Northwest Pipeline, LLC
8907 NE 219th Street
Battle Ground, WA 98604

May 17, 2023

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

Subject: **Title V Operating Permit Renewal Application**
Air Operating Permit 007R3, Expires June 19, 2024
Northwest Pipeline, LLC – Sumas Compressor Station
NWCAA ID: 1434-V-W
Whatcom County, Washington

Dear Mr. Bouwman:

Northwest Pipeline, LLC (Northwest) hereby submits the attached Title V Operating Permit Renewal Application for the Sumas Compressor Station, located at 4738 Jones Road in Sumas, Whatcom County, Washington.

No changes have been made and no new equipment has been installed at the facility since the current Title V Operating Permit was issued on June 19, 2019 other than those described below. Note, however, Northwest is in the process of updating the notice of construction permit to incorporate an emissions reduction project where the existing older reciprocating engines will be replaced with cleaner turbines. Within one year of startup of the new equipment, Northwest will submit an application to update the Title V Operating Permit to incorporate the new equipment.

The current Title V Operating Permit expires June 19, 2024, and the renewal application is due no later than twelve (12) months prior to permit expiration.

The only changes being requested to the Operating Permit are identified below.

- Please update the Responsible Official from Robert Harmon to Camilo Amezquita and update the facility contact from Tyson Green to Sam Chesnut.

- Please remove Unit 12 (C-Plant boiler). This emission source was removed from service and replaced with an electric unit.

A Site-Wide Potential to Emit Summary is provided below:

Northwest Pipeline LLC
Sumas Compressor Station
Application to Renew Title V Operating Permit

Site-Wide Potential-to-Emit (PTE) Summary

Status	Source ID	Description	NOx tpy	CO tpy	VOC tpy	HCHO tpy	MeOH tpy	Tot HAP tpy	CO2e tpy
Existing	Unit 1	Compressor Engine 01 - Ingersoll-Rand 412-KVS	209.06	25.09	9.34	4.18	0.20	5.71	9,267
Existing	Unit 2	Compressor Engine 02 - Ingersoll-Rand 412-KVS	209.06	25.09	9.34	4.18	0.20	5.71	9,267
Existing	Unit 3	Compressor Engine 03 - Ingersoll-Rand 412-KVS	209.06	25.09	9.34	4.18	0.20	5.71	9,267
Existing	Unit 4	Compressor Engine 04 - Ingersoll-Rand 412-KVS	209.06	25.09	9.34	4.18	0.20	5.71	9,267
Existing	Unit 5	Compressor Engine 05 - Dresser-Rand Clark TCV-12	301.30	56.10	17.44	8.02	0.36	11.56	17,018
Existing	Unit 6	Compressor Engine 06 - Dresser-Rand Clark TCV-12	301.30	56.10	17.44	8.02	0.36	11.56	17,018
Existing	Unit 7	Compressor Turbine 01 - Solar Mars 90-12000S	43.62	53.13	3.04	0.31	---	0.46	48,675
Existing	Unit 8	Compressor Turbine 02 - Solar Mars 90-12000S	43.62	53.13	3.04	0.31	---	0.46	48,675
Existing	Unit 9	Compressor Turbine 03 - Solar Mars 90-12000S	43.62	53.13	3.04	0.31	---	0.46	48,675
Existing	Unit 10	D Plant - Sellers C60 Boiler	1.07	0.90	0.06	8E-04	---	0.02	1,296
Existing	Unit 11	A Plant - Sellers C100 Boiler	1.80	1.51	0.10	1E-03	---	0.04	2,177
Existing	Unit 13	Backup Generator - Cummins GTA-855	1.62	2.65	0.02	0.01	2E-03	0.02	83
Existing	Unit 14	Backup Generator - Caterpillar G3408	3E-03	0.01	0.02	0.02	2E-03	0.02	90
Existing	Unit 15	Backup Generator - Caterpillar G3412	2.01	3.30	0.03	0.02	3E-03	0.03	104
		Total PTE:	**1,576**	**380.30**	**81.59**	**33.74**	**1.52**	**47.50**	**220,878**

In addition to this paper copy with the Responsible Official's signature, an e-mail copy has also been provided to the Northwest Clean Air Agency.

If you have any questions concerning this Title V Operating Permit Renewal Application, please contact Monica Mogg at (360) 600-1907 or Monica.Mogg@Williams.com.

Sincerely,

DocuSigned by:
Camilo Amezquita
DABE55A3AC5F45D...

Camilo Amezquita
VP / GM - Northwest Pipeline

Attachments:

Title V Operating Permit Application Form
Compliance Monitoring Devices and Activities
Applicable Requirements (Sections 4 and 5 of Operating Permit 007R3)
Emission Calculations

Title V Operating Permit Renewal Application
Permit No. 007R3, Expires June 19, 2024

For the:

Northwest Pipeline, LLC

Sumas Compressor Station

NWCAA ID: 1434-V-W

Whatcom County, Washington

Submitted to:

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

Submitted by:

Northwest Pipeline, LLC
8907 NE 219th Street
Battle Ground, WA 98604

Prepared by:

EcoLogic Environmental Consultants, LLC
864 Windsor Court
Santa Barbara, CA 93111

May 2023

Title V Operating Permit Renewal Application
Permit No. 007R3, Expires June 19, 2024

Northwest Pipeline, LLC
Sumas Compressor Station (NWCAA ID: 1434-V-W)
Whatcom County, WA

Table of Contents

Title V Operating Permit Renewal Application
Permit No. 007R3, Expires June 19, 2024

Northwest Pipeline, LLC
Sumas Compressor Station (NWCAA ID: 1434-V-W)
Whatcom County, WA

Attachment 1
Title V Operating Permit Application Form

northwest Clean Air agency
1600 South Second Street
Mount Vernon, WA 98273-5202
ph 360.428.1617
fax 360.428.1620
www.nwcleanair.org

Title V Air Operating Permit Renewal Application

The information requested in this document must be provided for a complete application. Please submit to the Northwest Clean Air Agency (NWCAA) one paper copy and one electronic copy of the completed application. The certification at the end of this document applies to the entire submittal. If additional room to reply is required, please attach pages to this request.

In some cases, a prior submittal to the NWCAA (e.g., the annual emissions inventory) may include information requested below. If you would like to refer the NWCAA to that information rather than provide the information here, please note this in your response. Any submittal to which the NWCAA is referred will become part of your renewal application. It is also acceptable to attach relevant portions of your current Air Operating Permit if the information therein provides an adequate response to a question below.

Part 1: General Information

1) Company name and address [or plant name and address if different from the company name]

Northwest Pipeline LLC
295 Chipeta Way
Salt Lake City, UT
84158-0900

2) Current Air Operating Permit number and expiration date

Air Operating Permit 007R3 expires June 19, 2023

3) Owner's name and agent

Northwest Pipeline LLC
Monica Mogg

4) Responsible Official name and address

Camilo Amezquita
VP/GM - Northwest Pipeline
2800 Post Oak Blvd, Houston, TX 77056-6147

5) Telephone number and name of plant site manager/contact

Sam Chesnut - Operations Supervisor, Seattle Area
(360) 201-8923

6) Were there any changes to the facility impacting air emissions since receiving the current Air Operating Permit? [if yes, please describe changes]

Unit 12 (C-Plant boiler) was removed from service and replaced with an electric unit

Part 2: Process and Emissions Information

7) Will there be any changes to the operating scenario(s) identified in the current AOP?

No Changes

8) Provide a description of process and products by Standard Industrial Classification (SIC) Code. Please list the applicable SIC Code. Please repeat the list of processes and products for each alternative operating scenario.

SIC 4922 - Natural Gas Transmission

9) Please list any and all pollutants that would cause the facility to be classified as a "major source" as defined in WAC 173-401.

NOx, CO, Formaldehyde and Total HAPs

10) Please identify and describe all points of emissions at the facility except those that qualify as insignificant emission units or activities as defined in WAC 173-401-530. Are these emissions units correctly identified and defined in the current AOP? If not, please note the requested changes below.

Unit #1 Ingersoll-Rand 412KVS, Unit #2 Ingersoll-Rand 412KVS, Unit #3 Ingersoll-Rand 412KVS, Unit #4 Ingersoll-Rand 412KVS, Unit #5 Clark TCV-12, Unit #6 Clark TCV-12, Unit #7 Solar Mars 90, Unit #8 Solar Mars 90, Unit #9 Solar Mars 90, Unit #15 C Plant 522 Hp Emergency Generator

11) Please list and quantify all emissions of regulated air pollutants from the emission points identified in item 10 above. Please include calculations. If the most recent annual emissions inventory accurately describes these emissions, it is not necessary to repeat the same information here. Please refer the NWAPA to the most recent annual emissions inventory.

See Attachment 4 - Emission Calculation Spreadsheet

12) List the fuels used and their respective usage rates at design capacity for the emission points identified in item 10 above.

Natural gas is the sole fuel source for listed equipment at the Sumas Compressor Station. See Attachment 4 - Emission Calculation Spreadsheet for design capacities.

13) List the raw materials used and their respective usage rates at design capacity for the emission points identified in item 10 above.

See Attachment 4 - Emission Calculation Spreadsheet for design capacities.

14) List the production rate at design capacity for the emission points identified in item 10 above.

See Attachment 4 - Emission Calculation Spreadsheet

15) Identify the facility operating schedule (anticipated operating hours per day, days per week, weeks per year)

24 hours per day
7 days per week
52 weeks per year

16) Please identify all air pollution control equipment at the facility. Is this air pollution control equipment correctly identified and defined in the current AOP? If not, please provide information necessary to correct.
The D plant Auxiliary generator is equipped with an air fuel ratio controller/catalyst;
The C plant Auxiliary generator is equipped with an air fuel ratio controller/catalyst.

17) Please identify and describe all compliance monitoring devices or activities at the facility.

See Attachment 2 - compliance monitoring devices/activities

18) Identify any limitations on source operation that affect emissions of a regulated pollutant. Similarly, list any work practice standards that affect emissions of a regulated pollutant at this facility.
The Caterpillar 390 kW standby generator will operate no more than 400 hours per year.
The Caterpillar 270 kW standby generator will operate no more than 500 hours in any consecutive twelve month period.

Part 3: Applicable Requirements

19) Cite and describe all applicable requirements. An updated copy of the applicable requirements in the current AOP for the facility may be sufficient.

See Attachment 3 - Applicable Requirements from current AOP

20) Please list any applicable test method(s) for determining compliance with each applicable requirement listed in item 19 above. An updated copy of the current AOP for the facility may be sufficient.
40 CFR 60 Appendix A Method's 7A-7E, 9, 10, 20
EPA Conditional Test Method 034

21) Does the applicant propose any exemptions from an otherwise applicable requirement? If so, please explain.

No

22) Does the CAM rule (40 CFR part 64) apply to any of the emissions units?

No

23) Does the accidental release prevention regulation (40 CFR part 68) apply to the facility?
No

24) Do the federal Acid Rain rules (40 CFR parts 72-78) apply to any of the emissions units?
No

25) Are there any requested changes to any condition in the current Air Operating Permit? [if yes, identify the condition, the requested change, and the reason]

No

26) If the applicant would like to request that the permit shield be extended to cover certain requirements that the applicant believes are inapplicable, please list those requirements, below. Please include a brief narrative description of each requirement and the basis for the belief that each is inapplicable.

Applicant does not request permit shield to be extended

Part 4: Compliance Status and Certification

27) Describe the compliance status of the facility with regard to all applicable requirements. Compliance status for each applicable requirement shall be described as "continuous" or "intermittent". Please include the method used for determining compliance. If an annual compliance certification has been recently submitted to the NWCAA, the applicant may reference this report. However, if the applicable requirements or compliance status have changed since that submittal, an updated submittal is required.

Please see Compliance Report Submitted on January 19, 2023

28) Provide the following:

a) For applicable requirements with which the source is in compliance, provide a statement that the source will continue to comply with such requirements;
Northwest Pipeline LLC is currently in compliance and will continue to comply with all terms and conditions of Title V Operating Permit 007R3.

b) For applicable requirements that become effective during the permit term, provide a statement that the source will meet such requirements on a timely basis;
Northwest Pipeline LLC will comply on a timely basis with any applicable requirement that becomes effective during the permit term.

c) For applicable requirements with which the source is not in compliance at the time of permit issuance, provide a narrative description and provide a schedule of compliance. Such a schedule shall include a schedule of remedial measures, including an enforceable sequence of actions with milestones, leading to compliance with any applicable requirements for which the source will be in noncompliance at the time of permit issuance. This compliance schedule shall resemble and be at least as stringent as that contained in any judicial consent decree or administrative order to which the source is subject. Any such schedule of compliance shall be supplemental to, and shall not sanction noncompliance with, the applicable requirements on which it is based;
Not Applicable

d) For sources required to have a schedule of compliance to remedy a violation, provide a schedule for submission of certified progress reports every six months or at a more frequent period if specified in an applicable requirement; and

Not Applicable

Statement of Certification: *Based on information and belief formed after reasonable inquiry, the statements and information in this document and any attachments are true, accurate and complete.*

Camilo Amezquita	VP/GM - Northwest Pipeline
Name of designated responsible official	Title of responsible official
DocuSigned by: Camilo Amezquita DABE55A3AC5F45D...	5/19/2023
Signature of responsible official	Date

Title V Operating Permit Renewal Application
Permit No. 007R3, Expires June 19, 2024

Northwest Pipeline, LLC
Sumas Compressor Station (NWCAA ID: 1434-V-W)
Whatcom County, WA

Attachment 2
Compliance Monitoring Devices and Activities

Northwest Pipeline LLC - Sumas Compressor Station
Compliance Monitoring Devices and Activities

Emission Unit	Compliance Monitoring Device/Activity	Method for determining compliance
All	Monthly and twelve month rolling total NOx emission calculations for each significant emission unit	Recordkeeping
1,2,3,4	One of the four Ingersoll Rand engines shall be tested for NOx once every five years.	Method 7A-7E
5,6	One of the two Clark engines shall be tested for NOx once every five years.	Method 7A-7E
All	Sulfur monitoring to assure that only natural gas from the pipeline is used as fuel.	Sulfur Chromatograph
7,8,9	Boroscope analysis according to manufacturers recommended schedule	Recordkeeping
7,8,9	Inspection of fuel injectors according to manufacturers recommended schedule	Recordkeeping
7,8,9	Conduct NOx and CO emissions test using a portable emissions analyzer not less than 336 hours or 672 hours upon demonstrating compliance for 6 months.	Modified CTM-034
7,8,9	Accuracy of portable emissions analyzers shall be verified annually	Modified CTM-034
7,8,9	Total sulfur in the fuel is monitored with a sulfur chromatograph located at the Sumas Compressor Station.	Sulfur Chromatograph
7,8,9	Records of the number of startups and shutdowns are maintained.	Recordkeeping
7,8,9	Conduct annual opacity measurements	Method 9
7,8,9	Conduct annual NOx and CO Source tests	Method 10 and 20
7,8,9	Monthly NOx and CO emission calculations to demonstrate compliance with annual emission limit	Recordkeeping
7,8,9	Each startup and shutdown of units will be recorded.	Recordkeeping
All	Maintain log of all nuisance complaints received	Recordkeeping
Generator	The hours the standby generator operates are monitored with an hour meter to assure it operates less than 500 hours in any consecutive 12 month period.	Recordkeeping
Generator	Submit quarterly monitoring and process data report including total hours of operation for the 12 immediately preceeding months. Maintain operation and maintenance plan on site.	Recordkeeping
Generator	Maintain annual inventory of fuel usage and hours of operation will be limited to 400 hours per year. Maintain operation and maintenance plan on site.	Recordkeeping
Boiler	Submit quarterly monitoring and process data report including total monthly CO mass emissions.	Recordkeeping
Generator	The standby generator will be tested for NOx with a portable analyzer at least once every 500 hours of operation.	Modified CTM-034
Boiler	The boiler will be emissions tested for compliance with NOx limits not less frequently than once every 5 years of operation	Modified CTM-034
Boiler	Maintain annual inventory of fuel usage and hours of operation. Maintain operation and maintenance plan on site.	Recordkeeping
Boiler	Maintain annual inventory of fuel usage and hours of operation.	Recordkeeping

Title V Operating Permit Renewal Application
Permit No. 007R3, Expires June 19, 2024

Northwest Pipeline, LLC
Sumas Compressor Station (NWCAA ID: 1434-V-W)
Whatcom County, WA

Attachment 3
Applicable Requirements
Sections 4 and 5 of Operating Permit 007R3

SECTION 4 GENERALLY APPLICABLE REQUIREMENTS

The cited requirements in the "Citation" column and incorporated herein by reference are applicable plant-wide at the source, including insignificant emission units. These requirements are federally enforceable unless identified as "State Only". A requirement designated "State Only" is enforceable only by the state or the NWCAA, and not by the EPA or through citizen suits. The "Description" column is a brief description of the applicable requirements for informational purposes only and is not enforceable. Periodic or continuous monitoring requirements (including testing) are specified in the "Monitoring, Recordkeeping & Reporting" column, which identifies monitoring, recordkeeping and reporting (MR&R) obligations the source must perform as required by WAC 173-401-605(1) and 615(1) and (2) or the underlying requirement. MR&R obligations do not apply to insignificant emission units.

The requirements in the MR&R column listed below the *"Directly Enforceable"* label are legally enforceable requirements added under the NWCAA's "gap-filling" authority (WAC 173-401-615(1)(b) & (c), (10/17/02)). Other requirements not labeled *"Directly Enforceable"* or above the *"Directly Enforceable"* label are brief descriptions of the regulatory requirements for information purposes, and are not enforceable. Unless the text of the MR&R column is specifically identified to be directly enforceable, the language of the cited regulation takes precedence over a paraphrased requirement.

Term	Citation	Description	Monitoring, Recordkeeping, & Reporting
4.1 General	WAC 173-401-615(3) (10/17/02) 40 CFR 60 Subpart A 60.19(c) (2/12/98) 40 CFR 63 Subpart A 63.10(a)(5) (4/20/06)	Required Monitoring Reports Submit reports of any required monitoring to the NWCAA at least once every six months. All instances of deviations from permit requirements must be clearly identified in such reports.	*Directly Enforceable:* Monthly reports shall cover a calendar month, quarterly reports shall cover a calendar quarter, six-month reports shall cover January through June and July through December, and annual reports shall cover a calendar year. The reports shall be submitted within 30 days after the close of the period that the reports cover, except when the reporting deadline is specified in a permit term including, but not limited to: AOP Term 2.1.8 – Source Testing AOP Term 2.4.1 – Annual AOP Certification AOP Term 2.4.4 – Annual emissions inventory AOP Term 2.4.5 – Annual GHG emissions AOP Term 2.9.1 - GHG Clean Air Rule
4.2 General	NWCAA 342 (9/8/93) NWCAA 342 (7/14/05 State Only)	Operation and Maintenance Sources are required to keep any process and/or air pollution control equipment in good operating condition and repair.	Operating instructions and maintenance schedules for process and/or control equipment must be available on site.

Term	Citation	Description	Monitoring, Recordkeeping, & Reporting
4.3 General	PSD-92-4, Amendment 1, Condition 9, (5/11/98) PSD-01-08, Amendment 4, Condition 10, (10/6/11)	Operation and Maintenance Manuals for all equipment that has the potential to affect emissions to the atmosphere shall be developed and maintained.	*Directly Enforceable:* Monitor, keep records and report in accordance with the terms of this permit.
4.4 General	PSD-01-08, Amendment 4, Condition 9.4, (10/6/11) OAC 793d, Condition 1 (11/21/11)	Northwest Pipeline LLC – Sumas Compressor Station shall maintain monitoring and process records including but not limited to: • Fuel monitoring records • Operating hours records	Records shall be maintained for at least five years and provided on request by NWCAA and Ecology within ten working days.

Term	Citation	Description	Monitoring, Recordkeeping, & Reporting
4.5 Nuisance	NWCAA 530 (3/09/00 State Only)	General Nuisance No person shall discharge from any source quantities of air contaminants, with the exception of odors, in sufficient amounts and of such characteristics and duration as is likely to be injurious or cause damage to human health, plant or animal life, or property; or which unreasonably interferes with enjoyment of life and property. An air contaminant is defined as "dust, fumes, mist, smoke, other particulate matter, vapor gas, odorous substance, or any combination thereof.	*Directly Enforceable:* A written air contaminant complaint response plan will be maintained at the facility. Upon receiving an air contaminant complaint from the NWCAA or the public, all possible sources of the nuisance emissions at the facility shall be checked for proper operation. Problems identified shall be repaired or corrected as soon as practicable. If the problems identified cannot be repaired or corrected within four hours, action shall be taken to minimize emissions until repairs can be made and the NWCAA shall be notified within 12 hours with a description of the complaint and action being taken to resolve the problem. The results of the investigation, identification of any malfunctioning equipment or aberrant operation, and the date and time of repair or mitigation shall be recorded. A log of these records shall be maintained for inspection. Receipt of a nuisance complaint in itself shall not necessarily be a violation.
4.6 Nuisance	WAC 173-400-040(5) (9/20/93) WAC 173-400-040(6) (9/16/18 State Only)	Emission Detrimental to Persons or Property No person shall cause or allow the emission of any air contaminant from any source if it is detrimental to the health, safety, or welfare of any person, or causes damage to property or business.	
4.7 Odor	NWCAA 535 (3/09/00 State Only)	Odor Control Measures Appropriate practices and control equipment shall be installed and operated to reduce odor-bearing gases emitted into the atmosphere to a reasonable minimum. Any person who shall cause the generation of any odor from any source which may reasonably interfere with any other property owner's use and enjoyment of their property must use recognized best practices and control equipment to reduce these odors to a reasonable minimum. No person shall cause or permit the emission of any odorous air contaminant from any source if it is detrimental to the health, safety, or welfare of any person, or causes damage to property or business.	
4.8 Odor	WAC 173-400-040(5) (9/16/18 State Only)	Odors Source may not generate odors which may unreasonably interfere with property use and must use recognized good practice and procedures to reduce odors to reasonable minimum.	

Term	Citation	Description	Monitoring, Recordkeeping, & Reporting
4.9 Odor	OAC 793d, Condition 12, (11/21/11)	Odors shall not be detected off site that may result in a nuisance as determined by NWCAA personnel.	*Directly Enforceable:* Follow MR&R under AOP Term 4.5.
4.10 PM	NWCAA 550 (4/14/93)	Preventing Particulate Matter from Becoming Airborne Best Available Control Technology (BACT) required to prevent the release of fugitive matter to the ambient air. Nuisance particulate fallout is prohibited.	
4.11 PM	NWCAA 550 (9/11/14 State Only)	Preventing Particulate Matter from Becoming Airborne The owner or operator of a source or activity that generates fugitive dust, including, but not limited to, material handling, building construction or demolition, abrasive blasting, roadways and lots, shall employ reasonable precautions to prevent fugitive dust from becoming airborne and must maintain and operate the source or activity to minimize emissions. It shall be unlawful for any person to cause or allow the emission of particulate matter which becomes deposited upon the property of others in sufficient quantities and of such characteristics and duration as is, or is likely to be, injurious to human health, plant or animal life, or property, or which unreasonably interferes with enjoyment of life and property.	
4.12 PM	WAC 173-400-040(3) (9/16/18 State Only)	Fallout Source may not generate the emission of particulate matter to be deposited beyond the property line in sufficient quantity to interfere unreasonably with the use and enjoyment of the property upon which the material is deposited.	
4.13 PM	WAC 173-400-040(3)(a) (9/20/93) WAC 173-400-040(4)(a) (9/16/18 State Only)	Fugitive Emissions From an emissions unit engaging in materials handling, construction, demolition, or other operation which is a source of fugitive emissions, take reasonable precautions to prevent the release of air contaminants from the operation.	

Term	Citation	Description	Monitoring, Recordkeeping, & Reporting
4.14 PM	WAC 173-400-040(8)(a) (9/20/93) WAC 173-400-040(9)(a) (9/16/18 State Only)	Fugitive Dust Reasonable precautions to prevent release of fugitive dust required. Maintain and operate source to minimize emissions.	*Directly Enforceable:* Follow MR&R under AOP Term 4.5.
4.15 VE	NWCAA 451.1 (10/13/94)	Emission of Air Contaminant - Visual Standard No person shall cause or permit the emission, for any period aggregating more than 3 minutes in any 1 hour, of an air contaminant from any source which, at the point at emission, or within a reasonable distance of the point of emission, exceeds 20% opacity (Ecology Method 9A) except: When there is valid data to show that the opacity is in excess of 20% as a result of the presence of condensed water droplets, and that the concentration of the particulate matter, as shown by a source test approved by the Control Officer, is less than 0.10 (0.23 g/m^3) grain/dscf.	*Directly Enforceable:* At least once during each calendar quarter that an emission unit operates, conduct qualitative or quantitative (as described in (iii) below) visual observations on each stack while operating to determine whether there are visible emissions (VE). If, at any time, visible emissions are observed, take one or more the following actions within 24 hours or it will be considered prima facie evidence that all applicable opacity limits have been exceeded. (i) Complete action that returns visible emissions to a non-visible level. (ii) Shutdown the unit until appropriate corrective action can be taken.
4.16 VE	NWCAA 451.1 (11/8/07 State Only)	Emission of Air Contaminant - Visual Standard No person shall cause or permit the emission, for any period aggregating more than 3 minutes in any 1 hour, of an air contaminant from any source which, at the point at emission, or within a reasonable distance of the point of emission, exceeds 20% opacity except: When there is valid data to show that the opacity is in excess of 20% as a result of the presence of condensed water droplets, and that the concentration of the particulate matter, as shown by a source test approved by the Control Officer, is less than 0.10 (0.23 g/m^3) grain/dscf.	

Term	Citation	Description	Monitoring, Recordkeeping, & Reporting
4.17 VE	WAC 173-400-040(1) (9/20/93) WAC 173-400-040(2) (9/16/18 State Only)	Visible Emissions No person shall cause or allow the emission for more than three minutes, in any one hour, of an air contaminant from any emissions unit which at the emission point, or within a reasonable distance of the emission point, exceeds twenty percent opacity except: When the owner or operator of a source supplies valid data to show that the presence of uncombined water is the only reason for the opacity to exceed 20%.	(iii) Observe and record VE using a certified observer in accordance with EPA Method 9 (six consecutive minutes). If any single reading is greater than an applicable numerical opacity limit, the certified observer shall determine opacity in accordance with the appropriate method for each opacity limit applicable to that emission unit. A certified observer shall determine opacity on a daily basis according to each applicable opacity limit until visible emissions are determined to be in compliance with each opacity limit. For each qualitative or quantitative VE observation, record the date and time of the observation, emission unit(s) observed, and name of observer. For stacks with visible emissions, record any related equipment or operational failure, failure dates and times, duration of visible emissions, and corrective actions taken. If visible emissions are observed, a follow-up qualitative or quantitative observation shall be made within a month. If no visible emissions are observed, return to the quarterly observation frequency. Compliance with this MR&R does not excuse an exceedance of the underlying opacity standard.
4.18 PM	NWCAA 455.1 and 455.11 (9/8/93) NWCAA 455.1 and 455.11 (5/11/95 State Only)	Emission of Particulate Matter No person shall cause or permit emission of particulate matter in excess of 0.10 grain/dry standard cubic foot (dscf) (0.23 g/m3) (combustion emissions shall be corrected to 7% O2) except: 455.11: From all gaseous and distillate fuel burning equipment, emissions shall not exceed 0.05 grain/dscf (0.11 g/m3) at 7% O_2.	*Directly Enforceable:* Follow MR&R under AOP Term 4.15.
4.19 PM	WAC 173-400-060 (3/22/91) WAC 173-400-060 (7/1/16 State Only)	Emission Standards for General Process Units Particulate emissions greater than 0.1 grain/dscf prohibited.	

Term	Citation	Description	Monitoring, Recordkeeping, & Reporting
4.20 PM	WAC 173-400-050(1) and (3) (3/22/91) WAC 173-400-050(1) and (3) (7/1/16 State Only)	Emission Standards for Combustion and Incineration Units Particulate emissions from combustion units greater than 0.1 grains/dscf at 7% O_2 prohibited.	*Directly Enforceable:* Follow MR&R under AOP Term 4.15.
4.21 SO_2	NWCAA 462 (10/14/87)	Emission of Sulfur Compounds Sulfur compounds emissions, calculated as SO_2, shall not exceed 1,000 ppmvd at 7% O_2. This requirement is not violated if reasonable evidence is presented that concentrations will not exceed ambient standards and the permittee demonstrates that no practical method of reducing the concentration exists.	*Directly Enforceable:* Maintain records of type, quantity, and sulfur content of all fuel combusted in accordance with AOP term 5.4. Records shall be made available for inspection upon request.
4.22 SO_2	NWCAA 462 (3/13/97 State Only) WAC 173-400-040(7) (9/16/18 State Only)	Emission of Sulfur Compounds Sulfur compounds emissions, calculated as SO_2, shall not exceed 1,000 ppmvd at 7% O_2 averaged for a 60 consecutive minute period. This requirement is not violated if reasonable evidence is presented that concentrations will not exceed ambient standards and the permittee demonstrates that no practical method of reducing the concentration exists.	
4.23 SO_2	WAC 173-400-040(6) first paragraph only (9/20/93)	Sulfur Dioxide Sulfur dioxide emissions shall not exceed 1,000 ppmvd at 7% O_2 for combustion sources, based on the average of any 60 consecutive minute period.	
4.24 SO_2	NWCAA 520.14 (4/14/93)	Sulfur Compounds in Fuel Prohibited to burn, sell, or make available for sale for burning in fuel burning equipment within the jurisdiction of the NWCAA, fuel containing sulfur in excess of the following for a time period not to exceed 30 days in a 12-month period: • gaseous fuels – 50 grains/100 scf	

Term	Citation	Description	Monitoring, Recordkeeping, & Reporting
4.25 SO_2	NWCAA 520.14 (5/9/96 state only)	Sulfur Compounds in Fuel Prohibited to burn, sell, or make available for sale for burning in fuel burning equipment within the jurisdiction of the NWCAA, fuel containing sulfur in excess of the following for a time period not to exceed 30 days in a 12-month period: • gaseous fuels – 50 grains/100 scf Ocean-going vessels are exempt.	*Directly Enforceable:* Follow MR&R under AOP Term 4.21.

SECTION 5 SPECIFICALLY APPLICABLE REQUIREMENTS FOR EMISSION UNITS

The cited requirements in the "Citation" column and incorporated herein by reference are applicable to emission units specified in the header of the table. These requirements are federally enforceable unless identified as "State Only". A requirement designated "State Only" is enforceable only by the state or the NWCAA, and not by the EPA or through citizen suits. The "Description" column is a brief description of the applicable requirements for informational purposes only and is not enforceable. Periodic or continuous monitoring requirements, including testing, are specified in the "Monitoring, Recordkeeping and Reporting" (MR&R) column, which identifies MR&R obligations the source must perform as required by WAC 173-401-605(1) and 615(1) and (2) or the underlying requirement. MR&R obligations do not apply to insignificant emission units. The test method cited or any credible evidence may be used to determine compliance.

The requirements in the MR&R column labeled "Directly Enforceable" are legally enforceable requirements added under the NWCAA's "gap-filling" authority (WAC 173-401-615(1)(b) & (c), (10/17/02)). Other requirements not labeled "Directly Enforceable" are brief descriptions of the regulatory requirements for information purposes, and are not enforceable. Unless the text of the MR&R column is specifically identified to be directly enforceable, the language of the cited regulation takes precedence over a paraphrased requirement.

All of the federal regulations listed in Section 5 have been adopted by reference in Section 104.2 of the NWCAA Regulation. NWCAA 104.2 was last amended by the agency on September 13, 2018.

Table 5-1 Specifically Applicable Requirements

Permit Term	Citation	Description	Monitoring, Recordkeeping & Reporting
All Compressors			
5.1 NO_X	PSD 92-4 Amendment 1 Condition 3 (5/11/98) OAC 793d Conditions 2 and 9(a) and 9(c) (11/21/11)	NO_X Limit - The total NO_X emissions from the compressors on site (including turbines and reciprocating engines) shall not exceed 1200 tons for any twelve consecutive months.	NWP-SCS shall utilize source test data, operating data, and emissions factors to determine compliance status. Data shall be summarized on a monthly basis, but reported quarterly. Include in the reports: Certification that only natural gas from the pipeline was burned. Results of all calculations used to determine NOx emissions. On a monthly basis, permittee shall utilize source test data, operating data and emissions factors to determine compliance status. Use 40 CFR 60 Appendix A Method 20, a portable analyzer using EPA Conditional Test Method 34, or an alternative testing protocol approved by Ecology for assuring accuracy.
All Reciprocating Engines (Units 1- 6; A- and B-Plants)			

Permit Term	Citation	Description	Monitoring, Recordkeeping & Reporting
5.2 NO_X	PSD 92-4 Amendment 1 Condition 3 (5/11/98) OAC 793d Conditions 10 and 11 (11/21/11)	The NO_X emissions from one of the four identical Ingersoll–Rand 412 KVS (Units 1-4) reciprocating engines and from one of the two identical Clark TCV-12 (Units 5 and 6) reciprocating engines shall be determined by stack testing once every five years.	Test plan shall be submitted at least 30 days prior to test. Test result shall be submitted no later than 60 days after testing. Use 40 CFR 60 Appendix A Method 7A-7E.
Mars 90S Turbines (Units 7-8, C- and D-Plants), Caterpillar 270 kW Emergency Generator, and Sellers C60 Heater/Boiler (D-Plant)			
5.3 SO_2	PSD-01-08, Amendment 4 Condition 1 (10/6/11) OAC 793d Conditions 1, 4 and 9(a) (11/21/11)	NWP is allowed to burn only natural gas from the pipeline.	Submit quarterly reports certifying that only natural gas from the pipeline was used. Quarterly reports shall be submitted no later than 45 days after the end of each calendar quarter.
5.4 SO_2	OAC 793d, Conditions 6 and 9(b) (11/21/11)	NWP-SCS shall monitor total sulfur in natural gas combusted at the Sumas facility on an hourly basis.	Monitor sulfur content of the fuel on an hourly schedule in units of grains of total sulfur per 100 standard cubic feet of natural gas. Quarterly reports shall be submitted no later than 45 days after the end of each calendar quarter. Report the fuel composition including a summary of the results for the reporting period, an electronic copy of hourly data and an explanation of all times during which the monitor was inoperable or malfunctioning. Missing data shall not be considered a deviation if 1) NWP has provided cause of inoperability, 2) NWCAA has not found cause to be unreasonable, and 3) NWP substitutes all periods of missing data with highest valid measurement during previous 30 days.
5.5 NO_X	OAC 793d, Conditions 3 and 9(c) (11/21/11)	NO_X Limit - The total NOx emissions for Units 7, 8 and 9 (Mars 90 turbines), the Caterpillar emergency generator and the Sellers C60 heater/boiler (D-Plant) shall not exceed 127.11 tons for any twelve consecutive months.	NWP-SCS shall utilize source test data, operating data and emissions factors to determine compliance status. Data shall be summarized on a monthly basis, but reported quarterly. The reports are due no later than 45 days after the end of each calendar quarter and shall include results of all calculations performed during the calendar quarter that were used to determine compliance status.

Permit Term	Citation	Description	Monitoring, Recordkeeping & Reporting
5.6 VE	OAC 793d Conditions 5, 8(h) and 11 (11/21/11)	Visible emissions for Units 7, 8 and 9 (Mars 90 turbines), the Caterpillar emergency generator and the Sellers C60 heater/boiler (D-plant) shall not exceed 5% opacity except during periods of startup or shutdown.	For Units 7, 8, and 9, NWP-SCS shall complete annual source tests at peak load for opacity using 40 CFR 60 Appendix A Method 9. Annual source tests shall occur no later than 13 months after the previous test. Test plans shall be submitted at least 30 days prior to test. Test results shall be submitted no later than sixty days after testing. Directly Enforceable: For Units 7, 8 and 9, the Caterpillar standby generator and the Sellers C60 heater/boiler (D-plant), follow MR&R procedure in Permit condition 4.15. Report exceedances in the quarterly compliance report.
5.7 General	PSD-01-08 Amendment 4 Condition 10 (10/6/11) OAC 793d, Condition 1 (11/21/11)	Operation and Equipment (O&M) Manual for the facility. Within 90 days of startup NWP-SCS shall identify operational procedures for the emergency generator, Sellers C60 heater/ boiler (D-plant) and combustion turbines that constitute proper operation relative to compliance with emission limitations.	O&M manuals shall be kept up-to-date and readily available at the facility. Manuals shall include, at a minimum: Manufacturers' operating instructions and design specifications. Normal operating parameters and design specifications. Updates to reflect any modifications made to equipment or operating procedure.
Mars 90S Turbines (Units 7, 8 and 9; C- and D-Plants)			
5.8 General	OAC 793d Conditions 8(j) and 8(k) (11/21/11)	Facility shall perform a boroscope analysis on each turbine not later than 12 months after initial startup and then according to the manufacturer's specified schedule. Visual inspections of the fuel injectors shall be completed 12 months after startup and then according to the manufacturer's specified schedule.	The results of any testing shall be maintained on site and available for review by NWCAA personnel.

Permit Term	Citation	Description	Monitoring, Recordkeeping & Reporting
5.9 SO_2	40 CFR §60.333(b) (7/8/04) §60.334(h)(3)(i) (2/24/06) NWCAA 104.2 (9/13/18)	<u>NSPS Subpart GG – Fuel Bound Sulfur</u> Sulfur content of fuels limited to 0.8%, by weight. Any daily period during which the sulfur content of the fuel being combusted in the gas turbine exceeds 0.8%, by weight, shall be deemed a period of excess emissions and reported.	NWP-SCS has elected not to monitor the total sulfur content of the gaseous fuel as allowed by §60.334(h)(3)(i) and formalized in a letter to NWCAA dated 01/23/04.
5.10 NO_X	PSD-01-08 Amendment 4 Condition 4 (10/6/11) OAC 793d Conditions 1, 8(a)-(c), 8(d)(i), 8(d)(iii), 8(f)-(h), 9(e)(ii)-(iii) and 11 (11/21/11) 40 CFR §60.7(b) (2/12/99) NWCAA 104.2 (9/13/18)	NO_X emissions are limited to 25 ppmvd over a three hour average when corrected to 15% O_2 ISO except during startup and shutdown.	NWP-SCS shall monitor compliance by measuring NOx concentration in each turbine exhaust stack by use of a portable emissions analyzer not less frequently than every 336 hours of operation. NWP-SCS shall perform three consecutive tests using the portable analyzer. Should the average of the three tests indicate noncompliance, shut down the unit as soon as practical and contact the NWCAA within 12 hours. Exceedance of the limit imposed by Condition 8(d)(i) of OAC 793d as indicated by the average of the three consecutive tests shall be prima facie evidence of a violation of Condition 8(d)(i) of OAC 793d. After six consecutive months of testing, OAC 793d(8)(f)(iv) includes a process for relaxing the testing frequency to once every 672 hours of operation. NWP-SCS shall verify the accuracy of any portable analyzers not less than once every calendar year in conjunction with annual stack tests and keep records of accuracy verification for not less than five years and make them available upon request within five days for NWCAA review. The NO_X emission limit is relieved during startup and shutdown. NWP-SCS shall keep a record of each startup and shutdown event as defined in OAC 793d and 40 CFR 60. Testing shall be done in accordance with EPA Designated Conditional Test Method 34. An alternate test method may be used if approved in writing by NWCAA prior to the test. Submit quarterly monitoring and process data report. Report shall be submitted no later than 45 days after the end of each calendar quarter. Report shall include all exhaust stack NOx concentrations measured using the portable analyzer

Permit Term	Citation	Description	Monitoring, Recordkeeping & Reporting
			during the previous quarter. For each occurrence of NO_X emissions in excess of the limits report: (1) time of occurrence; (2) magnitude of the emission; (3) the duration (4) probable cause; (5) corrective actions taken; and (6) any other Agency contacted. Annual source tests shall occur no later than 13 months after the previous test. Testing for NO_x shall be conducted at four points in the normal operating range of the turbines, including the minimum point in the normal operating range and peak load. Testing for opacity shall be at peak load. Test plan shall be submitted at least thirty days prior to test. Source test results shall be submitted no later than 60 days after testing. Use following test 40 CFR 60 Appendix A Methods: Opacity Method 9 NO_X Method 20
5.11 NO_X	40 CFR §60.332(a)(2) and (d) (6/30/16) §60.334(c) (2/24/06) NWCAA 104.2 (9/13/18)	<u>Subpart GG NO_X Standard</u> The turbines shall not discharge into the atmosphere any gases which contain nitrogen oxides in excess of 196 ppmvd at 15% O_2.	If the owner or operator has previously submitted and received EPA or local authority approval of a petition for an alternative procedure for continuously monitoring compliance with an applicable NOx emissions limit that procedure may continue to be used. Monitor NO_X emissions in accordance with alternate monitoring program described in AOP Condition 5.10. Notes: Heat rate of Solar Mars 90 turbines = 7,789 Btu/Hp-hr @ 59°F Fuel flow of Solar Mars 90 turbines = 100.03 MMBtu/hr @ 59°F Net Output Power of Solar Mars 90 turbines = 12,841 Hp @ 59°F Net Output Power of Solar Mars 90 turbines = 9.58 MW @ 59°F

Permit Term	Citation	Description	Monitoring, Recordkeeping & Reporting
5.12 NO_X	OAC 793d Condition 8(d)(ii), 8(e), 8(i), 9(e)(i) and 9(e)(iii) (11/21/11)	Total NO_X emissions from Units 7, 8 and 9 shall not exceed 126 tons during any consecutive 12-month period. NO_X emissions during startup and shutdown shall be counted toward the 12 month mass emission limit at a rate of 4 lbs per startup or shutdown.	Within 20 days of the end of each month NWP-SCS shall determine the tons of NO_X from each turbine for the most recent consecutive 12 month period. For this calculation, NWP shall utilize a time-weighted average of the relevant stack test results wherein the results of each source test shall be the presumed emission rate until the next source test. Submit quarterly monitoring and process data report. Report shall be submitted no later than 45 days after the end of each calendar quarter. Report shall include results of all calculations necessary to show compliance status for the reporting period. For each occurrence of NOx emissions in excess of the limits report: (1) time of occurrence; (2) magnitude of the emission; (3) the duration (4) probable cause; (5) corrective actions taken; and (6) any other Agency contacted.
5.13 CO	PSD-01-08 Amendment 4 Condition 5.3, 5.5.2 and 9.3.2, (10/06/11) OAC 793d Condition 1 (11/21/11)	Mass emissions of CO shall not exceed 46.5 tons per turbine for any consecutive 12 month period.	Within 20 days of the end of each month NWP-SCS shall determine the tons of CO emissions from each of the turbines for the most recent consecutive 12 months. Use time-weighted average of relevant stack tests. Submit quarterly monitoring and process data report. Report shall include the total CO mass emissions for the 12 immediately preceding months for each turbine.
5.14 CO	PSD-01-08 Amendment 4 Conditions 5.1, 5.2, 5.4, 5.5.1, 6, 7, 9.3.1, 9.3.3, 9.3.4, 9.3.5 and 9.3.6 (6/14/06) OAC 793d Condition 1 (11/21/11)	CO emissions shall not exceed 50 ppmvd over a one hour average corrected to 15% O_2. Mass emissions of CO shall not exceed 14.0 lbs/hour per turbine as a one hour average.	NWP-SCS shall demonstrate compliance initially and annually in accordance with 40 CFR 60 Appendix A Method 10 except that instrument span may be reduced as appropriate. NWP-SCS shall submit a test plan to WDOE and NWCAA for approval 30 days prior to testing. Complete test report shall be submitted to NWCAA no later than 60 days after completion of test. Initial compliance shall be demonstrated within 180 days of initial startup. Annual compliance shall be demonstrated no sooner than 10 months after the previous test and no later than 13 months after the previous test. NWP-SCS shall provide safe access and sampling ports. For compliance monitoring the turbine exhaust stack CO concentration shall be measured not less frequently than

Permit Term	Citation	Description	Monitoring, Recordkeeping & Reporting
			every 336 hours of operation using a portable emissions analyzer. Testing shall be done with accordance with EPA Designated Conditional Test Method 034. An alternate or modified test method may be used if approved in writing by Ecology prior to the test. Accuracy of the portable analyzer shall be verified no less than once every calendar year in accordance with the approved protocol. NWP-SCS shall perform three consecutive tests using the portable analyzer. Should the average of the three tests indicate noncompliance, shut down the unit as soon as practical and contact the NWCAA within 12 hours. Exceedance of the limit imposed by Condition 5.1 of PSD-01-08, Amendment 4 as indicated by the average of the three consecutive tests shall be prima facie evidence of a violation of Condition 5.1 of PSD-01-08, Amendment 4. After six consecutive months of testing, the PSD permit includes a process for relaxing the testing frequency to once every 672 hours of operation. Submit quarterly monitoring and process data report. Report shall include: All exhaust stack CO concentrations measured using the portable analyzer during the reporting period Details of any scheduled portable analyzer test not completed Results of portable analyzer tests completed during the reporting period For each occurrence of CO monitored emissions in excess of the concentration limits or mass limits, report: (1) time of occurrence; (2) magnitude of the emission; (3) the duration (4) probable cause; (5) corrective actions taken; and (6) any other Agency contacted.

Permit Term	Citation	Description	Monitoring, Recordkeeping & Reporting
Caterpillar 270 kW Emergency Generator (D-Plant)			
5.15 General	PSD-01-08 Amendment 4 Condition 2.1, 2.2 and 9.1 (10/6/11) OAC 793d Condition 1, 7 and 9(d) (11/21/11)	The standby generator shall be operated no more than 500 hours in any consecutive 12 month period.	Compliance shall be monitored by installing a non-resettable hour meter with monthly recording of the hour meter reading; or alternatively, automated data collection may be used. Submit quarterly monitoring and process data report. Report shall include the total hours of operation for the 12 immediately preceding months.
5.16 General	PSD-01-08 Amendment 4 Condition 2.3 (10/6/11) OAC 793d Condition 1 (11/21/11)	Install a three-way catalytic converter Model # EQ-601-08-C2 or equivalent.	Directly Enforceable: Develop operation and maintenance plan and make it available within five days for NWCAA review.
Caterpillar 390 kW Emergency Generator (C-Plant)			
5.17 General	OAC 403 Rev. 1 Condition 3 (1/2/96)	An operation and maintenance plan shall be made available to the operators.	Directly Enforceable: Develop operation and maintenance plan and make it available within five days for NWCAA review.
5.18 General	OAC 403 Rev. 1 Conditions 4, 5 and 6 (1/2/96)	The emergency generator shall burn only natural gas from the pipeline and be limited to no more than 400 hours of operation per year.	Maintain annual inventory of fuel usage and hours of operation.
5.19 VE	OAC 403 Rev. 1 Condition 2 (1/2/96)	Opacity shall not exceed 5% for more than six minutes in any one hour period.	Directly Enforceable: If visible emissions are observed by plant personnel, the facility shall take immediate corrective action, maintain records of observations and corrective action taken, and report the incident to the NWCAA as soon as possible. Report exceedances in the quarterly compliance report.
Sellers C60 Boiler/Heater (D-Plant)			
5.20 CO	PSD-01-08 Amendment 4 Condition 3 and 9.2 (10/6/11)	The CO emissions shall be calculated using AP-42 factors or other methods approved by Ecology.	Submit quarterly monitoring and process data report. Report shall include the total monthly CO mass emissions.

Permit Term	Citation	Description	Monitoring, Recordkeeping & Reporting
	OAC 793d Condition 1 (11/21/11)		
~~Sellers C60 Heater/Boiler (C-Plant)~~			
~~5.21 General~~	~~OAC 403 Rev. 1 Condition 3 (1/2/96)~~	~~An operation and maintenance plan shall be made available to the operators.~~	~~Directly Enforceable:~~ ~~Develop operation and maintenance plan and make it available within five days of a request for NWCAA review.~~
~~5.22 General~~	~~OAC 403 Rev. 1 Conditions 4 and 6 (1/2/96)~~	~~The boiler shall burn only natural gas from the pipeline.~~	~~Maintain annual inventory of fuel usage and hours of operation.~~
~~5.23 VE~~	~~OAC 403 Rev. 1 Condition 2 (1/2/96)~~	~~Opacity shall not exceed 5% for more than six minutes in any one hour period.~~	~~Directly Enforceable:~~ ~~If visible emissions are observed by plant personnel, the facility shall take immediate corrective action, maintain records of observations and corrective action taken, and report the incident to the NWCAA as soon as possible.~~ ~~Report exceedances in the quarterly compliance report.~~
Sellers C100 Boiler/Heater (A-Aux)			
5.24 General	OAC 259 Condition 2 (9/18/89)	Natural gas shall be the only fuel allowed to be combusted in this boiler.	Directly Enforceable Maintain annual inventory of fuel usage and hours of operation.
~~Sellers C60 Heater/Boiler (C-Plant),~~ Sellers C60 Heater/Boiler (D-Plant), and Sellers C100 Heater/Boiler (A-Aux)			
5.25 Boiler MACT	40 CFR §63.7500(a) & (e) (11/20/15) §63.7505(a) (11/20/15) §63.7515(d) (11/20/15) §63.7540(a)(10) & (a)(12) (11/20/15)	<u>Boiler MACT Tune-ups</u> Conduct a tune-up on the boilers no less than once every 61 months. The periodic tune-up shall include the following; inspect the burner, clean and replace burner components as necessary, inspect the burner flame pattern and adjust as necessary, inspect and maintain the air-to-fuel ratio system to ensure it is calibrated and functioning properly by measuring CO concentrations in the exhaust	At least once every five calendar years, submit electronically to EPA's Central Data Exchange (www.cdx.epa.gov) a report demonstrating that a periodic tune-up was completed. The report shall include the tune-up and burner inspection dates, a statement regarding deviations during the reporting period, and a certification by the Responsible Official. Maintain a copy of each compliance report submitted. Maintain a record describing each tune-up including CO concentrations before and after the tune-up and any corrective actions taken as a part of the tune-up

Permit Term	Citation	Description	Monitoring, Recordkeeping & Reporting
	§63.7550(a), (b), (c)(1), (c)(5), (h)(3) and Table 9 (11/20/15) §63.7555(a) (11/20/15) NWCAA 104.2 (9/13/18)	with a portable analyzer before and after adjustments are made.	
Cummins GTA 855 250 kW (A-Aux), and Caterpillar 270 kW (D-Plant) Emergency RICE			
5.26 RICE NESHAP	40 CFR §63.6595(a)(1) (1/30/13) §63.6605 (1/30/13) §63.6625(e) (1/30/13) §63.6655(a)(5) (1/30/13) NWCAA 104.2 (9/13/18)	At all times operate and maintain the engines, including associated air pollution control equipment and monitoring equipment, in a manner consistent with safety and good air pollution control practices for minimizing emissions.	Determination of whether such operation and maintenance procedures are being used will be based on information available to the Agency which may include, but is not limited to, monitoring results, review of operation and maintenance procedures, review of operation and maintenance records, and inspection of the source. Maintain records of actions taken during periods of malfunction to minimize emissions including corrective actions to restore malfunctioning process and air pollution control and monitoring equipment to its normal or usual manner of operation. Keep the manufacturer's emission-related written instructions or develop your own maintenance plan which must provide to the extent practicable for the maintenance and operation of the engine in a manner consistent with good air pollution control practice for minimizing emissions.
5.27 RICE NESHAP	40 CFR §63.6602 (1/30/13) §63.6625(f) and (j) (1/30/13) §63.6640 (1/30/13) §63.6655(a)(2), (4) and (5) (1/30/13) Table 2c(6) (3/6/13) and Table 6(9)	<u>Emission Limitations</u> (a) Operate and maintain the stationary RICE according to the manufacturer's emission-related operation and maintenance instructions; (b) Install a non-resettable hour meter; (c) Change oil and filter every 500 hours of operation or annually, whichever comes first, or alternately follow the provisions in 40 CFR §63.6625(j) to test the oil;	Keep the following records: (a) Records of the occurrence and duration of each malfunction of operation (i.e., process equipment) or the air pollution control and monitoring equipment. (b) Records of all required maintenance performed on the air pollution control and monitoring equipment. (c) Records of actions taken during periods of malfunction to minimize emissions.

Permit Term	Citation	Description	Monitoring, Recordkeeping & Reporting
	(1/30/13) to 40 CFR 63 Subpart ZZZZ NWCAA 104.2 (9/13/18)	(d) Inspect spark plugs every 1,000 hours of operation or annually, whichever comes first; (e) Inspect all hoses and belts every 500 hours of operation or annually, whichever comes first, and replace as necessary.	
5.28 RICE NESHAP	40 CFR §63.6625(h) (1/30/13) §63.6640(f)(1) (1/30/13) §63.6655(e) and (f) (1/30/13) NWCAA 104.2 (9/13/18)	There is no time limit on the use of emergency stationary RICE in emergency situations. Maintenance checks and readiness testing of such units is limited to 100 hr/year. You must minimize the engine's time spent at idle during startup and minimize the engine's startup time to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes, after which time the emission standards applicable to all times other than startup in Table 2c to subpart ZZZZ to 40 CFR 63 apply. The owner or operator may petition the Administrator for approval of additional hours to be used for maintenance checks and readiness testing, but a petition is not required if the owner or operator maintains records indicating that Federal, State, or local standards require maintenance and testing of emergency RICE beyond 100 hours per year. You may operate your engines for up to 50 hours per year in non-emergency situations, but those 50 hours are counted towards the 100 hours per year provided for maintenance and testing. The engines may not be operated for more than 30 minutes prior to the time when the emergency condition is expected to occur, and the engine operation must be terminated immediately after the facility is notified that the emergency condition is no longer imminent.	You must keep records of the hours of operation of the engine that is recorded through a non-resettable hour meter. You must document how many hours are spent for emergency operation, including what classified the operation as emergency and how many hours are spent for non-emergency operation. You must keep records of the maintenance conducted on the stationary RICE in order to demonstrate that you operated and maintained the stationary RICE and after-treatment control device (if any) according to your own maintenance plan. If the engines are used for demand response operation, you must keep records of the notification of the emergency situation, and the time the engine was operated as part of demand response.

Title V Operating Permit Renewal Application
Permit No. 007R3, Expires June 19, 2024

Northwest Pipeline, LLC
Sumas Compressor Station (NWCAA ID: 1434-V-W)
Whatcom County, WA

Attachment 4
Emissions Calculations

Criteria Pollutant Summary
Hazardous Air Pollutants Summary
Greenhouse Gas Pollutant Summary

Units 1-4	Ingersoll-Rand 412-KVS Compressor Engine
Units 5-6	Dresser-Rand Clark TCV-12 Compressor Engine
Units 7-9	Solar Mars 90-12000S Compressor Turbine
Unit 10	Sellers C60 Boiler (D Plant)
Unit 11	Sellers C100 Boiler (A Plant)
Unit 13	Cummins GTA-855 Backup Generator
Unit 14	Caterpillar G3408 Backup Generator
Unit 15	Caterpillar G3412 Backup Generator

Northwest Pipeline LLC

Sumas Compressor Station

Application to Renew Title V Operating Permit

Criteria Pollutants

Status	Source ID	APCE	Description	Site Rating	hr/yr	NOx		CO		VOC (w/HCHO)		SO2		PM10/2.5	
						lb/hr*	tpy	lb/hr*	tpy	lb/hr*	tpy	lb/hr*	tpy	lb/hr*	tpy
Sumas Compressor Station - Point Sources															
Existing	Unit 1	na	Compressor Engine 01 - Ingersoll-Rand 412-KVS	1,500 bhp	8,760	47.73	209.06	5.73	25.09	2.13	9.34	0.01	0.05	1E-03	0.01
Existing	Unit 2	na	Compressor Engine 02 - Ingersoll-Rand 412-KVS	1,500 bhp	8,760	47.73	209.06	5.73	25.09	2.13	9.34	0.01	0.05	0.00	0.01
Existing	Unit 3	na	Compressor Engine 03 - Ingersoll-Rand 412-KVS	1,500 bhp	8,760	47.73	209.06	5.73	25.09	2.13	9.34	0.01	0.05	0.00	0.01
Existing	Unit 4	na	Compressor Engine 04 - Ingersoll-Rand 412-KVS	1,500 bhp	8,760	47.73	209.06	5.73	25.09	2.13	9.34	0.01	0.05	0.00	0.01
Existing	Unit 5	na	Compressor Engine 05 - Dresser-Rand Clark TCV-12	4,000 bhp	8,760	68.79	301.30	12.81	56.10	3.98	17.44	0.02	0.09	1.27	5.58
Existing	Unit 6	na	Compressor Engine 06 - Dresser-Rand Clark TCV-12	4,000 bhp	8,760	68.79	301.30	12.81	56.10	3.98	17.44	0.02	0.09	1.27	5.58
Existing	Unit 7	na	Compressor Turbine 01 - Solar Mars 90-12000S	12,841 bhp	8,760	9.96	43.62	12.13	53.13	0.69	3.04	1.40	6.13	0.66	2.90
Existing	Unit 8	na	Compressor Turbine 02 - Solar Mars 90-12000S	12,841 bhp	8,760	9.96	43.62	12.13	53.13	0.69	3.04	1.40	6.13	0.66	2.90
Existing	Unit 9	na	Compressor Turbine 03 - Solar Mars 90-12000S	12,841 bhp	8,760	9.96	43.62	12.13	53.13	0.69	3.04	1.40	6.13	0.66	2.90
Existing	Unit 10	na	D Plant - Sellers C60 Boiler	2.50 MMBtu/hr	8,760	0.25	1.07	0.21	0.90	0.01	0.06	1E-03	0.01	0.02	0.08
Existing	Unit 11	na	A Plant - Sellers C100 Boiler	4.20 MMBtu/hr	8,760	0.41	1.80	0.35	1.51	0.02	0.10	2E-03	0.01	0.03	0.14
Existing	Unit 13	na	Backup Generator - Cummins GTA-855	335 bhp	500	6.46	1.62	10.59	2.65	0.09	0.02	2E-03	4E-04	0.06	0.01
Existing	Unit 14	na	Backup Generator - Caterpillar G3408	362 bhp	500	0.01	3E-03	0.05	0.01	0.10	0.02	2E-03	5E-04	0.06	0.01
Existing	Unit 15	na	Backup Generator - Caterpillar G3412	522 bhp	400	10.07	2.01	16.51	3.30	0.14	0.03	3E-03	5E-04	0.09	0.02
				Point Sources:		**375.58**	**1,576**	**112.61**	**380.30**	**18.95**	**81.59**	**4.29**	**18.78**	**4.79**	**20.16**

Northwest Pipeline LLC

Sumas Compressor Station

Application to Renew Title V Operating Permit

Hazardous Air Pollutants (HAP)

Status	Source ID	APCE	Description	Site Rating	hr/yr*	Acetaldehyde		Acrolein		Benzene		Butadiene		Ethylbenzene		HCHO		n-Hexane	
						lb/hr*	tpy	lb/hr*	tpy	lb/hr*	tpy	lb/hr*	tpy	lb/hr*	tpy	lb/hr*	tpy	lb/hr*	tpy
Sumas Compressor Station - Point Sources																			
Existing	Unit 1	na	Compressor Engine 01 - Ingersoll-Rand 412-KVS	1,500 bhp	8,760	0.15	0.66	0.09	0.41	0.01	0.03	5E-03	0.02	7E-04	3E-03	0.95	4.18	0.02	0.09
Existing	Unit 2	na	Compressor Engine 02 - Ingersoll-Rand 412-KVS	1,500 bhp	8,760	0.15	0.66	0.09	0.41	0.01	0.03	5E-03	0.02	7E-04	3E-03	0.95	4.18	0.02	0.09
Existing	Unit 3	na	Compressor Engine 03 - Ingersoll-Rand 412-KVS	1,500 bhp	8,760	0.15	0.66	0.09	0.41	0.01	0.03	5E-03	0.02	7E-04	3E-03	0.95	4.18	0.02	0.09
Existing	Unit 4	na	Compressor Engine 04 - Ingersoll-Rand 412-KVS	1,500 bhp	8,760	0.15	0.66	0.09	0.41	0.01	0.03	5E-03	0.02	7E-04	3E-03	0.95	4.18	0.02	0.09
Existing	Unit 5	na	Compressor Engine 05 - Dresser-Rand Clark TCV-12	4,000 bhp	8,760	0.26	1.13	0.26	1.13	0.06	0.28	0.03	0.12	4E-03	0.02	1.83	8.02	0.01	0.06
Existing	Unit 6	na	Compressor Engine 06 - Dresser-Rand Clark TCV-12	4,000 bhp	8,760	0.26	1.13	0.26	1.13	0.06	0.28	0.03	0.12	4E-03	0.02	1.83	8.02	0.01	0.06
Existing	Unit 7	na	Compressor Turbine 01 - Solar Mars 90-12000S	12,841 bhp	8,760	4E-03	0.02	6E-04	3E-03	1E-03	0.01	4E-05	2E-04	3E-03	0.01	0.07	0.31	---	---
Existing	Unit 8	na	Compressor Turbine 02 - Solar Mars 90-12000S	12,841 bhp	8,760	4E-03	0.02	6E-04	3E-03	1E-03	0.01	4E-05	2E-04	3E-03	0.01	0.07	0.31	---	---
Existing	Unit 9	na	Compressor Turbine 03 - Solar Mars 90-12000S	12,841 bhp	8,760	4E-03	0.02	6E-04	3E-03	1E-03	0.01	4E-05	2E-04	3E-03	0.01	0.07	0.31	---	---
Existing	Unit 10	na	D Plant - Sellers C60 Boiler	2.50 MMBtu/hr	8,760	---	---	---	---	5E-06	2E-05	---	---	---	---	2E-04	8E-04	4E-03	0.02
Existing	Unit 11	na	A Plant - Sellers C100 Boiler	4.20 MMBtu/hr	8,760	---	---	---	---	9E-06	4E-05	---	---	---	---	3E-04	1E-03	0.01	0.03
Existing	Unit 13	na	Backup Generator - Cummins GTA-855	335 bhp	500	0.01	2E-03	0.01	2E-03	4E-03	1E-03	2E-03	5E-04	7E-05	2E-05	0.06	0.01	---	---
Existing	Unit 14	na	Backup Generator - Caterpillar G3408	362 bhp	500	0.01	2E-03	0.01	2E-03	5E-03	1E-03	2E-03	5E-04	8E-05	2E-05	0.06	0.02	---	---
Existing	Unit 15	na	Backup Generator - Caterpillar G3412	522 bhp	400	0.01	2E-03	0.01	2E-03	0.01	1E-03	3E-03	6E-04	1E-04	2E-05	0.09	0.02	---	---
				Point Sources:		**1.16**	**4.96**	**0.92**	**3.90**	**0.18**	**0.72**	**0.08**	**0.32**	**0.02**	**0.09**	**7.90**	**33.74**	**0.12**	**0.53**

Status	Source ID	APCE	Description	Site Rating	hr/yr*	Methanol		POM/PAH		Toluene		2,2,4-TMP		Xylenes		Trace/Other		Total HAP	
						lb/hr*	tpy	lb/hr*	tpy	lb/hr*	tpy	lb/hr*	tpy	lb/hr*	tpy	lb/hr*	tpy	lb/hr*	tpy
Sumas Compressor Station - Point Sources																			
Existing	Unit 1	na	Compressor Engine 01 - Ingersoll-Rand 412-KVS	1,500 bhp	8,760	0.05	0.20	0.01	0.03	0.01	0.03	5E-03	0.02	3E-03	0.01	0.01	0.03	1.30	5.71
Existing	Unit 2	na	Compressor Engine 02 - Ingersoll-Rand 412-KVS	1,500 bhp	8,760	0.05	0.20	0.01	0.03	0.01	0.03	5E-03	0.02	3E-03	0.01	0.01	0.03	1.30	5.71
Existing	Unit 3	na	Compressor Engine 03 - Ingersoll-Rand 412-KVS	1,500 bhp	8,760	0.05	0.20	0.01	0.03	0.01	0.03	5E-03	0.02	3E-03	0.01	0.01	0.03	1.30	5.71
Existing	Unit 4	na	Compressor Engine 04 - Ingersoll-Rand 412-KVS	1,500 bhp	8,760	0.05	0.20	0.01	0.03	0.01	0.03	5E-03	0.02	3E-03	0.01	0.01	0.03	1.30	5.71
Existing	Unit 5	na	Compressor Engine 05 - Dresser-Rand Clark TCV-12	4,000 bhp	8,760	0.08	0.36	0.01	0.04	0.03	0.14	0.03	0.12	0.01	0.04	0.02	0.10	2.64	11.56
Existing	Unit 6	na	Compressor Engine 06 - Dresser-Rand Clark TCV-12	4,000 bhp	8,760	0.08	0.36	0.01	0.04	0.03	0.14	0.03	0.12	0.01	0.04	0.02	0.10	2.64	11.56
Existing	Unit 7	na	Compressor Turbine 01 - Solar Mars 90-12000S	12,841 bhp	8,760	---	---	3E-03	0.02	0.01	0.06	4E-05	2E-04	0.01	0.03	3E-03	0.01	0.11	0.46
Existing	Unit 8	na	Compressor Turbine 02 - Solar Mars 90-12000S	12,841 bhp	8,760	---	---	3E-03	0.02	0.01	0.06	4E-05	2E-04	0.01	0.03	3E-03	0.01	0.11	0.46
Existing	Unit 9	na	Compressor Turbine 03 - Solar Mars 90-12000S	12,841 bhp	8,760	---	---	3E-03	0.02	0.01	0.06	4E-05	2E-04	0.01	0.03	3E-03	0.01	0.11	0.46
Existing	Unit 10	na	D Plant - Sellers C60 Boiler	2.50 MMBtu/hr	8,760	---	---	4E-04	2E-03	8E-06	4E-05	---	---	---	---	3E-06	1E-05	0.01	0.02
Existing	Unit 11	na	A Plant - Sellers C100 Boiler	4.20 MMBtu/hr	8,760	---	---	7E-04	3E-03	1E-05	6E-05	---	---	---	---	5E-06	2E-05	0.01	0.04
Existing	Unit 13	na	Backup Generator - Cummins GTA-855	335 bhp	500	0.01	2E-03	7E-04	2E-04	2E-03	4E-04	---	---	6E-04	1E-04	5E-04	1E-04	0.09	0.02
Existing	Unit 14	na	Backup Generator - Caterpillar G3408	362 bhp	500	0.01	2E-03	7E-04	2E-04	2E-03	4E-04	---	---	6E-04	2E-04	6E-04	1E-04	0.10	0.02
Existing	Unit 15	na	Backup Generator - Caterpillar G3412	522 bhp	400	0.01	3E-03	1E-03	2E-04	2E-03	5E-04	---	---	9E-04	2E-04	8E-04	2E-04	0.14	0.03
				Point Sources:		**0.38**	**1.52**	**0.06**	**0.25**	**0.14**	**0.58**	**0.07**	**0.33**	**0.05**	**0.22**	**0.08**	**0.33**	**11.16**	**47.50**

Northwest Pipeline LLC

Sumas Compressor Station

Application to Renew Title V Operating Permit

Greenhouse Gas (GHG) Pollutants

Status	Source ID	APCE	Description	Site Rating	hr/yr	Heat Input (HHV)	CO2 GWP: 1	CO2e	CH4 GWP: 25	CO2e	N2O GWP: 298	CO2e	TOTAL CO2e	
						MMBtu/hr	tpy	tpy	tpy	tpy	tpy	tpy	lb/hr*	tpy
Sumas Compressor Station - Point Sources														
Existing	Unit 1	na	Compressor Engine 01 - Ingersoll-Rand 412-KVS	1,500 bhp	8,760	18.07	9,257	9,257	0.17	4.36	0.02	5.20	**2,116**	**9,267**
Existing	Unit 2	na	Compressor Engine 02 - Ingersoll-Rand 412-KVS	1,500 bhp	8,760	18.07	9,257	9,257	0.17	4.36	0.02	5.20	**2,116**	**9,267**
Existing	Unit 3	na	Compressor Engine 03 - Ingersoll-Rand 412-KVS	1,500 bhp	8,760	18.07	9,257	9,257	0.17	4.36	0.02	5.20	**2,116**	**9,267**
Existing	Unit 4	na	Compressor Engine 04 - Ingersoll-Rand 412-KVS	1,500 bhp	8,760	18.07	9,257	9,257	0.17	4.36	0.02	5.20	**2,116**	**9,267**
Existing	Unit 5	na	Compressor Engine 05 - Dresser-Rand Clark TCV-12	4,000 bhp	8,760	33.18	17,000	17,000	0.32	8.01	0.03	9.55	**3,885**	**17,018**
Existing	Unit 6	na	Compressor Engine 06 - Dresser-Rand Clark TCV-12	4,000 bhp	8,760	33.18	17,000	17,000	0.32	8.01	0.03	9.55	**3,885**	**17,018**
Existing	Unit 7	na	Compressor Turbine 01 - Solar Mars 90-12000S	12,841 bhp	8,760	100.02	48,189	48,189	3.79	94.63	1.31	391.64	**11,113**	**48,675**
Existing	Unit 8	na	Compressor Turbine 02 - Solar Mars 90-12000S	12,841 bhp	8,760	100.02	48,189	48,189	3.79	94.63	1.31	391.64	**11,113**	**48,675**
Existing	Unit 9	na	Compressor Turbine 03 - Solar Mars 90-12000S	12,841 bhp	8,760	100.02	48,189	48,189	3.79	94.63	1.31	391.64	**11,113**	**48,675**
Existing	Unit 10	na	D Plant - Sellers C60 Boiler	2.50 MMBtu/hr	8,760	2.50	1,288	1,288	0.02	0.62	0.02	7.04	**296**	**1,296**
Existing	Unit 11	na	A Plant - Sellers C100 Boiler	4.20 MMBtu/hr	8,760	4.20	2,164	2,164	0.04	1.04	0.04	11.82	**497**	**2,177**
Existing	Unit 13	na	Backup Generator - Cummins GTA-855	335 bhp	500	2.85	83	83	2E-03	0.04	2E-04	0.05	**333**	**83**
Existing	Unit 14	na	Backup Generator - Caterpillar G3408	362 bhp	500	3.08	90	90	2E-03	0.04	2E-04	0.05	**360**	**90**
Existing	Unit 15	na	Backup Generator - Caterpillar G3412	522 bhp	400	4.44	103.81	103.81	2E-03	0.05	2E-04	0.06	**519.56**	**103.91**
				Point Sources:		**455.75**	**219,325**	**219,325**	**12.77**	**319.13**	**4.14**	**1233.84**	**51,579**	**220,878**

Northwest Pipeline LLC

Sumas Compressor Station

Application to Renew Title V Operating Permit

Compressor Engine (Unit 1 - Unit 4) Emissions

Source ID	Description	Reference	Pollutant	Pre-Controlled Emissions				Control Efficiency	Controlled Emissions		
				g/bhp-hr	lb/MMBtu	lb/hr	tpy		g/bhp-hr	lb/hr	tpy
	Compressor Engines 01-04	Stack Test - Sep-09	NOx	14.43	2.64	47.73	209.06	---	**14.43**	**47.73**	**209.06**
		Stack Test - Sep-09	CO	1.73	0.32	5.73	25.09	---	**1.73**	**5.73**	**25.09**
	Ingersoll-Rand	AP-42 Table 3.2-2	VOC	0.64	0.12	2.13	9.34	---	**0.64**	**2.13**	**9.34**
	412-KVS (4SLB)	AP-42 Table 3.2-2	SO2	3.21E-03	5.88E-04	0.01	0.05	---	**3E-03**	**0.01**	**0.05**
		AP-42 Table 3.2-2	PM10/2.5	4.21E-04	7.71E-05	0.00	0.01	---	**0.00**	**0.00**	**0.01**
	1,500 bhp	AP-42 Table 3.2-2	Acetaldehyde	4.57E-02	8.36E-03	0.15	0.66	---	**0.05**	**0.15**	**0.66**
	8,760 hr/yr	AP-42 Table 3.2-2	Acrolein	2.81E-02	5.14E-03	0.09	0.41	---	**3E-02**	**0.09**	**0.41**
		AP-42 Table 3.2-2	Benzene	2.40E-03	4.40E-04	0.01	0.03	---	**2E-03**	**8E-03**	**0.03**
		AP-42 Table 3.2-2	Butadiene, 1,3-	1.46E-03	2.67E-04	5E-03	0.02	---	**1E-03**	**5E-03**	**0.02**
Unit 1		AP-42 Table 3.2-2	Ethylbenzene	2.17E-04	3.97E-05	7E-04	3E-03	---	**2E-04**	**7E-04**	**3E-03**
Unit 2		Stack Test	Formaldehyde	2.88E-01	5.28E-02	0.95	4.18	---	**0.29**	**0.95**	**4.18**
Unit 3		AP-42 Table 3.2-2	n-Hexane	6.06E-03	1.11E-03	0.02	0.09	---	**6E-03**	**0.02**	**0.09**
Unit 4		AP-42 Table 3.2-2	Methanol	1.37E-02	2.50E-03	0.05	0.20	---	**0.01**	**0.05**	**0.20**
(Each)		AP-42 Table 3.2-2	POM/PAH	2.04E-03	3.74E-04	0.01	0.03	---	**2E-03**	**0.01**	**0.03**
	Manufactured 1956	AP-42 Table 3.2-2	Toluene	2.23E-03	4.08E-04	0.01	0.03	---	**2E-03**	**0.01**	**0.03**
	NESHAP ZZZZ Affected	AP-42 Table 3.2-2	TMP, 2,2,4-	1.37E-03	2.50E-04	5E-03	0.02	---	**1E-03**	**5E-03**	**0.02**
		AP-42 Table 3.2-2	Xylenes	1.01E-03	1.84E-04	3E-03	0.01	---	**1E-03**	**3E-03**	**0.01**
	12,045 Btu/bhp-hr (HHV)	AP-42 Table 3.2-2	Other/Trace HAP	1.75E-03	3.21E-04	0.01	0.03	---	**2E-03**	**0.01**	**0.03**
	18.07 MMBtu/hr (HHV)	Sum	Total HAP	0.39	0.07	1.30	5.71	---	**0.39**	**1.30**	**5.71**
	17,713 scf/hr	40CFR98 - Table C1	CO2 (GWP=1)	639.11	116.98	2,113	9,257	---	**639.11**	**2,113**	**9,257**
	155.17 MMscf/yr	40CFR98 - Table C2	CH4 (GWP=25)	0.01	2.20E-03	0.04	0.17	---	**0.01**	**0.04**	**0.17**
	1,020 Btu/scf (HHV)	40CFR98 - Table C2	N2O (GWP=298)	1.20E-03	2.20E-04	0.00	0.02	---	**1E-03**	**4E-03**	**0.02**
		Weighted Sum	CO2e	639.77	117.10	2,116	9,267	---	**639.77**	**2,116**	**9,267**

Notes:

1 - The emissions shown are based on operation at 100% of rated load for 8,760 hr/yr.

2 - For worst-case emissions estimates, all particulate matter is assumed to be less than 2.5 microns in diameter, thus PM10 emissions equal PM2.5 emissions.

3 - "Other/Trace HAPs" includes: Carbon Tetrachloride, Chlorobenzene, Chloroform, Dichloropropene, 1,3-Dichloropropene, Ethylene Dibromide, Methylene Chloride, Phenol, Propylene Oxide, Styrene, 1,1,2,2-Tetrachloroethane, 1,1,2-Trichloroethane, and Vinyl Chloride (as per AP-42).

4 - The fuel heating value will vary, 1,020 Btu/scf (HHV) is at the low end of the range and results in a high (conservative) fuel consumption estimate. (It does NOT impact the emission estimates.)

Northwest Pipeline LLC

Sumas Compressor Station

Application to Renew Title V Operating Permit

Compressor Engine (Unit 5 - Unit 6) Emissions

Source ID	Description	Reference	Pollutant	Pre-Controlled Emissions				Control Efficiency	Controlled Emissions		
				g/bhp-hr	lb/MMBtu	lb/hr	tpy		g/bhp-hr	lb/hr	tpy
	Compressor Engines 05-06	Stack Test	NOx	7.80	2.07	68.79	301.30	---	**7.80**	**68.79**	**301.30**
		Stack Test	CO	1.45	0.39	12.81	56.10	---	**1.45**	**12.81**	**56.10**
	Dresser-Rand	AP-42 Table 3.2-1	VOC	0.45	0.12	3.98	17.44	---	**0.45**	**3.98**	**17.44**
	Clark TCV-12 (2SLB)	AP-42 Table 3.2-1	SO2	2.21E-03	5.88E-04	0.02	0.09	---	**2E-03**	**0.02**	**0.09**
		Stack Test	PM10/2.5	0.14	0.04	1.27	5.58	---	**0.14**	**1.27**	**5.58**
	4,000 bhp	AP-42 Table 3.2-1	Acetaldehyde	2.92E-02	7.76E-03	0.26	1.13	---	**0.03**	**0.26**	**1.13**
	8,760 hr/yr	AP-42 Table 3.2-1	Acrolein	2.93E-02	7.78E-03	0.26	1.13	---	**0.03**	**0.26**	**1.13**
		AP-42 Table 3.2-1	Benzene	7.30E-03	1.94E-03	0.06	0.28	---	**0.01**	**0.06**	**0.28**
		AP-42 Table 3.2-1	Butadiene, 1,3-	3.09E-03	8.20E-04	0.03	0.12	---	**3E-03**	**0.03**	**0.12**
		AP-42 Table 3.2-1	Ethylbenzene	4.06E-04	1.08E-04	0.00	0.02	---	**4E-04**	**0.00**	**0.02**
Unit 5		AP-42 Table 3.2-1	Formaldehyde	2.08E-01	5.52E-02	1.83	8.02	---	**0.21**	**1.83**	**8.02**
Unit 6		AP-42 Table 3.2-1	n-Hexane	1.67E-03	4.45E-04	0.01	0.06	---	**0.00**	**0.01**	**0.06**
(Each)		AP-42 Table 3.2-1	Methanol	9.33E-03	2.48E-03	0.08	0.36	---	**0.01**	**0.08**	**0.36**
		AP-42 Table 3.2-1	POM/PAH	1.01E-03	2.68E-04	0.01	0.04	---	**1E-03**	**0.01**	**0.04**
	Manufactured 1966-1968	AP-42 Table 3.2-1	Toluene	3.62E-03	9.63E-04	0.03	0.14	---	**0.00**	**0.03**	**0.14**
	NESHAP ZZZZ Affected	AP-42 Table 3.2-1	TMP, 2,2,4-	3.18E-03	8.46E-04	0.03	0.12	---	**3E-03**	**0.03**	**0.12**
		AP-42 Table 3.2-1	Xylenes	1.01E-03	2.68E-04	0.01	0.04	---	**1E-03**	**0.01**	**0.04**
	8,295 Btu/bhp-hr (HHV)	AP-42 Table 3.2-1	Other/Trace HAP	2.47E-03	6.57E-04	0.02	0.10	---	**2E-03**	**0.02**	**0.10**
	33.18 MMBtu/hr (HHV)	Sum	Total HAP	0.30	0.08	2.64	11.56	---	**0.30**	**2.64**	**11.56**
	32,529 scf/hr	40CFR98 - Table C1	CO2 (GWP=1)	440.13	116.98	3,881	17,000	---	**440.13**	**3,881**	**17,000**
	284.96 MMscf/yr	40CFR98 - Table C2	CH4 (GWP=25)	0.01	2.20E-03	0.07	0.32	---	**0.01**	**0.07**	**0.32**
	1,020 Btu/scf (HHV)	40CFR98 - Table C2	N2O (GWP=298)	8.30E-04	2.20E-04	0.01	0.03	---	**8E-04**	**0.01**	**0.03**
		Weighted Sum	CO2e	440.59	117.10	3,885	17,018	---	**440.59**	**3,885**	**17,018**

Notes:

1 - The emissions shown are based on operation at 100% of rated load for 8,760 hr/yr.

2 - For worst-case emissions estimates, all particulate matter is assumed to be less than 2.5 microns in diameter, thus PM10 emissions equal PM2.5 emissions.

3 - "Other/Trace HAPs" includes: Carbon Tetrachloride, Chlorobenzene, Chloroform, Dichloropropene, 1,3-Dichloropropene, Ethylene Dibromide, Methylene Chloride, Phenol, Propylene Oxide, Styrene, 1,1,2,2-Tetrachloroethane, 1,1,2-Trichloroethane, and Vinyl Chloride (as per AP-42).

4 - The fuel heating value will vary, 1,020 Btu/scf (HHV) is at the low end of the range and results in a high (conservative) fuel consumption estimate. (It does NOT impact the emission estimates.)

Northwest Pipeline LLC

Sumas Compressor Station

Application to Renew Title V Operating Permit

Compressor Turbine (Unit 7 - Unit 9) Emissions

Source ID	Description	Reference	Pollutant	Pre-Controlled Emissions				Control Efficiency	Controlled Emissions		
				g/bhp-hr	lb/MMBtu	lb/hr	tpy		g/bhp-hr	lb/hr	tpy
	Compressor Turbines 07-09	Vendor Data	NOX	---	---	9.96	43.62	---	---	**9.96**	**43.62**
		Vendor Data	CO	---	---	12.13	53.13	---	---	**12.13**	**53.13**
		Vendor Data	VOC	---	---	0.69	3.04	---	---	**0.69**	**3.04**
	Solar Mars 90-12000S	Engineering Estimate	SO2	0.05	1E-02	1.40	6.13	---	**0.05**	**1.40**	**6.13**
		AP-42 Table 3.1-2a	PM10/2.5	0.02	0.0066	0.66	2.90	---	**0.02**	**0.66**	**2.90**
		AP-42 Table 3.1-3	*Acetaldehyde	1.41E-04	4.00E-05	4E-03	0.02	---	**1E-04**	**4E-03**	**0.02**
	12,841 bhp (site-rating)	AP-42 Table 3.1-3	*Acrolein	2.26E-05	6.40E-06	6E-04	3E-03	---	**2E-05**	**6E-04**	**3E-03**
	8,760 hr/yr	AP-42 Table 3.1-3	Benzene	4.24E-05	1.20E-05	1E-03	5E-03	---	**4E-05**	**1E-03**	**5E-03**
		AP-42 Table 3.1-3	Butadiene, 1,3-	1.52E-06	4.30E-07	4E-05	2E-04	---	**2E-06**	**4E-05**	**2E-04**
		AP-42 Table 3.1-3	Ethylbenzene	1.13E-04	3.20E-05	3E-03	0.01	---	**1E-04**	**3E-03**	**1E-02**
Unit 7		AP-42 Table 3.1-3	*Formaldehyde	2.51E-03	7.10E-04	0.07	0.31	---	**3E-03**	**0.07**	**0.31**
Unit 8		AP-42 Table 3.1-3	n-Hexane	---	---	---	---	---	---	---	---
Unit 9		AP-42 Table 3.1-3	Methanol	---	---	---	---	---	---	---	---
(Each)		AP-42 Table 3.1-3	POM/PAH	1.23E-04	3.47E-05	3E-03	0.02	---	**1E-04**	**3E-03**	**0.02**
	Constructed: 2003	AP-42 Table 3.1-3	Toluene	4.59E-04	1.30E-04	1E-02	0.06	---	**5E-04**	**1E-02**	**0.06**
	NSPS GG: Affected	AP-42 Table 3.1-3	TMP, 2,2,4-	1.52E-06	4.30E-07	4E-05	2E-04	---	**2E-06**	**4E-05**	**2E-04**
		AP-42 Table 3.1-3	Xylenes	2.26E-04	6.40E-05	6E-03	0.03	---	**2E-04**	**6E-03**	**0.03**
	7,789 Btu/bhp-hr (HHV)	AP-42 Table 3.1-3	Other/Trace HAP	1.02E-04	2.90E-05	3E-03	1E-02	---	**1E-04**	**3E-03**	**1E-02**
	100.02 MMBtu/hr (HHV)	Sum	Total HAP	3.74E-03	1.06E-03	0.11	0.46	---	**4E-03**	**0.11**	**0.46**
	96,543 scf/hr	AP-42 Table 3.1-2a	CO2 (GWP=1)	388.63	110.00	11,002	48,189	---	**388.63**	**11,002**	**48,189**
	845.72 MMscf/yr	AP-42 Table 3.1-2a	CH4 (GWP=25)	3.05E-02	8.64E-03	0.86	3.79	---	**0.03**	**0.86**	**3.79**
	1,036 Btu/scf (HHV)	AP-42 Table 3.1-2a	N2O (GWP=298)	1.06E-02	3.00E-03	0.30	1.31	---	**0.01**	**0.30**	**1.31**
		Weighted Sum	CO2e	392.56	111.11	11,113	48,675	---	**392.56**	**11,113**	**48,675**

* = Aldehyde

Notes:

1 - The emissions shown are based on operation at 100% of rated load for 8,760 hr/yr. Actual load and operating hours will be less.

2 - As per vendor specifications, NMNEHC (non-methane/non-ethane hydrocarbons) do NOT include aldehydes. VOC is the sum of NMNEHC, Acetaldehyde, Acrolein, and Formaldehyde.

3 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5

4 - "Other/Trace HAPs" includes: Carbon Tetrachloride, Chlorobenzene, Chloroform, Dichloropropene, 1,3-Dichloropropene, Ethylene Dibromide, Methylene Chloride, Phenol, Propylene Oxide, Styrene, 1,1,2,2-Tetrachloroethane, 1,1,2-Trichloroethane, and Vinyl Chloride (as per AP-42).

4. SO2 emissions based maximum total sulfur content in natural gas tariff limit of 5 grains/100 scf and assumption that all sulfur in the fuel is converted to SO2. See below.

SO2 EF (lb/MMscf) = (5 gr S/100 scf) x (lb/7000 gr) x (lb-mol/16 lb S) x (32 lb SO2/lb-mol) x (1,000,000 scf/MMscf)

= 14.28 lb/MMscf

5 - Per the equipment vendor, VOC emissions are 20% of the unburned hydrocarbon (UHC) emissions.\

D-Plant Boiler (Unit 10) Emissions

Source ID	Description	Reference	Pollutant	Emission Factor		Emissions	
				lb/MMscf	lb/MMBtu	lb/hr	tpy
Unit 10	Boiler 01 D Plant - Sellers C60 Capacity: 2.50 MMBtu/hr (HHV) 1,020 Btu/scf (HHV) 8,760 hr/yr 2,451 scf/hr 21.47 MMscf/yr	EPA AP-42 Table 1.4-1	NOx	100.00	9.80E-02	**0.25**	**1.07**
		EPA AP-42 Table 1.4-1	CO	84.00	8.24E-02	**0.21**	**0.90**
		EPA AP-42 Table 1.4-2	NMNEHC	5.50	5.39E-03	**0.01**	**0.06**
		EPA AP-42 Table 1.4-2	VOC	5.50	5.39E-03	**0.01**	**0.06**
		EPA AP-42 Table 1.4-2	SO2	0.60	5.88E-04	**1E-03**	**0.01**
		EPA AP-42 Table 1.4-2	PM10/2.5	7.60	7.45E-03	**0.02**	**0.08**
		EPA AP-42 Table 1.4-3	Acetaldehyde	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Acrolein	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Benzene	2.10E-03	2.06E-06	**5E-06**	**2E-05**
		EPA AP-42 Table 1.4-3	Butadiene, 1,3-	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Ethylbenzene	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Formaldehyde	7.50E-02	7.35E-05	**2E-04**	**8E-04**
		EPA AP-42 Table 1.4-3	n-Hexane	1.80	1.76E-03	**0.00**	**0.02**
		EPA AP-42 Table 1.4-3	Methanol	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	POM/PAH	1.72E-01	1.69E-04	**4E-04**	**2E-03**
		EPA AP-42 Table 1.4-3	Toluene	3.40E-03	3.33E-06	**8E-06**	**4E-05**
		EPA AP-42 Table 1.4-3	TMP, 2,2,4-	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Xylenes	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Other/Trace HAP	1.20E-03	1.18E-06	**3E-06**	**1E-05**
		Sum	Total HAP	2.05	2.01E-03	**0.01**	**0.02**
		EPA AP-42 Table 1.4-2	CO2 (GWP=1)	120,000	117.65	**294.12**	**1,288**
		EPA AP-42 Table 1.4-2	CH4 (GWP=25)	2.30	2.25E-03	**0.01**	**0.02**
		EPA AP-42 Table 1.4-2	N2O (GWP=298)	2.20	2.16E-03	**0.01**	**0.02**
		Weighted Sum	CO2e	120,713	118.35	**295.87**	**1,296**

Notes:
1 - The emissions shown are based on operation at 100% of rated load for 8,760 hr/yr. Actual load and operating hours will be less.
2 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5
3 - "Other/Trace HAPs" includes: Carbon Tetrachloride, Chlorobenzene, Chloroform, Dichloropropene, 1,3-Dichloropropene, Ethylene Dibromide, Methylene Chloride, Phenol, Propylene Oxide, Styrene, 1,1,2,2-Tetrachloroethane, 1,1,2-Trichloroethane, and Vinyl Chloride (as per AP-42).

A-Plant Boiler (Unit 11) Emissions

Source ID	Description	Reference	Pollutant	Emission Factor		Emissions	
				lb/MMscf	lb/MMBtu	lb/hr	tpy
Unit 11	Boiler 02 A Plant - Sellers C100 Capacity: 4.20 MMBtu/hr (HHV) 1,020 Btu/scf (HHV) 8,760 hr/yr 4,118 scf/hr 36.07 MMscf/yr	EPA AP-42 Table 1.4-1	NOx	100.00	9.80E-02	**0.41**	**1.80**
		EPA AP-42 Table 1.4-1	CO	84.00	8.24E-02	**0.35**	**1.51**
		EPA AP-42 Table 1.4-2	NMNEHC	5.50	5.39E-03	**0.02**	**0.10**
		EPA AP-42 Table 1.4-2	VOC	5.50	5.39E-03	**0.02**	**0.10**
		EPA AP-42 Table 1.4-2	SO2	0.60	5.88E-04	**2E-03**	**0.01**
		EPA AP-42 Table 1.4-2	PM10/2.5	7.60	7.45E-03	**0.03**	**0.14**
		EPA AP-42 Table 1.4-3	Acetaldehyde	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Acrolein	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Benzene	2.10E-03	2.06E-06	**9E-06**	**4E-05**
		EPA AP-42 Table 1.4-3	Butadiene, 1,3-	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Ethylbenzene	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Formaldehyde	7.50E-02	7.35E-05	**3E-04**	**1E-03**
		EPA AP-42 Table 1.4-3	n-Hexane	1.80	1.76E-03	**0.01**	**0.03**
		EPA AP-42 Table 1.4-3	Methanol	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	POM/PAH	1.72E-01	1.69E-04	**7E-04**	**3E-03**
		EPA AP-42 Table 1.4-3	Toluene	3.40E-03	3.33E-06	**1E-05**	**6E-05**
		EPA AP-42 Table 1.4-3	TMP, 2,2,4-	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Xylenes	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Other/Trace HAP	1.20E-03	1.18E-06	**5E-06**	**2E-05**
		Sum	Total HAP	2.05	2.01E-03	**0.01**	**0.04**
		EPA AP-42 Table 1.4-2	CO2 (GWP=1)	120,000	117.65	**494.12**	**2,164**
		EPA AP-42 Table 1.4-2	CH4 (GWP=25)	2.30	2.25E-03	**0.01**	**0.04**
		EPA AP-42 Table 1.4-2	N2O (GWP=298)	2.20	2.16E-03	**0.01**	**0.04**
		Weighted Sum	CO2e	120,713	118.35	**497.05**	**2,177**

Notes:
1 - The emissions shown are based on operation at 100% of rated load for 8,760 hr/yr. Actual load and operating hours will be less.
2 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5
3 - "Other/Trace HAPs" includes: Carbon Tetrachloride, Chlorobenzene, Chloroform, Dichloropropene, 1,3-Dichloropropene, Ethylene Dibromide, Methylene Chloride, Phenol, Propylene Oxide, Styrene, 1,1,2,2-Tetrachloroethane, 1,1,2-Trichloroethane, and Vinyl Chloride (as per AP-42).

Northwest Pipeline LLC

Sumas Compressor Station

Application to Renew Title V Operating Permit

Cummins Back-up Generator (Unit 13) Engine Emissions

Source ID	Description	Reference	Pollutant	Pre-Controlled Emissions				Control Efficiency	Controlled Emissions		
				g/bhp-hr	lb/MMBtu	lb/hr	tpy		g/bhp-hr	lb/hr	tpy
Unit 13	**Backup Generator Engine** **Cummins GTA-855 (4SRB)** **335 bhp** **500 hr/yr** Manufactured 1993 NESHAP ZZZZ Affected 8,500 Btu/bhp-hr (HHV) 2.85 MMBtu/hr (HHV) 2,792 scf/hr 1.40 MMscf/yr 1,020 Btu/scf (HHV)	AP-42 Table 3.2-3	NOx	8.75	2.27	6.46	28.31	---	**8.75**	**6.46**	**1.62**
		AP-42 Table 3.2-3	CO	14.34	3.72	10.59	46.40	---	**14.34**	**10.59**	**2.65**
		AP-42 Table 3.2-3	VOC (w/Aldehydes)	0.12	0.03	0.09	0.40	---	**0.12**	**0.09**	**0.02**
		AP-42 Table 3.2-3	SO2	2.27E-03	5.88E-04	2E-03	0.01	---	**2E-03**	**2E-03**	**4E-04**
		AP-42 Table 3.2-3	PM10/2.5	7.48E-02	1.94E-02	0.06	0.24	---	**0.07**	**0.06**	**0.01**
		AP-42 Table 3.2-3	Acetaldehyde*	1.08E-02	2.79E-03	0.01	0.03	---	**0.01**	**0.01**	**2E-03**
		AP-42 Table 3.2-3	Acrolein*	1.01E-02	2.63E-03	0.01	0.03	---	**0.01**	**0.01**	**2E-03**
		AP-42 Table 3.2-3	Benzene	6.09E-03	1.58E-03	4E-03	0.02	---	**0.01**	**4E-03**	**1E-03**
		AP-42 Table 3.2-3	Butadiene, 1,3-	2.56E-03	6.63E-04	2E-03	0.01	---	**3E-03**	**2E-03**	**5E-04**
		AP-42 Table 3.2-3	Ethylbenzene	9.56E-05	2.48E-05	7E-05	3E-04	---	**1E-04**	**7E-05**	**2E-05**
		AP-42 Table 3.2-3	Formaldehyde*	7.90E-02	2.05E-02	0.06	0.26	---	**0.08**	**0.06**	**0.01**
		AP-42 Table 3.2-3	n-Hexane	---	---	---	---	---	**---**	**---**	**---**
		AP-42 Table 3.2-3	Methanol	1.18E-02	3.06E-03	0.01	0.04	---	**0.01**	**0.01**	**2E-03**
		AP-42 Table 3.2-3	POM/PAH	9.18E-04	2.38E-04	7E-04	3E-03	---	**9E-04**	**7E-04**	**2E-04**
		AP-42 Table 3.2-3	Toluene	2.15E-03	5.58E-04	2E-03	0.01	---	**0.00**	**2E-03**	**4E-04**
		AP-42 Table 3.2-3	TMP, 2,2,4-	---	---	---	---	---	**---**	**---**	**---**
		AP-42 Table 3.2-3	Xylenes	7.52E-04	1.95E-04	6E-04	2E-03	---	**8E-04**	**6E-04**	**1E-04**
		AP-42 Table 3.2-3	Other/Trace HAP	6.91E-04	1.79E-04	5E-04	2E-03	---	**7E-04**	**5E-04**	**1E-04**
		Sum	Total HAP	0.12	0.03	0.09	0.40	---	**0.12**	**0.09**	**0.02**
		40CFR98 - Table C1	CO2 (GWP=1)	451.01	116.98	333	1,459	---	**451.01**	**333**	**83**
		40CFR98 - Table C2	CH4 (GWP=25)	0.01	2.20E-03	0.01	0.03	---	**0.01**	**0.01**	**2E-03**
		40CFR98 - Table C2	N2O (GWP=298)	8.50E-04	2.20E-04	6E-04	3E-03	---	**9E-04**	**6E-04**	**2E-04**
		Weighted Sum	CO2e	451.48	117.10	333	1,460	---	**451.48**	**333**	**83**

* = Aldehyde

Notes: 1 - The Pre-controlled emissions shown are based on operation at 100% of rated load for 8,760 hr/yr. Controlled emissions are based on operation at 100% load for 500 hr/yr.

2 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5

3 - "Other/Trace HAPs" includes: Carbon Tetrachloride, Chlorobenzene, Chloroform, Dichloropropene, 1,3-Dichloropropene, Ethylene Dibromide, Methylene Chloride, Phenol, Propylene Oxide, Styrene, 1,1,2,2-Tetrachloroethane, 1,1,2-Trichloroethane, and Vinyl Chloride (as per AP-42).

4 - The fuel heating value will vary, 1,020 Btu/scf (HHV) is at the low end of the range and results in a high (conservative) fuel consumption estimate. (It does NOT impact the emission estimates.)

Northwest Pipeline LLC

Sumas Compressor Station

Application to Renew Title V Operating Permit

Caterpillar Back-up Generator (Unit 14) Engine Emissions

Source ID	Description	Reference	Pollutant	Pre-Controlled Emissions				Control Efficiency	Controlled Emissions		
				g/bhp-hr	lb/MMBtu	lb/hr	tpy		g/bhp-hr	lb/hr	tpy
Unit 14	**Backup Generator Engine** **Caterpillar G3408 (4SRB)** **362 bhp** **500 hr/yr** Manufactured 2003 NESHAP ZZZZ Affected 8,500 Btu/bhp-hr (HHV) 3.08 MMBtu/hr (HHV) 3,017 scf/hr 1.51 MMscf/yr 1,020 Btu/scf (HHV)	Source Test - Dec-03	NOx	---	---	0.01	0.04	---	**---**	**0.01**	**3E-03**
		Source Test - Dec-03	CO	---	---	0.05	0.22	---	**---**	**0.05**	**0.01**
		AP-42 Table 3.2-3	VOC (w/Aldehydes)	0.12	0.03	0.10	0.44	---	**0.12**	**0.10**	**0.02**
		AP-42 Table 3.2-3	SO2	2.27E-03	5.88E-04	2E-03	0.01	---	**2E-03**	**2E-03**	**5E-04**
		AP-42 Table 3.2-3	PM10/2.5	7.48E-02	1.94E-02	0.06	0.26	---	**0.07**	**0.06**	**0.01**
		AP-42 Table 3.2-3	Acetaldehyde*	1.08E-02	2.79E-03	0.01	0.04	---	**0.01**	**0.01**	**2E-03**
		AP-42 Table 3.2-3	Acrolein*	1.01E-02	2.63E-03	0.01	0.04	---	**0.01**	**0.01**	**2E-03**
		AP-42 Table 3.2-3	Benzene	6.09E-03	1.58E-03	5E-03	0.02	---	**0.01**	**5E-03**	**1E-03**
		AP-42 Table 3.2-3	Butadiene, 1,3-	2.56E-03	6.63E-04	2E-03	0.01	---	**3E-03**	**2E-03**	**5E-04**
		AP-42 Table 3.2-3	Ethylbenzene	9.56E-05	2.48E-05	8E-05	3E-04	---	**1E-04**	**8E-05**	**2E-05**
		AP-42 Table 3.2-3	Formaldehyde*	7.90E-02	2.05E-02	0.06	0.28	---	**0.08**	**0.06**	**0.02**
		AP-42 Table 3.2-3	n-Hexane	---	---	---	---	---	**---**	**---**	**---**
		AP-42 Table 3.2-3	Methanol	1.18E-02	3.06E-03	0.01	0.04	---	**0.01**	**0.01**	**2E-03**
		AP-42 Table 3.2-3	POM/PAH	9.18E-04	2.38E-04	7E-04	3E-03	---	**9E-04**	**7E-04**	**2E-04**
		AP-42 Table 3.2-3	Toluene	2.15E-03	5.58E-04	2E-03	0.01	---	**0.00**	**2E-03**	**4E-04**
		AP-42 Table 3.2-3	TMP, 2,2,4-	---	---	---	---	---	**---**	**---**	**---**
		AP-42 Table 3.2-3	Xylenes	7.52E-04	1.95E-04	6E-04	3E-03	---	**8E-04**	**6E-04**	**2E-04**
		AP-42 Table 3.2-3	Other/Trace HAP	6.91E-04	1.79E-04	6E-04	2E-03	---	**7E-04**	**6E-04**	**1E-04**
		Sum	Total HAP	0.12	0.03	0.10	0.44	---	**0.12**	**0.10**	**0.02**
		40CFR98 - Table C1	CO2 (GWP=1)	451.01	116.98	360	1,577	---	**451.01**	**360**	**90**
		40CFR98 - Table C2	CH4 (GWP=25)	0.01	2.20E-03	0.01	0.03	---	**0.01**	**0.01**	**2E-03**
		40CFR98 - Table C2	N2O (GWP=298)	8.50E-04	2.20E-04	7E-04	3E-03	---	**9E-04**	**7E-04**	**2E-04**
		Weighted Sum	CO2e	451.48	117.10	360	1,578	---	**451.48**	**360**	**90**

* = Aldehyde

Notes: 1 - The Pre-controlled emissions shown are based on operation at 100% of rated load for 8,760 hr/yr. Controlled emissions are based on operation at 100% load for 500 hr/yr.

2 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5

3 - "Other/Trace HAPs" includes: Carbon Tetrachloride, Chlorobenzene, Chloroform, Dichloropropene, 1,3-Dichloropropene, Ethylene Dibromide, Methylene Chloride, Phenol, Propylene Oxide, Styrene, 1,1,2,2-Tetrachloroethane, 1,1,2-Trichloroethane, and Vinyl Chloride (as per AP-42).

4 - The fuel heating value will vary, 1,020 Btu/scf (HHV) is at the low end of the range and results in a high (conservative) fuel consumption estimate. (It does NOT impact the emission estimates.)

Northwest Pipeline LLC

Sumas Compressor Station

Application to Renew Title V Operating Permit

Caterpillar Back-up Generator (Unit 15) Engine Emissions

Source ID	Description	Reference	Pollutant	Pre-Controlled Emissions				Control Efficiency	Controlled Emissions		
				g/bhp-hr	lb/MMBtu	lb/hr	tpy		g/bhp-hr	lb/hr	tpy
Unit 15	**Backup Generator Engine** **Caterpillar G3412 (4SRB)** **522 bhp** **400 hr/yr** Manufactured 1993 NESHAP ZZZZ Affected 8,500 Btu/bhp-hr (HHV) 4.44 MMBtu/hr (HHV) 4,350 scf/hr 1.74 MMscf/yr 1,020 Btu/scf (HHV)	AP-42 Table 3.2-3	NOx	8.75	2.27	10.07	44.12	---	**8.75**	**10.07**	**2.01**
		AP-42 Table 3.2-3	CO	14.34	3.72	16.51	72.29	---	**14.34**	**16.51**	**3.30**
		AP-42 Table 3.2-3	VOC (w/Aldehydes)	0.12	0.03	0.14	0.63	---	**0.12**	**0.14**	**0.03**
		AP-42 Table 3.2-3	SO2	2.27E-03	5.88E-04	3E-03	0.01	---	**2E-03**	**3E-03**	**5E-04**
		AP-42 Table 3.2-3	PM10/2.5	7.48E-02	1.94E-02	0.09	0.38	---	**0.07**	**0.09**	**0.02**
		AP-42 Table 3.2-3	Acetaldehyde*	1.08E-02	2.79E-03	0.01	0.05	---	**0.01**	**0.01**	**2E-03**
		AP-42 Table 3.2-3	Acrolein*	1.01E-02	2.63E-03	0.01	0.05	---	**0.01**	**0.01**	**2E-03**
		AP-42 Table 3.2-3	Benzene	6.09E-03	1.58E-03	7E-03	0.03	---	**0.01**	**7E-03**	**1E-03**
		AP-42 Table 3.2-3	Butadiene, 1,3-	2.56E-03	6.63E-04	3E-03	0.01	---	**3E-03**	**3E-03**	**6E-04**
		AP-42 Table 3.2-3	Ethylbenzene	9.56E-05	2.48E-05	1E-04	5E-04	---	**1E-04**	**1E-04**	**2E-05**
		AP-42 Table 3.2-3	Formaldehyde*	7.90E-02	2.05E-02	0.09	0.40	---	**0.08**	**0.09**	**0.02**
		AP-42 Table 3.2-3	n-Hexane	---	---	---	---	---	**---**	**---**	**---**
		AP-42 Table 3.2-3	Methanol	1.18E-02	3.06E-03	0.01	0.06	---	**0.01**	**0.01**	**3E-03**
		AP-42 Table 3.2-3	POM/PAH	9.18E-04	2.38E-04	1E-03	5E-03	---	**9E-04**	**1E-03**	**2E-04**
		AP-42 Table 3.2-3	Toluene	2.15E-03	5.58E-04	2E-03	0.01	---	**0.00**	**2E-03**	**5E-04**
		AP-42 Table 3.2-3	TMP, 2,2,4-	---	---	---	---	---	**---**	**---**	**---**
		AP-42 Table 3.2-3	Xylenes	7.52E-04	1.95E-04	9E-04	4E-03	---	**8E-04**	**9E-04**	**2E-04**
		AP-42 Table 3.2-3	Other/Trace HAP	6.91E-04	1.79E-04	8E-04	3E-03	---	**7E-04**	**8E-04**	**2E-04**
		Sum	Total HAP	0.12	0.03	0.14	0.63	---	**0.12**	**0.14**	**0.03**
		40CFR98 - Table C1	CO2 (GWP=1)	451.01	116.98	519	2,273	---	**451.01**	**519**	**104**
		40CFR98 - Table C2	CH4 (GWP=25)	0.01	2.20E-03	0.01	0.04	---	**0.01**	**0.01**	**2E-03**
		40CFR98 - Table C2	N2O (GWP=298)	8.50E-04	2.20E-04	1E-03	4E-03	---	**9E-04**	**1E-03**	**2E-04**
		Weighted Sum	CO2e	451.48	117.10	520	2,276	---	**451.48**	**520**	**104**

* = Aldehyde

Notes: 1 - The Pre-controlled emissions shown are based on operation at 100% of rated load for 8,760 hr/yr. Controlled emissions are based on operation at 100% load for 400 hr/yr.

2 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5

3 - "Other/Trace HAPs" includes: Carbon Tetrachloride, Chlorobenzene, Chloroform, Dichloropropene, 1,3-Dichloropropene, Ethylene Dibromide, Methylene Chloride, Phenol, Propylene Oxide, Styrene, 1,1,2,2-Tetrachloroethane, 1,1,2-Trichloroethane, and Vinyl Chloride (as per AP-42).

4 - The fuel heating value will vary, 1,020 Btu/scf (HHV) is at the low end of the range and results in a high (conservative) fuel consumption estimate. (It does NOT impact the emission estimates.)

Potentially Applicable

AP-42 and GHG EMISSION FACTORS

(Preferentially use test data or vendor data where available)

	Pollutant	Natural Gas-Fired Reciprocating Engines			Stationary Gas-Fired Turbines	
		AP-42 Table 3.2-1; 3.2-2; 3.2-3 07/00			AP-42 Table 3.1-1; 3.1-2a; 3.1-3 04/00	
		2SLB lb/MMBtu	4SLB lb/MMBtu	4SRB lb/MMBtu	Uncontrolled lb/MMBtu	Lean Pre-Mix# lb/MMBtu
CRITERIA	NOx (<90% Load)	3.17E+00	4.08E+00	2.27E+00	3.23E-01	9.91E-02
	CO (≥ 90% Load)	3.86E-01	3.17E-01	3.72E+00	8.23E-02	1.51E-02
	VOC (NMNEHC w/o Aldehydes*)	4.93E-02	5.17E-02	6.50E-03	2.06E-03	2.06E-03
	VOC (NMNEHC w/ Aldehydes*)	1.20E-01	1.18E-01	3.24E-02*	2.82E-03	2.13E-03
	SO2 (2,000 gr-S/MMscf ≈ 0.0007 W%)	5.88E-04	5.88E-04	5.88E-04	5.88E-04	5.88E-04
	PM10/2.5 (Condensible and Filterable)	4.83E-02	9.99E-03	1.94E-02	6.63E-03	6.63E-03
HAPs	Acetaldehyde*	7.76E-03	8.36E-03	2.79E-03	4.00E-05	4.00E-05
	Acrolein*	7.78E-03	5.14E-03	2.63E-03	6.40E-06	6.40E-06
	Benzene	1.94E-03	4.40E-04	1.58E-03	1.20E-05	9.10E-07
	Butadiene, 1,3-	8.20E-04	2.67E-04	6.63E-04	4.30E-07	4.30E-07
	Ethylbenzene	1.08E-04	3.97E-05	2.48E-05	3.20E-05	3.20E-05
	Formaldehyde (HCHO)*	5.52E-02	5.28E-02	2.05E-02	7.10E-04	2.00E-05
	n-Hexane	4.45E-04	1.11E-03	---	---	---
	Methanol (MeOH)	2.48E-03	2.50E-03	3.06E-03	---	---
	Polycyclic Organic Matter (POM/PAH)	2.68E-04	3.74E-04	2.38E-04	3.47E-05	3.47E-05
	Toluene	9.63E-04	4.08E-04	5.58E-04	1.30E-04	1.30E-04
	Trimethylpentane, 2,2,4- (i-Octane)	8.46E-04	2.50E-04	---	---	---
	Xylenes	2.68E-04	1.84E-04	1.95E-04	6.40E-05	6.40E-05
	Other/Trace HAP**	6.57E-04	3.21E-04	1.79E-04	2.90E-05	2.90E-05
	TOTAL HAP	7.95E-02	7.22E-02	3.24E-02*	1.06E-03	3.57E-04
GHG	CO2 (GWP=1)	1.10E+02	1.10E+02	1.10E+02	1.10E+02	1.10E+02
	CH4 (GWP=25)	1.45E+00	1.25E+00	2.30E-01	8.64E-03	8.64E-03
	N2O (GWP=298)	Use 40CFR98	Use 40CFR98	Use 40CFR98	3.00E-03	3.00E-03
	CO2e	Use 40CFR98	Use 40CFR98	Use 40CFR98	Use 40CFR98	Use 40CFR98

(*AP-42 shows V-HAP>VOC?) (#Lean Pre-Mix - aka: Dry Low Emissions (DLE or DLN) or SoLoNOx)

	Pollutant	Natural Gas (External) Combustion			Industrial Flares	Diesel Engines
		AP-42 Table 1.4-1; 1.4-2; 1.4-3 (<100 MMBtu/hr) 07/98			13.5-1 06/17	3.3-1; 3.3-2 10/96
		Uncontrolled lb/MMBtu	LoNOx Burners lb/MMBtu	Flue Gas Recirc lb/MMBtu	Combustion lb/MMBtu	Uncontrolled lb/MMBtu
CRITERIA	NOx (≥ 90% Load)	9.80E-02	4.90E-02	3.14E-02	Use Ext. Comb.	4.41E+00
	CO (≥ 90% Load)	8.24E-02	8.24E-02	8.24E-02	3.10E-01	9.50E-01
	VOC (NMNEHC w/o Aldehydes*)	5.32E-03	5.32E-03	5.32E-03		3.60E-01
	VOC (NMNEHC w/ Aldehydes*)	5.39E-03	5.39E-03	5.39E-03	Use Ext. Comb.	3.62E-01
	SO2 (2,000 gr-S/MMscf ≈ 0.0007 W%)	5.88E-04	5.88E-04	5.88E-04		2.90E-01
	PM10/2.5 (Condensible and Filterable)	7.45E-03	7.45E-03	7.45E-03		3.10E-01
HAPs	Acetaldehyde*	---	---	---		7.67E-04
	Acrolein*	---	---	---		9.25E-05
	Benzene	2.06E-06	2.06E-06	2.06E-06		9.33E-04
	Butadiene, 1,3-	---	---	---		3.91E-05
	Ethylbenzene	---	---	---		---
	Formaldehyde (HCHO)*	7.35E-05	7.35E-05	7.35E-05		1.18E-03
	n-Hexane	1.76E-03	1.76E-03	1.76E-03	Use Ext. Comb.	---
	Methanol (MeOH)	---	---	---		---
	Polycyclic Organic Matter (POM/PAH)	1.69E-04	1.69E-04	1.69E-04		1.68E-04
	Toluene	3.33E-06	3.33E-06	3.33E-06		4.09E-04
	Trimethylpentane, 2,2,4- (i-Octane)	---	---	---		---
	Xylenes	---	---	---		2.85E-04
	Other/Trace HAP**	1.18E-06	1.18E-06	1.18E-06		---
	TOTAL HAP	2.01E-03	2.01E-03	2.01E-03		3.87E-03
GHG	CO2 (GWP=1)	1.18E+02	1.18E+02	1.18E+02		1.64E+02
	CH4 (GWP=25)	2.25E-03	2.25E-03	2.25E-03	Use Ext. Comb.	
	N2O (GWP=298)	2.16E-03	6.27E-04	6.27E-04		Use 40CFR98
	CO2e	Use 40CFR98	Use 40CFR98	Use 40CFR98		

40CFR98 - Default Greenhouse Gas (GHG) Emission Factors					
Fuel Type	Table C-1 to Subpart C of Part 98		Table C-2 to Subpart C of Part 98		Weighted Sum
	Default HHV	Carbon Dioxide lb CO2/MMBtu	Methane lb CH4/MMBtu	Nitrous Oxide lb N2O/MMBtu	CO2e lb CO2e/MMBtu
Fuel Oil No. 2 (Diesel)	138,000 Btu/gal	1.63E+02	6.61E-03	1.32E-03	1.64E+02
Propane	91,000 Btu/gal	1.39E+02	6.61E-03	1.32E-03	1.39E+02
Natural Gas	1,026 Btu/scf	1.17E+02	2.20E-03	2.20E-04	1.17E+02

* Aldehyde (not measured in EPA Test Method 25)

** Other/Trace HAPs include: Carbon Tetrachloride, Chlorobenzene, Chloroform, Dichloropropene, ,3-Dichloropropene, Ethylene Dibromide, Methylene Chloride, Naphthalene, Phenol, Propylene, Oxide, Styrene, 1,1,2,2-Tetrachloroethane, 1,1,2-Trichloroethane, and Vinyl Chloride (as per AP-42).

Global Warming Potential (100 Yr) (GWP) Table A-1 to Subpart A of Part 98		
CO2	CH4	N2O
1	25	298

Revised: 05/22/19

Title V Operating Permit Renewal Application
Permit No. 007R3, Expires June 19, 2024

Northwest Pipeline, LLC
Sumas Compressor Station (NWCAA ID: 1434-V-W)
Whatcom County, WA

End of Title V Operating Permit Renewal Application