PORT OF GRAYS HARBOR WOOD PELLET PLANT

Notice of Construction Permit Application

Prepared for
Pacific Northwest Renewable Energy, LLC

July 2023

ESA

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July 21, 2023

Olympic Region Clean Air Authority
2940 Limited Lane NW
Olympia, Washington 98502

Subject: NOC Application Submittal

Dear Mark Goodin:

On behalf of Pacific Northwest Renewable Energy, LLC, Environmental Science Associates is submitting a Notice of Construction application for a wood pellet manufacturing facility to be located in Hoquiam, Washington. A signed Form 1 and application fee will be provided separately.

Sincerely,

Ed Warner
Air Quality Analyst

Received
JUL 2 4 2023
ORCAA

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TABLE OF CONTENTS

Port of Grays Harbor Wood Pellet Plant, Notice of Construction Permit Application

Page

List of Figures

List of Tables

Appendices

Acronyms and Other Abbreviations

Abbreviation	Definition
°C	degrees Celsius
°F	degrees Fahrenheit
K	degrees Kelvin
ASIL	Acceptable Source Impact Level
BACT	Best Available Control Technology
CAS	Chemical Abstract Service
CFR	Code of Federal Regulations
CI	compression ignition
CO	carbon monoxide
EPA	U.S. Environmental Protection Agency
HAP	hazardous air pollutants
ICE	internal combustion engine
lb/hr	pounds per hour

Abbreviation	Definition
m	meters
m/s	meters per second
MACT	Maximum Achievable Control Technology
MMBtu/hr	million British thermal units per hour
mph	miles per hour
NAAQS	national ambient air quality standards
NED	National Elevation Dataset
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NO_2	nitrogen dioxide
NOC	Notice of Construction
NO_X	nitrogen oxides
NSPS	New Source Performance Standards
ORCAA	Olympic Region Clean Air Agency
PM	particulate matter
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in diameter
PM_{10}	particulate matter less than or equal to 10 microns in diameter
PNWRE	Pacific Northwest Renewable Energy
PSD	Prevention of Significant Deterioration
PTE	potential to emit
RACT	Reasonably Available Control Technology
RCO	regenerative catalytic oxidizer
RICE	reciprocating internal combustion engine
RBLC	Reasonably Available Control Technology (RACT)/Best Available Control Technology (BACT)/ Lowest Achievable Emission Reduction (LAER) Clearinghouse
RTO	regenerative thermal oxidizer
SIL	Significant Impact level
SO_2	sulfur dioxide
SQER	Small Quantity Emission Rate
TAP	toxic air pollutant
tBACT	Best Available Control Technology for toxic air pollutants associated with a project
TPY	tons per year
UTM	Universal Transverse Mercator
VOC	volatile organic compounds
WAC	Washington Administrative Code
WBAN	Weather-Bureau-Army-Navy
WDOE	Washington Department of Ecology
WESP	wet electrostatic precipitator
Willis Enterprises	Willis Enterprises Moon Island Chip Mill

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PORT OF GRAYS HARBOR WOOD PELLET PLANT

Notice of Construction Permit Application

1 Executive Summary

Pacific Northwest Renewable Energy, LLC (PNWRE) is proposing to construct and operate a wood pellet facility on an approximately 60-acre parcel in the city of Hoquiam, Washington. The facility would include a wood biomass pellet plant, storage silos, and a new conveyor that would connect to an existing conveyor at the Willis Enterprises Moon Island Chip Mill (Willis Enterprises).

The processing of woody biomass at the proposed PNWRE facility would involve the use of three truck tippers; a chips cleaning line with air emissions controlled by a cyclone; two wet hammer mills with air emissions controlled by cyclones; one hog fuel furnace and dryer with air emissions controlled by a wet electrostatic precipitator (WESP) and a regenerative thermal oxidizer (RTO); four dry hammer mills, each with air emissions controlled by a combined cyclone and fabric filter system (cyclofilter); 12 pellet mills in production and two cooling lines with air emissions controlled by baghouses; a regenerative catalytic oxidizer (RCO) controlling air emissions from the combined dry hammer mills and pellet cooling lines; five wood pellet storage silos; and a covered conveyor system to deliver wood pellets to the existing Willis Enterprises conveyance system and ship loadout facility. The wet raw materials for pellet production and hog fuel for the furnace would be delivered to the facility via truck. The facility would have the capacity to process up to 440,800 tons per year (TPY) of dried wood pellets.

The project would induce emissions of air contaminants in the region, thereby requiring an approved Notice of Construction (NOC) application from the Olympic Region Clean Air Agency (ORCAA). The PNWRE facility is not expected to generate criteria pollutant emissions in quantities that would trigger the need for a Prevention of Significant Deterioration (PSD) permit but is anticipated to trigger the need for a Title V Air Operating Permit. The facility would be an area source of hazardous air pollutants (HAPs), as potential emissions of each individual HAP would be less than the applicable major source threshold, 10 TPY. Total HAP are less than the combined HAP major-source threshold, 25 TPY.

This report serves as the NOC permit application required by ORCAA. The purpose of this application is to document an emission inventory for the PNWRE facility, review relevant permitting programs and equipment standards, and compare project-specific air modeling results to applicable thresholds. General forms required by ORCAA for an NOC application are found in **Appendix A**.

2 Facility Description

2.1 Site Description

Pacific Northwest Renewable Energy (PNWRE) is proposing to construct and operate a wood pellet facility located on an approximately 60-acre parcel in the city of Hoquiam, Washington. The facility would be adjacent to the Willis Enterprises Moon Island Chip Mill (Willis Enterprises) and near Terminal 3 at the Port of Grays Harbor. Hoquiam is in Grays Harbor County and falls under the jurisdiction of the Olympic Region Clean Air Agency (ORCAA). The area has a moderate coastal climate with mild summer and winter temperatures and plentiful rain. The county is currently designated as attainment/unclassifiable for all federal ambient air quality standards for criteria pollutants.[1] **Figure 1** shows the general location of the proposed PNWRE facility.

Figure 1 General Location of the Proposed Wood Pellet Facility

2.2 Process Description

The processing of wood pellets at the proposed PNWRE facility would involve the use of three truck tippers with outdoor storage piles; a chip cleaning line; two wet hammer mills; one hog fuel furnace and dryer with air emissions controlled by a wet electrostatic precipitator (WESP) and a regenerative thermal oxidizer (RTO); four dry hammer mills; 12 pelletizers; two pellet coolers; a regenerative catalytic oxidizer (RCO) that controls emissions from the dry hammer mills and

1 U.S. Environmental Protection Agency. 2021. “Status of Washington Designated Areas.” Available: https://www3.epa.gov/airquality/urbanair/sipstatus/reports/wa_areabypoll.html. Last updated March 12, 2021. Accessed May 31, 2023.

pelletizers; five pellet storage silos; and a conveyance system for product loadout. The woody biomass raw materials for processing and hog fuel for the furnace would be delivered via truck. A new conveyor would transport wood pellets from the silos and connect them to the existing Willis Enterprises conveyor system located on the Willis Enterprises chip mill site. Pellets would then be conveyed to the Port of Grays Harbor Terminal 3 for loading onto vessels. The facility would be designed to produce, store, and export up to 440,800 short tons per year (TPY) of wood pellets at 8% moisture content. While the facility's operational plan is based on 8,000 hours per year, air quality impacts are calculated based on 8,760 hours per year. Facility layout and process flow diagrams are found in **Appendix B**.

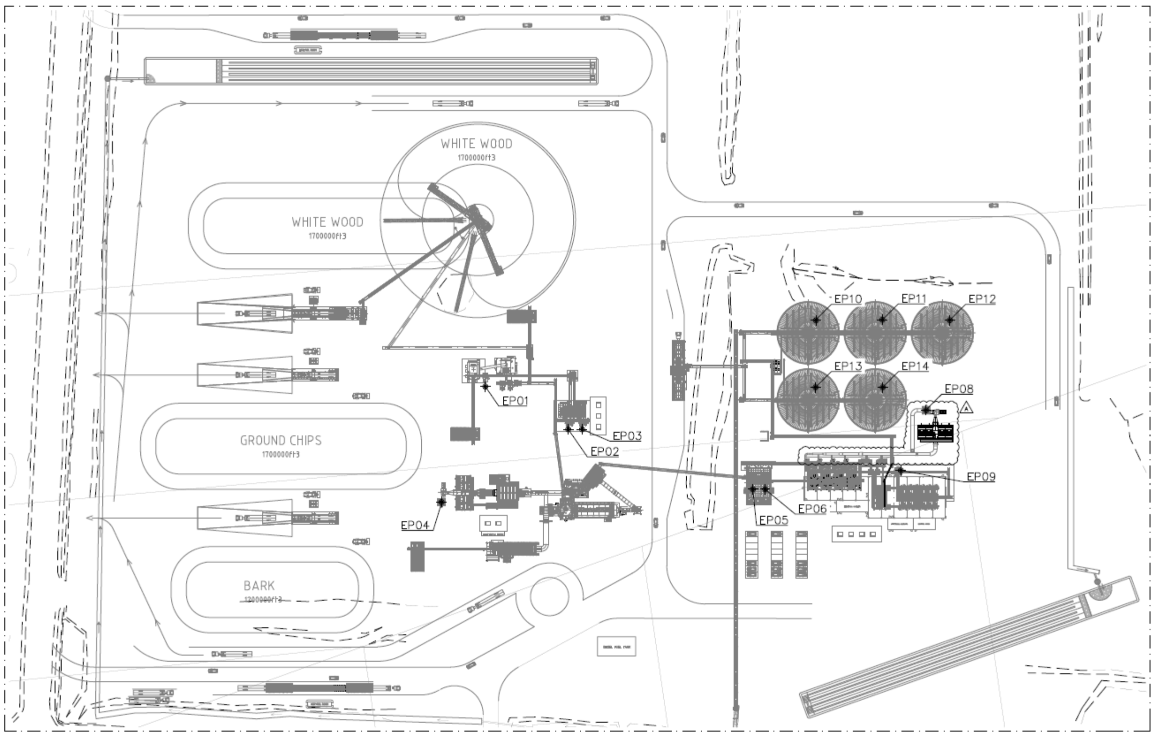

Figure 2 General Facility Layout

2.2.1 Raw-Material Receiving and Storage Area

The manufacture of wood pellets would start with the raw woody biomass consisting of forest residues (ground chips) and mill residues (white wood), which would be delivered by truck. Trucks delivering ground chips and white wood would be emptied via dedicated truck tippers while front-end loaders would form outdoor storage piles of these materials. Biomass fuel or bark, also referred to as "hog fuel," would likewise be delivered via truck and a front-end loader would form an outdoor storage pile. These storage piles are expected to be up to 1.7 acres each in size. PNWRE is also considering the use of a radial stacker/reclaimer for the handling, stockpiling, and transfer of white wood after it has been deposited by the truck tipper. This method would generate the same amount of emissions as the material handling and stockpiling of white wood via front-end loader, but it would eliminate emissions associated with front-end loader traffic for this material. The analysis herein presents emissions for the receiving and storage of white wood as if a front-end loader were being used, to conservatively represent the highest potential emissions impact; however, PNWRE may implement the radial stack/reclaimer instead, depending on economic conditions.

To minimize the dust emissions from vehicle traffic, the PNWRE facility would implement a dust control plan. The plan would include abiding by a 10 miles per hour (mph) posted speed limit for all vehicles and heavy equipment, regularly applying water on road surfaces via water truck, and using a pickup broom truck as needed.

Front-end loaders would transfer raw materials and biomass fuel to dedicated walking-floor bins. The walking floors would move the materials to the next phase in their processing. From this point onward, all raw material handing processes would be fully enclosed. The ground-chips walking floor would discharge to a chain conveyor that would feed the chip cleaning line. The white wood walking floor would discharge to a disc screen that would separate larger pieces for further sizing in the wet hammer mills, with the remaining product routed to the dryer. The bark walking floor would route the biomass fuel to the furnace.

2.2.2 Chip Cleaning Line

Ground chips created from forest residuals include impurities such as sand and stone that must be separated from the wood. The chip cleaning line would use a series of scalper rolls to remove these impurities and organize the chips by size. The smallest sizes, or fines, would be routed to the dryer feeding system, while the intermediate fraction would be sent to the wet hammer mills. A cyclone would be used to mitigate particulate emissions, while also recovering airborne product from the scalping process to combine it with the fines routed to the dryer feeding system. The oversized pieces and impurities would be discharged to a container as waste.

2.2.3 Wet Hammer Mills

Wet hammer mills would be used to reduce the size of the raw materials to facilitate optimum drying. They are referred to as “wet hammer mills” because the raw materials would not have been dried yet. Two identical hammer mills in parallel would be used to reduce the size of the chips. Each wet hammer mill would use a cyclone to mitigate particulate emissions, while also recovering product to route to the dryer feeding system. After the chips pass through the wet hammer mills, they would be discharged downward by mechanical and pneumatic systems to conveyors that would transport them to the dryer.

2.2.4 Drying Line

The drying line is the heart of the proposed PNWRE facility. The drying line would include the furnace, drum dryer, and emissions control system. The furnace would combust hog fuel to provide heat for the dryer and would have a maximum heat input capacity of 164.81 million British thermal units per hour (MMBtu/hr). Wet raw materials would be staged in a metering bin before being fed to the drum dryer inlet. Hot flue gas from the furnace would be routed through the drum dryer, where the heat would dry the raw material from approximately 45 percent moisture content to a target 10 percent final moisture content. Dried material would be conveyed from the drum dryer discharge through a pair of high-efficiency cyclones in parallel that would separate the dried wood material from the moisture-rich exhaust gas stream. The exhaust stream then either would be recycled back through the drum dryer or would pass through the emissions control system before emitting from a stack into the atmosphere. The dried material would be conveyed to a dry-product intermediate-storage silo.

The emissions control system for the drying line would consist of cyclones and a WESP for controlling emissions of particulate matter (PM); and an RTO for mitigating emissions of volatile organic compounds (VOC), carbon monoxide (CO), and organic HAP and toxic air pollutants (TAPs). A WESP controls PM using electrical forces to remove particles entrained within an exhaust stream onto collector surfaces such as pipes or plates within the WESP. The particulate is washed from the collector surfaces with liquid spray for collection and disposal. Cyclones are located prior to the WESP to recover airborne product and reduce the inlet PM loading to the WESP. An RTO is a type of thermal incinerator or oxidizer that destroys VOC and condensable organics by burning them at high temperatures, while oxidizing the CO in the exhaust to carbon dioxide.

2.2.5 Dry-Product Intermediate Storage

Dried material would pass from the dryer into the dry-product intermediate-storage silo. Two dust filter-equipped vents in this vessel (EP-05 and EP-06) would emit exhaust to the atmosphere. The retention time in the silo would allow the material moisture content to homogenize, which would help to optimize the pelletizing process. A chain conveyor would transport the product from the outlet of the silo to the dry hammer mills.

2.2.6 Dry Hammer Mills

Four dry hammer mills would process the dried material to the desired size. Each hammer mill would emit exhaust through a combined cyclone and fabric filter device (cyclofilter) for recovering product and controlling particulate emissions. The exhaust streams would then be combined with exhaust streams from the pellet coolers, then passed through an RCO for VOC control before emitting from a stack to the atmosphere. An RCO functions like an RTO to destroy VOC and condensable TAP via oxidation; however, it uses a catalyst material rather than ceramic material to achieve oxidation at lower temperatures.

2.2.7 Milled Dry-Product Intermediate Storage

From the dry hammer mills, the dried and milled product would be conveyed to the milled dry-product intermediate-storage silo with a dust filter-equipped vent (EP-09). The dried product would be offered additional retention time for achieving a more homogenous moisture content, a key factor for achieving the desired quality in the final product. A chain conveyor would transport the product from the outlet of the silo to the pellet mill hoppers that would independently feed each pellet mill.

2.2.8 Pellet Mills

There would be two pellet lines consisting of six pellet mills each, for a total of 12 pellet mills. In each pellet mill, rollers would push the material through the holes of a die plate. Knives on the exterior of the die plate would cut the wood pellets from the plate once the pellets achieve the required length. The temperature of a freshly produced pellet is around 200 degrees Fahrenheit (°F). Therefore, each of the two pellet lines would discharge into a pellet cooler where the material would flow countercurrent to a stream of ambient air introduced in the cooler. The air flow reduces the temperature of the wood pellets at the point of pellet discharge. Each pellet cooler would be equipped with a baghouse to remove dust from the exhaust stream. The exhaust streams from the two pellet cooler baghouses would be combined with the exhaust streams from the dry hammer mills, then passed through an RCO for VOC control before emitting from a stack to the atmosphere.

2.2.9 Pellet Silos and Loadout

Pellets would move from the pellet coolers to the 5 pellet silos. The total combined capacity of the pellet silos would be approximately 60,000 short tons. Pellets would be aggregated in the silos until enough volume is accumulated for bulk shipments. The silos would utilize aeration fans and venting to maintain low pellet temperature for final shipment. An automated enclosed conveyor would draw pellets from the silos evenly according to loading schedules and transport them to the neighboring Willis Enterprises' existing conveyors and vessel loadout facilities. Willis Enterprises operates under an RC2-class ORCAA registration (source number 2112, file number 647). PNWRE would also have the ability to deliver pellets via a truck unloading system; however, this system would be used only in special circumstances. PNWRE proposes no more than 10 loaded trucks per day and 32,000 tons per year of truck loadout utilization.

2.2.10 Emergency Equipment

An emergency backup diesel generator would be available for use during periods of power loss. The generator would be no larger than 300-kilowatt capacity.

3 Emission Calculations

Table 1 identifies the facility-wide criteria pollutant emissions from point sources for the proposed PNWRE facility. The emissions are based on operation at maximum capacity assuming compliance with the proposed emissions limitations, consistent with the definition for potential to emit (PTE) from ORCAA Regulation 1.4. The table includes point-source emissions only and excludes fugitive emissions because wood pellet production is not among the 28 listed categories of PSD regulations with lower major source thresholds (100 TPY) that require including fugitive emissions for comparison to major-source regulatory thresholds. Although the proposed facility would not exceed the PSD major-source threshold of 250 TPY for any criteria pollutant, some pollutants would exceed the Title V major-source threshold of 100 TPY. PNWRE would apply for the required Title V Operating Permit within 12 months of commencing operation. Detailed emissions calculations are found in **Appendix C**.

TABLE 1
FACILITY-WIDE POTENTIAL EMISSIONS

Pollutant	Facility-wide Point-Source PTE (TPY)	Title V Major-Source Threshold (TPY)	Title V Major? (Yes/No)	PSD Major-Source Threshold (TPY)	PSD Major? (Yes/No)
Filterable PM	108	N/A	N/A	250	No
Total PM_{10} [1]	88	100	No	250	No
Total $PM_{2.5}$ [1]	71	100	No	250	No
NO_X	230	100	Yes	250	No
CO	185	100	Yes	250	No
VOC	67	100	No	250	No
SO_2	18	100	No	250	No
CO_2e	163,592	N/A	N/A	100,000	No[2]
Total HAP	1.32	25	No	N/A	N/A
Max Individual HAP[3]	0.31	10	No	N/A	N/A

NOTES: CO = carbon monoxide; CO_2e = carbon dioxide equivalent; HAP = hazardous air pollutant; N/A = not applicable; NO_X = nitrogen oxides; PM = particulate matter; $PM_{2.5}$ = particulate matter 2.5 microns or less in diameter; PM_{10} = particulate matter 10 microns or less in diameter; PSD = Prevention of Significant Deterioration; PTE = potential to emit; SO_2 = sulfur dioxide; TPY = tons per year; VOC = volatile organic compound

1 Total PM_{10} and $PM_{2.5}$ include condensable fraction.

2 CO_2e cannot trigger PSD unless already triggered by another pollutant.

3 The maximum individual HAP is formaldehyde.

4 Regulatory Applicability Analysis

This section identifies and discusses the federal and state air quality regulations that potentially apply to the stationary sources associated with this project.

4.1 Applicability of Notice of Construction

ORCAA Regulations Rule 6.1 states that an approved NOC permit application is required for construction, installation, or establishment of any stationary source and applies to the proposed PNWRE wood pellet facility. The NOC forms required by ORCAA can be found in **Appendix A**. As outlined in ORCAA Rule 6.1.4, for the NOC application to be approved, the applicant must demonstrate that Best Available Control Technology (BACT) has been employed for all air pollutants. In addition, TAP emissions regulated under Washington Administrative Code (WAC) Chapter 173-460 must meet the applicable requirements of that program. The facility shall comply with all applicable federal regulations such as New Source Performance Standards (NSPS) and National Emissions Standards for Hazardous Air Pollutants (NESHAP). This NOC application has been prepared to demonstrate that the proposed PNWRE facility would comply with all requirements in ORCAA Rule 6.1.4 and allow ORCAA to issue an air permit.

4.2 Prevention of Significant Deterioration (Major New Source Review)

The Washington Department of Ecology (WDOE) administers the state PSD air quality permitting program that applies to new sources or modifications that are considered "major." The PSD program defines a major new source or a major modification as having potential emissions of any pollutant regulated under the program that exceeds 250 TPY.

As discussed in Section 3 of this report, the PNWRE wood pellet facility would not emit any criteria pollutant at a rate exceeding 250 TPY; therefore, the project is not required to submit an application for a PSD permit. This NOC application demonstrates that criteria pollutants would not be emitted in quantities that would trigger the PSD program.

4.3 Title V Operating Permit Program

Title V of the federal Clean Air Act requires facilities with the potential to emit more than 100 tons of a regulated criteria pollutant, 10 tons of a single HAP, or 25 tons of all HAPs combined on an annual basis, to obtain a Title V Air Operating Permit. As described in Section 3 of this report, facility-wide potential emissions are expected to exceed 100 TPY for a criteria pollutant; therefore, a Title V Air Operating Permit would be required. PNWRE would submit a Title V Air Operating Permit application within 12 months of the commencement of operation.

4.4 New Source Performance Standards

The NSPS are federal emissions standards applied to specific categories of stationary sources that are constructed, modified, or reconstructed after the standard was proposed. These standards are found in Title 40, Part 60 of the Code of Federal Regulations (CFR). The NSPS represent the minimum level of control that is required on a new or modified source. The following sections discuss some potentially applicable NSPS regulations. Note that some of the discussions demonstrate that the NSPS are not applicable to the PNWRE wood pellet facility.

4.4.1 40 CFR 60 Subpart A – General Provisions

Elements of Subpart A apply to each affected facility under any NSPS rule, as specified in each NSPS source category standard. Subpart A contains general requirements for notifications, monitoring, performance testing, reporting, recordkeeping, operation, and maintenance.

4.4.2 40 CFR 60 Subpart Db – Industrial, Commercial, and Institutional Steam Generating Units

This NSPS applies to industrial, commercial, and institutional steam generating units with a heat input greater than 100 MMBtu/hr that began construction, modification, or reconstruction after June 19, 1984. While this regulation applies to wood-burning combustion units, it is focused on combustion used to produce steam or heat water. A steam generating unit is defined within this regulation as a device that combusts any fuel or byproduct/waste and produces steam or heats water or heats any heat transfer medium. The burner in the dryer includes one 165 MMBtu/hr burner firing biomass (wood materials) to provide heat for the dryer. The burner would generate heat for the direct drying of wood materials only, and no heat from the burner would be utilized to generate steam, heat water, or heat any heat transfer medium. PNWRE does not propose installation of any steam-generating units at the wood pellet facility; therefore, the facility would not be subject to NSPS Subpart Db.

4.4.3 40 CFR 60 Subpart CCCC – Commercial and Industrial Solid Waste Incineration Units

This NSPS applies to commercial and solid waste incineration units (CISWI) and air curtain incinerators (ACI). A CISWI is defined within this regulation as any distinct operating unit at a commercial or industrial facility that combusts a solid waste meeting the definition in 40 CFR Part 241. As stated in §241.2, traditional fuels that are produced as fuels and are unused products that have not been discarded are not solid wastes, including cellulosic biomass (virgin wood). The traditional fuels definition further states that clean cellulosic biomass, defined in §241.2 to include forest-derived biomass such as bark and hogged fuel, is a fuel product. Therefore, the bark that would be used as fuel for the facility furnace is not solid waste and the furnace is not a CISWI. An ACI is defined within this NSPS as an incinerator that operates by forcefully projecting a curtain of air across an open chamber or pit in which combustion occurs. There are no proposed ACI for the PNWRE wood pellet facility. The facility would not be subject to NSPS CCCC.

4.4.4 40 CFR 60 Subpart IIII – Stationary Compression Ignition Internal Combustion Engines

This NSPS applies to manufacturers, owners, and operations of certain stationary compression ignition (CI) internal combustion engines (ICEs). PNWRE is proposing to operate a CI ICE emergency generator. Therefore, NSPS IIII is applicable to the CI ICE at the facility. PNWRE proposes to operate the CI ICE as an emergency engine as defined in this regulation. The facility shall comply with the following requirements:

- Use only ultra-low-sulfur diesel.
- Operate, maintain, install, and configure the engines per the manufacturer's instructions.
- Maintain a copy of the U.S. Environmental Protection Agency (EPA) certificate for the engine.
- Ensure that the engine is equipped with a non-resettable hour meter and that run logs noting the reason for operation are maintained.
- Limit maintenance and readiness testing to 100 hours per year. (There is no time limit on the use of emergency stationary ICE in emergency situations.)

4.5 National Emissions Standards for Hazardous Air Pollutants

The NESHAP are emission standards for HAPs from specific source categories. These regulations generally specify the Maximum Achievable Control Technology (MACT) that must be applied for a given industry category. Consequently, these rules are often called "MACT standards." These federal regulations are found in 40 CFR Parts 61 and 63 and are applicable to major and area sources of HAPs. A "HAP major source" is defined as a facility with potential emissions exceeding 25 TPY for total HAPs or potential emissions exceeding 10 TPY for any individual HAP. An “area source” is a stationary source of HAPs that is not a major source. As identified in Table 1, the proposed PNWRE wood pellet facility would be an area source of HAP emissions because maximum individual HAP emissions would be less than 10 TPY and total HAP emissions would be less than 25 TPY. The following sections discuss some potentially applicable NESHAP regulations. Note that some of the discussions demonstrate that the NESHAP is not applicable to the facility.

4.5.1 40 CFR 63 Subpart A – General Provisions

All affected sources are subject to the general provisions of 40 CFR 63 Subpart A unless specifically excluded by the source-specific NESHAP. Subpart A requires initial notification and performance testing, recordkeeping, and monitoring; provides reference methods; and mandates general control device requirements all other subparts as applicable.

4.5.2 40 CFR 63 Subpart DDDD – Plywood and Composite Wood Products

This regulation applies to major sources of HAPs that manufacture plywood or composite wood products by bonding wood materials (e.g., fibers, particles, strands, veneers) or agricultural fiber, generally with resin under heat and pressure, to form a structural panel or engineered wood product. The PNWRE wood pellet facility would not use any form of resin or manufacture structural panels or any similar type of wood product (i.e., veneer, particleboard, fiberboard, kiln-dried lumber). Furthermore, the facility would be an area source of HAPs; therefore, NESHAP Subpart DDDD is not applicable to the proposed facility.

4.5.3 40 CFR 63 Subpart DDDDD – Industrial, Commercial, and Institutional Boilers and Process Heaters

This regulation applies to solid, liquid, and gaseous-fired boilers and process heaters at major sources of HAP emissions. This regulation includes the following language in the definition of a process heater: “an enclosed device using controlled flame, and the unit’s primary purpose is to transfer heat indirectly to a process material… Process heaters are devices in which the combustion gases do not come into direct contact with the process materials.” The combustion gases from the dryer burner at the PNWRE facility’s drying line would be in direct contact with the wood materials; therefore, the dryer burner does not meet the definition of a process heater. Boilers are defined within this regulation as an enclosed device using controlled flame combustion for the primary purpose of recovering thermal energy in the form of steam or hot water. The furnace for the dryer would not be used for generating steam or hot water; therefore, it does not meet the definition of a boiler. Furthermore, the PNWRE facility would be an area source of HAP emissions. For these reasons, the proposed facility is not subject to Subpart DDDDD.

4.5.4 40 CFR 63 Subpart JJJJJJ – Industrial, Commercial, and Institutional Boilers Area Sources

This regulation applies to industrial, commercial, and institutional boilers located at area sources of HAPs. Boilers are defined within this regulation as an enclosed device using controlled flame combustion for the primary purpose of recovering thermal energy in the form of steam or hot water. The furnace for the dryer would not be used for generating steam or hot water; therefore, it does not meet the definition of a boiler. The PNWRE facility would be an area source of HAP emissions; however, there would be no boilers that meet the applicability criteria, so this regulation would not apply.

4.5.5 40 CFR 63 Subpart QQQQQQ – Wood Preserving Area Sources

This regulation applies to wood preserving operations located at area sources of HAPs. A "wood preserving operation" is defined by Subpart QQQQQQ as a pressure treatment process with use of a wood preservative containing chromium, arsenic, dioxins, or methylene chloride, where the preservative is applied to the wood product inside a retort or similarly closed vessel. The PNWRE facility would not use any wood preservatives in the production of wood pellets; therefore, this regulation would not apply.

4.5.6 40 CFR 63 Subpart ZZZZ – Stationary Reciprocating Internal Combustion Engines

This regulation applies to reciprocating internal combustion engines (RICE) at both major and area sources of HAPs. The PNWRE facility would operate one diesel-fired emergency generator that would meet the applicability criteria of this regulation. The emergency CI RICE would have a maximum rated design power greater than 25 horsepower and a construction date after January 1, 2006; therefore, these engines would be considered new units under the rule. New CI RICE at area sources of HAPs must meet the requirements of this rule by meeting the requirements of 40 CFR 60 Subpart IIII; no other requirements from 40 CFR 63 Subpart ZZZZ apply to the emergency CI RICE.

4.6 General Air Pollution Control Regulations

ORCAA Regulation 8 establishes general emission standards that apply to all emission units, including those at the project site. PNWRE would comply with these general emissions standards. The relevant general emission standards are as follows:

- Rule 8.2 General Standards for Maximum Visual Emissions – opacity from any emissions unit (with some exceptions) is limited to 20 percent.
- Rule 8.3 General Standards for Maximum Particulate Matter – PM emissions are limited to 0.10 grains per dry standard cubic foot of gas for most sources, and reasonable precautions must be taken to prevent fugitive particulate material from becoming airborne. This rule also prohibits PM fallout that negatively affects adjacent properties.

4.7 Washington Toxic Air Pollutant Regulations

In Washington, all new and modified sources emitting TAPs must show compliance with the Washington TAP program found in WAC Chapter 173-460. The program requires that an NOC application demonstrate, using the procedures established by the program, that the increase in TAP emissions from a project would be sufficiently low to protect human health and safety from potential carcinogenic and/or other toxic effects. Like the federal list of toxic air contaminants referred to as HAPs, WDOE maintains a list of carcinogens and noncarcinogens referred to as TAPs in WAC 173-460-150. The Washington TAP program and associated TAP list was last updated in November 2019. The procedures for a new source of TAP emissions to comply with the program are:

1. Apply BACT for toxic air pollutants associated with a project (tBACT), then quantify the level of emissions of each TAP.

2. In an NOC application, address each TAP emissions quantification greater than its *de minimis* level per specified averaging period in the TAP list in WAC 173-460-150.

3. Conduct a first-tier review[2] by investigating whether the TAP addressed in an NOC application has an emissions impact less than its corresponding Acceptable Source Impact Level (ASIL) from the TAP list in WAC 173-460-150. If the estimated impacts are less than the ASIL, then health risks are considered insignificant and a permit may be issued.

    a. The initial screening method for a first-tier review is to compare estimated TAP emissions rates to their Small Quantity Emission Rate (SQER) values found in the TAP list in WAC 173-460-150. If a TAP emissions rate is less than its SQER, its impact is considered to be less than its ASIL and the requirements of the Washington TAP program have been satisfied for NOC approval.

    b. If a TAP emissions level is not less than its SQER, then dispersion modeling may be conducted to determine a maximum ambient concentration for that TAP. If the modeled TAP concentration is less than its ASIL, then health risks are considered insignificant and the requirements of the Washington TAP program have been satisfied for NOC approval.

4. If TAP emissions levels cannot be shown to be insignificant via the first-tier review, then conduct a second-tier review. A second-tier review[3] requires that the applicant submit a petition to WDOE to conduct the second-tier review. WDOE will make an approval recommendation to the permitting agency after reviewing the petition.

5. If a second-tier review cannot demonstrate that cancer and health risks are within allowable limits, then conduct a third-tier review. A third-tier review[4] is a risk management analysis conducted by WDOE to determine whether the risk of the project is acceptable based on available preventive measures and estimated environmental benefits to the state of Washington. WDOE will make an approval recommendation based upon the risk management analysis.

The TAP emissions from the proposed PNWRE facility satisfy the criteria of the Washington TAP program for NOC approval based upon a first-tier review. **Table 2** summarizes the results of the first-tier review, demonstrating that each TAP emitted in quantities greater than *de minimis* levels either would be emitted at a rate less than its SQER or has a modeled concentration measuring less than its ASIL. Detailed TAP emissions calculations are included in Appendix C. A discussion of the air dispersion modeling methodology is found in Section 6.

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[2] WAC 173-460-080 (https://app.leg.wa.gov/WAC/default.aspx?cite=173-460-080) codifies the first-tier review procedure.

[3] WAC 173-460-090 (https://app.leg.wa.gov/WAC/default.aspx?cite=173-460-090) codifies the second-tier review procedure.

[4] WAC 173-460-100 (https://app.leg.wa.gov/WAC/default.aspx?cite=173-460-100) codifies the third-tier review procedure.

TABLE 2
RESULTS OF FIRST-TIER REVIEW FOR TOXIC AIR POLLUTANT EMISSIONS

CAS Registry Number	TAP Name	Averaging Period	Emission Rate (lb/averaging period)	SQER[1] (lb/averaging period)	Modeling Required? (Yes/No)	ASIL[1] (mg/m^3)	Modeling Result (mg/m^3)
57-97-6	7,12-Dimethylbenz(a)anthracene	year	1.72E-03	1.40E-03	Yes	8.50E-06	1.42E-08
75-07-0	Acetaldehyde	year	3.29E+02	6.00E+01	Yes	3.70E-01	8.58E-03
107-02-8	Acrolein	24-hr	1.39E+00	2.60E-02	Yes	3.50E-01	4.09E-02
56-55-3	Benz(a)anthracene	year	8.42E-02	8.90E-01	No	N/A	N/A
71-43-2	Benzene	year	6.90E+01	2.10E+01	Yes	1.30E-01	1.03E-02
50-32-8	Benzo(a)pyrene	year	9.53E-03	1.60E-01	No	N/A	N/A
117-81-7	Bis-(2-ethylhexyl phthalate)	year	7.16E+00	6.80E+01	No	N/A	N/A
53-70-3	Dibenzo(a,h)anthracene	year	2.93E-02	8.20E-02	No	N/A	N/A
50-00-0	Formaldehyde	year	6.27E+02	2.70E+01	Yes	1.70E-01	1.33E-02
1330-20-7	m,p-Xylene	24-hr	3.45E+00	1.60E+01	No	N/A	N/A
91-20-3	Naphthalene	year	4.69E+00	4.80E+00	No	N/A	N/A
123-38-6	Propionaldehyde	24-hr	1.96E-01	5.90E-01	No	N/A	N/A
7440-38-2	Arsenic	year	1.61E+00	4.90E-02	Yes	3.00E-04	6.21E-06
7440-41-7	Beryllium	year	8.07E-02	6.80E-02	Yes	4.20E-04	3.12E-07
7440-43-9	Cadmium	year	4.14E-01	3.90E-02	Yes	2.40E-04	1.89E-06
CRVICOMP	Chromium, hexavalent	year	2.53E-01	6.50E-04	Yes	4.00E-06	9.68E-07
7440-47-3	Chromium, total	24-hr	4.56E-03	7.40E-03	No	N/A	N/A
7440-48-4	Cobalt	24-hr	1.31E-03	7.40E-03	No	N/A	N/A
7439-96-5	Manganese	24-hr	3.17E-01	2.20E-02	Yes	3.00E-01	1.14E-02
7439-97-6	Mercury	24-hr	1.39E-02	2.20E-03	Yes	3.00E-02	5.03E-04
7440-02-0	Nickel	year	2.61E+00	6.20E-01	Yes	3.80E-03	1.05E-05
7440-62-2	Vanadium	24-hr	8.70E-04	7.40E-03	No	N/A	N/A

NOTES: CAS = Chemical Abstract Service; $\mu g/m^3$ = micrograms per cubic meter; ASIL = Acceptable Source Impact Level; hr = hour; lb = pounds; N/A = not applicable; SQER = Small Quantity Emission Rate; TAP = toxic air pollutant

1 SQER and ASIL values are from Washington Administrative Code 173-460-150.

5 Best Available Control Technology

ORCAA Rule 6.1.4 states that any new stationary source of emissions must employ Best Available Control Technology (BACT) for all air pollutants. A paraphrasing of the regulatory language defining BACT in Rule 1.4 is that it is an emission limitation based on the maximum degree of reduction for each air pollutant subject to regulation under the Washington Clean Air Act emitted from any new stationary source which the permitting agency, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such stationary source. Sources must also employ BACT for toxic air pollutants (tBACT) as part of the Washington TAP program. This section includes a BACT analysis, addressing tBACT where appropriate, from the following sources of emissions at the PNWRE wood pellet facility:

- Raw material receiving
- Chips cleaning line
- Wet hammer mills
- Drying line
- Dry hammer mills and pellet line
- Intermediate and final product storage silos
- Product loadout
- Vehicle traffic
- Emergency generator

5.1 BACT Methodology

Presented below are the five basic steps of a top-down BACT review:

5.1.1 Step 1 – Identify All Control Technologies

Available control technologies are identified for each emission unit in question. The following methods are used to identify potential technologies: (1) Researching the Reasonably Available Control Technology (RACT)/Best Available Control Technology (BACT)/Lowest Achievable Emission Reduction (LAER) Clearinghouse (RBLC) database, (2) survey regulatory agencies, and (3) draw from previous engineering experience.

5.1.2 Step 2 – Eliminate Technically Infeasible Options

After the identification of control options, an analysis is conducted to eliminate technically infeasible options. A control option is eliminated from consideration if there are process-specific conditions that prohibit the implementation of the control.

5.1.3 Step 3 – Rank Remaining Control Technologies by Control Effectiveness

Once technically infeasible options are removed from consideration, the remaining options are ranked based on their control effectiveness. If there is only one remaining option, or if all remaining technologies could achieve equivalent control efficiencies, ranking based on control efficiency is not required.

5.1.4 Step 4 – Evaluate the Most Effective Controls and Document Results

The BACT process is intended to require sources to implement the most efficient air pollution control strategies that are feasible. When a source selects a control strategy that does not represent the most efficient option in the ranking, a detailed economic, energy, and environmental impact evaluation must be performed that justifies the selection. If a control option is determined to be economically feasible without adverse energy or environmental impacts, it is not necessary to evaluate the remaining options with lower control efficiencies.

The economic evaluation centers on the cost effectiveness of the control option. Costs of installing and operating control technologies are estimated and annualized following the methodologies outlined in EPA’s Control Cost Manual and other industry resources. Cost effectiveness is expressed in dollars per ton of pollutant controlled. Objective analyses of energy and environmental impacts associated with each option are also conducted.

If the most effective control device is selected, a detailed cost analysis is not required.

5.1.5 Step 5 – Select BACT

In the final step, one pollutant-specific control option is selected that satisfies BACT for each emission unit under review based on evaluations from the previous step. A BACT emissions limit is proposed when appropriate that reflects the control option selected by the analysis. Vendor-provided information can be found in **Appendix D**.

5.2 BACT Analysis for Raw-Material Receiving

Woody biomass would be delivered to the PNWRE facility via trucks that would be emptied via truck dumpers and formed into outdoor storage piles with front-end loaders. There would be three truck dumpers and associated storage piles: one for forest residues (chips), one for sawmill residues (white wood), and one for biomass used as fuel (bark). Filterable PM would be emitted as the material slides from the open truck trailer and lands on the ground, as the front-end loaders drop the material onto piles, and again as the front-end loaders empty the material into dedicated walking-floor bins. Filterable PM would also be emitted from wind erosion of the outdoor storage piles. These emissions sources are considered fugitive emissions sources because they would occur outdoors and could not be reasonably passed through a stack, chimney, or vent. After the deposit of raw materials into the walking-floor bins, all raw-material handling processes would be fully enclosed and/or within buildings. Raw material is considered “wet” because of its moisture content, estimated between 18 percent and 55 percent depending on the wood species.

5.2.1 PM BACT for Raw-Material Receiving

5.2.1.1 Steps 1–4 – Identify and Evaluate Control Technologies for Raw-Materials Receiving

Fugitive PM emissions from raw-material handling are analogous to fugitive dust emissions. Because these emissions cannot reasonably be passed through a stack, chimney, or vent, add-on pollution control technologies designed for these types of emissions points are not technically feasible. The primary pollution control strategy accepted as BACT for fugitive dust emissions is the use of wet suppression techniques to increase the moisture content of the material. Increased moisture content results in heavier material particles, which makes it more difficult for them to become airborne. Given that the wood materials would already have a high moisture content upon delivery to the PNWRE facility, the raw material would achieve the benefits of wet suppression techniques without additional application of water.

5.2.1.2 Step 5 – Select BACT for Raw-Materials Receiving

The wood materials would achieve the benefits of wet suppression techniques because they would already have a high moisture content upon delivery to the PNWRE facility. Therefore, no additional control technology is proposed as BACT for the truck dumpers or material storage piles.

5.3 BACT Analysis for Chips Cleaning Line and Wet Hammer Mills

Both the chips cleaning line and the wet hammer mills would involve mechanical handling of the raw "wet" materials, either to clean and organize by size in the case of the chips cleaning line, or to reduce the size of the chips in the case of the wet hammer mills. In both of these activities, filterable PM emissions would be generated from the handling of the raw materials.

5.3.1 PM BACT for Chips Cleaning Line and Wet Hammer Mills

5.3.1.1 Step 1 – Identify Control Technologies for Chips Cleaning Line and Wet Hammer Mills

The following PM control technologies for the chips cleaning line and wet hammer mills have been identified:

- Baghouse
- Cyclone

Baghouse[5]

In a fabric filter baghouse, a particle-laden exhaust stream is passed through a tightly woven or felted fabric, causing the PM in the exhaust stream to be collected on the fabric by sieving and other mechanisms. Fabric filters may be in the form of sheets, cartridges, or bags, with a number of the individual fabric filter units housed together in a group. Bags are the most common type of filter. The dust cake that forms on the filter from the collected PM can significantly increase collection efficiency. Fabric filters are frequently referred to as "baghouses" because the fabric is usually configured in cylindrical bags. Typical design efficiencies are between 99 and 99.9 percent.

Cyclone[6]

A cyclone removes particulate from a gas stream by centrifugal and inertial forces, induced by forcing particulate-laden gas to change direction. Typically, cyclones are effective for particulate greater than 10 microns in diameter; however, there are high-efficiency cyclones designed to be effective for particulate matter less than or equal to 10 microns and 2.5 microns in diameter (PM_{10} and $PM_{2.5}$, respectively). Cyclones operate by creating a double vortex inside the cyclone body, usually a cone-shaped chamber. The incoming gas is forced into circular motion down the

5 U.S. Environmental Protection Agency. 2003. Air Pollution Control Technology Fact Sheet: Fabric Filter – Pulse-Jet Cleaned Type (also referred to as Baghouses). EPA-452/F-03-025. Available: https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100RQ6L.txt. Accessed June 15, 2023.

6 U.S. Environmental Protection Agency. 2003. Air Pollution Control Technology Fact Sheet: Cyclones. EPA-452/F-03-005. Available: https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100C75Q.txt. Accessed June 15, 2023.

cyclone near the inner surface of the cyclone tube. At the bottom of the cyclone, the gas turns and spirals up through the center of the tube and out of the top of the cyclone. Control efficiencies for a single conventional cyclone are 70–90 percent for PM, 30–90 percent for PM_{10}, and 0–40 percent for $PM_{2.5}$. High-efficiency single cyclones are designed to achieve higher control of smaller particles and have control efficiencies of 80–99 percent for PM, 60–95 percent for PM_{10}, and 20–70 percent for $PM_{2.5}$.

5.3.1.2 Step 2 – Eliminate Technically Infeasible Options for Chips Cleaning Line and Wet Hammer Mills

The material processed in the chips cleaning line and wet hammer mills is high in moisture content. Baghouses are not suitable for high-moisture-content exhaust streams because of the crusty caking or plugging of the fabric filters that would occur.[7] This plugging leads to blinding, a phenomenon that prevents airflow through the cake buildup and reduces efficiency. Therefore, a baghouse is not technically feasible for the chips cleaning line and wet hammer mills and has been removed from further consideration.

5.3.1.3 Step 3 – Rank Remaining Control Options by Effectiveness for Chips Cleaning Line and Wet Hammer Mills

The only remaining feasible control technology is cyclones.

5.3.1.4 Step 4 – Evaluate the Most Effective Controls and Document Results for Chips Cleaning Line and Wet Hammer Mills

The only remaining feasible control technology is cyclones.

5.3.1.5 Step 5 – Select BACT for Chips Cleaning Line and Wet Hammer Mills

PNWRE proposes the use of cyclones for controlling PM from the chips cleaning line and wet hammer mills. Cyclones provide the added benefit of allowing for reclamation of airborne product. PNWRE would route product reclaimed by the cyclones to the drying line. PM emissions from the chips cleaning line cyclone would not exceed 6.81 lb/hr and PM emissions from each wet hammer mill cyclone would not exceed 1.91 lb/hr.

5.4 BACT/tBACT Analysis for Drying Line

The drying line includes the hog fuel furnace and drum dryer. The furnace would combust hog fuel to provide heat for the dryer and would have a maximum heat input capacity of 164.81 MMBtu/hr. Wet raw materials would be staged in a metering bin before being fed to the drum dryer inlet. Hot flue gas from the furnace would be routed through the drum dryer where the heat would dry the raw material from approximately 50 percent moisture content to a target 10 percent final moisture content. Dried material would be conveyed from the drum dryer discharge through a pair of high-efficiency cyclones in parallel that would separate the dried wood material from the moisture-rich exhaust gas stream. The exhaust stream then either would be recycled back through the drum dryer or would pass through the emissions control system before emitting from a stack

[7] U.S. Environmental Protection Agency. 2003. Air Pollution Control Technology Fact Sheet: Fabric Filter – Pulse-Jet Cleaned Type (also referred to as Baghouses). EPA-452/F-03-025. Available: https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100RQ6L.txt. Accessed June 15, 2023.

into the atmosphere. The furnace would generate combustion emissions of filterable and condensable PM, nitrogen oxides (NO_X), CO, VOC, and sulfur dioxide (SO_2). TAP emissions would also be generated during this process. This BACT analysis would also serve as tBACT for complying with the Washington TAP program.

5.4.1 PM BACT for Drying Line

5.4.1.1 Step 1 – Identify Control Technologies for Drying Line

Filterable PM and condensable PM would be generated from the combustion of wood fuel in the dryer furnace. An RBLC search to identify PM control technologies for the drying line identified the following:

- Baghouse
- Electrostatic precipitator
- Wet electrostatic precipitator

Baghouse

Refer to the discussion in Section 5.3.1.1 for a description of the theory of operation of a baghouse.

Electrostatic Precipitator[8]

An ESP is a PM control device that uses electrical forces to move particles entrained within an exhaust stream onto collector surfaces such as pipes or plates. The entrained particles are given an electrical charge when they pass through a corona, a region where the gaseous ions flow. Electrodes in the center of the flow lane are maintained at high voltage and generate the electrical field that forces the particles to the collector surface. In dry ESPs, the collectors are knocked, or "rapped," by various mechanical means to dislodge the particulate, which slides downward into a hopper where they are collected and disposed of. Typical design efficiencies are between 99 and 99.9 percent.

Wet Electrostatic Precipitator[9]

A WESP is a PM control device that uses electrical forces to move particles entrained within an exhaust stream onto collector surfaces such as pipes or plates in the same manner as a dry ESP. Where a WESP differs from a dry ESP is that the collectors are either intermittently or continuously washed by a spray of liquid to remove the particulate from the surfaces. Water is usually the liquid used for washing the collection surfaces. A drainage system collects the wet effluent, which is then disposed of. A WESP can be effective in collecting sticky particles and mists, as well as explosive or flammable dusts. The humid atmosphere that results from washing in a WESP cools and conditions the gas stream, causing pollutants to condense. Liquid particles such as condensable PM are collected along with particles and provide another means of rinsing the collection surfaces. Typical design efficiencies are between 99 and 99.9 percent.

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[8] U.S. Environmental Protection Agency. 2003. Air Pollution Control Technology Fact Sheet: Dry Electrostatic Precipitator (ESP)—Wire-Plate Type. EPA-452/F-03-028. Available: https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1008OHL.txt. Accessed June 26, 2023.

[9] U.S. Environmental Protection Agency. 2003. Air Pollution Control Technology Fact Sheet: Wet Electrostatic Precipitator (ESP)—Wire-Plate Type. EPA-452/F-03-030. Available: https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1008OHV.txt. Accessed June 15, 2023.

5.4.1.2 Step 2 – Eliminate Technically Infeasible Options for Drying Line

The drying line uses heat to draw moisture from the product and transfer it to the exhaust stream, resulting in a moisture-laden exhaust stream. Baghouses are not suitable for high-moisture-content exhaust streams because of the crusty caking or plugging of the fabric filters that would occur.[10] This plugging leads to blinding, a phenomenon that prevents airflow through the cake buildup and reduces efficiency. Therefore, a baghouse is technically infeasible for the drying line and has been removed from further consideration.

Dry ESPs are not recommended for removing sticky or moist particles.[11] Therefore, a dry ESP is not technically feasible for the drying line and has been removed from further consideration.

5.4.1.3 Step 3 – Rank Remaining Control Options by Effectiveness for Drying Line

The only remaining control technology is the WESP.

5.4.1.4 Step 4 – Evaluate the Most Effective Controls and Document Results for Drying Line

The only remaining control technology is the WESP. In addition to filterable PM effectiveness, a WESP controls TAPs that are in particulate form, such as most metals, as well as aerosolized PM, acid mists, and VOCs.[12]

5.4.1.5 Step 5 – Select BACT for Drying Line

PNWRE proposes installation and utilization of a WESP with filterable PM not to exceed 7.73 pounds per hour (lb/hr) as BACT for the drying line's filterable particulate emissions. Filterable PM_{10} and $PM_{2.5}$ are assumed to be equivalent to filterable PM from this source. When accounting for condensable particulate emissions, total PM_{10} and $PM_{2.5}$ are not to exceed 12.74 lb/hr.

5.4.2 NO_X BACT for Drying Line

5.4.2.1 Steps 1–4 – Identify and Evaluate Control Technologies for Drying Line

The drying line's furnace would burn hog fuel (wood bark) as a fuel source. A regenerative thermal oxidizer, or RTO, that would combust natural gas would also be proposed to control other pollutants. NO_X emissions result primarily from thermal NO_X formation during combustion. Nitrogen and oxygen in the combustion air combine with one another at the high temperatures in a flame. An RBLC search to identify NO_X control technologies for hog fuel-fired or wet bark-fired dryers at wood pellet facilities did not yield any results. Therefore, good combustion practices, which is always available, is the only available control technology.

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[10] U.S. Environmental Protection Agency. 2003. Air Pollution Control Technology Fact Sheet: Fabric Filter – Pulse-Jet Cleaned Type (also referred to as Baghouses). EPA-452/F-03-025. Available: https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100RQ6L.txt. Accessed June 15, 2023.

[11] U.S. Environmental Protection Agency. 2003. Air Pollution Control Technology Fact Sheet: Dry Electrostatic Precipitator (ESP)—Wire-Plate Type. EPA-452/F-03-028. Available: https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1008OHL.txt. Accessed June 26, 2023.

[12] U.S. Environmental Protection Agency. 2003. Air Pollution Control Technology Fact Sheet: Wet Electrostatic Precipitator (ESP)—Wire-Plate Type. EPA-452/F-03-030. Available: https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1008OHV.txt. Accessed June 15, 2023.

5.4.2.2 Step 5 – Select BACT for Drying Line

PNWRE proposes good combustion practices—the only available control technology—with NO_X emissions not to exceed 52 lb/hr as BACT for the drying line's NO_X emissions.

5.4.3 CO and VOC BACT for Drying Line

5.4.3.1 Steps 1–4 – Identify and Evaluate Control Technologies for Drying Line

CO and VOC emissions result primarily from the incomplete combustion of fuels. Wood combustion also releases VOC from compounds evaporated from the wood. Because of their similar formation mechanisms and control strategies, CO and VOC are analyzed together during BACT. An RBLC search to identify CO and VOC control technologies identified the following:

- Good combustion practices
- Regenerative thermal oxidizer

Regenerative Thermal Oxidizer[13,14]

An RTO is a type of thermal incinerator or oxidizer that destroys VOC and condensable organics by burning them at high temperatures. Thermal oxidizers also reduce CO emissions in direct-fired dryer exhausts by oxidizing the CO in the exhaust to carbon dioxide. RTOs are designed to preheat the inlet emission stream with heat recovered from the incineration exhaust gases. A gas burner brings the preheated emissions up to an incineration temperature between 788 degrees Celsius (°C) and 871°C (1,450°F and 1,600°F) in a combustion chamber with sufficient gas residence time to complete the combustion. Combustion gases then pass through a cooled ceramic bed where heat is extracted. By reversing the flow through the beds, the heat transferred from the combustion exhaust air preheats the gases to be treated, thereby reducing auxiliary fuel requirements.

PNWRE considers this technology to be available for the dryer.

5.4.3.2 Step 5 – Select BACT for Drying Line

Good combustion practices and RTO are proposed as BACT for the drying line's VOC and CO emissions, with VOC emissions not to exceed 6.58 lb/hr and CO emissions not to exceed 42 lb/hr. The RTO would be rated to achieve at least 95 percent destruction efficiency of VOC.

5.4.4 SO_2 BACT for Drying Line

5.4.4.1 Steps 1–4 – Identify and Evaluate Control Technologies for Drying Line

SO_2 emissions result primarily from a mass balance conversion of sulfur present in the combustion fuels. Wood does not typically have a notable sulfur content and therefore does not emit SO_2 in large quantities. An RBLC search to identify SO_2 controls applied to hog fuel or wet bark combustion did not yield any results. Accordingly, good combustion practices, which are always available, are proposed to satisfy BACT for SO_2.

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[13] U.S. Environmental Protection Agency. 2003. Air Pollution Control Technology Fact Sheet: Regenerative Incinerator. EPA-452/F-03-021. Available: https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1008OH5.txt. Accessed June 19, 2023.

[14] U.S. Environmental Protection Agency. 2002. AP-42, Section 10.6.2, Particleboard Manufacturing. Available: https://www.epa.gov/sites/default/files/2020-10/documents/c10s06-2.pdf. Accessed June 19, 2023.

5.4.4.2 Step 5 – Select BACT for Drying Line

Good combustion practices are proposed as BACT for the drying line's SO_2 emissions.

5.4.5 tBACT for Drying Line

tBACT, which is BACT as applied to TAP emissions, is required by the Washington TAP program. TAP emissions from the drying line would be in the form of VOC emissions, or PM emissions in the case of most metals. Therefore, the BACT strategies employed for control of PM and VOC emissions from the drying line (WESP and RTO) would satisfy tBACT as well.

5.5 BACT/tBACT Analysis for Combined Exhaust from the Dry Hammer Mills and Pellet Line

PNWRE intends to route emissions from the dry hammer mills and the pellet line to a common stack prior to release to the atmosphere. Therefore, the BACT analysis addresses both of these processes together. The dry hammer mills would reduce the size of the dried material for optimal pellet formation. The dried material would be pressed and cut into pellets of desired dimensions in the pellet line, experiencing a reduction in dusting characteristics after having been formed into pellets. PM and VOC emissions would be generated from these processes. The TAP emissions would be in the form of VOC emissions; therefore, tBACT would equate to the BACT employed for VOC control.

5.5.1 PM BACT for Dry Hammer Mills and Pellet Line

5.5.1.1 Step 1 – Identify Control Technologies for Dry Hammer Mills and Pellet Line

The following PM control technologies would be analyzed:

- Fabric filters/baghouse
- Cyclone

5.5.1.2 Step 2 – Eliminate Technically Infeasible Options for Dry Hammer Mills and Pellet Line

These technologies are feasible.

5.5.1.3 Step 3 – Rank Remaining Control Options by Effectiveness for Dry Hammer Mills and Pellet Line

1. Fabric filters/baghouse
2. Cyclones

5.5.1.4 Step 4 – Evaluate the Most Effective Controls and Document Results for Dry Hammer Mills and Pellet Line

PNWRE proposes to use "cyclofilters," which are a combination of cyclones and fabric filters, for controlling the PM from the dry hammer mills. The cyclone portion of the cyclofilter would allow for product recovery while the fabric filtration would offer the best-performing PM control. Each of the four dry hammer mills would emit exhaust through a dedicated cyclofilter before the exhaust combines with the exhaust from the pellet coolers. Each of the two pellet coolers would emit exhaust to a baghouse before the exhaust combines with the exhaust from the dry hammer mills.

5.5.1.5 Step 5 – Select BACT for Dry Hammer Mills and Pellet Line

PNWRE proposes the combined use of cyclofilters and baghouses for controlling PM from the dry hammer mills and pellet line. The cyclofilters would allow for airborne product reclamation and the integrated fabric filter system would offer the best-performing PM control. The combined emission streams would have a filterable PM emission rate not to exceed 1.87 lb/hr. Filterable PM_{10} and $PM_{2.5}$ are assumed to be equivalent to filterable PM from this source. The combined exhaust streams would have controlled the PM sufficiently to prevent blinding of catalyst used in the downstream RCO for VOC control before release to the atmosphere. When considering the condensable PM formed during combustion in the RCO, the total PM_{10} and $PM_{2.5}$ emissions would not exceed 1.89 lb/hr.

5.5.2 VOC BACT/tBACT for Dry Hammer Mill and Pellet Line

5.5.2.1 Step 1 – Identify Control Technologies for Dry Hammer Mill and Pellet Line

The following VOC/TAP control technologies would be analyzed:

- Regenerative Thermal Oxidizer
- Regenerative Catalytic Oxidizer

Refer to the discussion in Section 5.4.3.1 for a description of the theory of operation of an RTO.

An RCO is a regenerative incinerator that operates under principles similar to those of an RTO, where VOC is destroyed via oxidation. An RCO uses a catalyst material rather than ceramic material in the packed bed. This allows for destruction of VOC at a lower oxidation temperature.[15] An RCO has a destruction efficiency similar to that of an RTO, but with lower fuel requirements because of the lower temperatures.

5.5.2.2 Step 2 – Eliminate Technically Infeasible Options for Dry Hammer Mill and Pellet Line

These technologies are feasible for this source of emissions.

5.5.2.3 Step 3 – Rank Remaining Control Options by Effectiveness for Dry Hammer Mill and Pellet Line

Both RTO and RCO achieve the same levels of VOC/TAP control.

[15] U.S. Environmental Protection Agency. 2003. Air Pollution Control Technology Fact Sheet: Regenerative Incinerator. EPA-452/F-03-021. Available: https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1008OH5.txt. Accessed June 19, 2023.

5.5.3.4 Step 4 – Evaluate the Most Effective Controls and Document Results for Dry Hammer Mill and Pellet Line

PNWRE proposes to use an RCO for control of the VOC/TAP from this source of emissions. No further evaluation is necessary because PNWRE has proposed the best-performing technology.

5.5.3.5 Step 5 – Select BACT/tBACT for Dry Hammer Mill and Pellet Line

PNWRE proposes an RCO for controlling VOC/TAP from the combined exhaust stream for the dry hammer mill and pellet line. The RCO would be rated to achieve at least 95 percent destruction efficiency of the VOC/TAP emissions with a VOC emission rate not to exceed 8.6 lb/hr.

5.6 BACT Analysis for Intermediate and Final Product Storage Silos and Truck Loadout

The dry-product intermediate-storage silo (two vents, EP-06 and EP-06) is a vessel that would be used for staging material after it exits the drying line and before it is processed in the dry hammer mills. Milled dry-product intermediate-storage silo EP-09 is a vessel that would be used for staging material after it exits the dry hammer mills and before it is processed in the pellet line. The estimated maximum potential PM emissions of these enclosed silo vents would not exceed 0.07 TPY each and vent filters are included in the design, so additional control devices are not necessary.

Five pellet storage silos, EP-10 through EP-14, would provide staging for final product before loadout. The silos would utilize aeration fans and venting via mechanical extractor to maintain low pellet temperature for final shipment. Pellets have reduced dusting characteristics because of their inherent moisture content and high density. Each silo would maintain a maximum PM PTE of no more than 3.85 TPY, so additional control devices are not necessary.

Transferring to Willis Enterprises’ existing conveyance and vessel loadout equipment would be the primary means of product export; however, the facility would include truck loadout capability onsite (EP-15) that could be used in special circumstances. Because this source would be used only in special circumstances, PNWRE proposes no more than 10 loaded trucks per day and 32,000 tons per year of truck loadout utilization. Fugitive PM emissions would be generated from the deposit of pellets into trucks; however, maximum potential PM emissions would be less than 0.02 TPY, so additional control devices are not necessary.

PNWRE proposes proper maintenance and good operating practices as BACT for PM emissions from the product storage silos and truck loadout.

5.7 BACT Analysis for Vehicle Traffic

Raw materials would be provided to PNWRE via heavy-duty trucks and front-end loaders would move the unloaded raw materials as needed. In special circumstances, pellets could be exported from the facility via heavy-duty trucks. This vehicle traffic on the facility’s unpaved roads would be a source of PM emissions.

5.7.1 PM BACT for Vehicle Traffic

5.7.1.1 Steps 1–4 – Identify and Evaluate Control Technologies for Vehicle Traffic

The following PM control technology is generally applied to unpaved roads and is considered feasible:

- Reasonable precautions, including regular application of water or other dust suppressants.

The PNWRE facility would implement a dust control plan, which would include abiding by a 10-mph posted speed limit for all vehicles and heavy equipment, regularly applying water on road surfaces via water truck, and using a pickup broom truck as needed. The Western Region Air Partnership Fugitive Dust Handbook[16] provides control efficiencies for various control strategies on unpaved roads, offering 44 percent control for limiting speeds to 25 mph and up to 74 percent from applying water. The PNWRE dust control plan would require even lower speeds, daily monitoring of road surfaces that would include watering, and use of a pickup broom truck as needed. Therefore, an 85 percent control efficiency has been identified and applied to unpaved haul road traffic based on the combined application of these measures.

5.7.1.2 Step 5 – Select BACT for Vehicle Traffic

PNWRE proposes to mitigate PM emissions from vehicle traffic by employing reasonable precautions and adherence to a dust control plan as BACT. This is consistent with ORCAA Regulation 8.3(c), which requires that reasonable and/or appropriate precautions be taken to prevent fugitive particulate material from becoming airborne.

5.8 BACT/tBACT Analysis for Emergency Generator

A 300-kilowatt backup emergency generator would be installed at the PNWRE facility. The diesel-fired engine for this generator would be certified to meet the emissions standards of 40 CFR 60, Subpart IIII and would be fired with ultra-low-sulfur diesel only. Other than emergency use, backup emergency engines are limited by 40 CFR 60, Subpart IIII to no more than 100 hours per year of operation for maintenance checks and readiness testing.

Add-on controls for emergency backup diesel-fired generators are impractical because of the intermittent and infrequent operation of these units. Therefore, PNWRE proposes that BACT/tBACT for all pollutants be good combustion practices and following manufacturer's instructions for maintenance. In addition, PNWRE would comply with the applicable conditions for emergency engines from 40 CFR 60, Subpart IIII.

PNWRE has not selected a specific generator yet; however, the selected unit would not exceed 300 kilowatts in capacity. A conservative estimate of sufficient engine size (500 horsepower) and EPA Tier 3 nonroad emissions standards have been used to account for engine emissions from maintenance checks and readiness testing.

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16 Western Governors' Association. 2006. *WRAP Fugitive Dust Handbook.* Denver, CO. Prepared by Countess Environmental, Westlake Village, CA. September 7, 2006. Available: https://www.wrapair.org/forums/dejf/fdh/content/FDHandbook_Rev_06.pdf. Accessed July 5, 2023.

6 Air Dispersion Modeling Methodology

This section of the application report presents the procedures used to perform the air dispersion modeling analysis.

6.1 Model Selection

Version 22112 of the AERMOD model was used to estimate maximum ground-level concentrations in the air dispersion analysis. AERMOD is a refined, steady-state, multi-source air dispersion model used for industrial sources.

6.2 Meteorological Data

The modeling analysis was performed using five years of representative meteorological data prepared for input with AERMOD version 22112. The AERMOD meteorological data were derived using several data sets, including surface station data collected at the Bowerman Airport, WA, station (WBAN Station No. 94225) for calendar years 2018–2022. Upper air sounding data are taken from the Quillayute Airport, WA station (WBAN Station No. 72797). The meteorological data were processed with AERMET v22112, along with the ADJU* option to account for deficiencies in AERMOD under low wind speed conditions. Wind roses are found in **Appendix E**.

The AERMINUTE pre-processor (version 15272), a tool for assessing 1-minute ASOS data, was used to process 1-minute wind speed and direction data from Bowerman Airport. AERMINUTE produces hourly average winds from the 1-minute data that are used as inputs to AERMET's second stage.

In addition to the meteorological data, processing of land use data to derive albedo, Bowen ratio, and surface roughness was conducted using the AERSURFACE preprocessor (version 20060) in a manner consistent with EPA guidance. The resulting parameters are used by AERMOD to estimate surface energy fluxes and construct boundary layer profiles. EPA guidance indicates that AERSURFACE should be used to process land use arcs out to one kilometer from the project site and using arcs equal or greater than 30 degrees for assessing surface roughness. The most recent version of the AERSURFACE also allows for the incorporation of imperviousness data and canopy data that helps inform the surface roughness calculations. Bowen ratio and albedo are assessed by calculating their geometric means associated with common land use types across a 10 kilometer by 10 kilometer region.

For the project site, AERSURFACE processed National Land Cover (2016 NLCD) data acquired from the EPA.[17] These data were used as inputs to the AERSURFACE tool along with information on the meteorological surface data site, including that the site is not expected to have continuous snow cover in winter, that the site is not in an arid region, and that the site is an airport. The tool was also supplied with the canopy and imperviousness data from the NLCD data set.

[17] National Land Cover Data, as published by the EPA, ftp://newftp.epa.gov/aqmg/nlcd/

The results from AERSURFACE provided an albedo of 0.13 that did not vary by season. The Bowen ratio was calculated as 0.28, 0.24, 0.21, and 0.28 for winter, spring, summer, and autumn respectively. The surface roughness estimated by AERSURFACE is provided in **Table 3**.

TABLE 3
BOWERMAN AIRPORT SURFACE ROUGHNESS

Sector	Winter	Spring	Summer	Autumn
1	0.165	0.170	0.174	0.172
2	0.075	0.082	0.096	0.094
3	0.013	0.017	0.019	0.017
4	0.006	0.007	0.008	0.007
5	0.002	0.002	0.003	0.002
6	0.002	0.003	0.003	0.003
7	0.002	0.002	0.002	0.002
8	0.004	0.005	0.005	0.005
9	0.021	0.027	0.033	0.027
10	0.054	0.058	0.061	0.058
11	0.068	0.070	0.072	0.070
12	0.106	0.110	0.113	0.110

6.3 Coordinate System

The locations of emission sources, structures, and receptors are represented in the Universal Transverse Mercator (UTM) coordinate system using the North American Datum of 1983, Continental U.S. projection. The UTM grid divides the world into coordinates that are measured in north meters (measured from the equator) and east meters (measured from the central meridian of a particular zone, which is set at 500 kilometers). UTM coordinates for this analysis are based on UTM Zone 10. The location of the PNWRE facility is approximately 5,203,070 Northing and 430,485 Easting in UTM Zone 10.

6.4 Terrain Elevations

Terrain elevations for receptors, buildings, and sources were determined using the National Elevation Dataset (NED) supplied by the U.S. Geological Survey. The NED is a seamless data set with the best available raster elevation data of the contiguous United States. NED data retrieved for this model have a grid spacing of 1/3 arc-second or 10 meters. The AERMOD preprocessor, AERMAP version 18081, was used to compute model object elevations from the NED grid spacing. AERMAP also calculates hill height data for all receptors.

6.5 Urban/Rural Determination

The proposed PNWRE facility is located in the city of Hoquiam on the west coast of Washington. According to 2020 census data, Hoquiam has a population of 8,774.[18] Outside of the city, most of the land use is not considered urban (medium- to high-intensity developed land). For the purposes of this model, it is conservatively assumed that the area surrounding the facility does not meet the definition of urban land use. Therefore, the urban option was not selected in AERMOD.

6.6 Receptor Grids

The model has receptors along the fence line spaced 12.5 meters apart. There is also a variable-density, circular Cartesian receptor grid extending 10,000 meters from the center of the PNWRE facility site. This receptor grid spacing was set up according to the following list:

- 25-meter spacing for the first 400 meters from the center of the facility site.
- 50-meter spacing from 400 to 900 meters from the center of the facility site.
- 100-meter spacing from 900 to 2,000 meters from the center of the facility site.
- 300-meter spacing from 2,000 to 4,500 meters from the center of the facility site.
- 600-meter spacing from 4,500 to 10,000 meters from the center of the facility site.

In addition to the receptor grid above, a fine 12.5-meter spaced grid was used for the first 150 meters extending outward from the proposed facility's fence line. **Figure 3** and **Figure 4** show maps of the receptors. **Figure 5** shows the proposed facility with the fence line represented by the red outline surrounding the facility with included buildings.

[18] U.S. Census Bureau, Population Division. 2023. Annual Estimates of the Resident Population for Incorporated Places in Washington: April 1, 2020 to July 1, 2022 (SUB-IP-EST2022-POP-53). May 2023. Available: https://www2.census.gov/programs-surveys/popest/tables/2020-2022/cities/totals/SUB-IP-EST2022-POP-53.xlsx. Accessed June 30, 2023.

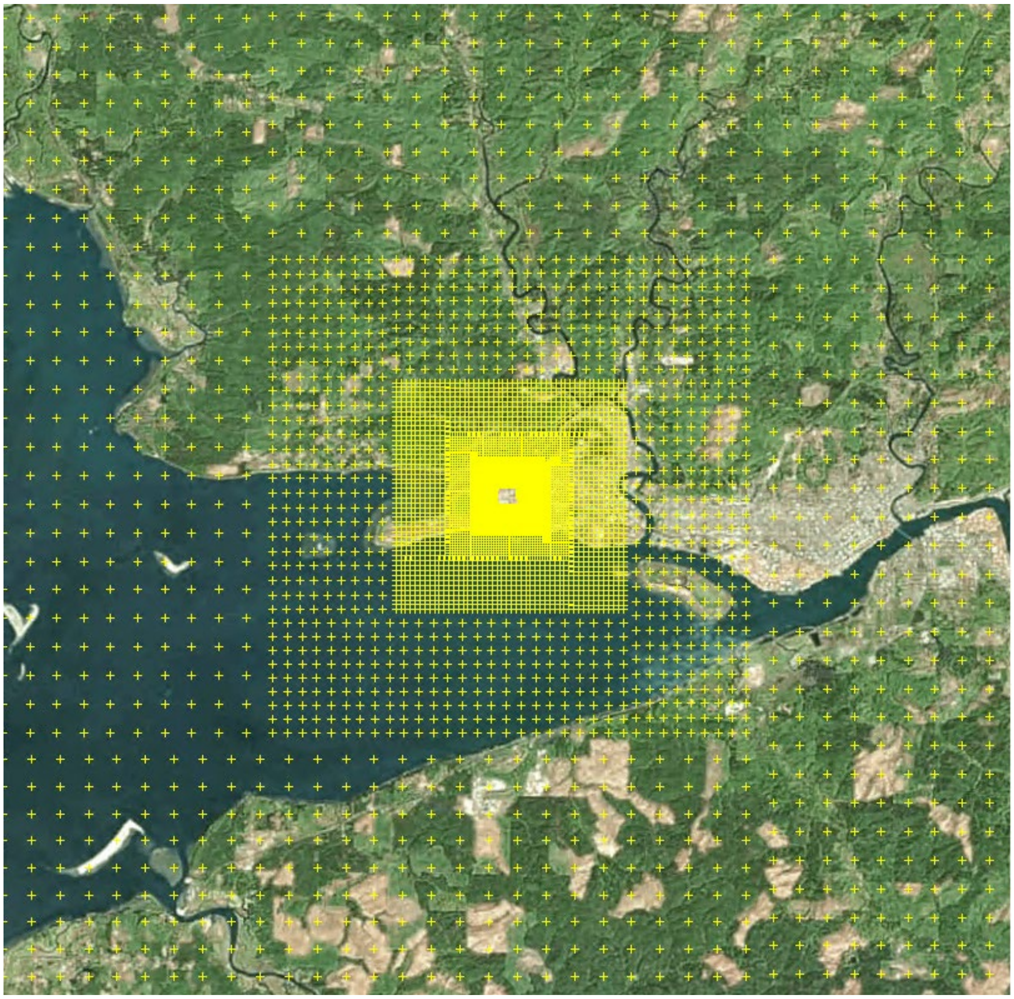

Figure 3 Zoomed-Out Receptor Grid

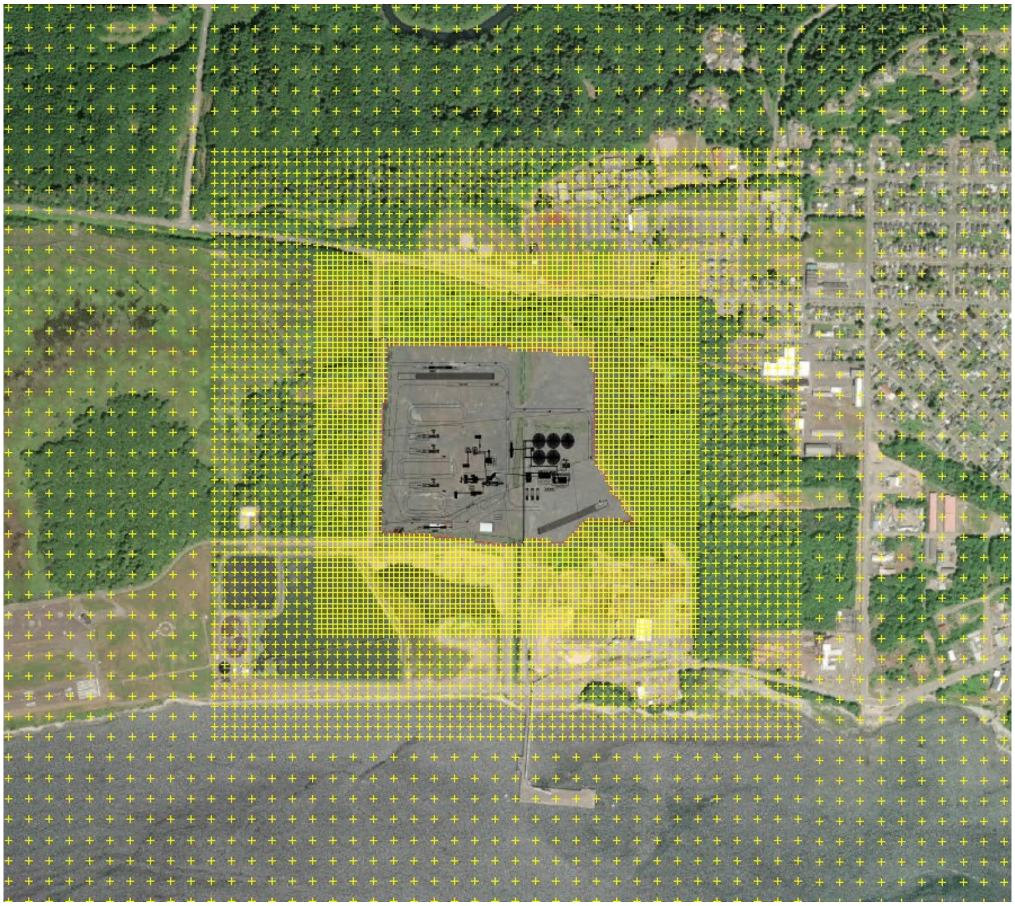

Figure 4 Zoomed-In Receptor Grid

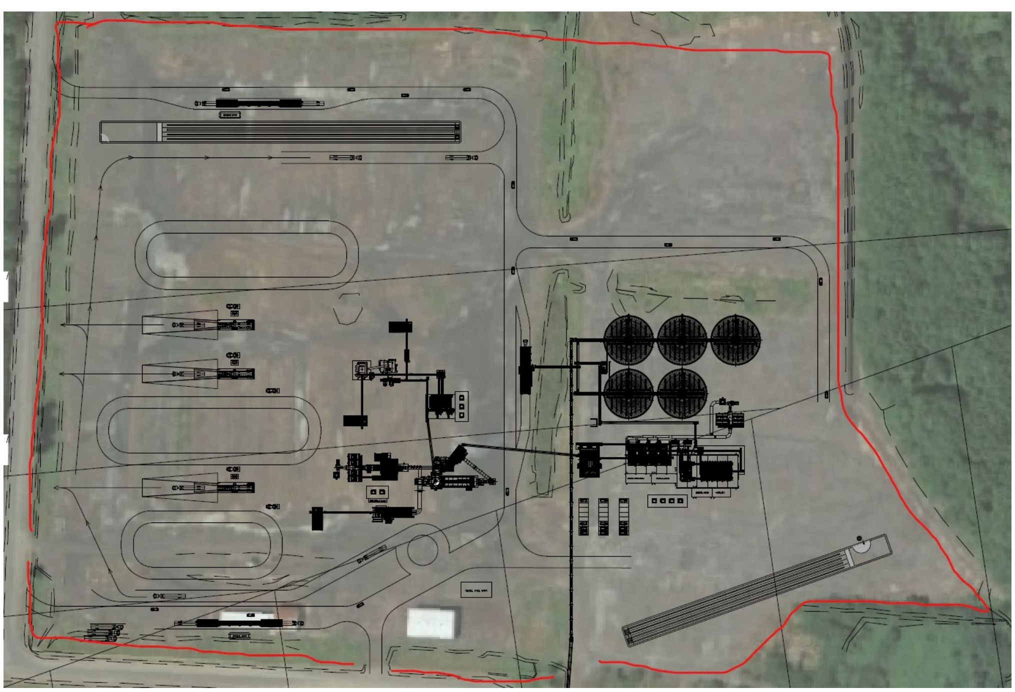

Figure 5 Facility Fence Line

6.7 Building Downwash

Emissions from a source are evaluated in terms of the source's proximity to nearby structures. The purpose of this evaluation was to determine whether stack discharges might become caught in the turbulent wakes of the structures at the PNWRE facility. Wind blowing around a building creates zones of turbulence greater than those that would exist if the buildings were absent. The concepts and procedures expressed in the Guideline for Determination of Good Engineering Practice Stack Height were applied.[19] All structures that may affect downwash of emissions from the proposed facility were included in the models and are presented in **Table 4**.

TABLE 4
BUILDING PARAMETERS

Building	Shape	Center (UTM X, UTM Y)	Building Height (m)	Side Length 1 (m)	Side Length 2 (m)	Diameter (m)
01	Rectangular	(430453, 5203005)	27.0	5.5	6.5	N/A
02	Rectangular	(430468, 5203026)	24.0	4.3	9.9	N/A
03	Rectangular	(430389, 5203010)	27.0	2.1	2.5	N/A
04	Rectangular	(430553, 5203020)	10.7	12.7	17.6	N/A
05	Rectangular	(430591, 5203027)	17.0	25.6	6.2	N/A
06	Rectangular	(430593, 5203016)	17.0	33.2	14.5	N/A
07	Rectangular	(430616, 5203011)	15.0	13.3	25.3	N/A
08	Rectangular	(430636, 5203010)	12.0	26.4	25.3	N/A
09	Rectangular	(430651, 5203026)	13.0	1.7	1.2	N/A
10	Rectangular	(430563, 5203091)	34.0	3.0	9.3	N/A
11	Rectangular	(430513, 5203090)	34.0	8.3	5.6	N/A
12	Rectangular	(430405, 5203088)	13.0	12.2	13.9	N/A
13	Rectangular	(430401, 5203051)	6.0	16.4	8.6	N/A
14	Rectangular	(430431, 5203120)	6.0	15.1	9.1	N/A
15	Rectangular	(430435, 5203099)	6.0	4.2	9.6	N/A
16	Rectangular	(430457, 5203085)	10.0	6.2	6.9	N/A
17	Rectangular	(430458, 5203064)	10.0	16.2	12.4	N/A
18	Rectangular	(430465, 5203006)	7.5	30.7	9.6	N/A
19	Rectangular	(430377, 5202978)	6.0	8.3	18.5	N/A
20	Rectangular	(430401, 5203016)	6.0	10.5	22.0	N/A
21	Rectangular	(430421, 5203017)	6.0	16.2	21.5	N/A
22	Circular	(430580, 5203112)	34.0	N/A	N/A	33.5
23	Circular	(430613, 5203112)	34.0	N/A	N/A	33.5
24	Circular	(430647, 5203112)	34.0	N/A	N/A	33.5
25	Circular	(430580, 5203071)	34.0	N/A	N/A	33.5
26	Circular	(430613, 5203071)	34.0	N/A	N/A	33.5

NOTES: m = meter; UTM = Universal Transverse Mercator; N/A = not applicable

[19] EPA, 1985. Guideline for Determination of Good Engineering Practice Stack Height. Available: https://www.epa.gov/sites/default/files/2020-09/documents/gep.pdf.

6.8 Source Types and Parameters

Emission releases from the equipment on-site were represented in the model as point sources, horizontal point sources, area sources, and volume sources. Emission unit parameters were based on vendor quotes and emissions estimates using EPA AP-42 and Region 10 Memorandum of emission factors for activities at sawmills in the Pacific Northwest. Area and volume source parameters were based on the dimensions of nearby structures or obstructions according to the User's Guide for the AMS/EPA Regulatory Model (AERMOD). The current facility site layout is provided in Appendix B.

The modeling parameters for the sources are determined based the following and are included in **Table 5** and **Table 6** as well as **Appendix F**:

- Exhaust temperature, exhaust flow rate/velocity, stack height, and stack diameter were obtained from client information. Engineering assumptions applied for modeling the backup emergency generator.
- Dimensions for the following volume source emission units were determined based on dimensions from the facility site plan and Table 3-2 of the AERMOD Users' Guide.
- Dimensions for the following area source emission units were configured according to Section 3.3.2.3 of the AERMOD Users' Guide.
- Haul road volume source parameters were determined using the dimensions of an average semi-truck trailer and the EPA guidance memo on haul roads.

TABLE 5
POINT SOURCE PARAMETERS

Source	Release Type	Center (UTM X, UTM Y)	Release Height (m)	Exit Velocity (m/s)	Exit Temperature (K)	Diameter (m)
Chips cleaning line	Vertical	(430412, 5203082)	15.0	15.7	283.2	1.20
Wet hammer mill 1 pneumatic system	Vertical	(430455, 5203054)	15.0	17.7	283.2	0.60
Wet hammer mill 2 pneumatic system	Vertical	(430462, 5203054)	15.0	17.7	283.2	0.60
Drying line WESP/RTO	Vertical	(430389, 5203010)	27.0	15.4	328.2	2.20
Dry milling & pellet line RCO	Vertical	(430640, 5203064)	27.0	18.6	374.2	2.10
Dry product intermediate storage	Horizontal	(430550, 5203018)	13.0	13.4	283.2	0.84
Dry product intermediate storage	Horizontal	(430556, 5203018)	13.0	13.4	283.2	0.84
Milled dry product intermediate storage	Horizontal	(430625, 5203028)	11.0	13.4	283.2	0.84
Silo 1	Vertical	(430583, 5203118)	28.0	13.8	283.2	0.84
Silo 2	Vertical	(430617, 5203118)	28.0	13.8	283.2	0.84
Silo 3	Vertical	(430650, 5203118)	28.0	13.8	283.2	0.84
Silo 4	Vertical	(430583, 5203077)	28.0	13.8	283.2	0.84
Silo 5	Vertical	(430617, 5203077)	28.0	13.8	283.2	0.84
Emergency generator	Vertical	(430415, 5203000)	2.7	130.3	822.2	0.10

NOTES: m = meter; m/s = meter per second; K = degrees Kelvin; UTM = Universal Transverse Mercator; N/A = not applicable

TABLE 6
VOLUME AND AREA SOURCE PARAMETERS

Source	Source Type	Configuration/Location	Release Height (m)	Initial Horizontal Dimension (m)	Initial Vertical Dimension (m)
White wood storage pile	Polygon Area	Dimension of the storage pile	3.05	N/A	1.4
Ground chips storage pile	Polygon Area	Dimension of the storage pile	3.05	N/A	1.4
Hog fuel wood storage pile	Polygon Area	Dimension of the storage pile	3.05	N/A	1.4
Truck route for white wood delivery	Multiple Volume	Following delivery route; entry and exit	2.55	9.0	5.1
Truck route for ground chips delivery	Multiple Volume	Following delivery route; entry and exit	2.55	9.0	5.1
Truck route for hog fuel delivery	Multiple Volume	Following delivery route; entry and exit	2.55	9.0	5.1
Truck route for product loadout	Multiple Volume	Following delivery route; entry and exit	2.55	9.0	5.1
Front end loader activity for white wood	Multiple Volume	Following loader paths to unload truck and load floor bin	4.46	10.7	8.9
Front end loader activity for ground chips	Multiple Volume	Following loader paths to unload truck and load floor bin	4.46	10.7	8.9
Front end loader activity for hog fuel wood	Multiple Volume	Following loader paths to unload truck and load floor bin	4.46	10.7	8.9
Product truck loading	Volume	Dimensions of the truck loading bucket	3.04	1.9	10.2

NOTES: m = meter; m/s = meter per second; N/A = not applicable

Emissions for all sources were calculated on a PTE basis and represent the maximum expected emissions from facility operations as described in Section 3 for point sources and presented in Appendix C for fugitive sources. Emissions from the emergency engine were estimated using 100 hours/year, per 40 CFR 60, Subpart IIII for emergency engines. The occurrence of maintenance and testing of this unit was assumed to only contribute to a maximum of one hour runtime on any given day for the 24-hour PM_{10}, 24-hour $PM_{2.5}$, 1-hour nitrogen dioxide (NO_2), 1-hour carbon monoxide (CO), and 8-hour CO national ambient air quality standards (NAAQS).

7 Air Dispersion Modeling Analysis

7.1 Toxic Air Pollutant Modeling

The Washington TAP program requires that where any predicted TAP emission rates would exceed their corresponding SQER values, the project proponent must show via dispersion modeling, that the predicted maximum concentrations do not exceed their corresponding ASIL concentration. The SQER and ASIL values are codified in WAC 173-460-150. As shown in Table 2 in Section 4.7 of this report, PNWRE identified 12 predicted TAP emissions rates that exceeded their SQER values and thus require dispersion modeling as part of the first-tier analysis. **Table 7** summarizes the results of the dispersion modeling and shows that the modeled concentrations are less than their respective ASIL values.

TABLE 7
MODELING RESULTS FOR TOXIC AIR POLLUTANTS

CAS Registry Number	TAP Name	Averaging Period	Emission Rate (lb/averaging period)	SQER[1] (lb/averaging period)	ASIL[1] (μg/m^3)	Modeling Result (μg/m^3)
57-97-6	7,12-Dimethylbenz(a) anthracene	year	1.72E-03	1.40E-03	8.50E-06	1.42E-08
75-07-0	Acetaldehyde	year	3.29E+02	6.00E+01	3.70E-01	8.58E-03
107-02-8	Acrolein	24-hr	1.39E+00	2.60E-02	3.50E-01	4.09E-02
71-43-2	Benzene	year	6.90E+01	2.10E+01	1.30E-01	1.03E-02
50-00-0	Formaldehyde	year	6.27E+02	2.70E+01	1.70E-01	1.33E-02
7440-38-2	Arsenic	year	1.61E+00	4.90E-02	3.00E-04	6.21E-06
7440-41-7	Beryllium	year	8.07E-02	6.80E-02	4.20E-04	3.12E-07
7440-43-9	Cadmium	year	4.14E-01	3.90E-02	2.40E-04	1.89E-06
CRVICOMP	Chromium, hexavalent	year	2.53E-01	6.50E-04	4.00E-06	9.68E-07
7439-96-5	Manganese	24-hr	3.17E-01	2.20E-02	3.00E-01	1.14E-02
7439-97-6	Mercury	24-hr	1.39E-02	2.20E-03	3.00E-02	5.03E-04
7440-02-0	Nickel	year	2.61E+00	6.20E-01	3.80E-03	1.05E-05

NOTES: CAS = Chemical Abstract Service; μg/m^3 = micrograms per cubic meter; ASIL = Acceptable Source Impact Level; hr = hour; lb = pounds; N/A = not applicable; SQER = Small Quantity Emission Rate; TAP = toxic air pollutant

1 SQER and ASIL values are from Washington Administrative Code 173-460-150.

7.2 National Ambient Air Quality Standards Modeling

ORCAA guidance for ambient air quality analyses suggests using an approved screening method to predict emissions impacts and compare them to the significance levels in ORCAA's rule 6.1.4 (Table 6.1.b).[20] If impacts are less than the insignificant impact thresholds, it can be concluded that the proposed source will not contribute to a violation of a standard. Based on engineering judgement, increases in PM_{10}, $PM_{2.5}$, NO_2, and CO emissions from the project would exceed the insignificant impact thresholds. Therefore, a cumulative NAAQS analysis would be required to demonstrate that the project would not cause or contribute to a violation of the NAAQS.

In a cumulative NAAQS analysis, the scope of the analysis is expanded from the SIL analysis to include impacts from nearby sources by including background concentrations. Background concentrations in **Table 8** were obtained from NW-AIRQUEST.[21] For each pollutant and averaging period, the concentration of the closest grid point to the proposed facility (coordinates 46.99, -123.89) was used.

20 ORCAA, 2023. Ambient Air Quality Analysis Fact Sheet. Available: https://www.orcaa.org/wp-content/uploads/AAQA-Fact-Sheet_2023.pdf. Accessed July 14, 2023.

21 Idaho DEQ, 2023. Background Concentrations 2014-2017. Available: https://idahodeq.maps.arcgis.com/apps/MapSeries/index.html?appid=0c8a006e11fe4ec5939804b873098dfe.

TABLE 8
BACKGROUND CONCENTRATIONS

Pollutant	Averaging Period	Background Concentration	Unit of Measure
PM_{10}	24-hour	42.1	µg/m^3
$PM_{2.5}$	24-hour	12.5	µg/m^3
	Annual	5.1	µg/m^3
NO_2	1-hour	15.1	ppb
	Annual	2.6	ppb
CO	1-hour	1.04	ppm
	8-hour	0.69	ppm

NOTES: µg/m^3 = micrograms per cubic meter; ppb = parts per billion; ppm = parts per million; CO = carbon monoxide; NO_2 = nitrogen dioxide; $PM_{2.5}$ = particulate matter 2.5 microns or less in diameter; PM_{10} = particulate matter 10 microns or less in diameter

Table 9 shows the modeled concentrations for the proposed PNWRE facility. All criteria pollutant concentrations are below the NAAQS. Therefore, the proposed facility has been demonstrated to be in compliance with the NAAQS.

TABLE 9
NATIONAL AMBIENT AIR QUALITY STANDARDS MODEL RESULTS

Pollutant	Averaging Period	Design Concentration	Modeled Concentration	Total Concentration	NAAQS	Exceeds NAAQS? (Yes/No)
PM_{10} (µg/m^3)	24-hour	H6H	79.8	122	150	No
$PM_{2.5}$ (µg/m^3)	24-hour	H8H	11.6	24.1	35	No
	Annual		3.86	8.96	12	No
NO_2 (ppb)	1-hour	H8H	68.6	83.7	100	No
	Annual		0.818	3.42	53	No
CO (ppm)	1-hour	H2H	0.381	1.42	35	No
	8-hour	H2H	0.0809	0.771	9	No

NOTES: µg/m^3 = micrograms per cubic meter; ppb = parts per billion; ppm = parts per million; CO = carbon monoxide; NAAQS = national ambient air quality standard; NO_2 = nitrogen dioxide; $PM_{2.5}$ = particulate matter 2.5 microns or less in diameter; PM_{10} = particulate matter 10 microns or less in diameter