 airplanes per month.

In addition, additional factors that [Ecology] indicated would be potentially relevant to an aggregation analysis (in [Ecology's] April 29, 2011 email [from David Ogulei, Ecology] to Frank Migaiolo of Boeing Everett regarding that facility's "777 rate increase project") are discussed as follows:

**(a) Any minor source applications filed since the last PSD-approved project was completed at the facility.** No minor new source application has been filed in the last five years.<sup>4</sup> In conjunction with [Boeing's] discussion of the production capacity planning process, above, [Boeing believes that any project] that occurred at the facility more than five years ago would not be closely related enough to the currently proposed project to support aggregation.

**(b) Any funding information indicating one project.** According to the 737 Program Management Office, they are not aware of any funding information that would indicate a previous project should be aggregated with the current project. Funding decisions for the current project are made under the authority of the September 2010 Program Directive and are separate from and independent of the funding decisions for the prior projects which relied on earlier Program Directives for their authority. Each prior project was determined to be economically viable without regard to any potential future 737 rate increases. The proposed project is not necessary to meet any obligations to Boeing customers entered into prior to the September 2010 Rate Directive.

**(c) The relationship of the changes to the current project and the overall basic purpose of the plant.** The overall basic purpose of the plant is to produce commercial airplanes for delivery to airline customers. As discussed above, none of the previous changes to the 737 factory have been for the purpose of achieving a production rate capacity greater than 35 airplanes per month.

As discussed above, Boeing Renton has determined that there are no past projects that need to be considered and aggregated when performing the PSD applicability analysis for the 737 production capacity increase project. Based on Ecology's review of Boeing Renton's analysis, Ecology finds no reason to dispute this conclusion.

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<sup>4</sup> Permit No. PSD-08-01 was issued in 2008 and amended in 2010.

### **2.1.2.2. Debottlenecking**

Once the scope of the project has been identified, including aggregation of related activities or projects, if applicable, the source must then determine whether the project, as a whole, will result in a significant emissions increase from the modified and any affected emissions units. Affected units are those units upstream or downstream from the unit(s) undergoing a physical change or change in the method of operation that will experience an emission increase as a result of the project. Affected units include “debottlenecked units” and units that experience an “increase in utilization” as a result of the project.<sup>5</sup> The current EPA rules permit emissions increases from debottlenecked units (and any other unit that increases its utilization as a result of the project) to be calculated using an actual-to-projected-actual applicability test.<sup>6</sup>

The primary changes to be made at the Boeing Renton facility in order to enable the projected 42 airplanes per month production rate (504 airplanes per year) involve the replacement of four wing panel booths in Building 4-20, the addition of one new wing booth in Building 4-86, and the modification of one existing wing booth in Building 4-86. Other changes to 737 manufacturing operations to achieve the 42 per month production rate do not involve changes to spray booths or other emission units.

As directed by Ecology, Boeing Renton evaluated all existing emissions units that will be “debottlenecked” by the 737 production capacity increase project and that will experience an emission increase as a result of the project. The analysis indicates that the project will debottleneck the following airplane parts manufacturing operations: Wing Assembly Operations; Wing Clean, Seal, Test, and Paint Operations; Final Assembly Operations; Delivery Operations; and Combustion Operations.

### **2.1.3. Baseline Actual Emissions**

For an existing<sup>7</sup> emissions unit (other than an electric utility steam generating unit), baseline actual emissions are<sup>8</sup> the average rate, in tpy, at which the emissions unit actually emitted the pollutant during any consecutive 24-month period selected by the owner or operator within the 10-year period immediately preceding either:

- a. The date the owner or operator begins actual construction of the project, or
- b. The date a complete permit application is received by Ecology, whichever is earlier.

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<sup>5</sup> To address the “confusion over [EPA’s] past policies for calculating emissions from debottlenecked units and from units experiencing an “increase in utilization,” EPA proposed changes to the debottlenecking rule provisions that would “apply to any unchanged unit at a source that increases its utilization following a change elsewhere at the source.” 71 FR 54238, Sept. 14, 2006.

<sup>6</sup> EPA does not require that sources use projected actual emissions to calculate their emissions increases. If a source prefers, it can calculate its emissions increases by comparing its past actual emissions to its future potential to emit. See 71 FR 54238 and footnote 7, Sept. 14, 2006.

<sup>7</sup> For a new emissions unit, the baseline actual emissions for purposes of determining the emissions increase that will result from the initial construction and operation of such unit shall equal zero.

<sup>8</sup> See 40 C.F.R. § 52.21(b)(48)(ii).

The calculation of baseline actual emissions for each emissions unit that will undergo an emissions increase must:

- a. Include emissions associated with start-ups, shutdowns, and malfunctions;
- b. Include fugitive emissions (to the extent quantifiable);
- c. Adjust downward to exclude any noncompliant emissions that occurred while the source was operating above an emission limitation that was legally enforceable during the consecutive 24-month baseline period;
- d. Adjust downward to exclude any emissions that would have exceeded an emission limitation with which the major stationary source must currently comply, had such major stationary source been required to comply with such limitations during the consecutive 24-month period;<sup>9</sup>
- e. Use only one consecutive 24-month period to determine the baseline actual emissions for all the emissions units being changed, but can use a different consecutive 24-month period for each regulated PSD pollutant; and
- f. Not be based on any consecutive 24-month period for which there is inadequate information for determining annual emissions, in tpy, and for adjusting this amount if required by 40 C.F.R. § 52.21(b)(48)(ii)(b) and (c).

Boeing Renton addressed each of the above requirements in calculating baseline actual emissions for the 737 production capacity increase project. Boeing Renton calculated the actual emissions based on the annual emission reports submitted to and accepted by Puget Sound Clean Air Agency (PSCAA). The emission rates were based on actual production and consumption rate, material safety data sheets (MSDSs), and/or EPA emission factors. Baseline actual emissions and the selected baseline periods are summarized in Table 3. Boeing Renton selected the calendar years 2009 and 2010 as the baseline period for all pollutants except for CO<sub>2</sub>e, which was calendar years 2006 and 2007. Average 737 production for 2009 and 2010 was 374 airplanes per year. Although Table 3 reports baseline actual emissions for the four Building 4-20 wing panel booths that will be shut down with the project, Boeing Renton is not taking credit for emission reductions resulting from shutting down those units. Boeing Renton will decommission these booths within 180 days of starting up the new booths and will notify Ecology and PSCAA as required by the PSD permit. Therefore, any emission reductions resulting from shutting down those units may continue to be creditable for future permitting actions provided other creditability criteria are met.

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<sup>9</sup> In Washington State, this adjustment does not currently apply to MACT limits per 40 C.F.R. § 52.21(b)(48)(ii)(c) because the state has not taken credit for such emissions reductions in an attainment demonstration or maintenance plan consistent with the requirements of 40 C.F.R. §51.165(a)(3)(ii)(G).

**Table 2. Baseline Actual Emissions (TPY)**

Pollutant	PM <sup>a</sup>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>x</sub>	VOC	CO	Lead	ODS	CO <sub>2</sub> e
Baseline Period	2009-2010	2009-2010	2009-2010	2009-2010	2009-2010	2009-2010	2009-2010	2009-2010	2009-2010	2006-2007
Wing Assembly				0	0	58.6	0	0	0	
Wing Coating				0	0	76.0	0	0	0	0
Final Assembly				0	0	14.3	0	0	0	0
Paint Hangars/ Flightline <sup>b</sup>				0	0	36.2	0	0	0	0
737 Assembly <sup>c</sup>										2,714
Combustion <sup>d</sup>	1.3	1.3	1.3	0.1	34.2	0.9	13.3	0.0001	0	22,039
Miscellaneous Sources of Ozone Depleting Substances (ODS)	0	0	0	0	0	0	0	0	0	0
Building 4-20 wing panel booths (4 booths, to be shut down)						3.3 <sup>e</sup>				
Building 4-20 Wing panel booths (4 new booths)	0	0	0	0	0	0	0	0	0	0
Building 4-86 new wing booth (PB-4)	0	0	0	0	0	0	0	0	0	0
Building 4-86 inspar vertical wing booth (PP-8)						3.3 <sup>f</sup>				
<b>TOTAL EMISSIONS</b>	<b>≤ 2.3</b>	<b>≤ 2.3</b>	<b>≤ 2.3</b>	<b>0.1</b>	<b>34.2</b>	<b>186.0</b>	<b>13.3</b>	<b>0.0001</b>	<b>0.0</b>	<b>24,753</b>

- a. Total PM, SO<sub>2</sub>, NO<sub>x</sub>, CO, Lead emissions from noncombustion sources were less than 1 tpy.  
 b. Includes emissions from Building 4-41 paint hangar but not Building 5-50 paint hangar.  
 c. All CO<sub>2</sub>e emissions are accounted for in 737 Assembly.  
 d. All combustion-related emissions are accounted for in Combustion.  
 e. Boeing does not wish to take credit for these reductions at this time, so they are not included in the project total.  
 f. These emissions are also included in the Wing Coating baseline total of 76 tons so, to prevent double-counting, they are not included in the total.

CO = carbon monoxide  
 NO<sub>x</sub> = nitrogen oxides  
 PM = particulate matter  
 SO<sub>x</sub> = sulfur oxides  
 CO<sub>2</sub>e = carbon dioxide equivalents

During the baseline period, Boeing Renton did not operate above any legally enforceable emission limitation and there are no new emission standards that affect these units or activities that have come into effect between the baseline period and the date of this application. Therefore, no adjustments are required under 40 C.F.R. § 52.21(b)(48)(ii)(b) or (c).

#### 2.1.4. Projected Actual Emissions

Projected actual emissions are determined by projecting what the existing emission unit will emit once regular operation occurs following the project, as follows:

- Over a 5-year period following the project if there is not an increase in the emission unit's design capacity or PTE, or
- Over a 10-year period following the project if there is an increase in the emission unit's design capacity or PTE.<sup>10</sup>

The 737 production capacity increase project will involve an increase in the design capacity of one existing inspar (vertical) wing booth (PP-8). Therefore, projected actual emissions are based on a 10-year projection. Boeing Renton is projecting the maximum 737 production rate over the 10 years following the project at a level below the design capacity (i.e., below the production capacity assuming a 365 manufacturing days per year schedule) resulting from the project. When estimating projected actual emissions, Boeing Renton:<sup>11</sup>

- a. Considered all relevant information regarding the intended operation of the 737 production line in the configuration that will exist after the proposed project, including but not limited to, historical operational data, the company's own representations, the company's expected business activity and the company's highest projections of business activity, the company's filings with the state or federal regulatory authorities, and compliance plans under the approved State Implementation Plan;
- b. Included emissions associated with start-ups, shutdowns, and malfunctions, and quantifiable fugitive emissions, where applicable; and
- c. Did not exclude any emissions that existing units could have accommodated during the consecutive 24-month period used to establish the baseline actual emissions and that are unrelated to the proposed project.

Table 3 shows the adjusted projected actual emissions reported by Boeing Renton. For new units (i.e., the four wing panel booths in Building 4-20 and the new inspar vertical wing booth in Building 4-86), the projected actual emissions are equal to the units' PTE. Boeing Renton normally operates two production shifts per day and the projected production rate of 504 airplanes per year is based on two shifts per day. However, the new booths will be physically capable of operating three shifts per day; hence, the PTE for the new booths is based on three shifts per day operation. The potential emissions from all the four new booths in 4-20 would be

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<sup>10</sup> See 40 C.F.R. § 52.21(b)(41)(i).

<sup>11</sup> See 40 C.F.R. § 52.21(b)(41)(ii).

8.3 tpy of VOC.<sup>12</sup> The PTE of the new and modified 4-86 booths combined would be approximately 23.7 tpy of VOC, with each unit having a PTE of about 11.9 tpy of VOC.

**Table 3. Projected Actual Emissions (TPY)**

Pollutant	PM <sup>a</sup>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>x</sub>	VOC	CO	Lead	ODS	CO <sub>2e</sub>
Wing Assembly				0	0	79.0	0	0	0	
Wing Coating				0	0	102.5	0	0	0	0
Final Assembly				0	0	19.3	0	0	0	0
Paint Hangars/ Flightline <sup>b</sup>				0	0	48.7	0	0	0	0
737 Assembly <sup>c</sup>										3,855
Combustion <sup>d</sup>	2.3	2.3	2.3	0.3	62.9	1.6	24.4	0.0002	0	35,553
Miscellaneous Sources of Ozone Depleting Substances (ODS)	0	0	0	0	0	0	0	0	0	0
Building 4-20 wing panel booths (4 booths, to be shut down)	0	0	0	0	0	0	0	0	0	0
Building 4-20 Wing panel booths (4 new booths) <sup>e</sup>						8.3				
Building 4-86 new wing booth (PB-4)	0.1	0.1	0.1	0	0	11.9	0	0	0	0
Building 4-86 inspar vertical wing booth (PP-8)	0.1	0.1	0.1	0	0	11.9	0	0	0	0
<b>TOTAL EMISSIONS</b>	<b>≤ 3.5</b>	<b>≤ 3.5</b>	<b>≤ 3.5</b>	<b>0.3</b>	<b>62.9</b>	<b>283.3</b>	<b>24.4</b>	<b>0.0002</b>	<b>0.0</b>	<b>39,408</b>

- a. Total PM, SO<sub>2</sub>, NO<sub>x</sub>, CO, and Lead emissions from noncombustion sources will be less than 1 tpy.
- b. Includes emissions from Building 4-41 paint hangar but not Building 5-50 paint hangar.
- c. All CO<sub>2e</sub> emissions are accounted for in 737 Assembly.
- d. All combustion-related emissions are accounted for in Combustion.
- e. Projected actual emissions for new units are equal to the units' PTE. Each new wing panel booth has a PTE of approximately 2.1 tpy VOC.

<sup>12</sup> Boeing's application explains that the "four new Wing Panel Booths to be located in Building 4-20 will be capable of accommodating up to 756 airplanes per year. Since each wing has two panels and each airplane has two wings, this represents a total of 3,024 panels per year." Therefore, potential emissions from the four 4-20 booths have been calculated based on a maximum production rate of 756 planes per year. See Table D-6 of the application. Regarding the 4-86 booths, Boeing states that the "new and modified Inspar Wing Booths will have the capacity of painting one wing per day, 365 wings per year." Therefore, potential emissions from the 4-86 booths have been calculated based on 182.5 planes per year per booth. See Table D-7 of the PSD application.

Since Permit No. PSD-08-01 accounted for Renton’s paint hangars (i.e., Buildings 5-50 and 4-41 paint hangars) and assembly operations emissions for a total of 492 airplanes per year, paint hangar emissions resulting from the production of up to 492 airplanes per year have not been evaluated as part of this project. Although Boeing has not decided where to apply the final exterior coating on the additional 12 airplanes per year (the difference between 504 and 492 airplanes per year), it is physically possible that those 12 additional airplanes per year will be coated at the Boeing Renton facility Building 4-41 paint hangar. To estimate the emissions from painting 12 additional airplanes per year at the Building 4-41 paint hangar, Boeing multiplied the baseline emissions from the Building 4-41 paint hangar by the ratio of future to baseline airplane production (i.e., 504/374). This resulted in a projected maximum VOC emissions increase at the Building 4-41 paint hangar of 12.57 tpy.

To demonstrate that this was a conservative estimate of the expected emissions increase at the paint hangars, Boeing reviewed the Building 4-41 paint hangar emissions from 2007 to 2009. For the year with the greatest emissions per airplane, 2008, the average VOC emissions for exterior coating of completed 737s at Renton was 0.406 ton per airplane. If all 12 additional airplanes were coated in Renton, the result would be an additional 4.9 tons of VOC per year. This is considerably less than the estimated 12.57 tpy estimated increase using the ratio of increased airplane production of 504/374. Therefore, the estimated 12.57 tpy increase in paint hangar emissions more than accounts for the potential increase.

### 2.1.5. Project Emissions Increase

The project emissions increase is calculated by subtracting the baseline actual emissions from the projected actual emissions. As shown in Table 4, VOC emissions from the project exceed the PSD SER for VOC. Therefore, a “netting” analysis was conducted for VOC. No further analysis is required for other pollutants since emission increases from the project do not exceed the applicable PSD SER for those pollutants.

**Table 4. Project Emissions Change (TPY) <sup>a</sup>**

Pollutant	PM	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>x</sub>	VOC	CO	Lead	ODS	CO <sub>2e</sub>
<b>Significant Emission Rate</b>	<b>25</b>	<b>15</b>	<b>10</b>	<b>40</b>	<b>40</b>	<b>40</b>	<b>100</b>	<b>0.6</b>	<b>100<sup>b</sup></b>	<b>75,000</b>
Baseline Actual Emissions	≤ 2.3	≤ 2.3	≤ 2.3	0.1	34.2	186.0	13.3	0.0001	0.0	24,753
Projected Actual Emissions	≤ 3.5	≤ 3.5	≤ 3.5	0.3	62.9	283.3	24.4	0.0002	0.0	39,408
Project Emissions Increase	≤ 1.2	≤ 1.2	≤ 1.2	0.2	28.7	97.3	11.1	0.0001	0.0	14,655
<b>Is the Project Emissions Increase Significant?</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>Yes</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>
a. Emissions increase calculation does not include the expected emissions decrease from shutting down the four existing wing panel booths in Building 4-20. b. See WAC 173-400-720(4)(b)(iii)(B).										

### **2.1.6. Contemporaneous Net Emissions Increase**

Because the VOC emissions increase due to the project alone exceeds the VOC SER, Boeing Renton conducted a “netting” analysis for VOC emissions as directed by Ecology. The “netting” analysis involves adding all creditable increases and decreases in actual emissions that are contemporaneous with the proposed change (i.e., occurring during the period beginning on the date five years before construction commences on the proposed project and ending on the date that the emission increase from the proposed project occurs). See 40 C.F.R. § 52.21(b)(2)(ii). Creditable increases do not include any increases that Ecology or EPA has relied on in issuing a PSD permit. See 40 C.F.R. § 52.21(b)(3)(iii)(a).

In the past five years, the following projects have or may have caused VOC emission increases as a result of debottlenecking operations:

- Reconfiguration and refurbishment of existing Paint Hangar 1 (P1) in Building 5-50.
- Installation of additional automated spar assembly tools and a metal shim wet milling machine in Building 4-21.
- Installation of an additional automatic wing fastener.
- Installation of additional assembly tooling and support equipment in Buildings 4-20, 4-21, 4-81, and 4-82.

Ecology relied on the VOC emission increases from the changes listed above when Ecology approved Permit Nos. PSD-08-01 and PSD-08-01 Amendment 1, and Boeing Renton have complied with the emission requirements of those permits. Other increases in emissions over the past five years have been due to demand growth and were able to be accommodated by existing capacity and changes that Ecology has approved under Permit No. PSD-97-2 for Building 4-86 or PSD-88-4 for Building 4-41 paint hangars.

In addition, Boeing is not seeking changes to any of the PSD permit conditions. Therefore, there have not been any other increases in actual emissions at Boeing Renton that are contemporaneous with this particular change and are otherwise creditable. Furthermore, Boeing Renton is not taking credit in the netting analysis for any contemporaneous emission decreases. Therefore, the net emission increase for the project is the same as the emission increase for the project, approximately 97 tpy of VOC.

### **2.2. New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants**

New Source Performance Standards (NSPS) apply to certain types of equipment that are newly constructed, modified, or reconstructed after a given applicability date. There are no NSPS that apply to the proposed 737 production capacity increase project.

The National Emission Standards for Hazardous Air Pollutants (NESHAPs) apply to categories of equipment with hazardous air pollutant emissions. 40 C.F.R. Part 63, Subpart GG, also known as the “Aerospace NESHAP,” applies to facilities that are engaged in the manufacture or rework of commercial, civil, or military aerospace vehicles or components and that are major sources of hazardous air pollutants. All aerospace manufacturing and rework operations at the Boeing Renton facility, including those associated with the 737 production capacity increase project, must comply with the Aerospace NESHAP requirements.

### 3. BEST AVAILABLE CONTROL TECHNOLOGY (BACT) DETERMINATION

#### 3.1. Definitions and Policy Concerning BACT

All new major sources or major modifications are required to utilize BACT for those new and modified emission units that will experience an increase in emissions as a result of the project. BACT 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 C.F.R. § 52.21(b)(12)).

BACT is only applied to emission units that are new or existing and undergo a physical or operational change that results in the increased emissions. In the case of the 737 production capacity increase project, the only new emission units would be four new wing panel spray booths in Building 4-20 and one new wing booth in Building 4-86, as shown in Table 5. In addition, one wing booth in Building 4-86 will undergo a physical change or change in the method of operation. Therefore, BACT is triggered for VOC emissions from these six booths. VOC emission increases that result from increased utilization of existing emission units due to debottlenecking are not subject to BACT requirements.

**Table 5. New and Modified Emission Units**

Building	Booth Type	Quantity	New/ Modified	VOC Emissions (tpy/booth)	Exhaust Rate (acfm)
Building 4-20	Wing Panel Booth	4	New	2.08	50,600
Building 4-86	Wing Booth (PB-4)	1	New	11.86	140,000
Building 4-86	Wing Booth (PP-8)	1	Modified	11.86	140,000

Federal guidance requires each PSD permit applicant to implement a “top-down” BACT analysis process for each new or physically or operationally changed emissions unit. The “top-down” BACT process starts by considering the most stringent form of emissions reduction technology possible, and then determines if that technology is technically feasible and economically

justifiable. If the technology is proven infeasible or unjustifiable based on technical and economical feasibility or energy or other environmental considerations, then the next less stringent level of reduction is considered. The most stringent level of emissions control that is not successfully ruled out by the applicant is selected as BACT. Ultimately, the burden is on the applicant to prove why the most stringent level of control should not be used.

### **3.2. BACT for VOC Emissions from Wing Spray Booths**

Boeing Renton submitted a review of relevant available technology including research on prior BACT determinations listed and described in EPA's RACT/BACT/LAER Clearinghouse (RBLC) and control technology determinations found in the South Coast Air Quality Management District (SCAQMD) and the California Air Resources Board (CARB) databases.

Boeing Renton found the following control technologies for VOC to have been successfully applied in spray-painting operations. Based on our independent research, Ecology believes this is a substantially complete list.

#### **3.2.1. Thermal Oxidation**

Thermal oxidation involves heating the VOC-laden air stream up enough that the VOC will oxidize to CO<sub>2</sub> and water. A thermal oxidizer introduces the VOC emissions in an air stream to a burner that destroys those emissions prior to release to the atmosphere. This control technology has been improved upon over the years to include preheating the incoming air stream to obtain additional fuel efficiencies. Vendor information for thermal oxidizers with and without preheaters was obtained from Callidus and John Zink. The thermal oxidizer control technology overall cost-effectiveness in dollars per ton of VOC removed is shown in Table 6.

Large exhaust air systems generally use a process called regenerative thermal oxidation (RTO). An RTO uses two or more chambers containing heat-absorbing material. The heat of combustion from oxidizing the VOC, along with whatever supplementary heat, in the first chamber in the flow train is absorbed by the subsequent chambers. When the next chamber in the train is hot enough to oxidize the VOC, flow is diverted to it, and it becomes the combustion chamber as it releases its heat to the exhaust gas. Overall, the system cycles back and forth between chambers. Up to about 95 percent of the heat load can be recovered, or in other words, the net heat load may be as low as five percent of the "direct heat" requirement.

To improve fuel efficiency, the RTO can be augmented by the addition of a concentrator "wheel." The wheel provides for a more concentrated VOC content in a smaller air stream for burning. Boeing Renton obtained vendor information for the RTO with concentrator control technology from Anguil. Even though Anguil advised not to use a regenerative thermal oxidizer with a concentrator on the wing panel booths, estimated overall cost-effectiveness for the RTO with a concentrator, in dollars per ton VOC removed, is shown in Table 6 for both Buildings 4-20 and 4-86.

Based on the control cost estimates shown in Table 6, Ecology considers the cost of this control option to be unjustifiable for BACT purposes.

**Table 6. Summary of VOC Control Technology Costs<sup>a</sup>**

Type of Control Technology	Vendor Name	Estimated Maximum Control Efficiency	Total Cost Per Ton of VOC Removed <sup>b</sup>		Estimated Total Control Capital Cost		Percent of Booth Cost	
			Building 4-20	Building 4-86	Building 4-20	Building 4-86	Building 4-20	Building 4-86
Thermal Oxidizer	Callidus	98.9%	\$622,394	\$420,745	\$4,430,462	\$2,769,040	35.4%	9.2%
Thermal Oxidizer with Preheater	John Zink	98.9%	\$342,475	\$390,572	\$7,384,104	\$12,922,182	59.1%	43.1%
Thermal Oxidizer with Preheater	Callidus	98.9%	\$426,192	\$225,408	\$7,384,104	\$5,538,078	59.1%	14.5%
Carbon Adsorption	Thermal Recovery Systems	99.3%	\$142,721	\$54,062	\$2,086,732	\$1,059,412	16.7%	3.5%
Regenerative Thermal Oxidizer (RTO)	Anguil	99.3%	\$150,662	\$81,643	\$3,175,165	\$5,538,078	25.4%	18.5%
RTO with Concentrator	Anguil	93.2%	\$449,780 <sup>c</sup>	\$167,597	\$2,584,436	\$5,168,872	20.7%	17.2%
<b>Estimated Project Cost Without Add-on Controls</b>					<b>\$12,500,000</b>	<b>\$20,000,000</b>		
a. Compliance with the Aerospace NESHAP requirements (including the use of low-VOC coatings, high transfer efficiency paint-spraying equipment and techniques, and Best Management Practices) is not addressed in this table because that control option was selected as BACT. b. Costs for Building 4-20 are based on a preliminary exhaust flow estimate of 25,000 acfm. The current design calls for an exhaust flow rate of 50,600 acfm. Therefore, cost per ton of VOC controlled would be greater than the values shown. c. Anguil advised not to use a regenerative thermal oxidizer with a concentrator on the wing panel booths.								

### 3.2.2. Carbon Adsorption

Carbon adsorption uses a filter bank of canisters that contain activated carbon or zeolite. The VOC-laden exhaust air is passed through granular adsorbents. Some of the VOC are attracted to and attach themselves to the surface of the adsorbent, occupying available “active sites.” When the active sites are all occupied, the adsorbent is saturated. The VOC must be removed to reactivate the adsorbent for repeated use. This is usually done by heating the adsorbent in situ with either hot air or steam. If the VOC can be stripped from the adsorbent at a sufficient concentration, they may be concentrated for recovery. Otherwise, the control technology must use an additional disposal method.

Vendor information for the carbon adsorption technology was obtained from Thermal Recovery Systems. Estimated overall cost-effectiveness for carbon adsorption, in dollars per ton VOC removed, is shown in Table 6.

Based on the control cost estimates shown in Table 6, Ecology considers the cost of this control option to be unjustifiable for BACT purposes.

### **3.2.3. Low-VOC Coatings, High Transfer Efficiency Paint-Spraying Equipment and Techniques, and Best Management Practices**

The use of low-VOC coatings, high transfer efficiency paint-spraying equipment and techniques, and best management practices are specified and required in the Aerospace NESHAP (40 C.F.R. Part 63, Subpart GG). Boeing Renton already uses low-VOC coatings that meet specifications required by the Aerospace NESHAP for airplane coating operations. Boeing Renton also uses high transfer efficiency coating techniques, such as High Volume Low Pressure (HVLV) spray guns, which provide high transfer efficiency and reduce the overall amount of paint required to perform a coating job. In addition, Boeing Renton uses good work practices to minimize VOC emissions, including storing coatings and solvents in closed containers, bagging solvent hand-wipe cleaning rags when not in use, and capturing and containing solvent used for cleaning spray equipment. The VOC emissions standards for uncontrolled use of cleaning solvents and coatings as defined in 40 C.F.R. Part 63, Subpart GG, Aerospace NESHAP and PSCAA Regulation II, 3.09 will be applied in this operation. Ecology recognized these as BACT and required their application in previous PSD permits issued to Boeing Renton.

No cost analysis was performed because Boeing Renton has proposed this option as BACT.

### **3.2.4. VOC BACT Determination**

Ecology determines that BACT for VOC emissions from the four new 737 wing panel spray booths in Building 4-20 and the new inspar and the modified inspar wing spray booths in Building 4-86 consists of the following:

- Compliance with all applicable VOC emission standards of the National Emission Standards for Aerospace Manufacturing and Rework Facilities, 40 C.F.R. Part 63, Subpart GG (Aerospace NESHAP), as in effect on July 1, 2011.
- Limiting VOC emissions to 11.0 pounds per wing coated in the new wing panel spray booths in Building 4-20 on a 12-month rolling average, and a combined total of 8.3 tons of VOC in any twelve (12) consecutive month period.
- Limiting VOC emissions to 65.0 pounds per wing coated in the new inspar wing spray booth (PB-4) and the modified inspar wing spray booth (PP-8) in Building 4-86 on a 12-month rolling average, and a combined total of 23.7 tons for any twelve (12) consecutive month period.

Note that the above BACT determination only applies to the new or modified emission units (the four new wing panel booths proposed for Building 4-20 and the new inspar booth (PB-4) and the modified wing booth (PP-8) in Building 4-86), and the activities within those booths, because

those are the only emission units that are new or undergoing a physical change or change in method of operation and require a BACT analysis. For example, much of the other airplane manufacturing operations in Renton, such as attaching the wings to the main body, will not undergo a physical change or change in operation. They will only experience an increase in utilization. Under the PSD requirements, an increase in utilization, that does not otherwise require a physical or operational change and is not otherwise prohibited, does not require application of BACT. Finally, most of the other airplane manufacturing activities are already subject to the requirements of the Aerospace NESHAP.

### **3.3. Toxic Air Pollutants**

PSD rules require the applicant to consider emissions of toxic air pollutants during the course of a BACT analysis. One reason for this requirement is to ensure that the source does not employ an emissions control technique that controls the main pollutant of concern, but emits a new toxic air pollutant in large quantities.

PSCAA will issue one or more Notice of Construction (NOC) approvals for this project. The NOC approval(s) will govern emissions of toxic air pollutants.

## **4. AMBIENT AIR QUALITY IMPACTS ANALYSIS**

### **4.1. Regulatory Requirements**

The PSD permitting program requires that an ambient Air Quality Impacts Analysis (AQIA) be conducted for those pollutants that are subject to PSD review. As discussed in Section 3 of this Technical Support Document, only VOC emissions are subject to PSD review.

The AQIA starts with preliminary modeling for each pollutant to determine whether an applicant can forego detailed analysis and preconstruction monitoring. If the projected ambient concentration increase for a given pollutant is below the modeling significance level (MSL) for each averaging period as given in 40 C.F.R. Part 51, Appendix S, no further analysis of the ambient impact is required for that pollutant.

For those pollutants and averaging periods that have impacts greater than the MSL, a NAAQS analysis is used to determine if the proposed project will cause or contribute to an exceedance of a NAAQS.

The PSD increment analysis is used to determine if the change in the air quality since the applicable baseline dates is greater than the Class I and Class II PSD Increment Levels. There is no PSD increment for ozone or by extension for VOC. Typically, the AQIA includes an analysis of impacts to local areas that are within 50 kilometers of the project, and a regional air quality impact assessment for impacts beyond 50 kilometers. For projects in Washington State, this latter analysis usually includes impacts on Class I areas.

#### **4.2. Modeled Impacts from the 737 Production Capacity Increase Project**

There is no MSL defined for ozone or by extension for VOC. Instead, EPA has defined a policy that modeling for ozone is required for a proposed project only if the net emissions of either VOC or NO<sub>x</sub> are 100 tpy or more.<sup>13, 14, 15</sup> As shown in Section 3, the net increase in VOC emissions from the 737 production capacity increase project is approximately 97 tpy. Since the project's net emissions increase of VOC and NO<sub>x</sub> are both less than 100 tpy, no preliminary modeling is required for the proposed project. However, Boeing recently conducted ozone modeling of a project that involved a potential VOC increase of 297 tpy at its Everett facility (see Permit No. PSD-05-02) and found no significant contribution to any ozone NAAQS exceedance. The Everett facility is located within the Puget Sound area, approximately 60 kilometers (km) north of the Renton facility. Similar results would be expected for the Renton project if modeling was required.

In addition, for this project, Boeing is not requesting a change in Permit No. PSD-08-01 Amendment 1, which limits VOC emissions from Building 5-50 to 40.8 tpy (Condition 3.1) and limits VOC emissions from the Wing Buildup and Final Assembly operation in Buildings 4-20, 4-21, 4-81, and 4-82 to 118 tpy.

### **5. ADDITIONAL IMPACTS ANALYSIS**

PSD regulations and guidance require an additional impacts analysis to evaluate the effects of the project's emissions on visibility, local 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. Class I areas are areas of special national or regional value from a natural, scenic, recreational, or historic perspective and are afforded the highest level of protection under the PSD rules. They include most national parks, national wilderness areas, and national memorial parks. The additional impacts analysis also evaluates the effect of the project on growth in the area surrounding the project.

The impacts analysis includes an assessment of increment consumption and impacts to Air Quality Related Values (AQRVs) in Class I areas. AQRVs include regional visibility or haze; the effects of primary and secondary pollutants on sensitive plants; the effects of pollutant deposition on soils and receiving water bodies; and other effects associated with secondary aerosol formation. The Federal Land Managers (FLMs) for the National Park Service (NPS), U.S. Fish and Wildlife Service (USFWS), and U.S. Forest Service (USFS) have the responsibility of ensuring AQRVs in the Class I areas are not adversely affected.

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<sup>13</sup> Table I-C-4, NSR Workshop Manual, October 1990.

<sup>14</sup> "Interim guidance on New Source Review (NSR) Questions Raised in Letters Dated September 9 and 24, 1992," Stanley Meiburg, Director, Air, Pesticides and Toxics, Division, EPA Region VI to Mr. William R. Campbell, Executive Director Texas Air Control Board, November 19, 1992.

<sup>15</sup> Also see 40 C.F.R. § 52.21(i)(5)(i).

### 5.1. Visibility, PM<sub>2.5</sub>, and Ozone Impacts in Class I Areas

PSD rules require an analysis of impacts on federal Class I areas. Class I areas within 200 km of the Boeing Renton facility include the national parks and national wilderness areas listed in Table 7.

Air quality-related values include impacts on visibility from a federal Class I area and impacts on soil, flora, fauna, and aquatic resources within the Class I area. One screening tool that has been used by Ecology, EPA, and the FLMs to screen out projects that will likely not have a significant impact on air quality-related values, is to divide the expected emission increase in tpy (Q) by the distance to a federal Class I area in kilometers (D). If the result is less than 10, a project is normally considered to not have a significant impact on air quality-related values in the Class I area. As shown in Table 7, the Q/D is much less than 10 for all nearby Class I areas.

**Table 7. “Class I” Areas Within 200 km of the Boeing Renton Facility**

<b>Class I Area</b>	<b>Distance from Boeing Renton to Class I Area (km)</b>	<b>Emissions Quantity Divided by Distance (Q/D) (tons/km)</b>
Alpine Lakes Wilderness Area	45.5	2.1
Mt. Rainier National Park	58.9	1.6
Olympic National Park	72.1	1.3
Glacier Peak Wilderness Area	94.5	1.0
Goat Rocks Wilderness Area	104	0.9
North Cascades National Park	139	0.7
Mt. Adams Wilderness Area	140	0.7

Boeing Renton’s 4-86 Building Upgrade Project (Permit No. PSD-97-02) evaluated the facility-wide emission increases that would result from increasing production from 32 to 41 airplanes per month (i.e., a potential facility-wide increase in VOC emissions of up to 366 tpy). Because Boeing is not requesting changes to that limit, and the projected VOC emissions associated with the current project are less than the levels evaluated in Permit No. PSD-97-02, it is reasonable to expect that the current project would not have significant adverse additional impacts.

Boeing previously modeled air quality impacts of the Boeing-Everett 787 project at seven (7) Western Washington Class I areas (shown in Table 8), using the Community Multi-scale Air

Quality (CMAQ) modeling system.<sup>16</sup> The CMAQ modeling was performed in support of the application for Permit No. PSD-05-02, issued October 10, 2005. Impacts on ambient ozone concentrations and visibility were simulated using CMAQ.

The CMAQ analysis concluded that the increase in PM<sub>2.5</sub> concentrations due to a VOC emissions increase of 297 tpy at Boeing-Everett was very small (about 0.14 percent over the base case—2000 and 2001) and would not cause nor significantly contribute to an exceedance of the PM<sub>2.5</sub> NAAQS over a Class I area.

The largest percentage ozone increases of interest, ~30 parts per trillion (ppt) or 0.03 percent near Mt. Rainier NP and ~70 ppt or 0.1 percent at North Cascades NP, occurred briefly on July 15, 1996. The ozone increases were less than 100 ppt at any Class I area, which is less than 0.2 percent of the ozone NAAQS.

**Table 8. Distances from Boeing-Everett to the Nearest Class I Areas**

<b>Class I Area</b>	<b>Distance (km)</b>	<b>Approximate Direction from Boeing Renton</b>
Glacier Peak Wilderness Area	70	East
Alpine Lakes Wilderness Area	60	Southeast
North Cascades National Park	108	Northeast
Olympic National Park	91	West
Mount Rainier National Park	123	Southeast
Goat Rocks Wilderness Area	205	Southeast
Mount Baker Recreation Area*	93	North
* Mount Baker is not a designated Class I area, but it was evaluated at the request of Ecology and the FLMs.		

Boeing also evaluated the 24-hour average percentage increase in extinction coefficient against a five percent increase criterion, as recommended by the 2000 Federal Land Managers' Air Quality Related Values Workgroup (FLAG) guidance. The modeled extinction coefficient showed a fleeting maximum 0.1 percent hourly increase, about 1/50th of the FLAG threshold without considering the difference in averaging time. Larger averaging times would result in lower estimates of extinction.

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<sup>16</sup> CMAQ Models-3 User Manual, EPA/600/R-98/069b, National Exposure Research Laboratory, Research Triangle Park, North Carolina, 1998.

The CMAQ simulations indicated that an increase of 297 tpy of VOC at Boeing Everett presents no significant effects on PM<sub>2.5</sub>, ozone, extinction coefficient, deciview, or visual range. Based on those findings, and because the projected increase in VOC emissions from the Renton 737 production capacity increase project is significantly lower (97 tpy vs. 297 tpy), an additional AQIA was not conducted for the 737 production capacity increase project.

## **5.2. Local Impacts on Soils, Vegetation, and Animals**

According to EPA guidance,<sup>17</sup> for most types of soils and vegetation, ambient concentrations of criteria pollutants below the secondary NAAQS will not result in harmful effects. Only the VOC emissions from the 737 production capacity increase project are subject to PSD review. VOC is regulated as a precursor to ozone; however, ozone has no secondary NAAQS. Additionally, the expected VOC emissions from the project do not trigger a detailed ambient AQIA as discussed above. Consequently, Ecology concludes that the impacts on local soils, vegetation, and animals attributable to the 737 production capacity increase project will be negligible.

FLAG guidance does not provide a specific VOC impact on vegetation in the Pacific Northwest. The NPS has established monitors for ozone in three Class I areas in Washington State—Mount Rainer National Park, Olympic National Park, and North Cascades National Park. As discussed above, Boeing estimated that the incremental increase in ozone concentrations directly attributable to the larger Everett 787 project are less than 100 ppt. Ecology concludes that the increase in ozone from this project is not likely to cause harm to vegetation in any Class I area.

## **5.3. Construction and Growth Impacts**

Employment at Boeing Renton is expected to increase to a modest extent in association with this project. However, an increase in congestion on Washington's roads and highways as a result of the project is not expected. Therefore, the proposed project is not expected to cause adverse construction and growth-related impacts.

## **6. ENDANGERED SPECIES ACT**

Pursuant to Section V.A. of the agreement for the delegation of the federal PSD regulations by EPA to Ecology, dated February 23, 2005, Ecology shall not issue a PSD permit until EPA has notified Ecology in writing that EPA has satisfied its obligations, if any, under Section 7 of the Endangered Species Act (ESA), 16 U.S.C. § 1531 et seq., and 50 C.F.R. Part 402, Subpart B (Consultation Procedures), and with Section 305(b)(2) of the Magnuson-Stevens Fishery and Conservation Act (Magnuson-Stevens Act, MSA), 16 U.S.C. § 1801 et seq., 50 C.F.R. Part 600, Subpart K (EFH Coordination, Consultation, and Recommendations), for federal PSD permits, regarding essential fish habitat. Therefore, the final PSD permit will not be issued for this project until EPA has notified Ecology that this consultation has been completed.

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<sup>17</sup> Draft EPA New Source Review Workshop Manual, Chapter D, § IIC, 1990.

On October 6, 2011, the EPA notified Ecology that they have satisfied their obligations under the Endangered Species Act and the Magnuson-Stevens Act relative to this permitting action. The project will have no effect on listed threatened and endangered species at the Renton facility. No further ESA or MSA consultation was undertaken relative to this action.

## **7. STATE ENVIRONMENTAL POLICY ACT (SEPA)**

Under Washington State rules, a final PSD permit shall not be issued for a project until the applicant has demonstrated that SEPA review has been completed for the project. The City of Renton is the lead agency for SEPA review.

On July 22, 2011, the City of Renton published a Determination of Non-Significance (DNS) under application number LUA11-042, ECF, for the 737 production capacity increase project. The DNS became final on August 5, 2011. Ecology concludes that the applicant has adequately demonstrated compliance with SEPA requirements.

## **8. PUBLIC INVOLVEMENT**

This permitting action is subject to a minimum 30-day public comment period under WAC 173-400-740. Newspaper public notices announcing the public comment period were published in *The Seattle Times* and the *Seattle Daily Journal of Commerce* on September 13, 2011.

In accordance with WAC 173-400-740(2)(a), application materials and other related information were made available for public inspection at:

Washington State Department of Ecology  
Air Quality Program  
300 Desmond Drive  
Lacey, WA 98503  
Phone: (360) 407-6803

Puget Sound Clean Air Agency  
Attn: Stella Nehen  
1904 Third Avenue, Suite 105  
Seattle, WA 98101  
Phone: (206) 689-4011

Renton Main Library  
Attn: Reference Desk  
100 Mill Avenue South  
Renton, WA 98057  
Phone: (425) 226-6043

The public comment period closed on October 13, 2011. No comments on the draft permit were received during the public comment period.

## **9. CONCLUSION**

The project will have no significant adverse impact on air quality. The Washington State Department of Ecology finds that the applicant, The Boeing Company, has satisfied all requirements for issuance of a PSD permit.

## **10. AGENCY CONTACT**

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## ACRONYMS AND ABBREVIATIONS

Aerospace NESHAP	National Emission Standards for Aerospace Manufacturing and Rework Facilities (40 C.F.R. Part 63, Subpart GG)
AQIA	Air Quality Impacts Analysis
AQRVs	Air Quality Related Values
BACT	Best Available Control Technology
Boeing Renton	The Boeing Company, Boeing Commercial Airplanes–Renton facility
CARB	California Air Resources Board
cfm	Cubic feet per minute
C.F.R.	Code of Federal Regulations
CIC	Corrosion-inhibiting compound
CAA	Clean Air Act
CO	Carbon monoxide
CO <sub>2</sub> e	Carbon dioxide equivalents
CMAQ	Community Multiscale Air Quality Modeling System
°C	Degrees Celsius
DNS	Determination of Non-Significance
EAB	Environmental Appeals Board
Ecology	Washington State Department of Ecology
EDC	Renton Delivery Center
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
ESRC	Electrical Systems Responsibility Center
FLAG	Federal Land Managers' Air Quality Related Values Workgroup
FLM	Federal Land Manager
gal	Gallon(s)
hr	Hour(s)
HVLP	High Volume Low Pressure
Km	Kilometer(s)
LAER	Lowest Achievable Emission Rate
lb	Pound(s)
µg/m <sup>3</sup>	Microgram per cubic meter
mm Hg	Millimeters of Mercury Column
MSA	Magnuson-Stevens Act
MSDS	Material Safety Data Sheet

MSL	Modeling Significance Level
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOC	Notice of Construction
NO <sub>x</sub>	Nitrogen oxides
NP	National Park
NPS	National Park Service
NSPS	New Source Performance Standards
NSR	New Source Review
ODS	Ozone Depleting Substances
PM	Particulate Matter
PM <sub>2.5</sub>	Particulate matter with aerodynamic diameter less than or equal to 2.5 micrometers
PM <sub>10</sub>	Particulate matter with aerodynamic diameter less than or equal to 10 micrometers
PCHB	Pollution Control Hearings Board
ppt	Parts per trillion
PSCAA	Puget Sound Clean Air Agency
PSD	Prevention of Significant Deterioration of Air Quality
PTE	Potential to emit
RACT	Reasonably Available Control Technology
RBLC	EPA's RACT/BACT/LAER Clearinghouse
RCW	Revised Code of Washington
RTO	Regenerative Thermal Oxidizer
SCAQMD	South Coast Air Quality Management District
SEPA	State Environmental Policy Act
SER	Significant Emission Rate
SO <sub>2</sub>	Sulfur dioxide
TPY or tpy	Tons per year
U.S.C.	United States Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile Organic Compounds
WAC	Washington Administrative Code