Statement of Basis for the Air Operating Permit—Final

Puget Sound Energy
Ferndale Generating Station

Ferndale, Washington

August 4, 2022

northwest Clean Air agency

Serving Island, Skagit & Whatcom Counties

PERMIT INFORMATION

Puget Sound Energy
Ferndale Generating Station
5105 Lake Terrell Road, Ferndale, WA 98248

SIC: 4931 **NWCAA ID: 1667-V-W**
NAICS: 221
EPA AFS: 53-073-0037

Responsible Corporate Official

Mark Carlson
Director, Generation and Natural Gas Storage
Puget Sound Energy
1200 Prudential Blvd.
Longview, WA 98632
(360) 353-7220

Corporate Inspection Contact

Tim Miller, Plant Manager
Puget Sound Energy
Ferndale Generating Station
5105 Lake Terrell Road
Ferndale, WA 98248
(360) 380-2119

Northwest Clean Air Agency

1600 South Second Street
Mount Vernon, Washington 98273-5202
(360) 428-1617

Prepared by

Christos Christoforou, P.E.
Engineer
(360) 428-1617 ext. 214

Air Operating Permit Number:	**Issuance Date:**
006R4	August 4, 2022
Supersedes Permit Number:	**Expiration Date:**
006R3M1	August 4, 2027
Application Received Date:	**Renewal Application Due:**
July 8, 2021	August 4, 2026

TABLE OF CONTENTS

1 Introduction 1
1.1 Permit Changes in the Fourth Renewal 1
2 Facility Description 3
2.1 General Facility Description 3
2.2 Emission Unit Description 3
2.3 Emissions Inventory 8
2.4 Permitting History 9
2.5 Compliance History 11
3 Basis of Regulation Applicability 13
3.1 New Source Performance Standards (NSPS) 13
3.2 National Emissions Standards for Hazardous Air Pollutants (NESHAP) 15
3.3 Acid Rain Program 15
3.4 Compliance Assurance Monitoring (CAM) 16
3.5 Risk Management Plan (RMP) 17
3.6 New Source Review (NSR) 17
4 General Permit Assumptions 22
4.1 Permit Content 22
4.2 Excluded Requirements 22
4.3 Federal Enforceability 23
4.4 Gap Filling and Sufficiency Monitoring 24
4.5 Future Requirements 26
4.6 Compliance Options 26
5 Permit Elements and Basis for Terms and Conditions 27
5.1 Permit Organization 27
5.2 Permit Information and Attest 27
5.3 Section 1 Emission Unit Identification 27
5.4 Section 2 Standard Terms and Conditions 27
5.5 Section 3 Standard Terms and Conditions for NSPS and NESHAP 27
5.6 Generally Applicable Requirements 28
5.7 Section 5 Specific Requirements for Emissions Units 30
5.8 Section 6 Acid Rain Permit for Combustion Turbines 1A and 1B 34
5.9 Section 7 Inapplicable Requirements 35
6 Insignificant Emission Units 36
7 Definitions And Acronyms 40
8 Public Docket 42

TABLES

Table 2-1 Potential to Emit (ton/yr) 8
Table 2-2 Fuel consumption 9
Table 2-3 Emissions Inventory (ton/yr) 9
Table 2-4 Emissions Inventory for Air Toxics (lb/yr) 9
Table 4-1 AOP terms with Directly Enforceable gapfill provisions 25
Table 4-2 AOP terms with Directly Enforceable sufficiency provisions 26
Table 6-1 Insignificant Activities and Emission Units 36

FIGURES

Figure 2-1 PSE Ferndale Cogeneration Station location 4
Figure 2-2 Process flow diagram 5
Figure 2-3 PSE Ferndale plot plan 6

1 INTRODUCTION

The Puget Sound Energy, Ferndale Generating Station (identified herein as the permittee, the facility, or PSE Ferndale), located in Ferndale, Washington, is required to obtain an air operating permit because it has the potential to emit 100 tons or more of each of the following "criteria"[1] pollutants: oxides of nitrogen (NO_X), sulfur dioxide (SO_2), and carbon monoxide (CO). These air pollutants are defined as regulated pollutants in the Chapter 173-401 of the Washington Administrative Code (WAC). The primary sources of these and other emissions are produced by the burning of natural gas and fuel oil[2] in two General Electric (GE) Frame 7EA combustion turbines and associated duct burners at the facility. Furthermore, the PSE Ferndale Generating Station is subject to the acid rain program (Title IV of the Clean Air Act), which also triggers the requirement to obtain an air operating permit.

The purpose of this Statement of Basis is to set forth the legal and factual basis for the conditions of the PSE Ferndale Air Operating Permit (AOP) No. 006R4 in accordance with WAC 173-401-700(8). This document also provides background information to facilitate review of the permit by interested parties. The Statement of Basis is not a legally enforceable document.

1.1 Permit Changes in the Fourth Renewal

The Northwest Clean Air Agency (NWCAA) received an application for the renewal of the PSE Ferndale AOP on July 8, 2021.

The following changes have been made to the AOP during this renewal:

- Regulatory citations in the permit were revised to reflect new or modified regulations and updated revision/promulgation dates.
- Formatting throughout the entire permit has been updated to current NWCAA standards.
- Contact names and information for PSE and the NWCAA were updated as appropriate. In addition, the Permit Information page reflects the updated permit number and dates for the permit renewal.
- AOP Section 2 (Standard Terms and Conditions) has been replaced with the latest NWCAA standard version, containing any new or modified regulations and updated reference dates.
- AOP Section 3 (Standard Terms and Conditions for NSPS and NESHAP) has been replaced with the latest NWCAA standard version of applicable requirements, containing any new or modified regulations and updated reference dates.

[1] The Environmental Protection Agency (EPA) calls these pollutants "criteria" air pollutants because it regulates them by developing human health-based and/or environmentally-based criteria (science-based guidelines) for setting permissible levels in the ambient air. For more information, please visit the EPA's website www.epa.gov/air/urbanair.

[2] The terms "fuel oil", "No. 2 distillate", "diesel fuel", "diesel oil", "No. 2 diesel", and "oil" all are synonymous with the term "on-road spec oil" within the context of the facility's Air Operating Permit and Statement of Basis. "On-road spec oil" means "on-road specification No. 2 diesel fuel" containing no more than 0.05 percent sulfur by weight, as specified in 40 CFR 80.29, as amended through January 18, 2001.

- AOP Section 4 (Generally Applicable Requirements) were reviewed and updated. Section 4 primarily lists NWCAA and Washington Administrative Code (WAC) regulations, which often lack specific methods for compliance determination and require that additional monitoring, recordkeeping and recording provisions be added to the AOP for the purpose of compliance determination. This aspect of Air Operating Permits, known as gap-filling and sufficiency monitoring, is discussed further in Section 4.4. Gap-filled and sufficiency monitoring requirements in the AOP Section 4 were modified for this renewal to be consistent with NWCAA's new format for this section.
- The reference to NWCAA 104.2 was removed from individual permit term citations since it is cited in the introductions to Sections 3, 4 and 5.
- OAC 334g was issued on June 6, 2022 to allow for alternate ammonia testing methods. The relevant AOP terms have been updated.
- The Acid Rain Permit and Certificate of Representation for the two Units are included in AOP Section 6. Both documents have been updated since the last AOP renewal.
- The Statement of Basis content and layout were revised to standardize the documents issued for the Puget Sound Energy facilities within NWCAA jurisdiction. Factual information was revised to correct for current operation and some text has been rephrased to add clarification.

2 FACILITY DESCRIPTION

2.1 General Facility Description

The PSE Ferndale facility is located on 14 acres on the 5100 block of Lake Terrell Road in Ferndale, Washington (see Figure 2-1), approximately seven miles northwest of the City of Bellingham and adjacent to the Phillips 66 Ferndale Refinery (refinery). The facility produces up to 270 megawatts (MW) of electrical power output and steam for the refinery.

The PSE Ferndale Generating Station is a combined cycle cogeneration facility that produces electric power and steam from the combustion of natural gas and up to 20.4 million gallons of low-sulfur diesel per year. In a combined cycle gas turbine plant, a gas turbine generator generates electricity, and heat in the exhaust is used to make steam, which in turn drives a steam turbine to generate additional electricity. This last step enhances the efficiency of electricity generation. The Ferndale plant started as an Independent Power Producer (IPP) when it was built and came online in April of 1994. However, this status changed when it was purchased by PSE (a regulated utility) in 2012. The electric power generated is now transferred to the transmission system operated by PSE and steam is transferred, as requested, to the adjacent refinery for use in their processes. PSE Ferndale produces electricity and steam on an intermittent basis as electrical demand and economic factors allow.

PSE Ferndale consists of two combustion turbines, each equipped with 250 MMBtu/hr duct burners and a heat recovery steam generator. PSE Ferndale also operates an extraction/condensing steam turbine, as well as equipment for fuel oil storage, an electrical switchyard, and equipment for fire suppression, water treatment, and combustion turbine compressor cleaning. Each combustion turbine is capable of producing 91 MW, and the steam turbine is capable of producing 88 MW. Full nominal rating of the facility is 270 MW. Figure 2-2 shows the process flow diagram of the facility, and Figure 2-3 shows the facility plot plan.

Diesel is delivered to the PSE Ferndale site by tanker truck and is stored onsite in a 2.1 million-gallon capacity storage tank. Williams Northwest Pipeline supplies natural gas to the facility via a Cascade Natural Gas Corporation pipeline.

2.2 Emission Unit Description

Emission units at the facility consist of two combustion turbines that are each equipped with duct burners and selective catalytic reduction systems, and a single aboveground diesel fuel storage tank.

2.2.1 Combustion Turbines, Duct Burners, and Steam Generators

The two main emission units are GE Frame 7EA combined cycle combustion turbine generator systems and associated heat recovery steam generators, each of which employs a duct burner. As shown in Figure 2-2, each combustion turbine exhausts to a duct burner-equipped heat recovery steam generator, through a selective catalytic reduction section, then to an exhaust stack. The combustion turbines can be fueled by either natural gas or low-sulfur No. 2 diesel, but the duct burners inside the heat recovery steam generators are permitted to be fired on natural gas only.

Figure 2-1 PSE Ferndale Cogeneration Station location

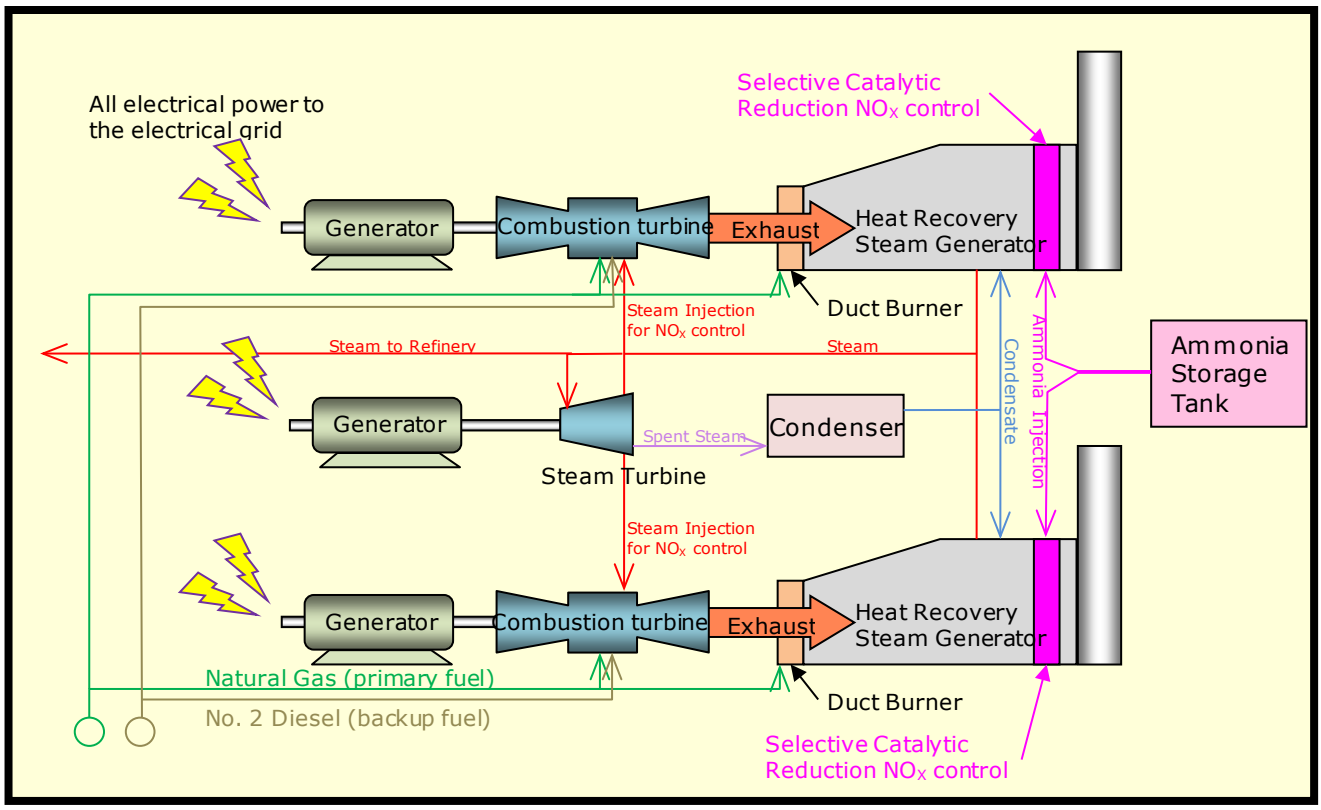
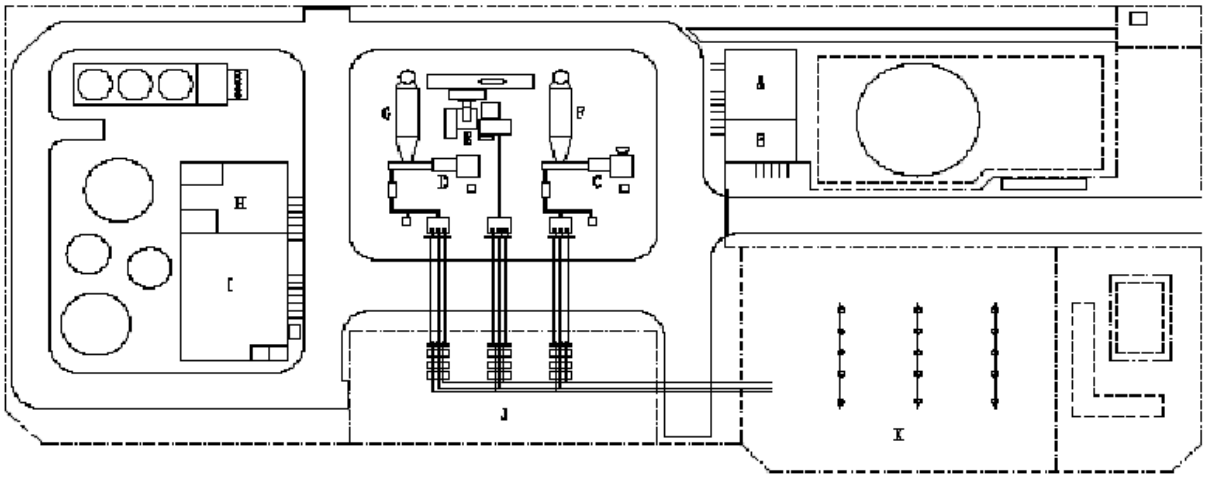


Figure 2-2 Process flow diagram

Figure 1-2

PSE-Ferndale Site Map



Legend:

Boundary and Fencing
Containment
Pavement

Equipment Locations:

A. Building A
B. Building B
C. Gas Turbine A
D. Gas Turbine B
E. Steam Turbine
F. HRSG A
G. HRSG B
H. Building H
I. Building I
J. Tennaka Switch Yard
K. Puget Power Substation

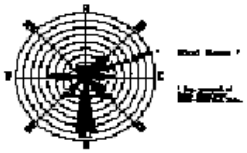


Figure 2-3 PSE Ferndale plot plan

The combustion turbines work on the same principle as those used in jet aircraft. First, incoming air is compressed by rotating vanes in the compressor section. The highly compressed hot air passes to the combustor section where it is mixed with fuel and ignited in combustion cans. Steam is injected into the combustor sections of the turbines to reduce peak combustion temperatures to reduce formation of NO_X. The rapidly expanding hot gases exit the combustion section and drive a turbine, which powers a generator at the back end as well as the compressor section. The hot gases then exhaust to the heat recovery steam generator (HRSG). The combustion turbines are designated GT/HRSG-1A and GT/HRSG-1B by PSE Ferndale (GT for gas turbine).

The HRSGs have three main components: duct burners, boiler tubes, and a catalyst grid. Hot gases from the turbines pass by the duct burners, which combust natural gas into the hot gas stream for additional steam production during peak steam and/or energy demand. The gases then pass through and transfer heat energy to a set of boiler tubes to convert water in the tubes to steam. This steam passes through a steam turbine generator on its way to the refinery. The exhaust gases, now somewhat depleted in energy, pass through a catalyst grid, where anhydrous ammonia is injected for control of NO_X and then pass through additional boiler tubes before being vented to the atmosphere through a vertical stack. The heat recovery steam generators are designated HRSG-1A and HRSG-1B.

The primary fuel used in the combustion turbines and HRSGs is natural gas. The maximum design heat rate for each combustion turbine when combusting natural gas is 10,116 Btu/kWh (the amount of Btu input needed to make 1 kWh of output, LHV, 100 percent load, 60°F) or 924 MMBtu/hr. An additional 250 MMBtu/hr can be added using the duct burners in each of the HRSGs.

The backup fuel used in the combustion turbines is No. 2 diesel fuel with a maximum sulfur content of 0.05 weight percent. The maximum design heat rate for each combustion turbine when combusting No. 2 diesel fuel is 10,145 Btu/kWh (LHV, 100 percent load, 60°F) or 927 MMBtu/hr.

The stacks for each of the GT/HRSG systems are the only two emission points from these units. The height of each stack is 180 ft, and the diameter of each stack is 14 ft.

Nitrogen oxides (NO_X) from the GT/HRSG systems are controlled by injection of steam into the turbine combustors and by a selective catalytic reduction (SCR) system. Steam injection limits peak combustion temperatures thereby reducing formation of thermal NO_X. Ammonia (NH_3) is injected ahead of a catalyst grid in the HRSG section to further lower the NO_X concentration in the exhaust gas. Most of the NO_X reacts in the presence of ammonia and the catalyst to form elemental nitrogen and water. Ammonia emissions (or "ammonia slip") are controlled by regulating the rate of ammonia injection into the SCR system.

Sulfur dioxide emissions are limited by the use of low-sulfur content fuels, i.e., natural gas and ultralow-sulfur diesel. The flow of each fuel is monitored continuously. The SO_2 emission rate from each GT/HRSG system is calculated based on the sulfur content of the fuel and the fuel flow rate.

Emissions of particulate matter, nearly all of which is composed of particles with a mean aerodynamic diameter smaller than 10 microns (PM_{10}), as well as carbon monoxide (CO) and volatile organic compounds (VOC), are minimized by the use of "good combustion practice." Stationary turbines generate the least amount of combustion byproducts such as PM_{10}, CO, and VOC when they are operating most efficiently. It is in the best interest of the source to maintain the equipment in peak operating condition in order to minimize operating expense. PSE Ferndale is required to maintain the GT/HRSG systems according to an approved air compliance operation and maintenance (O&M) manual.

Continuous emission monitoring systems (CEMS) continuously measure NO_X emissions and O_2 from the turbine exhaust stacks. And, although not directly required for compliance, PSE Ferndale also operates a NO_X CEMS just prior to the SCR to assist in monitoring SCR performance.

2.2.2 Bulk Storage Tank

In addition to the turbines and HRSGs, other major equipment includes the back-up diesel fuel storage tank. Low-sulfur No. 2 diesel fuel used as back-up fuel for the combustion turbines is stored on site in a 2.1 million-gallon vertical fixed-roof tank. The use of No. 2 diesel fuel is limited to a maximum of 20.4 million gallons per year (total for both turbines) by Condition 3 of PSD No. 91-04 Amendment 1. Actual diesel fuel usage was approximately 2,661 gallons in 2020.

"Good engineering practices" are used to minimize evaporative emissions of VOC from the diesel storage tank. Good engineering practices consist of painting the tank a light color and using it only for storage of low vapor pressure diesel fuel, and taking precautions to minimize spillage during fuel transfer activities. There is no specific air pollution control equipment installed on the diesel fuel storage tank.

2.2.3 Fire Pump Engine

PSE Ferndale maintains a 182 brake horsepower (BHP) diesel-driven fire pump for emergency use. The engine is tested for 30 minutes each week to ensure proper operation. The engine's fuel supply is a 270-gallon storage tank containing low sulfur diesel, which contains a maximum of 0.05 wt% sulfur. The engine is located in the fire pump room on the south end of the Water Treatment/Control Room building.

2.2.4 Ammonia Storage Tank

As described above in section 2.2.1, PSE Ferndale employs SCR, which requires ammonia injection into the exhaust gas ahead of a catalyst bed, to reduce NO_X emissions. Bulk anhydrous ammonia is stored onsite in a tank near the HRSGs. PSE Ferndale is required to have a Risk Management Plan according to the requirements of 40 CFR 68 because of the amount of ammonia stored on site for use in the SCR systems. Annual source tests measure ammonia emissions from the facility at the GT/HRSG stack.

2.3 Emissions Inventory

The facility qualifies as a major source subject to the requirements of the Clean Air Act (CAA) Title V program because it has the potential to emit more than 100 tons per year (tpy) of nitrogen oxides, sulfur dioxide, and carbon monoxide.

According to the Amendment 1 of PSD 91-04 application submitted to the WA State Department of Ecology, the facility's potential to emit is shown in Table 2-1.

Table 2-1 Potential to Emit (ton/yr)

	NOx	CO	SO2	VOC	PM	PM10
Potential emissions (ton/yr)	342	366	100	82	74	70

According to annual emissions inventories submitted by the facility (see Table 2-4), formaldehyde is the hazardous air pollutant emitted at highest rates. Using an emission factor of 7.10E-04 lb of formaldehyde per MMBtu, and an hourly heat consumption of 2533 MMBtu per hour, potential annual emissions for formaldehyde are 7.9 tons. Therefore, the facility is not major for HAP.

2.3.1 Actual Emissions

Tables 2-2 and 2-3 list fuel usage and air emissions, respectively, from the PSE Ferndale facility as reported in past annual emissions inventory reports.

Table 2-2 Fuel consumption

Fuel	2015	2016	2017	2018	2019	2020
Diesel (in 1000 gallons)	5.9	8.4	1.9	167.4	4.2	2.6
Natural gas (in million scf)	6,756	5,600	5,948	5,067	8,048	8,598

Table 2-3 Emissions Inventory (ton/yr)

Pollutant	2015	2016	2017	2018	2019	2020
PM	26.1	24	25.7	19.7	29.2	31.7
PM_{10}	26.1	24	25.7	19.7	29.2	31.7
$PM_{2.5}$	26.1	24	25.7	19.7	29.2	31.7
SO_2	6.6	8.2	8	5.8	7.8	9.2
NO_X	87.1	78.6	77.5	62.7	103.8	113.4
VOC	9.6	8.1	8.3	7.3	11.4	12.2
CO	10	8.5	8.7	7.6	11.9	13.2
CO_2	443,916	371,956	386,385	182,233	526,614	559,561

Table 2-4 Emissions Inventory for Air Toxics (lb/yr)

Toxic Air Pollutant	2015	2016	2017	2018	2019	2020
1,3-butadiene	4	2	2	2	4	4
Acetaldehyde	1,275	1,073	1,143	944	1,489	1,596
Acrolein	26	22	24	20	30	35
Ammonia	9,380	6,560	4,760	4,160	6,380	15,460
Benzene	86	72	76	64	100	107
Ethylbenzene	232	195	208	171	271	290
Formaldehyde	4,899	4,065	4,310	3,541	5,642	6,151
Hexane	399	278	12	377	504	212
Naphthalene	10	8	8	7	10	12
PAHs	8	13	14	13	18	20
Propylene oxide	207	175	186	153	242	259
Sulfuric acid	1,063	1,328	1,280	934	1,255	1,490
Toluene	971	818	871	719	1,133	1,216
Xylene	462	389	415	342	540	579
Zinc	7	4	0	6	8	4

2.4 Permitting History

On January 11, 1991, the facility submitted a Notice of Construction (NOC) application to the Northwest Clean Air Agency to construct and operate two combustion turbine/heat recovery steam generator trains with supplemental firing, a single steam turbine generator, two auxiliary boilers, and an emergency generator. The NOC was reviewed under the minor new source review program as required by NWCAA Regulation Section 300 and WAC 173-400-110, and Order of Approval to Construct (OAC) 330 was issued by

NWCAA on April 9, 1992 for the project.

The Washington State Department of Ecology (Ecology) Prevention of Significant Deterioration (PSD) Approval No. 91-04 was issued to the facility on June 10, 1992, and the facility began commercial operations in April 1994.

The facility requested a change to their PSD Approval in May 1996. The request was for removal of the words "or operation" from the following sentence in Condition 15: "This approval shall become void if construction of the project is not commenced within 18 (eighteen) months after receipt of final approval, or if construction or operation of the project is discontinued for a period of eighteen (18) months." Ecology made the administrative change to PSD 91-04 in June 1996. At the time this change was not considered to be an "amendment."

In June 1998, the facility requested several changes to their PSD and OAC permits. These included eliminating references to equipment never installed (two auxiliary boilers and one standby diesel generator) or fuels never used (refinery gas), clarifying permit language, clarifying reporting requirements, and allowing alternative monitoring methods for NH_3 and CO. These requested changes were made in OAC 330 Revision 3 issued in September 1999 and in Ecology PSD 91-04 Amendment 1 issued in January 2000.

In 2001 the facility implemented a project to install foggers on the turbines. The foggers inject water vapor into the inlet of the turbine to reduce the temperature of the ambient air thereby causing a gain in turbine performance. An analysis of emission increases was performed, and as a result the NO_X emission limit was reduced from 7 to 6 parts per million on a dry, volumetric basis (ppmvd[3]) to account for the slight increase in fuel consumption during fogger operation. No other emission limits were modified due to this project. OAC 330 Revision 4 was issued on June 7, 2001 to incorporate new conditions required for operation of the foggers. Condition 6 in the revised OAC required the facility to conduct annual testing for VOC.

In December 2001 a Notice of Construction was received from the facility to install performance enhancing upgrades to the turbines as part of the inspection and maintenance process at the station. These upgrades resulted in a 1.95% improvement in the efficiency of the turbines and a net increase in power output of about 4.95%. The potential increase in fuel usage was estimated to be 2.8% which would result in additional emissions. However, a PSD analysis was done by the Department of Ecology using the WEPCO methodology[4], and they determined that the increases would not be significant. OAC 330 Revision 5 was issued on April 12, 2002 to include minor changes in operating conditions as a result of this project. This included annual testing for PM/PM_{10} (front and back half analysis.)

OAC 330 Revision 5, Condition 6 required the facility to conduct annual source testing for CO, ammonia, VOC and PM/PM_{10}. In addition, the source test reports were to include a summary of the annual net increase or decrease in emissions of NO_X, PM_{10}, CO, VOC, and SO2 as a result of the project following the WEPCO procedure (past actual emissions vs. actual emissions) representing actual operating conditions throughout the year (e.g., including the effects of all fuels burned and the effects of the foggers, if they were operated). Source tests in 2002 and 2003 indicated that actual emissions were lower than emissions before the two projects. This is attributable to the increased efficiency of

[3] "by volume, on a dry basis" means that water vapor is removed from the exhaust gas prior to pollutant measurement, and the measurement is made on a volumetric basis (as opposed to a mass basis).

[4] The Wisconsin Electric Power Company (WEPCO) methodology allowed Ecology to analyze past-actual to future-actual emissions due to the turbine upgrade projects when determining the significance of emissions.

the upgraded turbines and the fact that the turbines rarely operate under peak load conditions.

In January 2007 the facility applied for an administrative revision to OAC 330 Revision 5 to remove the five-year requirement to conduct annual source testing for PM_{10} and VOC emissions. Tests completed during calendar years 2002 through 2006 satisfactorily demonstrated that the installation of the inlet air foggers in 2001 and the major turbine upgrades in 2002 did not result in past-actual to future-actual emissions in excess of PSD thresholds. This 1992 Pre-New Source Review (NSR) Reform rule applied only to electrical utility steam generating units and was allowed as an alternative to the standard PSD past-actual to future-potential test. Because annual source testing for CO and NH_3 were required during the original OAC 330 issuance as the sole means of compliance assurance for these pollutants, annual testing continues to be required for CO and NH_3.

The NWCAA issued OAC 330f on May 14, 2007, which removed the facility's obligation to conduct annual PM_{10} and VOC source testing. Additional revisions were made in an effort to facilitate incorporation of the OAC into the air operating permit (AOP). These include:

- Removal of the odor enforcement condition and obsolete conditions requiring initial source testing and the requirement to submit a quality assurance manual for CEM prior to commercial startup,
- Updating the ammonia source test method,
- Revision of elements prescribing source testing and CEM operation to reflect provisions of NWCAA Section 367 and NWCAA Appendix A that the Agency adopted in 2005.

The NWCAA issued OAC 330g on June 6, 2022, which amends Condition 5(B) to allow other testing methods for ammonia. In addition, the recurrence of testing was revised from "between 11 and 13 months" to "within 13 months" of the previous test.

2.5 Compliance History

The PSE Ferndale facility is a major source and, as such, has been either a registered air pollution source or a Title V source since its start-up in 1994.

2.5.1 Notice of Violation

PSE Ferndale is required to notify NWCAA if events such as a breakdown, start-up, or shutdown result in excess emissions to the atmosphere. NWCAA then makes a determination as to whether there was a violation of an AOP term. If a violation is determined to have occurred, enforcement action may be taken. This may include issuance of a Notice of Violation (NOV), reporting in the Aerometric Information Retrieval System (AIRS) database, and possible listing with EPA Region 10 as a High Priority Violation (HPV). The source is then tracked until it returns to compliance.

NWCAA has issued three NOVs to the facility since it began operation in 1994 – one for a late cylinder gas audit of the CEMS in 1998 (issued a NOV Warning), one for another late cylinder gas audit of the CEMS in late 2000, and one for failing to submit an AOP semi-annual monitoring certification in a timely manner in 2001.

At the time of this permit issuance, there are no unresolved enforcement issues.

2.5.2 Compliance Reports

The PSE Ferndale AOP requires monthly, quarterly, semiannual, and annual reports to be submitted to the NWCAA as part of the facility's ongoing compliance demonstration. The facility submits a monthly summary report of emissions and process information. The

monthly report also must identify any excess emissions and provide a discussion as to the cause and what was done to correct the problem. PSE Ferndale submits information about quality assurance/quality control (QA/QC) actions taken on continuous emission monitoring systems (such as Cylinder Gas Audits, Linearity Checks, or Relative Accuracy Test Audits) in quarterly reports submitted as part of the monthly report for the month in which the QA/QC actions occur. Each report submitted by the facility is certified by the responsible corporate official. Certification of the truth and accuracy of reported information by the responsible official is required at least semiannually. Annually, the responsible corporate official also certifies compliance with all applicable requirements in the AOP term by term and whether the facility was fully or intermittently in compliance with each term.

3 BASIS OF REGULATION APPLICABILITY

3.1 New Source Performance Standards (NSPS)

40 CFR 60 Subpart A – General Provisions: The NSPS General Provisions apply to the owner or operator of a stationary source that contains an affected facility. Since the combustion turbines at the facility are subject to 40 CFR 60 Subpart GG - NSPS for Stationary Gas Turbines and the duct burners are subject to 40 CFR 60 Subpart 60 Subpart Db – Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units, the combustion turbines and duct burners are "affected facilities". Therefore, the General Provisions of 40 CFR 60 Subpart A apply to those units. NSPS Subpart A requirements are listed in Section 3 of the AOP as generally applicable to affected facilities.

40 CFR 60 Subpart Db – Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units: This standard applies to the HRSG duct burners since they were constructed after June 19, 1984, and each has a maximum design heat input capacity of 250 MMBtu/hr, which is greater than the 100 MMBtu/hr applicability threshold but just below the threshold of applicability for 40 CFR 60 Subpart Da (more than 250 MMBtu/hr).

Subpart Db contains no sulfur dioxide (60.42b) or particulate matter (60.43b) limits for affected units fired on natural gas only. However, some recordkeeping and reporting requirements do apply.

60.44b(a)(4)(i) limits NO_X emissions from duct burners in combined cycle systems that combust natural gas to 0.20 lb NO_X (expressed as NO_2) per MMBtu heat input. In the previous version of the facility's AOP, a determination was made that the 0.20 lb NO_X/MMBtu limit did not apply since the duct burners are permitted to burn only natural gas. However, an exemption from the Subpart Db NO_X limit also requires a permitted operational limit of an annual capacity factor of 10% or less, which PSE Ferndale does not have. There is no federally enforceable requirement in any PSE Ferndale permit that limits the annual heat input to the duct burners. Therefore, the exemption in 40 CFR 60.44b(k) does not apply – the NO_X limit does indeed apply to the duct burners. PSE Ferndale is not required to install a continuous emissions monitoring system to measure NO_X emissions from the duct burners themselves (60.48b(h)).

NSPS Subpart Db specifies primarily fuel use-related recordkeeping and reporting requirements and an initial testing requirement for purposes of compliance demonstration with regard to the NO_X limit.

An initial source test was conducted on the GT/HRSG train in March and April 1994. NO_X emissions from the GT/HRSGs were measured at four loads; one load was the gas turbines fired at 100% capacity with no duct burner firing ("90% Load"), and one load was both the gas turbine and the duct burner fired at 100% capacity ("100% Load"). NSPS Subpart Db requires an initial source test for NO_X emissions according to 40 CFR 60 Appendix A Method 7E. During the initial source test, NO_X emissions were measured using 40 CFR 60 Appendix A Method 20, which refers to 40 CFR 60 Appendix A Method 7E for NO_X emissions measurement. The NO_X emissions from the GT/HRSG at 90% load (turbine only) averaged 0.023 lb/MMBtu for both GT-1A and GT-1B. At 100% load, (both turbine and duct burners firing at 100%), the NO_X emissions averaged 0.023 lb/MMBtu and 0.020 lb/MMBtu for GT-1A and GT-1B, respectively. Since the GT/HRSGs are each equipped with SCR after the duct burners, the NO_X emissions are controlled to 7 ppmvd at 15% O_2[5]

[5] Correcting pollutant concentration measurements to 15% oxygen eliminates the variability of excess air dilution in the exhaust gas.

when the turbines are fired on natural gas and 12 ppmvd at 15% O_2 when the turbines are fired on distillate. Therefore, the initial source tests showed that NO_X emissions from both duct burners are controlled below the NSPS Subpart Db limit of 0.20 lb/MMBtu.

40 CFR 60 Subpart Kb – Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced after July 23, 1984: This regulation does not apply to the fuel storage tank at the facility because, although the tank was constructed after July 23, 1984 and has a capacity greater than 151 m^3 (the tank has an approximate capacity of 2.1 million gallons or 7,949 m^3), the maximum true vapor pressure of the diesel fuel stored in the tanks is below the 3.5 kPa (0.5 psia) applicability threshold[6].

40 CFR 60 Subpart GG – Standards of Performance for Stationary Gas Turbines: The provisions of NSPS Subpart GG apply to stationary gas turbines with a heat input at peak load equal to or greater than 10.7 gigajoules (10 million Btu) per hour, based on the lower heating value of the fuel fired, for which construction, modification, or reconstruction is commenced after October 3, 1977. The two stationary gas turbines were installed at the facility after the adoption of NSPS Subpart GG; therefore, NSPS Subpart GG applies to the combustion turbines.

The steam injection rate for NO_X control does not need to be monitored since the facility employs continuous emissions monitoring for NO_X. [40 CFR 60.334(b)]

Under 40 CFR 60 Subpart GG, the facility requested approval of a custom fuel monitoring schedule based on the specific design and operation characteristics of the cogeneration facility. Fuel quality monitoring under the original rule was required, unless an alternative custom fuel monitoring plan was approved by EPA. In July 1994, EPA Region X granted the facility's request for an alternative monitoring plan, contingent upon the use of natural gas in the turbines and records documenting a constant supplier or source of fuel. The 2004 revision of 40 CFR 60 Subpart GG eliminated the requirement for sulfur sampling of fuels that qualify as natural gas, a definition of which was also included with the 2004 amendments. The revised rule rendered the existing custom schedule approved by EPA obsolete. The natural gas documentation required to be maintained by the facility is listed in Section 5 of the AOP.

40 CFR 60 Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines: PSE Ferndale maintains one 182 BHP diesel-fired fire pump engine that was installed prior to 1994. Subpart IIII does not apply to owners and operators of fire pump engines that commenced construction on or before July 11, 2005.

40 CFR 60 Subpart KKKK – Standards of Performance for Stationary Combustion Turbines: The combustion turbines at PSE Ferndale were constructed prior to the applicability date of February 18, 2005; therefore, this NSPS does not apply to the combustion turbines at PSE Ferndale.

[6] At 100°F, the vapor pressure of distillate fuel oil No. 2 (diesel) is 0.022 pounds per square inch (EPA AP-42 Chapter 7, Table 7.1-2, November 2006). This is equivalent to a vapor pressure of 0.15 kPa, which is well below the 3.5 kPa limit discussed above.
www.epa.gov/ttn/chief/ap42/ch07/final/c07s01.pdf

3.2 National Emissions Standards for Hazardous Air Pollutants (NESHAP)

One emission source, the 182 BHP diesel-fired emergency fire pump engine, is subject to a NESHAP. The applicability of relevant NESHAP regulations is addressed below.

40 CFR Part 61 (all) - National Emission Standards for Hazardous Air Pollutants There are no new or existing sources to which Part 61 applies at the PSE Ferndale facility; in particular, there are no asbestos building materials onsite.

40 CFR 63 Subpart A – General Provisions: NESHAP General Provisions apply to "affected sources". The emergency fire pump engine at the facility is an "affected source" since it is subject to 40 CFR 63 Subpart ZZZZ - NESHAP for Stationary Reciprocating Internal Combustion Engines. Therefore, portions of the General Provisions of 40 CFR 63 Subpart A apply to that engine as specified in Subpart ZZZZ. NESHAP Subpart A requirements are listed in Section 3 of the AOP as generally applicable to affected sources.

40 CFR 63 Subpart Q – National Emission Standards for Hazardous Air Pollutants for Industrial Process Cooling Towers: This standard would apply if PSE Ferndale emitted more than 10 tons per year of a single hazardous air pollutant (HAP) or if the total HAPs emitted from the plant exceeded 25 tons per year. Because formaldehyde is the overwhelming driver for NESHAP applicability and because the facility's potential to emit (PTE) formaldehyde is less than 10 tons per year, the standard does not apply to PSE Ferndale. Furthermore, chromium, an inorganic HAP, has never been used as a biocide in the cooling towers at PSE Ferndale.

40 CFR 63 Subpart DDDDD – National Emission Standards for Hazardous Air Pollutants Industrial, Commercial, and Institutional Boilers and Process Heaters: This subpart applies to boilers and process heaters that are located at major sources of HAP. Since PSE Ferndale emits less than 10 tons per year of any single HAP and less than 25 tons per year total HAPs, this standard does not apply.

40 CFR 63 Subpart YYYY – National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines: On January 14, 2003, the proposed combustion turbine NESHAP (CAA Section 112(b)) was published as 40 CFR 63 Subpart YYYY. Since PSE Ferndale emits less than 10 tons per year of any single HAP and less than 25 tons per year total HAPs, this standard does not apply.

40 CFR 63 Subpart ZZZZ— National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines: 40 CFR 63 Subpart ZZZZ establishes national emission and operating limitations for HAP emissions from stationary reciprocating internal combustion engines (RICE) located at major and area sources of HAP emissions. PSE Ferndale is an area source of HAP emissions and maintains a 182 BHP diesel-fired (compression-ignition) emergency fire pump engine that is subject to 40 CFR 63 Subpart ZZZZ. As a RICE that was constructed prior to June 12, 2006 and is used exclusively for emergency situations, the PSE Ferndale fire pump is considered an existing emergency stationary RICE located at an area source of HAP emissions under 40 CFR 63 Subpart ZZZZ.

3.3 Acid Rain Program

40 CFR Parts 72, 73, 74, 75, 76, 77, and 78 – The Acid Rain Program: Permits, Allowance System, Sulfur Dioxide Opt-Ins, Continuous Emission Monitoring, Nitrogen Oxides Emission Reduction Program, Excess Emissions, and Appeal Procedures: Title IV of the Clean Air Act authorizes the EPA to establish the Acid Rain Program. The purpose of the Acid Rain Program is to significantly reduce emissions of

sulfur dioxide and nitrogen oxides from utility electric generating plants in order to reduce the adverse health and ecological impacts of acidic deposition (or acid rain) resulting from such emissions. The EPA promulgated these rules on January 11 and March 23, 1993. In a letter to the Northwest Air Pollution Authority (now known as NWCAA) dated August 30, 1994, the facility explained that the plant was exempt from the acid rain regulations per 40 CFR 72.6 (b)(5) since:

- the facility was classified as a qualifying cogeneration facility pursuant to the provisions of Section 210 of the Public Utility Regulatory Policies Act of 1978 (PURPA),
- the facility had as of November 8, 1990 a qualifying power purchase commitment to sell 100% of the plant's total planned net output capacity to Puget Sound Power & Light Company, and
- the total installed net output capacity of the facility did not exceed 130%.

This exemption was lost when the power purchase contract between the facility and Puget Sound Energy expired on January 1, 2012. Since that date, the facility is considered a public electric generating utility and, therefore, subject to the acid rain regulations. The facility submitted their Acid Rain Permit application and associated Certificate of Representation on November 8, 2011.

The facility converted its CEM systems on the turbines from the performance and quality assurance/quality control requirements under 40 CFR 60 to those under 40 CFR 75. NWCAA Regulation Appendix A and 40 CFR 75 require specific quality assurance methods including daily calibration checks, quarterly linearity checks, and annual Relative Accuracy Test Audits (RATAs) that assure precise and accurate CEM information is collected. Cylinder gas audits (CGAs) are required by 40 CFR 60 Appendix F, which is required by NWCAA Regulation Appendix A (III)(A)(2), but the acid rain regulations (40 CFR 75) require more stringent quarterly linearity checks that meet the requirements of NWCAA Regulation Appendix A (III)(A)(1)[7].

3.4 Compliance Assurance Monitoring (CAM)

40 CFR 64 – Compliance Assurance Monitoring: The CAM rule under 40 CFR 64 requires owners or operators of subject sources to conduct monitoring that satisfies specific criteria established in the rule to provide a reasonable assurance of compliance with applicable requirements. Monitoring focuses on emission units that rely on pollution control equipment to achieve compliance. The CAM rule coordinates existing monitoring requirements with additional monitoring if current requirements fail to specify adequate detail. CAM applies to units that (1) are subject to an emission limit, (2) use an add-on control device to meet the emission limit, and (3) have potential pre-control device emissions that would classify the unit as a major source (referred to as an "uncontrolled major source").
The two combustion turbines and associated duct burners at the facility are subject to NO_X emission limits, and both units employ selective catalytic reduction control devices to

[7] NWCAA Regulation Appendix A (III)(A)(2) requires that all CEMs be operated in accordance with the appropriate Section of 40 CFR 60 Appendix F, and 40 CFR 60 Appendix F requires Cylinder Gas Audits (CGAs). However, NWCAA Regulation Appendix A (III)(A)(1) states that CEMs subject to acid rain regulations shall be capable of meeting the specifications outlined in the appropriate section of 40 CFR 75. NWCAA Appendix A (III)(A)(2), which requires all CEMs to be operated in accordance with the appropriate section of 40 CFR 60 Appendix F is interpreted to apply to all CEMs not otherwise covered by 40 CFR 75, and the PSE Ferndale CEMs, which are subject to the 40 CFR 75 acid rain regulations, shall be capable of meeting the specifications outlined in the appropriate section of 40 CFR 75 per NWCAA Appendix A (III)(A)(1).

achieve compliance. The combustion turbines also employ steam injection to control NO_X emissions. The two combustion turbine/heat recovery steam generator trains pre-control NO_X emissions exceed major source status (greater than 100 tons NO_X per year). These criteria would generally cause the combustion turbines and duct burners to be subject to the CAM rule. However, the AOP requires PSE Ferndale to operate a NO_X CEM at the combined turbine-duct burner exhaust outlet. CEMS are accepted as a continuous compliance determination method, and 40 CFR 64.2(b)(1)(vi) exempts units from the rule if the AOP specifies a continuous compliance determination method. Therefore, the combustion turbines and duct burners are not subject to CAM.

3.5 Risk Management Plan (RMP)

40 CFR 68 – Chemical Accident Prevention Provisions: PSE Ferndale is subject to the provisions of this program. The goal of 40 CFR 68 and the Risk Management Program (RMP) it requires is to prevent accidental release of substances that can cause serious harm to the public and the environment and to mitigate the severity of releases if they do occur. If a tank, drum, container, pipe, or other process at a facility contains any of the regulated toxic and flammable substances listed in 40 CFR 68.130 in an amount above the "threshold quantity" specified for that substance, the facility operator is required to develop and implement a risk management program.

PSE Ferndale uses anhydrous ammonia in the SCR systems for NO_X control on the combustion turbine (and duct burner) exhaust. Anhydrous ammonia in quantities greater than 10,000 pounds and aqueous ammonia (concentration of 20% or greater) in quantities greater than 20,000 pounds are regulated substances under 40 CFR 68 – Chemical Accident Prevention Provisions. As required, the facility submitted their original RMP to the EPA on June 22, 1999. The facility will certify ongoing compliance with all applicable requirements of 40 CFR 68 in their annual compliance certification.

3.6 New Source Review (NSR)

3.6.1 Basic Information

New Source Review (NSR) requires stationary sources of air pollution to acquire permits before they begin construction. NSR is also referred to as construction permitting or preconstruction permitting. NSR permits contain both construction and continuing operation requirements that apply for the life of the equipment or process.

There are three types of NSR permits. A source may have to acquire one or more of these permits:

- Prevention of Significant Deterioration (PSD) permits, which are required for new major sources or a major source making a major modification in an attainment[8] area;
- Nonattainment NSR permits, which are required for new major sources or major sources making a major modification in a nonattainment area; and
- Minor source permits, which are required for sources that emit pollutants below the major source threshold but above the minor source threshold. A facility application for a minor source permit is referred to as "Notice of Construction", or NOC. When issued, the permit is referred to as an "Order of Approval to Construct", or OAC. It

[8] An attainment area means a geographic area designated by EPA at 40 CFR 81 as having attained the National Ambient Air Quality Standard for a given criteria pollutant (Reference: WAC 173-400-030 (9)).

is generally the case that a major new or modified source will also require minor NSR permitting that covers a different subset of pollutants.

PSE Ferndale is located in an area that is in attainment for all pollutants. It is close to, but outside of the SO_2 Nonattainment Area centered around the Alcoa Intalco Aluminum Smelter in Cherry Point. Therefore, only PSD permits and minor source permits are required for projects at the facility.

3.6.2 What are Permits?

Permits are legal documents that the source must follow. Permits specify what emission limits must not be exceeded and how the source is to demonstrate compliance with the set limits. Permits may contain conditions to ensure that the source is built according to the permit application upon which the permitting agency relies for air impact analysis. For example, the permit may specify a stack height that was used by the permitting agency to determine compliance with air pollutant limits. Some limits in the permit may be specified at the request of the source to keep them from being subject to other requirements. For example, the source may take limits in a minor NSR permit to keep the source out of PSD. To assure that sources follow permit requirements, permits also contain monitoring, recordkeeping, and reporting (MR&R) requirements.

3.6.3 Who Issues the Permits?

In Washington State most NSR permits are issued by the Washington State Department of Ecology (Ecology) or local air pollution control agencies. The EPA issues the permit in some cases. Ecology and local air pollution control agencies have their own permit programs that are approved by EPA in the State Implementation Plan (SIP). In general, in the NWCAA jurisdiction, which encompasses Island, Skagit, and Whatcom Counties, Ecology issues major NSR permits (PSD permits) and NWCAA issues minor NSR permits (OACs).

3.6.4 Prevention of Significant Deterioration (PSD)

Before a major source can be constructed or modified in an area that meets all the health-based ambient air requirements (i.e. in an attainment area), the owner or operator must demonstrate that the project will not cause or contribute to violations of any ambient air quality standard or air quality increment. Also, the owner or operator must demonstrate that the project will not cause significant deterioration in nearby Class I Areas (parks and wilderness areas).

The PSE Ferndale facility qualifies as a major source and is, therefore, an applicable source under the PSD program (40 CFR 52.21) since the facility is located in an attainment area. (Note that in 2020 EPA designated a sulfur dioxide nonattainment area close to PSE Ferndale, but the facility is outside the Nonattainment Area. Therefore, provisions for facilities in attainment areas continue to apply to PSE Ferndale.) Emissions of NO_X, CO, SO_2, VOC, PM, and PM_{10} were subject to PSD review. The PSD Approval No. 91-04 was issued to the facility on June 10, 1992, and was amended in January 2000. The facility began commercial operations in April 1994. Details on revisions to this PSD permit are given in Section 2.

3.6.5 Minor New Source Review

New or modified sources of air pollution are required to obtain a permit from the NWCAA before beginning construction. Permits are referred to as Orders of Approval to Construct (OACs) and contain a wide range of local, state, and federal requirements to minimize air pollution impacts on the environment. The type of activity, the size of the operation, and the kinds of pollutants emitted determine permit conditions.

The facility was subject to minor NSR for ammonia. Ammonia is used in the SCR system as part of the NO_X emission control; however, some ammonia "slips" through the catalyst. Ammonia emissions are subject to minor NSR since, although ammonia is neither a criteria pollutant nor on EPA's list of Hazardous Air Pollutants (HAPs), ammonia is a state-listed Toxic Air Pollutant (TAP; see WAC 173-460-150).

The facility's OAC specifies annual source testing for ammonia and CO emissions at the GT/HRSG stacks while the turbines are fired on natural gas. Requirements regarding the use of foggers to cool inlet air are also addressed in the OAC. Section 2.4 details the minor NSR permits that cover the PSE Ferndale facility.

3.6.6 Nearby Sulfur Dioxide Nonattainment Area

The majority of NWCAA's jurisdiction is designated as in attainment for all criteria pollutants. The sole exception is a small area around the Alcoa Aluminum Smelter in Cherry Point, Whatcom County, which EPA designated in 2020 as out-of-attainment with the sulfur dioxide NAAQS. PSE Ferndale is located close to, but still outside, of this area. Therefore, the special rules that apply to facilities within the nonattainment area don't apply to PSE Ferndale.

Additional information about the nonattainment area is available on EPA's website, https://www.epa.gov/sulfur-dioxide-designations/epa-completes-fourth-round-sulfur-dioxide-designations.

3.6.7 Greenhouse Gas (GHG) Regulation

Greenhouse gases are chemicals that contribute to climate change by trapping heat in the atmosphere. The greenhouse gases recognized by EPA and Ecology are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFC), perfluorocarbons (PFC), and sulfur hexafluoride (SF_6). "Hydrofluorocarbons" or "HFCs" means a class of greenhouse gases primarily used as refrigerants, consisting of hydrogen, fluorine, and carbon.

PSE Ferndale is required to meet the following federal and state greenhouse gas emission requirements, as applicable.

3.6.8 40 CFR 98, Federal Mandatory Greenhouse Gas Emission Inventory Regulation

This regulation applies to PSE Ferndale due to its GHG emission levels and facility type. The rule requires annual GHG inventories and reporting starting in calendar year 2010, with reports due to EPA by no later than March 31 of the following year. This regulation is implemented in its entirety by the EPA. This regulation is excluded from appearing in a Title V air operating permit because it does not contain applicable requirements under the Title V program (WAC 173-401-200(4)).

3.6.9 WAC Chapter 173-407 WAC – Carbon Dioxide Mitigation Program, Greenhouse Gases Emissions Performance Standard and Sequestration Plans and Programs for Thermal Electric Generating Facilities (Part I WAC 173-407-010 through -070, and Part II, WAC 173-407-100 through -320)

Chapter 173-407 WAC, "Carbon Dioxide Mitigation Program, Greenhouse Gases Emissions Performance Standard And Sequestration Plans And Programs For Thermal Electric Generating Facilities", consists of two parts: Part I, WAC 173-407-010 through -070, and Part II, WAC 173-407-100 through -320. According to WAC 173-407-005, Part II,

"Greenhouse Gases Emissions Performance Standard And Sequestration Plans And Programs For Baseload Electric Generation Facilities Implementing Chapter 80.80 RCW", is the emissions performance standard that must be met first. Then the requirements of Part I, "Carbon Dioxide Mitigation For Fossil-Fueled Thermal Electric Generating Facilities, Implementing Chapter 80.80 RCW", are applied.

The Part II greenhouse gas emissions performance standard is applicable to all existing baseload electric generation facilities and units when a new baseload electric generating facility or unit at the existing facility is issued construction approval or site certification agreement (WAC 173-407-120(3)(a)), the existing facility or a unit is upgraded (WAC 173-407-120(3)(b)), or the existing facility or unit is subject to a new long-term financial commitment (WAC 173-407-120(3)(c)).

At this time, Part II performance standards do not apply to PSE Ferndale. Should PSE Ferndale become subject, these requirements do meet the definition of Title V "applicable requirements" and therefore will be incorporated into the AOP.

3.6.10 WAC Chapter 173-441, Reporting of Emissions of Greenhouse Gases

Chapter 173-441 WAC, "Reporting of Emissions of Greenhouse Gases", is a mandatory greenhouse gas (GHG) reporting rule for:

- Suppliers that supply applicable fuels sold in Washington State of which the complete combustion or oxidation would result in at least 10,000 metric tons of carbon dioxide annually; or
- Any listed facility that emits at least 10,000 metric tons of CO_2-equivalents (CO_2e) of greenhouse gases annually in the state.

WAC 173-441 was adopted by Ecology on December 1, 2010, and became effective on January 1, 2011. This regulation applies to PSE Ferndale because the facility emits at least 10,000 metric tons of CO_2e of greenhouse gases per year. Section 2.3 lists GHG emissions from the facility. Similar to the federal reporting rule under 40 CFR 98, WAC 173-441 requires annual GHG inventories with reports due no later than March 31 of the following year for facilities that are also subject to 40 CFR 98. This regulation is implemented in its entirety by Ecology and is considered an applicable requirement under the Title V program; as such, it is included in Section 2 of the Title V AOP.

3.6.11 WAC Chapter 173-442, Clean Air Rule (CAR) - remanded

This rule established GHG emissions standards for certain stationary sources, including facilities like PSE Ferndale. The rule applied if the three-year average for GHG beginning in the year 2012 was more than 100,000 metric tons CO_{2e} per year. As noted in Table 2-2, GHGs from PSE Ferndale exceed this threshold.

However, rule applicability of WAC 173-442 was challenged in Court. On January 16, 2020 the Washington Supreme Court issued an opinion and remanded the rule back to trial court for re-work, https://www.courts.wa.gov/opinions/pdf/958858.pdf:

> "*By the Act's plain terms, emission standards are designed to limit the release of air contaminants by regulating direct emitters. The Act provides no authority for Ecology to use emission standards to regulate businesses and utilities that merely distribute products that generate greenhouse gases when they are combusted somewhere down the line. Left unchecked. Ecology's expansive interpretation of its own authority would sweep many newly branded "indirect emitters" into the regulatory web. We are confident that if the State of Washington wishes to expand the definition of emission*

standards to encompass "indirect emitters," the legislature will say so. In the meantime. Ecology may not claim more authority than the legislature has granted in the Act.

Accordingly, we affirm the trial court's ruling that the Rule exceeds Ecology's authority under the Act by purporting to regulate nonemitters through emission standards. But we modify the remedy granted by the trial court—instead of striking the Rule in toto, we invalidate the Rule only to the extent it regulates nonemitters via an emission standard. We remand to the trial court for further proceedings consistent with this opinion."

Pending further action by the Courts, WAC 173-442 is not included in the PSE Ferndale AOP.

4 GENERAL PERMIT ASSUMPTIONS

4.1 Permit Content

The permit contains (1) standard terms; (2) generally applicable conditions for the type of facility permitted; and (3) specifically applicable conditions originating from PSD permits, approvals to construct, and federal New Source Performance Standards. Applicable requirements that were satisfied by a single past action on the part of the source are not included in the AOP. An example of this would be performance testing to demonstrate compliance with applicable emission limitations as a requirement of initial startup. Also, regulations that require action by a regulatory agency but not of the regulated source are not included as applicable permit conditions.

4.2 Excluded Requirements

Early facility history and activities related to one-time permitting requirements are listed below.

- The facility submitted notification of commencement of construction to Ecology and NWCAA in accordance with § 60.7 of 40 CFR 60 Subpart A of the NSPS. Construction commenced in December 1992.
- The facility was required in PSD 91-04 Condition 23 to participate in an ambient air monitoring program directed by the U. S. Forest Service in consultation with Ecology. The facility contributed $100,000 to the U. S. Forest Service to fund a study of air quality effects on ozone-sensitive lichen using passive ozone monitors in the Glacier Peak area, thereby fulfilling the requirement of PSD 91-04 Condition 23. The Forest Service submitted a study plan to use the money on July 26, 1993. This requirement is listed as Condition 11 in PSD 91-04 Amendment 1. Neither NWCAA nor the facility have the results of the study; however, the facility fulfilled their requirements and is in compliance with this PSD condition.
- The facility submitted notification of the March 1994 anticipated date of start-up to Ecology in accordance with § 60.7 of 40 CFR 60 Subpart A of the NSPS. Actual start-up was March 1994.
- The initial performance test requirements of PSD 91-04 (issued 5/18/92) Conditions 1, 2, 4, 5, 6, and 7 and NSPS requirements of 40 CFR § 60.44b (a), § 60.332 and § 60.333 were conducted in March 1994. Test results were submitted to the NWCAA in May 1994.
- The testing and monitor certification requirements of PSD 91-04 (issued 5/18/92) Condition 8 and NWCAA OAC 330 (issued 4/9/92) Conditions 4a and b were completed during August 1995. The facility submitted results to the NWCAA in September 1995.
- The requirement for annual source testing for PM_{10} and VOC was removed because the facility has successfully demonstrated that "new actual" minus "past actual" emissions do not exceed PSD significance levels, thereby verifying the assumption used to calculate "new projected actual" emissions. This change was made in OAC 330f, which was described at the end of Section 2.4.

PSD 91-04 Amendment 1 conditions 10, 11, 13, and 15 were excluded from the AOP for the following reasons:

- Condition 10: Initial performance tests for NOX, SO2, CO, VOC, PM10, opacity and ammonia were conducted in March and April 1994.

- Condition 11: The facility fulfilled the requirements of this term through participation in an ambient air monitoring program directed by the U.S. Forest Service as discussed in the bulleted list above.
- Condition 13: This condition requires construction of the project to begin within 18 months of PSD approval and to continue without an interruption greater than 18 months in duration. The terms of this condition were met since the facility has been fully constructed and operational since March 1994.
- Condition 15: This condition requires notification of initial start-up of the plant at least thirty days prior to start-up. The plant began operation in March 1994, and proper notification was submitted.

Furthermore, the requirement in PSD 91-04 Amendment 1 condition 2 that the facility submits a CO test plan for Ecology approval is not included in the AOP. In an email correspondence between NWCAA and Bob Burmark of Ecology (author of PSD 91-04 Amendment 1) dated April 10, 2012, Mr. Burmark clarified that:

> NWCAA is the regulatory authority for the facility, so has authority to approve test plans from the time the PSD is issued. After the PSD is put into the Title V permit, Ecology completely backs away from any involvement with regulatory activities like approving test plans unless asked by NWCAA. The wording in this condition is old, but that is how Ecology now interprets it.
>
> The exception to this policy is to approve any changes that really end up being changes to the PSD permit itself, like approving the use of a different test method or something similar. EPA R10 has specifically told us that we cannot delegate the responsibility of approving changes to the PSD permit itself to a local air authority.

4.3 Federal Enforceability

Federally enforceable requirements are terms and conditions required under the Federal Clean Air Act or under any of its applicable requirements such as NSPS or NESHAP. Local and state regulations may become federally enforceable by formal approval and incorporation into the State Implementation Plan (SIP) or through other delegation mechanisms. Federally enforceable requirements are enforceable by the EPA and citizens of the United States. All applicable requirements in the permit including Standard Terms and Conditions, Generally Applicable Requirements, and Specifically Applicable Requirements are federally enforceable unless identified in the permit as enforceable only by the state (i.e., labeled as "state only").

Chapter 173-401 WAC is not federally enforceable although the requirements of this regulation are based on federal requirements for the air operating permit program. Upon issuance of the permit, the terms based on Chapter 173-401 WAC will become federally enforceable for the source.

Most rules and requirements are followed by a date in parentheses. Two different versions (identified by the date) of the same regulatory citation may apply to the source if federal approval/delegation lags behind changes made to the Washington Administrative Code (WAC) or the NWCAA Regulation. The date associated with a WAC regulation denotes the "State Effective Date" of the regulation. For SIP-approved WAC regulations (identified by the absence of the "state only" designation), the date represents the "State Effective Date" of the regulation version that was SIP-approved. For NWCAA regulations, the date represents the most recent Board of Directors adoption date, which is identified as the "Passed" or "Amended" date in the NWCAA Regulation. For SIP-approved NWCAA regulations (also identified by the absence of the "state only" designation), the parenthetical date represents the "Passed" or "Amended" date of the regulation version

that was SIP-approved. The date associated with an OAC or PSD permit represents the latest revision date of that order. For a federal rule, the date is the rule's most recent promulgation date.

4.4 Gap Filling and Sufficiency Monitoring

Title V of the Federal Clean Air Act is the basis for the EPA's 40 CFR 70, which is the basis for the State of Washington air operating permit regulation, Chapter 173-401 WAC. Title V requires that all air pollution regulations applicable to the source be called out in the AOP for that source. Title V also requires that each applicable regulation be accompanied by a federally enforceable means of "reasonably assuring continuous compliance." Title V, 40 CFR 70, and WAC 173-401-615 all contain a "gap-filling" provision that enables NWCAA to add monitoring where no monitoring is present[9]. 40 CFR Part 70.6(c)(1) and WAC 173-401-630(1) contain authority to address situations where monitoring exists, but is deemed to be insufficient. NWCAA relied upon these authorities to add monitoring where needed to the AOP.

The majority of cases where monitoring needed to be added were older regulations and permits that contain no monitoring. For example, NWCAA used its gap-filling authority to add monitoring for the 20% visible emission standard, NWCAA 451.1. In any term where gap-filling has taken place, the regulatory citation for that term will contain the words "directly enforceable" and the introductory paragraphs for the AOP table include the reference to the citation of the gap-filling requirement.

There were also some limited cases where monitoring did exist but was found to be insufficient, stemming from PSD 91-04 (AOP term 5.1.16). NWCAA used its sufficiency monitoring authority (WAC 173-401-630(1)) to add monitoring in those cases. "Directly Enforceable" is included in the AOP term when NWCAA used its authority to supplement insufficient monitoring.

The type and frequency of monitoring added under the authority in WAC 173-401-615 were set based on the following factors:

1. Historical Compliance: NWCAA reviewed the facility's past compliance with the underlying requirement. This information helped inform the decision about monitoring frequency and stringency.
2. Margin of Compliance: The margin of compliance is a measure of whether the facility can easily achieve compliance with a requirement, or whether they operate close to the limit. NWCAA considered the facility's margin of compliance for each underlying requirement in setting monitoring for that requirement.

[9] WAC 173-401-615(1) Monitoring. Each permit shall contain the following requirements with respect to monitoring:
(a) All emissions monitoring and analysis procedures or test methods required under the applicable requirements, including any procedures and methods promulgated pursuant to sections 504(b) or 114 (a)(3) of the FCAA;
(b) Where the applicable requirement does not require periodic testing or instrumental or noninstrumental monitoring (which may consist of recordkeeping designed to serve as monitoring), periodic monitoring sufficient to yield reliable data from the relevant time period that are representative of the source's compliance with the permit, as reported pursuant to subsection (3) of this section. Such monitoring requirements shall assure use of terms, test methods, units, averaging periods, and other statistical conventions consistent with the applicable requirement. Recordkeeping provisions may be sufficient to meet the requirements of this paragraph; and
(c) As necessary, requirements concerning the use, maintenance, and, where appropriate, installation of monitoring equipment or methods.

3. Variability of Process and Emissions: Processes that vary their production rates and/or emissions over time require different monitoring from steady-state processes. NWCAA considered process and emission variability in setting monitoring.
4. Environmental Impact of a Problem – Exceedances of some permit requirements have greater environmental consequences than others. For example, a problem that causes an exceedance of the ammonia emission limit in the SCR for a turbine could have a greater environmental impact than failing to use ultra-low sulfur diesel at an emergency generator. NWCAA considered the environmental impact of a problem in setting monitoring.
5. Clarity and Complexity – The requirements that apply to AOP facilities are numerous, varied, and can be complex. The greater the number, variety, and complexity of requirements, the harder it is for a facility to understand and comply. NWCAA's goal is to write clear, concise permits the facilities can understand. To help achieve this goal, when possible, NWCAA aligned additional monitoring with monitoring that the facility is already performing. This approach required careful thought. NWCAA reviewed the monitoring the facility is already performing to see if it was adequate to stand-in as monitoring for the permit term, and only used it if deemed adequate.

Table 4-1 lists where NWCAA used its gap-filling monitoring authority and Table 4-2 lists Directly enforceable – sufficiency provisions in the AOP.

Table 4-1 AOP terms with Directly Enforceable gapfill provisions

AOP Term	Description	Monitoring
4.1	Required monitoring reports	Reporting periods identified
4.2	Operation and maintenance	Monitor, keep records and report
4.3-4.6, 4.22	Nuisance	Procedure followed when complaints are received
4.7-4.11	Fugitive PM	Procedure followed when complaints are received
4.12-4.17, 5.1.19, 5.1.20	Visible emissions	Visible emissions monitoring
4.18-4.23	Sulfur dioxide	Keep records of type, quantity, and sulfur content of fuel combusted
5.1.1	General	Keep O&M manuals readily available
5.1.2, 5.1.3, 5.1.18	General	Operate in accordance with O&M manuals
5.1.19, 5.1.20	GT/HRSG Opacity and PM_{10}	Visible emissions monitoring

Table 4-2 AOP terms with Directly Enforceable sufficiency provisions

AOP Term	Description	Monitoring
5.1.5	Temperature	Records of temperature
5.1.6-5.1.8	SO_2	Sulfur in fuel monitoring and reporting
5.1.16	NH_3	Recording of ammonia valve setting

4.5 Future Requirements

Applicable requirements promulgated with future effective compliance dates may be included as applicable requirements in the permit. Some requirements that are not applicable until triggered by an action, such as the requirement to file an application prior to constructing a new source, are addressed within the standard terms and conditions section of the permit.

There are presently no pending applications to construct or modify PSE Ferndale in such a way as to trigger New Source Review. The facility has certified in the permit application that the facility will meet any future applicable requirements on a timely basis.

4.6 Compliance Options

The facility did not request emissions trading provisions or specify more than one operating scenario in the air operating permit application; therefore, the permit does not address these options as allowed under WAC 173-401-650. This permit does not condense overlapping applicable requirements (streamlining) nor does it provide any alternative emission limitations.

5 PERMIT ELEMENTS AND BASIS FOR TERMS AND CONDITIONS

5.1 Permit Organization

The facility's Air Operating Permit (AOP) is organized in the following sequence:

Permit Information

Attest

Table of Contents

Section 1 Emission Unit Identification

Section 2 Standard Terms and Conditions

Section 3 Standard Terms and Conditions for New Source Performance Standards

Section 4 Generally Applicable Requirements

Section 5 Specific Requirements for Emissions Units

Section 6 Acid Rain Permit for Combustion Turbines 1A and 1B

Section 7 Inapplicable Requirements

5.2 Permit Information and Attest

5.2.1 Permit Information and Attest

The Information Page identifies the facility, the responsible corporate official, the Agency personnel responsible for permit preparation, the date of permit issuance, and the due date for the renewal application. The Attest section provides NWCAA's authorization for the source to operate under the terms and conditions contained in the air operating permit.

5.3 Section 1 Emission Unit Identification

The Emission Unit Identification section lists emission units, rated capacities, and air pollution control methods at the facility.

5.4 Section 2 Standard Terms and Conditions

The Standard Terms and Conditions section contains administrative requirements and prohibitions that do not have ongoing compliance monitoring requirements. Regulations that give legal authority to the standard terms and conditions are cited for each topic. At times, requirements are paraphrased; the language of the cited regulation takes precedence over the paraphrased summary. For understanding and readability, the terms and conditions have been grouped by function. Similar requirements from the State and the NWCAA are grouped together where possible. Requirements that are not applicable until triggered are also included. An example of these would be the requirement to file a "Notice of Construction" and "Application for Approval."

5.5 Section 3 Standard Terms and Conditions for NSPS and NESHAP

The Standard Terms and Conditions for NSPS and NESHAP section contains applicable requirements from Subpart A of 40 CFR 60 and Subpart A of 40 CFR 63.

5.6 Generally Applicable Requirements

AOP Section 4 entitled "Generally Applicable Requirements" identifies requirements that apply broadly to the facility. These requirements are generally not called out in OAC and instead are found as general air pollution rules in the NWCAA Regulation or the Washington Administrative Codes.

When referring to the tables in AOP Sections 4 and 5, the first column lists the AOP term number and pollutant or type of requirement. The AOP terms are numbered consecutively to individually identify each requirement and so that the reader may easily locate a referenced term. Next, the citation column includes the legal citation which is a federally enforceable requirement unless listed as "State Only". The "Description" column is a paraphrase of the requirement for informational purposes only; the language of the cited regulation takes precedence over a paraphrased requirement.

The last column lists the monitoring, recordkeeping and reporting (MR&R) requirements. The MR&R is a summary of the underlying requirements found in the "Citation" column and is not enforceable – the language of the cited regulation takes precedence over a paraphrased requirement. However, when there is text in the MR&R column that states "Directly Enforceable", all text below that statement has been added by the NWCAA as part of the agency's gap-filling authority; these additional requirements are enforceable. The agency uses gap-filling when the cited underlying requirement (e.g., regulation, OAC) does not provide adequate monitoring, recordkeeping and/or reporting methods to demonstrate compliance with the applicable requirement. In these cases, the NWCAA uses its authority under WAC 173-401-615(b) to gap-fill with adequate MR&R.

5.6.1 General Nuisance

NWCAA Regulations and the WAC contain requirements regarding emissions deemed to be a "general nuisance". Emissions of air contaminants that damage human health, plant or animal life, or otherwise interfere with the "enjoyment of life and property" are prohibited. These rules, however, do not include specific monitoring, recordkeeping, or reporting requirements. Therefore, according to the requirements of WAC 173-401-615, the MR&R for general nuisance terms was gap-filled. The gap-filled MR&R require the facility to inspect potential sources of nuisance emissions upon receipt of a compliant, repair problems found, document the inspection and subsequent work, and notify NWCAA if repairs cannot be made in a timely fashion.

5.6.2 Fugitive Emission Standards

PSE Ferndale does not conduct activities that typically generate fugitive emissions such as storage or transport of solid materials. Permit conditions require the facility to respond to and correct nuisance emissions as soon as possible. If emissions cannot be corrected within four hours, PSE Ferndale must notify the NWCAA within twelve hours with a description of the complaint and action being taken to resolve the problem. PSE Ferndale will provide assurance of compliance with these requirements in the annual compliance certification and by maintaining a log of nuisance complaints and associated repairs and mitigation actions.

5.6.3 Opacity Standard

The generally applicable opacity requirement limits any source at the facility to 20% opacity according to Ecology Method 9A. Because the combustion turbines have more stringent opacity requirements at 5% opacity by EPA Method 9 and Ecology Method 9A, respectively, and because visible emissions (VE) are not known to occur in general at PSE Ferndale, the MR&R for the opacity standard is written such that any visible emissions require immediate action with increasing stages of monitoring, depending on the situation.

Any observed VE require that one of three step be taken within 24 hours: correct the problem, a certified reader shall determine the opacity by EPA Method 9, or shut the unit down. If an EPA Method 9 test shows emissions in excess of any standard, an Ecology Method 9A reading must be taken. If a certified VE reader is unavailable to read the emissions, NWCAA will assume that all opacity standards have been exceeded. Observations and actions taken must be recorded and made available at the facility for inspection.

Visible emission observations are required monthly.

If opacity is greater than an applicable emission standard, the exceedance must be reported to NWCAA. All Method 9 or 9A opacity readings must be taken by an individual holding a valid Certification of Completion for Plume Evaluation Training from Ecology or other authorized training facility.

5.6.4 Particulate Matter Standards

The GT/HRSG stacks are sources of particulate matter emissions at the facility. Modern gas turbines, when fueled by natural gas or low-sulfur oil, are unlikely to exceed particulate matter emission standards if the units are properly operated and maintained.

The limit established in both the NWCAA regulations and the WAC. The WAC limit is 0.1 grains per dry standard cubic foot corrected to 7% oxygen, and the NWCAA limit is 0.05 grains per dry standard cubic foot corrected to 7% O_2. Performance tests conducted during March and April 1994 using EPA Reference Method 5 demonstrated compliance with particulate matter emission standards for the gas turbines. Tests were conducted on units operating at 100 percent of full load during both natural gas and oil firing.

Permit conditions require that the facility visually monitor emissions from these stacks as a surrogate to stack testing.

5.6.5 Sulfur Dioxide Standards

The GT/HRSGs are sources of sulfur dioxide emissions. The gas turbines are limited by conditions specified in the AOP to burning either natural gas or fuel oil containing no more than 0.05% by weight sulfur. Sulfur emissions from the duct burners are limited by allowing the firing of natural gas only.

"Natural gas" is defined in NSPS 40 CFR 60.331(u) Subpart GG as follows:

> Natural gas means a naturally occurring fluid mixture of hydrocarbons (e.g., methane, ethane, or propane) produced in geological formations beneath the Earth's surface that maintains a gaseous state at standard atmospheric temperature and pressure under ordinary conditions. Natural gas contains 20.0 grains or less of total sulfur per 100 standard cubic feet. Equivalents of this in other units are as follows: 0.068 weight percent total sulfur, 680 parts per million by weight (ppmw) total sulfur, and 338 parts per million by volume (ppmv) at 20 degrees Celsius total sulfur. Additionally, natural gas must either be composed of at least 70 percent methane by volume or have a gross calorific value between 950 and 1100 British thermal units (Btu) per standard cubic foot. Natural gas does not include the following gaseous fuels: landfill gas, digester gas, refinery gas, sour gas, blast furnace gas, coal-derived gas, producer gas, coke oven gas, or any gaseous fuel produced in a process which might result in highly variable sulfur content or heating value.

The facility receives natural gas from Northwest Pipeline via gas distribution lines maintained by Cascade Natural Gas. This same natural gas is used by all of the other natural gas consumers, private and industrial, in the Northwest. Natural gas contains approximately 1 to 2 grains of sulfur per 100 standard cubic feet on average and up to 5 grains of sulfur per 100 standard cubic feet, which includes 0.26 grains of sulfur per 100 standard cubic feet contributed by the methyl mercaptan added to this otherwise odorless

gas for the purposes of leak detection.

NWCAA Regulation Section 460 requires a sulfur dioxide ambient monitoring plan for sources with a heat input greater than 500 MMBtu/hour. NWCAA has determined that the requirement to burn only natural gas or "on-road spec" oil satisfies this requirement.

When natural gas is burned, the gas turbines will emit about 0.0163 lb SO_2 per MMBtu as shown in the following calculation:

$$\frac{6\ gr\ S}{100\ scf\ natural\ gas} \times \frac{1\ lb\ S}{7000\ gr\ S} \times \frac{1{,}000\ scf\ natural\ gas}{1.05\ MMBtu} \times \frac{2\ lb\ SO_2}{1\ lb\ S} = \frac{0.0163\ lb\ SO_2}{MMBtu}$$

Note: A "lb-mole" of a pure gas weighs the molecular weight of that gas in pounds and occupies 385.3 ft^3 at 68° F and 760 mmHg pressure. (A temperature of 68° F and a pressure of 760 mmHg are standard conditions according to NWCAA Section 200). A "lb-mole" of sulfur (S) weighs 32 lb and reacts with a lb-mole of oxygen (O_2) which also weighs 32 lb to form a lb-mole of sulfur dioxide, which weighs 64 lb. Therefore, 2 lb of SO_2 are generated for every lb of sulfur in the fuel.

The energy content of the natural gas used by the facility is approximately 0.930 MMBtu per 1,000 standard cubic feet of natural gas based on the lower heating value of the fuel.

The only diesel oil that is available for purchase now is ULSD (ultra-low sulfur diesel), which must contain no more than 15 ppm sulfur, or 0.0015%. According to Section 3.1 of the EPA's AP-42 emission factors (*Stationary Gas Turbines, 4/00*), the emission factor for sulfur dioxide from turbines burning fuel oil is 1.01 lb SO_2 per MMBtu times the percent sulfur of the fuel (by weight). Therefore, in the case of ULSD, the emission factor would be

$$\frac{1.01\ lb\ SO_2}{MMBtu \cdot \%S} \times 0.0015\ \%S = \frac{0.001515\ lb\ SO_2}{MMBtu}$$

This is well below the limit of 1.5 lb SO_2 per MMBtu.

The facility can adequately show compliance by burning only natural gas or "on-road spec" oil, and by maintaining fuel oil supplier-provided records of fuel oil specification, including sulfur content, for all oil burned.

PSD 91-04 Amendment 1 and OAC 330g limit diesel fuel combusted in the turbines to No. 2 distillate fuel oil with 0.05% by weight sulfur, which is $1/10^{th}$ of the allowable level under NWCAA 520. The facility can adequately show compliance with this requirement by burning only natural gas or ULSD oil (15 ppmvd sulfur content).

5.7 Section 5 Specific Requirements for Emissions Units

This section contains a table that lists applicable requirements that specifically apply to the main emission units. Turbines 1A and 1B and their duct burner-equipped heat recovery steam generator units are grouped together because, for the most part, they have the same applicable requirements. The emission limitations in Section 5 are often based on PSD or minor NSR (OAC) best available control technology (BACT) determinations. In addition, applicable NSPS subparts establish emission limits and associated MR&R requirements. The format and organization of this section are the same as for the generally applicable requirements.

Some of the conditions in this section contain terms that list MR&R for which the rationale is not readily apparent. These terms are discussed below.

5.7.1 Fuel Sulfur Content (Permit Terms 5.1.6 - 5.1.7)

Permit term 5.1.6 limits fuel combusted in the turbine to natural gas and up to 20.4 million gallons of diesel that contains no more than 0.05 wt% sulfur. The small amount of diesel used for periodic readiness testing is counted against the permitted oil firing limit of 20.4 million gallons per year annual total for both turbines.

Permit term 5.1.7 (40 CFR 60.333) limits the sulfur content of fuel burned in the turbines to 0.8% by weight and SO_2 stack emissions to 0.015% (150 ppm) corrected to 15% O_2 on a dry basis.

Natural gas and ULSD oil do not contain enough sulfur to exceed the limits in 40 CFR 60.333. Therefore, the use of natural gas and ULSD oil will adequately demonstrate compliance with these requirements.

5.7.2 Sulfur Dioxide Standard, Stack Emissions from Combustion Turbines (Permit Term 5.1.8)

This permit term cites condition 4 of PSD 91-04 Amendment 1 and condition 3f of OAC 330g, which limit SO_2 emissions from each GT/HRSG stack to 12 lb/hr when fired on natural gas and 59 lb/hr when fired on No. 2 distillate oil.

SO_2 is formed when sulfur in the fuels reacts with oxygen in the air during the combustion process. Two pounds of sulfur dioxide are emitted from the stack for every pound of sulfur in the fuel.

The amount of SO_2 emitted depends on the amount of sulfur in the fuel. When a turbine operates at capacity on natural gas containing 6 grains sulfur per 100 standard cubic feet (as 0.0163 lb SO_2 per MMBtu, see section 5.6.5 above), approximately 15 lb sulfur dioxide are emitted per hour from the turbine alone (i.e., not including the duct burner) as shown in the following calculation:

$$\frac{0.0163\ lb\ SO_2}{MMBtu} \times \frac{924\ MMBtu}{hr \cdot turbine} = \frac{15\ lb\ SO_2}{hr \cdot turbine}$$

Sulfur dioxide emissions from one of the duct burners fired on natural gas at 100% will add 4 lb/hr to the emission rate:

$$\frac{0.0163\ lb\ SO_2}{MMBtu} \times \frac{250\ MMBtu}{hr \cdot duct\ burner} = \frac{4\ lb\ SO_2}{hr \cdot duct\ burner}$$

Therefore, the total sulfur dioxide emissions from a GT/HRSG stack when both the turbine and the duct burner are fired on natural gas is 19 lb SO_2/hr:

$$\frac{15\ lb\ SO_2}{hr \cdot turbine} + \frac{4\ lb\ SO_2}{hr \cdot duct\ burner} = \frac{19\ lb\ SO_2}{hr \cdot GT/HRSG}$$

However, the limit for sulfur dioxide emissions from each GT/HRSG stack is 12 lb/hr. In order for the facility to meet the limit, the natural gas must contain less than 3.327 gr S/100 scf (including the 0.26 gr S/100 scf sulfur added as an odorant) as shown in the following calculations:

$$\frac{3.327\ gr\ S}{100\ scf\ natural\ gas} \times \frac{1\ lb\ S}{7000\ gr\ S} \times \frac{1{,}000\ scf\ natural\ gas}{0.930\ MMBtu} \times \frac{2\ lb\ SO_2}{1\ lb\ S} = \frac{0.01022\ lb\ SO_2}{MMBtu}$$

$$\frac{0.01022\ lb\ SO_2}{MMBtu} \times \left[\frac{924\ MMBtu}{hr \cdot turbine} + \frac{250\ MMBtu}{hr \cdot duct\ burner}\right] = \frac{12\ lb\ SO_2}{hr \cdot GT/HRSG}$$

Note that the facility purchases natural gas under contract from Northwest Pipeline-

Williams, and this is the same natural gas supplied to all industrial natural gas consumers in the NWCAA jurisdiction. The facility has no control over the sulfur content of the natural gas other than the purchase contract and no means by which to assure that the sulfur content of the natural gas remains below 3.327 gr S/100 scf.

When a turbine operates at full capacity on ULSD oil (15 ppmw sulfur) and the duct burners do not operate, approximately 1.4 lb SO_2/hr will be emitted from the stack as shown in the following calculation[10]:

$$\frac{0.0015\ lb\ SO_2}{MMBtu} \times \frac{927\ MMBtu}{hr \cdot turbine} = \frac{1.4\ lb\ SO_2}{hr \cdot turbine}$$

When the duct burners are also fired at 100% (on natural gas containing 6 gr S/100 scf), the sulfur dioxide emission rate is 50.65 lb SO_2/hr:

$$\frac{1.4\ lb\ SO_2}{hr \cdot turbine} + \frac{4\ lb\ SO_2}{hr \cdot duct\ burner} = \frac{5.4\ lb\ SO_2}{hr \cdot GT/HRSG}$$

This emission rate is below the 59 pounds SO_2 per hour limit for each GT/HRSG stack when firing ULSD oil. The facility can adequately show compliance with this permit term by burning only natural gas with less than 3.327 gr S/100 scf or ULSD oil, and maintaining fuel oil supplier-provided records of fuel oil specification, including sulfur content, for all oil burned.

5.7.3 Oxides of Nitrogen (NO_X) Standard for Combustion Turbines (Permit Terms 5.1.9 through 5.1.11)

Permit term 5.1.11 (40 CFR 60.332(a)(1)) limits NO_X emissions from each turbine to 0.0075% (equivalent to 75 ppm) corrected to 15% oxygen on a dry basis, plus allowances for heat rate and fuel bound nitrogen. According to the facility, the manufacturer's rated heat rate at load is 10,116 Btu/kW-hr (lower heating value, LHV) on natural gas and 10,145 Btu/KW-hr (LHV) on fuel oil, and the fuel-bound nitrogen is essentially zero (F = 0 in the equation below). The allowable NO_X concentration under 40 CFR 60.332(a)(1) when firing the combustion turbines on either fuel is 101 ppmvd, calculated from the equation given in § 60.332(a)(1) as shown below.

For firing on natural gas:

$$STD = 0.0075\% \times \frac{14.4}{Y} + F = 0.0075\% \times \frac{14.4}{10.672} + 0 \approx 0.01012\% = 101.2\ ppmdv\ NO_x$$

where:

$$Y = 10{,}116 \frac{Btu}{kW \cdot hr} \times \frac{1.055\ kJ}{Btu} \times \frac{1\ kW}{1{,}000\ W} = 10.672 \frac{kJ}{W \cdot hr}$$

For firing on fuel oil:

$$STD = 0.0075\% \times \frac{14.4}{Y} + F = 0.0075\% \times \frac{14.4}{10.703} + 0 \approx 0.01009\% = 100.9\ ppmdv\ NO_x$$

where:

$$Y = 10{,}145 \frac{Btu}{kW \cdot hr} \times \frac{1.055\ kJ}{Btu} \times \frac{1\ kW}{1{,}000\ W} = 10.703 \frac{kJ}{W \cdot hr}$$

The NO_X limitations in permit term 5.1.9 are more stringent than those found in permit term 5.1.11 at 7 ppmvd NO_X corrected to 15% oxygen daily average when fired on natural

[10] The EPA AP-42 emission factor (*AP-42, Section 3.1 Stationary Gas Turbines, 4/00*) for fuel oil is 1.01 lb SO_2 per MMBtu per %S times %S, where "%S" is percent sulfur by weight.

gas (6 ppmvd NO_X corrected to 15% oxygen daily average when the foggers are in operation) and 12 ppmvd corrected to 15% oxygen daily average when fired on fuel oil. These more stringent limits are established in both the PSD permit and the OAC. The PSD permit limit averaging period is "daily", and the OAC limit averaging period is "24-hour periods (on a daily basis)". The 24-hour averaging period allowance was made in the OAC so that during days in which a startup occurs (NO_X emissions are higher at startup since the NO_X pollution controls don't begin to function efficiently until the system warms up), the facility may count the non-operational hours during that day as zero NO_X emissions toward the "daily" average and still meet the limit. In the AOP, "calendar day" was added to the "24-hour" averaging period to clearly define the 24-hour period as a calendar day and not as a rolling 24-hour period.

The limit of 101 ppmvd NO_X (@ 15% O_2) is based on the NSPS and has a rolling four-hour averaging period. If the rolling four-hour 101 ppmvd NO_X limit is exceeded, either daily NO_X limit will also be exceeded (depending on fuel usage). The facility demonstrates compliance with NO_X emission limits by utilizing a CEMS on each turbine stack.

5.7.4 Oxides of Nitrogen (NO_X) Standard for Duct Burners (Permit Terms 5.1.12 - 5.1.14)

Permit term 5.1.14 (40 CFR 60.44b(a)(4)(i)) limits NO_X emissions from each duct burner to 0.20 lb NO_X (expressed as NO_2) per MMBtu heat input at all times, including periods of startup, shutdown, or malfunction. Permit term 5.1.9 limits NO_X emissions from the GT/HRSG stacks to 12 ppmvd @ 15% O_2, worst case (i.e., when firing fuel oil). Using Equation 19-1 from 40 CFR 60 Appendix A Method 19, the maximum allowable emission rate from the GT/HRSG stack is 0.0442 lb NO_2 per MMBtu:

$$E = C_d F_d \frac{20.9}{20.9 - \%O_{2d}} = \frac{lb}{scf} \times \frac{scf}{MMBtu} \times \frac{20.9}{20.9 - 15}$$

Where[11]:

$$C_d = \frac{12\ dscf\ NO_2}{1{,}000{,}000\ dscf\ exhaust} \times \frac{1\ lbmol\ NO_2}{385.3\ dscf\ NO_2} \times \frac{46\ lb\ NO_2}{1\ lbmol\ NO_2} = \frac{1.433\ e-6\ lb\ NO_2}{dscf\ exhaust}$$

$$F_d = 8710\ \frac{dscf}{MMBtu}\ (Table\ 19-2, 40\ CFR\ 60\ Appendix\ A\ Method\ 19)$$

Thus,

$$E = C_d F_d \frac{20.9}{20.9 - \%O_{2d}} = \frac{1.433\ e-6\ lb\ NO_2}{dscf\ exhaust} \times 8710\ \frac{dscf}{MMBtu} \times \frac{20.9}{20.9 - 15} = 0.0442\ \frac{lb\ NO_2}{MMBtu}$$

These calculations show that the gas turbine plus the duct burner are limited to a maximum NO_X emission rate of 0.0442 lb NO_2 per MMBtu, which is less than a quarter of the NSPS Subpart Db standard of 0.20 lb NO_2 per MMBtu for the duct burner alone. The facility shows compliance with this emission limit by complying with permit term 5.9 and monitoring NO_X emissions with a CEM.

[11] The molar volume of 385.3 scf / lbmol is based on the standard temperature of 68 °F and 1 atm as listed in both NWCAA Reg 200 and 40 CFR 60 Appendix A Method 19: 385.3 scf/lbmol = 0.7302413 scf*atm/°R/lbmol * (68 (°F) + 459.67)°R

5.7.5 Carbon Monoxide Standard for Combustion Turbines (Permit Terms 5.1.15 and 5.1.17)

NWCAA OAC 330g conditions 2(B) and 3(B), and PSD 91-04 Amendment 1 condition 2 limit CO emissions from each turbine exhaust stack to 44 pounds per hour and 20 ppmvd corrected to 15% O_2 on an hourly average. OAC 330g condition 5(A) requires annual source performance tests that measure CO emissions from the GT/HRSG stacks. These tests (results are kept on file) show that CO emissions from the GT/HRSG stacks remain well below the permitted emission limit.

5.7.6 Ammonia Standard for Combustion Turbines (Permit Terms 5.1.16 and 5.1.17)

NWCAA OAC 330g conditions 2(C) and 3(C) limit NH_3 emissions to 15 pounds per hour when firing natural gas, 16 pounds per hour when firing fuel oil, and 9 ppmvd corrected to 15% O_2 on an hourly average from each GT/HRSG stack. OAC 330g condition 5(B) requires annual source performance tests that measure NH_3 emissions from the GT/HRSG stacks.

The SCR unit is the final part of the NO_X control system. SCR involves injection of ammonia into the turbine exhaust stream ahead of a catalyst grid in the HRSG section. Most of the NO_X reacts in the presence of ammonia and the catalyst to form elemental nitrogen and water. Some ammonia gets through the HRSG without reacting with the NO_X. This excess ammonia is sometimes referred to as "ammonia slip".

The facility controls stack exhaust NO_X concentration and emission rate by steam injection into the combustion zone and by varying the amount of ammonia that is injected into the exhaust stream of each GT/HRSG. The amount of ammonia required to adequately control NO_X depends on the amount of NO_X control achieved by steam injection. Also, the amount of ammonia required to reduce the exhaust NO_X concentration increases over time as the catalyst degrades. The facility records the ammonia flow regulator valve setting (displayed as percent open) in their computer system for each GT/HRSG unit in order to monitor ammonia usage. The facility sends catalyst samples to an independent laboratory for testing as needed. The facility demonstrates compliance with ammonia limits by conducting an annual source test for ammonia and by maintaining the ammonia injection rate relative to NO_X concentration and stack flow.

5.7.7 Volatile Organic Compound (VOC) Standard for Combustion Turbines (Permit Term 5.1.18)

OAC 330g condition 3(D) and PSD 91-04 Amendment 1 condition 6 limits VOC emissions from each GT/HRSG stack to 15 pounds per hour. Initial performance testing for total hydrocarbons (THC) were conducted in March and April 1994. The maximum measured THC mass emission rate was approximately 40% of the standard. The proportion of THC that are VOCs is much less than 100%; therefore, the GT/HRSGs tested well below the VOC emission limit.

Additional VOC source testing was conducted as part of the turbine upgrade and fogger projects as discussed in section 2.4. Annual source testing for VOC was dropped from OAC 330f, also described in section 2.4. NWCAA has determined that proper operation and maintenance of the GT/HRSG systems is sufficient to show compliance with the VOC emission limit.

5.8 Section 6 Acid Rain Permit for Combustion Turbines 1A and 1B

The facility is required to submit an Acid Rain Permit Application and Certificate of Representation every five years. The initial application and Certificate of Representation

are included in Section 6 of the AOP.

5.9 Section 7 Inapplicable Requirements

WAC 173-401-640(2) allows a determination regarding requirements inapplicable to the source. Section 7 of the permit lists requirements deemed inapplicable based on the applicability of the cited regulation. A permit shield applies to the specific, listed inapplicable requirements.

6 INSIGNIFICANT EMISSION UNITS

Some categorically exempt insignificant emission units as defined in the WAC 173-401-532 are present at PSE Ferndale and are listed in this Statement of Basis (Table 6.1 below) rather than in the AOP. Emission units at the facility that have been determined to be insignificant on the basis of size or production rate as defined in WAC 173-401-530 and WAC 173-401-533 are listed in Table 6-1 below:

Table 6-1 Insignificant Activities and Emission Units

Exempt Unit	WAC Citation	Comment
Lube Oil Storage Totes	WAC 173-401 532 (3)	Maintenance and Water Treatment Building
Turbine and Generator Lube Oil Storage, Pumping and Handling Hydraulic Systems	WAC 173-401 532 (3)	Combustion Turbines (2) Steam Turbine (1) Combustion Turbine Generators (2) Steam Turbine Generator (1)
Bearing Vapor Extractors	WAC 173-401 532 (3)	Lube Oil Condenser Installed on Turbine Vapor Extractors. ESP Installed on Generator Vapor Extractors. Combustion Turbines (2) Steam Turbine (1) Combustion Turbine Generators (2) Steam Turbine Generator (1)
Lubricating Oil Storage & Handling	WAC-173-401-532 (3) (4) and (69)	
Boiler Water Treatment Storage Tanks: 500-gallon Oxygen Scavenging Tank 500-gallon Condensate pH Control Tank 1,500-gallon Polymer Tank Boiler Feed Water Treatment Chemicals	WAC 173-401 532 (4)	Boiler Chemical Feed Building
Cooling Tower Water Treatment Storage Tanks: 500-gallon Biocide Storage Tank 1300-gallon Sodium Hypochlorite Storage Tank (2)	WAC 173-401 532 (4)	Chemical Feed Building

Exempt Unit	WAC Citation	Comment
Wastewater Treatment Storage Tanks: 600,000-gallon Filter Water Tank 100,000-gallon Wastewater Holding Tank 600,000-gallon Demineralized Water Tank 90,000-gallon Neutralization Tank 1,500-gallon CDP Polymer/Alum Tank	WAC 173-401 532 (4)	West of Water Treatment and Control/Electrical Building CDP tank is located inside building.
Pressurized Storage of Gases for CEMs and Fuel Gas Analyzer	WAC 173-401-532 (5)	
Emissions from Fuel Oil Transfer System	WAC 173-401-530 (1)(d)	Fugitive emissions
Emissions from Natural Gas Fuel System	WAC 173-401-530 (1)(d)	Fugitive emissions
Emissions from Roadways	WAC 173-401-530 (1)(d)	Fugitive emissions
Parts Washer	WAC 173-401 530 (4)(d)	≤ 2 tons/yr of VOC
Waterwash Storage Tank	WAC 173-401 533 (2)(c)	Operation, loading and unloading of VOC storage tanks < 10,000-gallon capacity and vapor pressure < 80 mm Hg at 21°C.
Miscellaneous Gasoline Powered Maintenance Equipment (Snow blower, leaf blower, pumps, welder, press washer, etc)	WAC 173-401-533 (2)(f)	< 500k Btu/hr
Welding	WAC 173-401-533 (2)(i)	Less than 1 ton welding rod per day
Hot Water Heaters	WAC 173-401 533 (2)(r)	< 5 MMBtu/hr output, using natural gas, propane, or kerosene
Portable Heaters	WAC 173-401 533 (2)(r)	< 5 MMBtu/hr output, using natural gas, propane, or kerosene
Sodium Hydroxide (50%) Storage Tank	WAC 173-401-533 (2)(s)	Tanks, with appropriate closure, and associated pumping equipment used for the storage of salts, bases, acids, etc.

Exempt Unit	WAC Citation	Comment
Sulfuric Acid (93%) Storage Tank	WAC 173-401-533 (2)(s)	Tanks, with appropriate closure, and associated pumping equipment used for the storage of salts, bases, acids (<99% H_2SO_4), etc.
Laboratory Operations Including Fume Hoods	WAC 173-401 533 (3)(c)	Chemical or physical analytical laboratory operations including fume hoods and vacuum pumps
Vents from CEMS and Analyzers	WAC 173-401-532 (8)	
Trucks, Fork Lifts, Autos, etc.	WAC 173-401-532 (10)	
Plant Upkeep/Painting	WAC 173-401-532 (33)	
Steam Cleaning Operations	WAC 173-401-532 (39)	
Comfort Air Conditioning	WAC 173-401-532 (46)	
Natural Draft Hoods/Safety Valves	WAC 173-401-532 (47)	
Vents/Bathroom Facilities	WAC 173-401-532 (48)	
Office Activities	WAC 173-401-532 (49)	
Personal Care Activities	WAC 173-401-532 (50)	
Personal Cars	WAC 173-401-532 (54)	
Demineralization/O_2 Scavenging	WAC 173-401-532 (61)	
500-Gallon Oxygen Scavenger Tank	WAC 173-401-532 (61)	
850-Gallon Deposit Control Tank	WAC 173-401-532 (61)	
850-Gallon Corrosion Inhibitor Tank	WAC 173-401-532 (61)	
Repair and Maintenance Activities	WAC 173-401-532 (74)	
Steam Vents and Safety Release Valves	WAC 173-401-532 (87)	
Air Compressors	WAC 173-401-532 (88)	
Steam Leaks	WAC 173-401-532 (89)	
Process Water Storage Tanks	WAC 173-401-532 (94)	

Exempt Unit	WAC Citation	Comment
500-Gallon Balanced Polymer Tank - (3)	WAC 173-401-532 (117)	
Water Cooling Towers Processing Exclusively Noncontact Cooling Water	WAC 173-401-532 (121)	

7 DEFINITIONS AND ACRONYMS

Definitions are assumed to be those found in the underlying regulation. A short list of definitions has been included to cover those not previously defined.

An "applicable requirement" is a provision, standard, condition or requirement in any of the listed regulations or statutes as it applies to an emission unit or facility at a stationary source.

"Ecology" means the Washington State Department of Ecology.

An "emission unit" is any part or activity of a stationary source that emits or has the potential to emit any regulated air pollutant.

"Oil" means low sulfur No. 2 diesel fuel, containing no more than 0.05 percent sulfur by weight.

A "permit" means for the purposes of the air operating permit program an air operating permit issued pursuant to Title 5 of the 1990 Federal Clean Air Act Amendments.

"State" means for the purposes of the air operating permit program NWCAA or the Washington State Department of Ecology.

The following is a list of Acronyms used in the Air Operating Permit and/or Statement of Basis:

AIRS	Aerometric Information Retrieval System
AOP	Air Operating Permit
ASIL	Acceptable Source Impact Level
ASTM	American Society for Testing and Materials
BHP	Brake horsepower
CEM	Continuous Emissions Monitor
CEMS	Continuous Emissions Monitoring System
CFR	Code of Federal Regulations
EPA	The United States Environmental Protection Agency
FCAA	Federal Clean Air Act
HRSG	Heat Recovery Steam Generator
ISO	International Organization for Standardization
MMBtu	Million British thermal units
MR&R	Monitoring, recordkeeping, and reporting requirements
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOC	Notice of Construction
NO_X	Oxides of Nitrogen
NSPS	New Source Performance Standard
NSR	New Source Review
NWCAA	Northwest Clean Air Agency
O_2	Oxygen

OAC	Order of Approval to Construct
PM	Particulate Matter
PM_{10}	Particulate Matter less than 10 microns in diameter
ppmvd	(same as ppmvd) parts of pollutant per million parts of dry stack gas on a volumetric basis
PSD	Prevention of Significant Deterioration (federally required program for pre-construction review of sources)
QA/QC	quality assurance/quality control
RCW	Revised Code of Washington
SCR	Selective Catalytic Reduction
scf	standard cubic foot (cubic foot of gas at ISO STP)
SIP	State Implementation Plan
SO_2	sulfur dioxide
STP	Standard Temperature and Pressure: 20° C (68° F) and 760 mm Hg (29.92 in. Hg) per NWCAA Regulation (e.g. applies to fuel sulfur limit) 288 K (15° C, 59° F) and 101.3 kPa (1 atmosphere) per ISO (e.g. applies to natural gas volume measurement)
VOC	Volatile Organic Compounds
WAC	Washington Administration Code

8 PUBLIC DOCKET

Copies of PSE Ferndale's Air Operating Permit, permit application, and any technical support documents are available online at www.nwcleanair.org and at the following location:

Northwest Clean Air Agency
1600 South Second Street
Mount Vernon, WA 98273-5202