TECHNICAL SUPPORT DOCUMENT

PACIFICORP ENERGY
LEWIS RIVER HYDROELECTRIC PROJECTS

SWCAA Identification: 1993

Air Discharge Permit 18-3309

ADP Application CO-999

Issued: October 18, 2018

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Southwest Clean Air Agency

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Abbreviations

Acfm	Actual cubic feet per minute
ADP	Air Discharge Permit
AP-42	Compilation of Emission Factors, AP-42, Fifth Edition, Volume 1, Stationary Point and Area Sources – published by the US Environmental Protection Agency
BACT	Best available control technology
BART	Best Available Retrofit Technology
Btu	British thermal unit
CFR	Code of Federal Regulations
cfs	Cubic feet per second
CO	Carbon monoxide
CO_2e	Carbon dioxide equivalent
EPA	U.S. Environmental Protection Agency
GWP	Global warming potential
HAP	Hazardous air pollutant listed pursuant to Section 112 of the Federal Clean Air Act
LAER	Lowest Achievable Emission Rate
lb/hp-hr	Pounds per horsepower per hour
lb/hr	Pounds per hour
lb/yr	Pounds per year
MMBtu/hr	Millions of British thermal units per hour
NO_X	Nitrogen oxides
PM	Total particulate matter (includes both filterable and condensable particulate matter as measured by EPA Methods 5 and 202)
PM_{10}	Particulate matter with an aerodynamic diameter less than or equal to 10 micrometers (includes both filterable and condensable particulate matter as measured by EPA Methods 5 and 202)
$PM_{2.5}$	Particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers (includes both filterable and condensable particulate matter as measured by EPA Methods 5 and 202)
PSD	Prevention of Significant Deterioration
RACT	Reasonably Available Control Technology
RCW	Revised Code of Washington
SQER	Small Quantity Emission Rate listed in WAC 173-460
SO_2	Sulfur dioxide
SWCAA	Southwest Clean Air Agency
TAP	Toxic air pollutant pursuant to Chapter 173-460 WAC
T-BACT	Best Available Control Technology for toxic air pollutants
tpy	Tons per year
VOC	Volatile organic compound
WAC	Washington Administrative Code

1. FACILITY IDENTIFICATION

Applicant Name:	PacifiCorp Energy, Hydro Resources
Applicant Address:	PacifiCorp Energy, Hydro Resources
Facility Name:	Lewis River Hydroelectric Projects
Facility Address:	Various – see Section 5 for specific equipment locations
SWCAA Identification:	1993
Contact Person:	Brett Horton, Senior Compliance Analyst
Primary Process:	Hydroelectric Operation
SIC/NAICS Code:	4911 / 221111
Facility Classification:	Natural Minor

2. FACILITY DESCRIPTION

PacifiCorp operates several emergency generator engines along the Lewis River and at the three dams for purposes of providing emergency power in the event of a power outage. All three dams are located the north fork of the Lewis River. The Merwin Dam is located at River Mile (RM) 19.5 (Clark and Cowlitz Counties), the Yale Dam is located at RM 34.2 (Cowlitz County), and the Swift #1 dam is located at RM 47.9 (Skamania County). A fourth dam, Swift #2, is owned by Cowlitz County Public Utilities District and operated by PacifiCorp. Swift #2 is located downstream of Swift #1 and upstream from Yale; there are no emergency generator engines at Swift #2 Dam. PacifiCorp also operates prime-service engines at Swift Forest Camp, the Camp Creek Radio Tower, and the Marble Creek Radio Tower.

PacifiCorp also funds operation of the Lewis River Fish Hatchery, Speelyai Hatchery, and the Merwin Fish Hatchery. All hatcheries are operated by the Washington Department of Fish and Wildlife. Emergency generator engines are located at each hatchery. An ozone water treatment plant is located at the Merwin Hatchery.

3. CURRENT PERMITTING ACTION

This permitting action is in response to Air Discharge Permit application number CO-999 (ADP Application CO-999) received June 7, 2018. ADP application CO-999 requests approval to:

a. Camp Creek Radio Tower Generator Engine: Replace the 35 kW Cummins propane-fired generator set with a 45 kW Kohler propane-fired generator set.

b. Marble Creek Radio Tower Generator Engine: Replace the 35 kW_Cummins propane-fired generator set with a 45 kW Kohler propane-fired generator set.
c. Woodland Release Ponds Emergency Generator Engine: Install a new 125 kW Caterpillar diesel-fired emergency generator set at the Woodland Release Ponds.
d. Replace the two existing Swift Forest Camp generator sets with a single generator set certified for prime service.

4. PROCESS DESCRIPTION

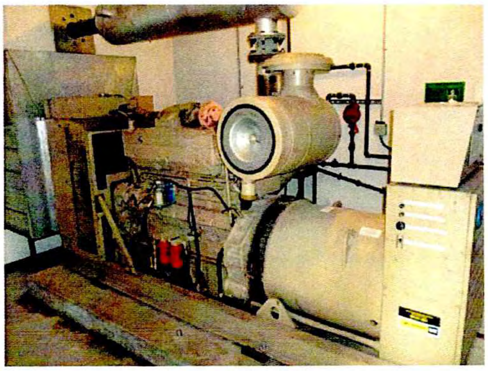
To ensure survival of fish at each hatchery, water flows cannot be interrupted for a significant amount of time. Emergency generator sets are installed at each hatchery to power these critical systems in the event of an interruption in grid power. Emergency generator sets are also located at each dam to power critical equipment in the event of a power interruption and at the Woodland Release Ponds. A prime-service generator engines will be located at the Swift Forest Campground (Swift Camp) to power water well pumps. Generator engines are located at two remote radio towers (Marble Creek Radio Tower and Camp Creek Radio Tower) to backup an off-grid solar power system.

The ozone plant at the Merwin Hatchery is used to disinfect incoming water primarily to protect steelhead from whirling disease. Ozone is generated from compressed air and bubbled through the incoming water for disinfection in two parallel ozone contact systems. The headspace of the ozone contact areas is vented through a single ozone decomposer. Residual ozone is then stripped from the water to protect the fish.

5. EQUIPMENT/ACTIVITY IDENTIFICATION

5.a Lewis River Hatchery Downstream Emergency Generator Engine. Equipment details are provided below:

Generator Set Make / Model:	Cummins / 500FDR7018HHW
Generator Output:	300 kW
Generator Serial Number:	MC-93901-3/12
Engine Make / Model:	Cummins / HC3-5
Engine Serial Number:	50182682
Fuel:	Diesel
Engine Power:	465 bhp
Engine Built:	1994
Engine Certification:	None
Stack Description:	~6" horizontal exhaust, ~14' above ground level, 875°F
NSPS/NESHAP/MACT:	40 CFR 60 Subpart IIII, 40 CFR 63 Subpart ZZZZ applicable



5.b Lewis River Hatchery Upstream Emergency Generator Engine. Equipment details are provided below:

Generator Set Make / Model:	Cummins / DFEK-5622934
Generator Output:	500 kW
Generator Serial Number:	F030515718
Engine Make / Model:	Cummins / QSX15-G9
Engine Serial Number:	79014388
Fuel:	Diesel
Engine Power:	755 bhp
Engine Built:	1996
Engine Certification:	EPA Tier 1
Stack Description:	(2) ~4" horizontal exhaust, ~8' 10" above ground level, 938°F
NSPS/NESHAP/MACT:	40 CFR 63 Subpart ZZZZ applicable

5.c Merwin Dam Emergency Generator Engine. Equipment details are provided below:

Generator Set Make / Model:	Caterpillar / DM0635-02
Generator Output:	750 kW
Generator Serial Number:	SR47AFK00122
Engine Make / Model:	Caterpillar / 3412
Engine Serial Number:	1EZ01311
Fuel:	Diesel
Engine Power:	1,109 bhp
Engine Built:	2000
Engine Certification:	None
Stack Description:	~12" exhaust, ~8' 10" above ground level, 957°F
NSPS/NESHAP/MACT:	40 CFR 63 Subpart ZZZZ applicable

5.d Swift #1 Dam Caterpillar Emergency Generator Engine. This unit serves as an emergency power source for the fish sorting collector (FSC) for Swift Dam. Equipment details are provided below:

Generator Set Make / Model:	Caterpillar / LC7 (Frame LC7024F)
Generator Output:	600 kW
Generator Serial Number:	G7A02687
Engine Make / Model:	Caterpillar / C18
Engine Serial Number:	EST00807
Fuel:	Diesel
Engine Power:	900 bhp
Engine Built:	2009
Engine Certification:	EPA Tier 2
Stack Description:	~12" vertical exhaust
NSPS/NESHAP/MACT:	40 CFR 63 Subpart ZZZZ applicable

5.e Woodland Release Ponds Emergency Generator Engine (new). This unit serves as an emergency power source for the Woodland Release Ponds where young fish are held and acclimated before release to the North Fork of the Lewis River. Equipment details are provided below:

Generator Set Make / Model:	Caterpillar / D125-8
Generator Output:	125 kW
Generator Set Serial Number:	To be determined
Engine Make / Model:	Caterpillar / C7.1
Engine Serial Number:	45500792
Fuel:	Diesel
Engine Power:	171.2 kW (230 hp)
Engine Built:	To be determined
Installed:	September 2017
Engine Certification:	EPA Tier 3 (for emergency use only)
Stack Description:	~4" diameter horizontal exhaust, discharging 10' above ground level, 843°F, 1,056 cfm. ~ 45°55'34.42"N, 122°43'11.50"W
NSPS/NESHAP/MACT:	40 CFR 60 Subpart IIII, 40 CFR 63 Subpart ZZZZ applicable

5.f Merwin Headquarters Emergency Generator Engine. Equipment details are provided below:

Generator Set Make / Model:	Generac Olympian / SG100
Generator Output:	100 kW
Generator Model:	32868-1266C
Generator Serial Number:	AD 209594 SRK
Engine Make / Model:	Generac Olympian / 76785
Engine Serial Number:	2023292
Fuel:	Propane
Engine Power:	147 bhp
Engine Built:	1995
Engine Certification:	None
Stack Description:	(2) ~4" vertical exhausts, 6' 10" from ground level, 1,250°F (estimated)
NSPS/NESHAP/MACT:	40 CFR 63 Subpart ZZZZ applicable

5.g Speelyai Hatchery Emergency Generator Engine. Equipment details are provided below:

Generator Make / Model:	Kohler / 1DDRZG-QS2
Generator Output:	90 kW
Generator Serial Number:	0714664
Engine Make / Model:	General Motors Industrial Powertrain Vortec 8.1L
Engine Serial Number:	8.1L-05589
Fuel:	Propane
Engine Power:	162 bhp
Engine Built:	09/2001
Engine Certification:	None
Stack Description:	~3.5" vertical exhaust, 11' 2" from ground level, 1,250°F (estimated)
NSPS/NESHAP/MACT:	40 CFR 63 Subpart ZZZZ applicable

5.h Yale Dam Emergency Generator Engine. Equipment details are provided below:

Generator Set Make / Model:	Generac Olympian / SG100
Generator Output:	100 kW
Generator Model:	99A04013-S
Generator Serial Number:	0714664
Engine Make / Model:	Generac 7.4L – Chevy / 76785
Engine Serial Number:	Unknown (type CG100-G367.4V16CBYYC)
Fuel:	Propane
Engine Power:	147 bhp
Engine Built:	09/2001
Engine Certification:	None
Stack Description:	(2) ~3.5" vertical exhaust, 7' from ground level, 1,250°F (estimated)
NSPS/NESHAP/MACT:	40 CFR 63 Subpart ZZZZ applicable

5.i Swift #1 Dam Ford Emergency Generator Engine. Equipment details are provided below:

Generator Make / Model:	Kohler / 60RZ272
Generator Output:	60 kW
Generator Serial Number:	169544
Engine Make / Model:	Ford 7.5L / HZA-1750-43A
Engine Serial Number:	13125
Fuel:	Propane
Engine Power:	105 bhp
Engine Built:	1970 (estimate)
Engine Certification:	None
Stack Description:	~3.5" exhaust, 8'4" from ground level, 1,200°F (estimated)
NSPS/NESHAP/MACT:	40 CFR 63 Subpart ZZZZ applicable

5.j Camp Creek Radio Tower Emergency Generator Engine (new). The Camp Creek Radio Tower is powered by this engine when power from the solar array and battery system is not available. Equipment details are provided below:

Generator Set Make / Model:	Kohler / 45REZG
Generator Output:	45 kW (standby)
Generator Serial Number:	SGM32J2NW
Engine Make / Model:	Power Solutions International powertrain with General Motors / 4.3 L Vortec Engine
Engine Serial Number:	43M0003214
Fuel:	Propane
Engine Power:	72 bhp (standby)
Engine Built:	1/23/2017
Engine Installed:	5/15/2017
Engine Certification:	40 CFR 60 certified for prime service – utilizing a 3-way catalyst
Stack Description:	~3" vertical exhaust, 100" from ground level, 272.7 acfm at 1,129.7°F 46°4'0.08"N, 122°3'12.43"W
NSPS/NESHAP/MACT:	40 CFR 60 Subpart JJJJ, 40 CFR 63 Subpart ZZZZ applicable.

5.k Marble Creek Radio Tower Generator Engine (new). The Marble Creek Radio Tower is powered by this engine when power from the solar array and battery system is not available. Equipment details are provided below:

Generator Set Make / Model:	Kohler / 45REZG
Generator Output:	45 kW (standby)
Generator Serial Number:	SGM32J2NX
Engine Make / Model:	Power Solutions International powertrain with General Motors / 4.3 L Vortec Engine
Engine Serial Number:	43M0003248
Fuel:	Propane
Engine Power:	72 bhp (standby)
Engine Built:	1/23/2017
Engine Installed:	5/9/2017
Engine Certification:	40 CFR 60 certified for prime service – utilizing a 3-way catalyst
Stack Description:	~3" vertical exhaust, 100" from ground level, 272.7 acfm at 1,129.7°F 45°58'44.43"N, 122°33'33.75"W
NSPS/NESHAP/MACT:	40 CFR 60 Subpart JJJJ, 40 CFR 63 Subpart ZZZZ applicable.

5.l Swift Camp Generator Engine (new). Until 2018 the Swift Forest Camp well has been alternately powered by the Swift Camp #1 Generator Set or the Swift Camp #2 Generator Set because utility power is not available. The new Swift Forest Camp Generator will replace both of these units. The new generator will operate on demand to provide water service at Swift Camp. Equipment details are provided below:

Generator Set Make / Model:	Kohler / 30REZGT
Generator Output:	25 kW (prime service), 28 kW (standby service)
Generator Serial Number:	To be determined
Engine Make / Model:	General Motors 3.0L Engine
Engine Serial Number:	To be determined
Fuel:	Propane/LPG
Engine Power:	49.2
Engine Built:	To be determined
Engine Certification:	40 CFR 60 certified for prime service – utilizing a 3-way catalyst
Stack Description:	~3" vertical exhaust, 6' from ground level, 250 acfm at 1,270°F ~46° 4'0.08"N, 122° 3'12.43"W
NSPS/NESHAP/MACT:	40 CFR 60 Subpart JJJJ, 40 CFR 63 Subpart ZZZZ applicable.

5.m Merwin Hatchery Ozone Plant. The ozone plant is used to reduce pathogens from river water used for raising steelhead. The ozone plant operates two parallel water disinfection trains. The plant contains two ozone generator cells, one of which is in use at any one time. Compressed air rather than pure oxygen is fed to the ozone generation cells. Each cell consists of horizontal stainless steel tubes in which glass electrodes are inserted. Ozone is generated through an electrical discharge. It is estimate that approximately 2-3% by weight of the oxygen in the air is transformed to ozone. The air/oxygen mixture is bubbled using airstones through the incoming water. It is estimated that approximately 50% of the ozone is dissolved into the water, and 50% of the ozone ends up in the headspace over the flowing water. The headspace of each train is vented to a single ozone destruct unit (decomposer). The decomposer utilizes a catalyst to reduce ozone to oxygen gas. Because the catalyst is deactivated by liquid water, the catalyst is downstream of a water knockout utilizing plastic packing, and a 750 watt electric heater is used to keep the catalyst at 80°F, well above the dewpoint temperature of the inlet gas.

Two Kaeser model SM 8 compressors with a rating of 30 scfm at 110 psig provide the compressed air to the ozone cells.

The unreacted ozone in the river water is removed in a pair of stripping towers and vented to the ambient air.

Location:	111 Merwin Hatchery CT., Ariel, WA 98603-9727
Make / Model:	PCI Ozone and Control Systems / HT-85
Capacity (each unit):	100 lb/day ozone generation when using O_2 feed. 2-3% by weight output expected for compressed air
Oxygen Usage (each unit):	17 scfm typical at ~16 psig
Year Installed:	1993
Water Flow:	2,500 gpm total in two contact basins
Stripping Towers:	Two towers, unknown make/model, containing packing ~18' tall x 8' diameter.
Air Flow:	Unknown
Stripping Tower Exhausts:	~18" diameter vertical, ~28' above grade Located at: 45°57'21.17"N, 122°33'51.43"W
Decomposers Make / Model:	Ozone Water Systems, Inc. / Custom
Decomposer Flow:	100 cfm (design capacity)
Decomposer Catalyst:	Carulite (manganese dioxide/copper oxide catalyst)
Decomposer Exhaust:	Exhausts into the intake of the southern stripping tower
Decomposer Installed:	2013

5.n Other Equipment:

The two gasoline storage tanks are considered to have minor emissions as long as the total throughput is less than 60,000 gal/yr. If the operating hours for an individual engine exceeds 300 hr/yr or the throughput exceeds 60,000 gal/yr, then the Permittee may need to request a modification to the ADP.

- Emergency Generator – Yale Microwave. Provides emergency power for the microwave station.
  (Note that this generator will likely be replaced in 2018 or 2019 with a Kohler 10RESVL or 12 RESVL)

Generator Rating:	4.5 kW
Generator Make:	Kohler
Generator Model:	5RMY21
Generator Serial Number:	262103
Engine Make:	Kohler
Engine Model:	K301
Engine Serial:	5RMY61
Engine Output Rating:	12 hp @ 3,600 rpm
Date Built:	Unknown
Fuel Consumption:	2.0 gal/hr (propane) at full standby load (estimate)
Stack Height:	9' from ground (1 stack), horizontal
Stack Diameter:	2", circular (1 stack)
Stack Temperature:	1,350°F
Flow Rate:	77 acfm

- Emergency Engine – Merwin Dam. For opening a spill gate on the Merwin Dam if station power and the backup generator both fail.

Engine Make:	Briggs & Stratton
Engine Model:	196437
Engine Serial Number:	Unknown
Engine Output Rating:	~ 8 hp (estimated)
Date Built:	Unknown
Fuel:	Unleaded gasoline

- Gasoline Dispensing – Merwin Dam. A 2,500-gal gasoline storage tank designed for submerged filling and equipped with coaxial vapor return is located at the Merwin Dam for refueling of facility vehicles. The maximum annual throughput is estimated at 50,000 gal.

- Gasoline Dispensing – Yale Dam. A 1,000-gal gasoline storage tank designed for submerged filling and equipped with coaxial vapor return is located at the Yale Dam for refueling of facility vehicles. The maximum annual throughput is estimated at 10,000 gal.

5.0 Equipment/Activity Summary.

ID No.	Generating Equipment/Activity	# of Units	Control Measure/Equipment	# of Units
1	Lewis River Hatchery Downstream Emergency Generator Engine	1	Ultra low sulfur diesel (≤ 0.0015% S) Limited operation - (≤ 100 hr/yr + emergency usage)	N/A
2	Lewis River Hatchery Upstream Emergency Generator Engine	1	Ultra low sulfur diesel (≤ 0.0015% S) Limited operation - (≤ 100 hr/yr + emergency usage) EPA Tier 1	N/A
3	Merwin Dam Emergency Generator Engine	1	Ultra low sulfur diesel (≤ 0.0015% S) Limited operation - (≤ 100 hr/yr + emergency usage)	N/A
4	Swift #1 Dam Caterpillar Emergency Generator Engine	1	Ultra low sulfur diesel (≤ 0.0015% S) Limited operation - (≤ 100 hr/yr + emergency usage) EPA Tier 2	N/A
5	Woodland Release Ponds Emergency Generator Engine	1	Ultra low sulfur diesel (≤ 0.0015% S) Limited operation - (≤ 100 hr/yr + emergency usage) EPA Tier 3	N/A
6	Merwin Headquarters Emergency Generator Engine	1	Low ash fuel (propane) Limited operation - (≤ 100 hr/yr + emergency usage)	N/A
7	Speelyai Hatchery Emergency Generator Engine	1	Low ash fuel (propane) Limited operation - (≤ 100 hr/yr + emergency usage)	N/A
8	Yale Dam Emergency Generator Engine	1	Low ash fuel (propane) Limited operation - (≤ 100 hr/yr + emergency usage)	N/A

ID No.	Generating Equipment/Activity	# of Units	Control Measure/Equipment	# of Units
9	Swift #1 Dam Ford Emergency Generator Engine	1	Low ash fuel (propane) Limited operation - (≤ 100 hr/yr + emergency usage)	N/A
10	Camp Creek Radio Tower Generator Engine	1	Low ash fuel (propane) Limited operation - (≤ 1,200 hr/yr) EPA certification with 3-way catalyst	N/A
11	Marble Creek Radio Tower Generator Engine	1	Low ash fuel (propane) Limited operation - (≤ 1,200 hr/yr) EPA certification with 3-way catalyst	N/A
12	Swift Camp Generator Engine	1	Low ash fuel (propane) Limited operation - (≤ 1,200 hr/yr) EPA certification with 3-way catalyst	N/A
13	Merwin Hatchery Ozone Plant	1	1 ozone decomposer on headspace, 1 vertical stack from each of 2 stripping towers	3

6. EMISSIONS DETERMINATION

6.a Lewis River Hatchery Downstream Emergency Generator Engine. Potential annual emissions from the combustion of ultra-low sulfur diesel (≤0.0015% sulfur by weight) were calculated with the assumption that the equipment will operate at full load for up to 500 hours per year.

Lewis River Hatchery Downstream Emergency Generator Engine

Hours of Operation =	500	hours
Power Output =	465	horsepower
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	21.0	gal/hr
Fuel Heat Content =	0.138	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emission Factor lb/hp-hr	Emissions lb/hr	Emissions tpy	Emission Factor Source
NO_X	0.031	14.42	3.60	AP-42 Table 3.3-1 (10/96)
CO	0.00668	3.11	0.78	AP-42 Table 3.3-1 (10/96)
VOC	0.0025141	1.17	0.29	AP-42 Table 3.3-1 (10/96)
SO_X as SO_2		0.0045	0.0011	Mass Balance
PM	0.0022	1.02	0.26	AP-42 Table 3.3-1 (10/96)
PM_{10}	0.0022	1.02	0.26	AP-42 Table 3.3-1 (10/96)
$PM_{2.5}$	0.0022	1.02	0.26	AP-42 Table 3.3-1 (10/96)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	Emission Factor Source
CO_2	73.96	1	163.05	22.50	118.13	40 CFR 98
CH_4	0.003	25	0.17	0.023	0.12	40 CFR 98
N_2O	0.0006	298	0.39	0.054	0.29	40 CFR 98
Total GHG - CO_2e			163.61	22.58	118.54	

Emissions must be calculated using the emission factors identified above unless new emission factors are provided by the manufacturer or developed through source testing.

6.b Lewis River Hatchery Upstream Emergency Generator Engine. Potential annual emissions from the combustion of ultra-low sulfur diesel (≤0.0015% sulfur by weight) were calculated with the assumption that the equipment will operate at full load for up to 500 hours per year.

Lewis River Hatchery Upstream Emergency Generator Engine

Hours of Operation =	500	hours
Power Output =	755	horsepower
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	38.3	gal/hr (estimated)
Fuel Heat Content =	0.138	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emission Factor g/hp-hr	Emissions lb/hr	Emissions tpy	Emission Factor Source
NO_X	6.86	11.42	2.85	Tier 1 Limit
CO	8.50	14.15	3.54	Tier 1 Limit
VOC	0.97	1.61	0.40	Tier 1 Limit
SO_X as SO_2		0.0083	0.0021	Mass Balance
PM	0.40	0.67	0.17	Tier 1 Limit
PM_{10}	0.40	0.67	0.17	Tier 1 Limit
$PM_{2.5}$	0.40	0.67	0.17	Tier 1 Limit

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	Emission Factor Source
CO_2	73.96	1	163.05	22.50	215.43	40 CFR 98
CH_4	0.003	25	0.17	0.023	0.22	40 CFR 98
N_2O	0.0006	298	0.39	0.054	0.52	40 CFR 98
Total GHG - CO_2e			163.61	22.58	216.17	

Emissions must be calculated using the emission factors identified above unless new emission factors are provided by the manufacturer or developed through source testing.

6.c Merwin Dam Emergency Generator Engine. Potential annual emissions from the combustion of ultra-low sulfur diesel (≤0.0015% sulfur by weight) were calculated with the assumption that the equipment will operate at full load for up to 500 hours per year.

Merwin Dam Emergency Generator Engine

Hours of Operation =	500	hours
Power Output =	749	horsepower
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	38.0	gal/hr (estimated)
Fuel Heat Content =	0.138	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emission Factor lb/hp-hr	Emissions lb/hr	Emissions tpy	Emission Factor Source
NO_X	0.024	17.53	4.38	Caterpillar
CO	0.0055	3.24	0.81	Caterpillar
VOC	0.000705	0.60	0.15	Caterpillar
SO_X as SO_2		0.0082	0.0021	Mass Balance
PM	0.0007	0.52	0.13	Caterpillar
PM_{10}	0.0007	0.52	0.13	Caterpillar
$PM_{2.5}$	0.0007	0.52	0.13	Caterpillar

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	Emission Factor Source
CO_2	73.96	1	163.05	22.50	213.72	40 CFR 98
CH_4	0.003	25	0.17	0.023	0.22	40 CFR 98
N_2O	0.0006	298	0.39	0.054	0.52	40 CFR 98
Total GHG - CO_2e			163.61	22.58	214.46	

Emissions must be calculated using the emission factors identified above unless new emission factors are provided by the manufacturer or developed through source testing.

6.d Swift #1 Dam Emergency Generator Engine. Potential annual emissions from the combustion of ultra-low sulfur diesel (≤0.0015% sulfur by weight) were calculated with the assumption that the equipment will operate at full load for up to 500 hours per year.

Swift #1 Dam Emergency Generator Engine

Hours of Operation =	500	hours
Power Output =	900	horsepower
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	42.7	gal/hr (Caterpillar)
Fuel Heat Content =	0.138	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emission Factor lb/hp-hr	Emissions lb/hr	Emissions tpy	Emission Factor Source
NO_X	0.0129	11.59	2.90	Caterpillar
CO	0.0011	0.95	0.24	Caterpillar
VOC	2.2E-05	0.020	0.0050	Caterpillar
SO_X as SO_2		0.0092	0.0023	Mass Balance
PM	7.7E-05	0.069	0.017	Caterpillar
PM_{10}	7.7E-05	0.069	0.017	Caterpillar
$PM_{2.5}$	7.7E-05	0.069	0.017	Caterpillar

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	Emission Factor Source
CO_2	73.96	1	163.05	22.50	240.20	40 CFR 98
CH_4	0.003	25	0.17	0.023	0.24	40 CFR 98
N_2O	0.0006	298	0.39	0.054	0.58	40 CFR 98
Total GHG - CO_2e			163.61	22.58	241.03	

Emissions must be calculated using the emission factors identified above unless new emission factors are provided by the manufacturer or developed through source testing.

6.e Woodland Release Ponds Emergency Generator Engine. Potential annual emissions from the combustion of ultra-low sulfur diesel (≤0.0015% sulfur by weight) were calculated with the assumption that the equipment will operate at full load for up to 200 hours per year.

Woodland Release Ponds Emergency Generator Engine

Hours of Operation =	200	hours
Power Output =	188	horsepower (estimate at full standby load - engine capable of 230 hp)
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	10.0	gal/hr (Caterpillar)
Fuel Heat Content =	0.138	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emission Factor lb/hp-hr	Emissions lb/hr	Emissions tpy	Emission Factor Source
NO_X	0.0066	1.23	0.12	Caterpillar
CO	0.0016	0.31	0.031	Caterpillar
VOC	0.0025141	0.47	0.047	AP-42 Table 3.3-1 (10/96)
SO_X as SO_2		0.0022	0.00022	Mass Balance
PM	0.0003	0.062	0.0062	Caterpillar
PM_{10}	0.0003	0.062	0.0062	Caterpillar
$PM_{2.5}$	0.0003	0.062	0.0062	Caterpillar

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	Emission Factor Source
CO_2	73.96	1	163.05	22.50	22.50	40 CFR 98
CH_4	0.003	25	0.17	0.023	0.02	40 CFR 98
N_2O	0.0006	298	0.39	0.054	0.05	40 CFR 98
Total GHG - CO_2e			163.61	22.58	22.58	

Emissions must be calculated using the emission factors identified above unless new emission factors are provided by the manufacturer or developed through source testing.

6.f Merwin Headquarters Emergency Generator Engine. Potential annual emissions from the combustion of propane were calculated with the assumption that the equipment will operate at full load for up to 500 hours per year.

Merwin Headquarters Emergency Generator Engine

Hours of Operation =	500	hours
Power Output =	147	bhp
Fuel Consumption Rate =	12.7	gallons per hour
Propane Heat Content =	91,500	Btu/gal for AP-42 emission factors
Propane Heat Content =	92,000	Btu/gal for 40 CFR 98 GHG emission factors
Propane Sulfur Content =	185	ppmw
Propane Density =	4.24	lbs/gallon
Fuel Consumption =	6,350	gallons per year

Pollutant	Emission Factor lb/MMBtu	Emissions lb/1,000 gal	lb/hr	tpy	Emission Factor Source
NO_X	4.08	373.32	4.74	1.19	AP-42 Sec 3.2 (7/00) - 4 stroke LB
CO	0.317	29.01	0.37	0.092	AP-42 Sec 3.2 (7/00) - 4 stroke LB
VOC	0.118	10.80	0.14	0.034	AP-42 Sec 3.2 (7/00) - 4 stroke LB
SO_X as SO_2	0.01715	1.57	0.020	0.0050	AP-42 Sec 3.2 (7/00)
PM	0.00999	0.91	0.012	0.0029	AP-42 Sec 3.2 (7/00)
PM_{10}	0.00999	0.91	0.012	0.0029	AP-42 Sec 3.2 (7/00)
$PM_{2.5}$	0.00999	0.91	0.012	0.0029	AP-42 Sec 3.2 (7/00)
Acetaldehyde	0.00836	7.6E-01	9.7E-03	2.4E-03	AP-42 Sec 3.2 (7/00)
Acrolein	0.00514	4.7E-01	6.0E-03	1.5E-03	AP-42 Sec 3.2 (7/00)
Benzene	0.00044	4.0E-02	5.1E-04	1.3E-04	AP-42 Sec 3.2 (7/00)
Ethylbenzene	0.0000397	3.6E-03	4.6E-05	1.2E-05	AP-42 Sec 3.2 (7/00)
Methanol	0.0025	2.3E-01	2.9E-03	7.3E-04	AP-42 Sec 3.2 (7/00)
Toluene	0.00041	3.7E-02	4.7E-04	1.2E-04	AP-42 Sec 3.2 (7/00)
Xylene	0.00018	1.7E-02	2.1E-04	5.3E-05	AP-42 Sec 3.2 (7/00)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	Emission Factor Source
CO_2	61.71	1	136.05	12.52	39.74	40 CFR 98
CH_4	0.003	25	0.17	0.015	0.048	40 CFR 98
N_2O	0.0006	298	0.39	0.036	0.12	40 CFR 98
Total GHG - CO_2e			136.61	12.57	39.90	

Emissions must be calculated using the emission factors identified above unless new emission factors are provided by the manufacturer or developed through source testing.

6.f Speelyai Hatchery Emergency Generator Engine. Potential annual emissions from the combustion of propane were calculated with the assumption that the equipment will operate at full load for up to 500 hours per year.

Speelyai Hatchery Emergency Generator Engine

Hours of Operation =	500	hours
Power Output =	162	bhp
Fuel Consumption Rate =	14.0	gallons per hour
Propane Heat Content =	91,500	Btu/gal for AP-42 emission factors
Propane Heat Content =	92,000	Btu/gal for 40 CFR 98 GHG emission factors
Propane Sulfur Content =	185	ppmw
Propane Density =	4.24	lbs/gallon
Fuel Consumption =	7,000	gallons per year

Pollutant	Emission Factor lb/MMBtu	Emissions lb/1,000 gal	lb/hr	tpy	Emission Factor Source
NO_X	4.08	373.32	5.23	1.31	AP-42 Sec 3.2 (7/00) - 4 stroke LB
CO	0.317	29.01	0.41	0.10	AP-42 Sec 3.2 (7/00) - 4 stroke LB
VOC	0.118	10.80	0.15	0.038	AP-42 Sec 3.2 (7/00) - 4 stroke LB
SO_X as SO_2	0.01715	1.57	0.022	0.0055	AP-42 Sec 3.2 (7/00)
PM	0.00999	0.91	0.013	0.0032	AP-42 Sec 3.2 (7/00)
PM_{10}	0.00999	0.91	0.013	0.0032	AP-42 Sec 3.2 (7/00)
$PM_{2.5}$	0.00999	0.91	0.013	0.0032	AP-42 Sec 3.2 (7/00)
Acetaldehyde	0.00836	7.6E-01	1.1E-02	2.7E-03	AP-42 Sec 3.2 (7/00)
Acrolein	0.00514	4.7E-01	6.6E-03	1.6E-03	AP-42 Sec 3.2 (7/00)
Benzene	0.00044	4.0E-02	5.6E-04	1.4E-04	AP-42 Sec 3.2 (7/00)
Ethylbenzene	0.0000397	3.6E-03	5.1E-05	1.3E-05	AP-42 Sec 3.2 (7/00)
Methanol	0.0025	2.3E-01	3.2E-03	8.0E-04	AP-42 Sec 3.2 (7/00)
Toluene	0.00041	3.7E-02	5.2E-04	1.3E-04	AP-42 Sec 3.2 (7/00)
Xylene	0.00018	1.7E-02	2.4E-04	5.9E-05	AP-42 Sec 3.2 (7/00)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	Emission Factor Source
CO_2	61.71	1	136.05	12.52	43.81	40 CFR 98
CH_4	0.003	25	0.17	0.015	0.053	40 CFR 98
N_2O	0.0006	298	0.39	0.036	0.13	40 CFR 98
Total GHG - CO_2e			136.61	12.57	43.99	

Emissions must be calculated using the emission factors identified above unless new emission factors are provided by the manufacturer or developed through source testing.

6.g Yale Dam Emergency Generator Engine. Potential annual emissions from the combustion of propane were calculated with the assumption that the equipment will operate at full load for up to 500 hours per year.

Yale Dam Emergency Generator Engine

Hours of Operation =	500 hours
Power Output =	147 bhp
Fuel Consumption Rate =	12.8 gallons per hour
Propane Heat Content =	91,500 Btu/gal for AP-42 emission factors
Propane Heat Content =	92,000 Btu/gal for 40 CFR 98 GHG emission factors
Propane Sulfur Content =	185 ppmw
Propane Density =	4.24 lbs/gallon
Fuel Consumption =	6,400 gallons per year

Pollutant	Emission Factor lb/MMBtu	Emissions lb/1,000 gal	lb/hr	tpy	Emission Factor Source
NO_X	4.08	373.32	4.78	1.19	AP-42 Sec 3.2 (7/00) - 4 stroke LB
CO	0.317	29.01	0.37	0.093	AP-42 Sec 3.2 (7/00) - 4 stroke LB
VOC	0.118	10.80	0.14	0.035	AP-42 Sec 3.2 (7/00) - 4 stroke LB
SO_X as SO_2	0.01715	1.57	0.020	0.0050	AP-42 Sec 3.2 (7/00)
PM	0.00999	0.91	0.012	0.0029	AP-42 Sec 3.2 (7/00)
PM_{10}	0.00999	0.91	0.012	0.0029	AP-42 Sec 3.2 (7/00)
$PM_{2.5}$	0.00999	0.91	0.012	0.0029	AP-42 Sec 3.2 (7/00)
Acetaldehyde	0.00836	7.6E-01	9.8E-03	2.4E-03	AP-42 Sec 3.2 (7/00)
Acrolein	0.00514	4.7E-01	6.0E-03	1.5E-03	AP-42 Sec 3.2 (7/00)
Benzene	0.00044	4.0E-02	5.2E-04	1.3E-04	AP-42 Sec 3.2 (7/00)
Ethylbenzene	0.0000397	3.6E-03	4.6E-05	1.2E-05	AP-42 Sec 3.2 (7/00)
Methanol	0.0025	2.3E-01	2.9E-03	7.3E-04	AP-42 Sec 3.2 (7/00)
Toluene	0.00041	3.7E-02	4.8E-04	1.2E-04	AP-42 Sec 3.2 (7/00)
Xylene	0.00018	1.7E-02	2.2E-04	5.4E-05	AP-42 Sec 3.2 (7/00)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	Emission Factor Source
CO_2	61.71	1	136.05	12.52	40.05	40 CFR 98
CH_4	0.003	25	0.17	0.015	0.049	40 CFR 98
N_2O	0.0006	298	0.39	0.036	0.116	40 CFR 98
Total GHG - CO_2e			136.61	12.57	40.22	

Emissions must be calculated using the emission factors identified above unless new emission factors are provided by the manufacturer or developed through source testing.

6.h Swift #1 Ford Emergency Generator Engine. Potential annual emissions from the combustion of propane were calculated with the assumption that the equipment will operate at full load for up to 500 hours per year.

Swift #1 Ford Emergency Generator Engine

Hours of Operation =	500	hours
Power Output =	105	bhp
Fuel Consumption Rate =	9.1	gallons per hour
Propane Heat Content =	91,500	Btu/gal for AP-42 emission factors
Propane Heat Content =	92,000	Btu/gal for 40 CFR 98 GHG emission factors
Propane Sulfur Content =	185	ppmw
Propane Density =	4.24	lbs/gallon
Fuel Consumption =	4,550	gallons per year

Pollutant	Emission Factor lb/MMBtu	Emissions lb/1,000 gal	lb/hr	tpy	Emission Factor Source
NO_X	4.08	373.32	3.40	0.85	AP-42 Sec 3.2 (7/00) - 4 stroke LB
CO	0.317	29.01	0.26	0.066	AP-42 Sec 3.2 (7/00) - 4 stroke LB
VOC	0.118	10.80	0.10	0.025	AP-42 Sec 3.2 (7/00) - 4 stroke LB
SO_X as SO_2	0.01715	1.57	0.014	0.0036	AP-42 Sec 3.2 (7/00)
PM	0.00999	0.91	0.0083	0.0021	AP-42 Sec 3.2 (7/00)
PM_{10}	0.00999	0.91	0.0083	0.0021	AP-42 Sec 3.2 (7/00)
$PM_{2.5}$	0.00999	0.91	0.0083	0.0021	AP-42 Sec 3.2 (7/00)
Acetaldehyde	0.00836	7.6E-01	7.0E-03	1.7E-03	AP-42 Sec 3.2 (7/00)
Acrolein	0.00514	4.7E-01	4.3E-03	1.1E-03	AP-42 Sec 3.2 (7/00)
Benzene	0.00044	4.0E-02	3.7E-04	9.2E-05	AP-42 Sec 3.2 (7/00)
Ethylbenzene	0.0000397	3.6E-03	3.3E-05	8.3E-06	AP-42 Sec 3.2 (7/00)
Methanol	0.0025	2.3E-01	2.1E-03	5.2E-04	AP-42 Sec 3.2 (7/00)
Toluene	0.00041	3.7E-02	3.4E-04	8.5E-05	AP-42 Sec 3.2 (7/00)
Xylene	0.00018	1.7E-02	1.5E-04	3.8E-05	AP-42 Sec 3.2 (7/00)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	Emission Factor Source
CO_2	61.71	1	136.05	12.52	28.47	40 CFR 98
CH_4	0.003	25	0.17	0.015	0.035	40 CFR 98
N_2O	0.0006	298	0.39	0.036	0.083	40 CFR 98
Total GHG - CO_2e			136.61	12.57	28.59	

Emissions must be calculated using the emission factors identified above unless new emission factors are provided by the manufacturer or developed through source testing.

6.i Camp Creek Radio Tower Generator Engine. Potential annual emissions from the combustion of propane were calculated with the assumption that the equipment will operate at full load for up to 1,200 hours per year.

Camp Creek Radio Tower Generator Engine 4-stroke rich-burn engine

Hours of Operation =	1,200	hours
Power Output =	72	bhp
Fuel Consumption Rate =	6.76	gallons per hour (246 scfh - Kohler)
Propane Heat Content =	91,500	Btu/gal for AP-42 emission factors
Propane Heat Content =	92,000	Btu/gal for 40 CFR 98 GHG emission factors
Propane Sulfur Content =	185	ppmw
Propane Density =	4.24	lbs/gallon
Fuel Consumption =	8,110	gallons per year

Pollutant	Emission Factor g/kW-hr	Emission Factor lb/MMBtu	Emissions lb/1,000 gal	lb/hr	tpy	Emission Factor Source
NO_X	0.07	0.01	1.23	0.0083	0.0050	Kohler
CO	0.59	0.11	10.33	0.070	0.042	Kohler
VOC	0.07	0.01	1.23	0.008	0.0050	Kohler
SO_X as SO_2		0.01715	1.57	0.011	0.0064	Mass Balance
PM		0.0194	1.78	0.012	0.0072	AP-42 Sec 3.2 (7/00)
PM_{10}		0.0194	1.78	0.012	0.0072	AP-42 Sec 3.2 (7/00)
$PM_{2.5}$		0.0194	1.78	0.012	0.0072	AP-42 Sec 3.2 (7/00)
1,1,2,2-Tetrachloroethane		0.0000253	2.3E-03	1.6E-05	9.4E-06	AP-42 Sec 3.2 (7/00)
Acetaldehyde		0.00279	2.6E-01	1.7E-03	1.0E-03	AP-42 Sec 3.2 (7/00)
Acrolein		0.00263	2.4E-01	1.6E-03	9.8E-04	AP-42 Sec 3.2 (7/00)
Benzene		0.00158	1.4E-01	9.8E-04	5.9E-04	AP-42 Sec 3.2 (7/00)
Formaldehyde		0.0205000	1.9E+00	1.3E-02	7.6E-03	AP-42 Sec 3.2 (7/00)
Methylene Chloride		0.0000412	3.8E-03	2.5E-05	1.5E-05	AP-42 Sec 3.2 (7/00)
Toluene		0.000558	5.1E-02	3.5E-04	2.1E-04	AP-42 Sec 3.2 (7/00)
Xylene		0.000195	1.8E-02	1.2E-04	7.2E-05	AP-42 Sec 3.2 (7/00)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	Emission Factor Source
CO_2	61.71	1	136.05	12.52	50.75	40 CFR 98
CH_4	0.003	25	0.17	0.015	0.062	40 CFR 98
N_2O	0.0006	298	0.39	0.036	0.147	40 CFR 98
Total GHG - CO_2e			136.61	12.57	50.96	

Emissions must be calculated using the emission factors identified above unless new emission factors are provided by the manufacturer or developed through source testing.

6.j Marble Creek Radio Tower Generator Engine. Potential annual emissions from the combustion of propane were calculated with the assumption that the equipment will operate at full load for up to 1,200 hours per year.

Marble Creek Radio Tower Generator Engine		4-stroke rich-burn engine
Hours of Operation =	1,200	hours
Power Output =	72	bhp
Fuel Consumption Rate =	6.76	gallons per hour (246 scfh - Kohler)
Propane Heat Content =	91,500	Btu/gal for AP-42 emission factors
Propane Heat Content =	92,000	Btu/gal for 40 CFR 98 GHG emission factors
Propane Sulfur Content =	185	ppmw
Propane Density =	4.24	lbs/gallon
Fuel Consumption =	8,110	gallons per year

Pollutant	Emission Factor g/kW-hr	Emission Factor lb/MMBtu	Emissions lb/1,000 gal	lb/hr	tpy	Emission Factor Source
NO_X	0.07	0.013	1.23	0.008	0.0050	Kohler
CO	0.59	0.11	10.33	0.070	0.0419	Kohler
VOC	0.07	0.013	1.23	0.008	0.0050	Kohler
SO_X as SO_2		0.01715	1.57	0.011	0.0064	Mass Balance
PM		0.0194	1.78	0.012	0.0072	AP-42 Sec 3.2 (7/00)
PM_{10}		0.0194	1.78	0.012	0.0072	AP-42 Sec 3.2 (7/00)
$PM_{2.5}$		0.0194	1.78	0.012	0.0072	AP-42 Sec 3.2 (7/00)
1,1,2,2-Tetrachloroethane		0.0000253	2.3E-03	1.6E-05	9.4E-06	AP-42 Sec 3.2 (7/00)
Acetaldehyde		0.00279	2.6E-01	1.7E-03	1.0E-03	AP-42 Sec 3.2 (7/00)
Acrolein		0.00263	2.4E-01	1.6E-03	9.8E-04	AP-42 Sec 3.2 (7/00)
Benzene		0.00158	1.4E-01	9.8E-04	5.9E-04	AP-42 Sec 3.2 (7/00)
Formaldehyde		0.0205000	1.9E+00	1.3E-02	7.6E-03	AP-42 Sec 3.2 (7/00)
Methylene Chloride		0.0000412	3.8E-03	2.5E-05	1.5E-05	AP-42 Sec 3.2 (7/00)
Toluene		0.000558	5.1E-02	3.5E-04	2.1E-04	AP-42 Sec 3.2 (7/00)
Xylene		0.000195	1.8E-02	1.2E-04	7.2E-05	AP-42 Sec 3.2 (7/00)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	Emission Factor Source
CO_2	61.71	1	136.05	12.52	50.75	40 CFR 98
CH_4	0.003	25	0.17	0.015	0.062	40 CFR 98
N_2O	0.0006	298	0.39	0.036	0.15	40 CFR 98
Total GHG - CO_2e			136.61	12.57	50.96	

Emissions must be calculated using the emission factors identified above unless new emission factors are provided by the manufacturer or developed through source testing.

6.k Swift Forest Camp Generator Engine. Potential annual emissions from the combustion of propane were calculated with the assumption that the equipment will operate at full load for up to 1,200 hours per year.

Swift Forest Camp Generator Engine

Hours of Operation =	1,200	hours
Power Output =	49.2	bhp
Fuel Consumption Rate =	4.23	gallons per hour (154 scfh)
Propane Heat Content =	91,500	Btu/gal for AP-42 emission factors
Propane Heat Content =	92,000	Btu/gal for 40 CFR 98 GHG emission factors
Propane Sulfur Content =	185	ppmw
Propane Density =	4.24	lbs/gallon
Fuel Consumption =	5,078	gallons per year

Pollutant	Emission Factor g/kW-hr	Emission Factor lb/MMBtu	Emissions lb/1,000 gal	lb/hr	tpy	Emission Factor Source
NO_X	0.05	0.010	0.96	0.0040	0.002	Kohler - LP
CO	0.72	0.15	13.76	0.058	0.035	Kohler - LP
VOC		0.0296	2.71	0.011	0.007	AP-42 Sec 3.2 (7/00)
SO_X as SO_2		0.01715	1.57	0.0066	0.0040	Mass Balance
PM		0.0194	1.78	0.0075	0.0045	AP-42 Sec 3.2 (7/00)
PM_{10}		0.0194	1.78	0.0075	0.0045	AP-42 Sec 3.2 (7/00)
$PM_{2.5}$		0.0194	1.79	0.0075	0.0045	AP-42 Sec 3.2 (7/00)
1,1,2,2-Tetrachloroethane		0.0000253	2.3E-03	9.8E-06	5.9E-06	AP-42 Sec 3.2 (7/00)
Acetaldehyde		0.00279	2.6E-01	1.1E-03	6.5E-04	AP-42 Sec 3.2 (7/00)
Acrolein		0.00263	2.4E-01	1.0E-03	6.1E-04	AP-42 Sec 3.2 (7/00)
Benzene		0.00158	1.4E-01	6.1E-04	3.7E-04	AP-42 Sec 3.2 (7/00)
Formaldehyde		0.0205000	1.9E+00	7.9E-03	4.8E-03	AP-42 Sec 3.2 (7/00)
Methylene Chloride		0.0000412	3.8E-03	1.6E-05	9.6E-06	AP-42 Sec 3.2 (7/00)
Toluene		0.000558	5.1E-02	2.2E-04	1.3E-04	AP-42 Sec 3.2 (7/00)
Xylene		0.000195	1.8E-02	7.6E-05	4.5E-05	AP-42 Sec 3.2 (7/00)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	Emission Factor Source
CO_2	61.71	1	136.05	12.52	31.78	40 CFR 98
CH_4	0.003	25	0.17	0.015	0.039	40 CFR 98
N_2O	0.0006	298	0.39	0.036	0.092	40 CFR 98
Total GHG - CO_2e			136.61	12.57	31.91	

Emissions must be calculated using the emission factors identified above unless new emission factors are provided by the manufacturer or developed through source testing.

6.1 Merwin Hatchery Ozone Plant. Ozone is emitted from the two decomposer stacks and the stacks of the two stripping towers. The plant is online and operating except when it is necessary to take it off-line for maintenance. After disinfection, all residual ozone is stripped from the water. WDFW operators indicate that they target a residual ozone concentration upstream of the stripping towers between 0.04 and 0.08 ppm 0 ppm downstream of the stripping towers. For the purposes of calculating maximum potential emissions, a residual concentration of 0.17 ppm was assumed because this was the original design target. Ozone emissions from the stripping towers are calculated using a straight mass balance.

Maximum potential emissions were calculated using the assumption that ozone is produced at the full rated capacity of 100 pounds per day, 50% of the ozone generated is adsorbed into the water, and an estimated O_2 to O_3 conversion efficiency of 3% (an estimated range of 2% - 3% for compressed air systems was provided during a phone conversation with an industry expert in 2012).

Merwin Ozone Plant (each of two identical O_3 generators, each rated at 100 lbs/day)		
Maximum Air Usage =	133	scfm
Maximum Oxygen Usage =	27.9	scfm
	2.3	lb/min
	139	lb/hr
	3,333	lb/day
O_2 to O_3 Conversion Efficiency =	3.0%	(2% - 3% estimated)
Maximum O_3 Production =	100	lb/day
Maximum O_3 Production =	4.17	lb/hr
Fraction of Ozone Adsorbed into Water =	50%	
Max. Ozone Residual Before Stripping Towers =	0.17	ppm (runs 0.04 to 0.08 typically)
Water Flow =	2,500	gallons per minute
Annual Quantity of Water Treated =	1,314,000,000	gallons
Annual Quantity of Air Used =	70,038,377	ft^3 air
Decomposer Efficiency =	95%	
Maximum Ozone Emissions From Decomosers =	0.10	lb/hr (assumes no reaction in water)
Ozone Emissions From Decomosers =	**913**	lb/yr
Maximum Ozone Emissions From Stripping Towers =	0.21	lb/hr
Ozone Emissions From Stripping Towers =	**1,863**	lb/yr
Total Ozone Emissions =	**2,775**	lb/yr

Emissions must be calculated using the emission factors identified above unless new emission factors from a manufacturer or vendor are provided or new emission factors are developed through source testing.

6.m Facilitywide Potential Emissions (PTE) Summary.

Pollutant	Annual Emissions (tpy)
Nitrogen oxides	18.51
Carbon monoxide	5.87
Volatile organic compounds	1.05
Sulfur oxides as sulfur dioxide	0.04
Particulate matter	0.61
PM_{10}	0.61
$PM_{2.5}$	0.61
Ozone	1.39
Toxic Air Pollutants	0.05
Hazardous Air Pollutants	0.05
CO_2e	1,103

7. REGULATIONS AND EMISSION STANDARDS

Regulations that have been used to evaluate the acceptability of the proposed facility and establish emission limits and control requirements include, but are not limited to, the regulations, codes, or requirements listed below.

7.a Title 40 Code of Federal Regulations (CFR) Part 60.4200 et seq. "Subpart IIII - Standards of Performance for Stationary Compression Ignition Internal Combustion Engines" requires that new diesel engines meet specific emission standards at the point of manufacture and during operation. In addition, maximum fuel sulfur contents are specified and minimum maintenance standards were established. The Swift #1 Dam Caterpillar Emergency Generator Engine, and the Woodland Release Ponds Emergency Generator Engine are affected sources because they were manufactured after the relevant applicability date (April 1, 2006). For affected emergency engines, the following is required:

(1) Owners or operators must comply with the emission standards as specified in §60.4205, for all pollutants. [40 CFR 60.4205]

(2) For engines with less than 30 liters of displacement per cylinder, owners or operators must use diesel fuel with a maximum sulfur content of 15 ppm and a minimum cetane index of 40 or a maximum aromatic content of 35 percent. [40 CFR 60.4207(b)]

(2) Owners or operators must operate and maintain each stationary CI internal combustion engine and control device according to the manufacturer's written instructions. In addition, owners and operators may only change those settings that are permitted by the manufacturer; and [40 CFR 60.4211(a)]

(3) Emergency engines may be operated for maintenance checks and readiness testing, provided that the tests are recommended by federal, state or local government, the manufacturer, the vendor, the regional transmission organization or equivalent balancing authority and transmission operator, or the insurance company associated with the engine. 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 ICE beyond 100 hours per calendar year. [40 CFR 60.4211(f)(2)(i)]

7.b 40 CFR Part 60.4230 et seq. "Subpart JJJJ - Standards of Performance for Stationary Spark Ignition Internal Combustion Engines" requires that new spark ignition engines meet specific emission standards at the point of manufacture and during operation. Depending on the type of engine, affected engines are engines built after dates ranging from 2006 to 2009. Enforcement of this regulation has not been delegated from EPA to SWCAA. 40 CFR 60.4231(c) requires new stationary SI ICE with a maximum engine power greater than 25hp that are rich burn engines that use LPG to meet the emission standards in 40 CFR 1048. 40 CFR 1048 standards for new "constant-speed" engines (generator sets require a constant speed) require engines to meet the following standards:

(1) Steady-State Testing: $HC+NO_X$ = 2.7 g/kW-hr and CO = 4.4 g/kW-hr or a varying formula found in 40 CFR 1048.101(a)(3).

(2) Field Testing: $HC+NO_X$ = 3.8 g/kW-hr and CO = 6.5 g/kW-hr or a varying formula found in 40 CFR 1048.101(c)(3).

7.c 40 CFR Part 63.6580 et seq. "Subpart ZZZZ - National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Stationary Reciprocating Internal Combustion Engines" establishes national emission limitations and operating limitations for HAP emitted from stationary reciprocating internal combustion engines (RICE) located at major and area sources of HAP emissions. All of the generator engines are affected sources under this regulation. A new stationary RICE at an area source must comply with Subpart ZZZZ by meeting the requirements of 40 CFR 60 Subpart IIII for compression ignition engines or 40 CFR 60 Subpart JJJJ for spark ignition engines. The Swift #1 Dam Caterpillar Emergency Generator Engine and the Woodland Release Ponds Emergency Generator Engine are "new" diesel engines at an area source; therefore, compliance with 40 CFR 60 Subpart IIII constitutes compliance with 40 CFR 63 Subpart ZZZZ for these engines. The Camp Creek Radio Tower Generator Engine, the Marble Creek Radio Tower Generator Engine, and the Swift Camp Generator Engine are new spark ignition engines at an area source, therefore compliance with 40 CFR 60 Subpart JJJJ constitutes compliance with 40 CFR 63 Subpart ZZZZ. The remainder of the engines are existing engines at an area source. For existing emergency engines at an area source, the owner or operator is required to:

(1) Change oil and filter every 500 hours of operation or annually, whichever comes first except as allowed by 40 CFR 63.6625(i). [40 CFR 63.6603(a) and Table 2d(4)(a)]
(2) Inspect air cleaner every 1,000 hours of operation or annually, whichever comes first. [40 CFR 63.6603(a) and Table 2d(4)(b)]
(3) Inspect all hoses and belts every 500 hours of operation or annually, whichever comes first, and replace as necessary. [40 CFR 63.6603(a) and Table 2d(4)(c)]
(4) Operate and maintain the stationary RICE and after-treatment control device (if any) according to the manufacturer's emission-related written instructions or develop a 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. [40 CFR 63.6625(e)]
(5) Install a non-resettable hour meter if one is not already installed. [40 CFR 63.6625(f)]
(6) 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. [40 CFR 63.6625(h)]
(7) Report each instance in which the owner did not meet each operating limitation. [40 CFR 63.6640(b)]
(8) Limit operation of the engine to emergency use and maintenance checks and readiness testing. Operation for maintenance checks and readiness testing may be conducted only to the extent that the tests are recommended by Federal, State or local government, the manufacturer, the vendor, or the insurance company associated with the engine. Operation for maintenance checks and readiness testing is limited to 100 hours per year. [40 CFR 63.6640(f)(1)(ii)]
(9) Record the occurrence and duration of each malfunction of operation (i.e., process equipment). [40 CFR 63.6655(a)(2)]
(10) Record maintenance conducted on the engine in order to demonstrate that the engine was operated and maintained according to the applicable maintenance plan. [40 CFR 63.6655(e)]
(11) Record the hours of operation of the engine by use of a non-resettable hour meter. The owner or operator 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. [40 CFR 63.6655(e)]

Enforcement of this regulation has not been delegated from EPA to SWCAA and the requirements from this regulation have not been included in the Air Discharge Permit.

7.d Revised Code of Washington (RCW) 70.94.141 empowers any activated air pollution control authority to prepare and develop a comprehensive plan or plans for the prevention, abatement and control of air pollution within its jurisdiction. An air pollution control authority may issue such orders as may be necessary to effectuate the purposes of the Washington Clean Air Act [RCW 70.94] and enforce the same by all appropriate administrative and judicial proceedings subject to the rights of appeal as provided in Chapter 62, Laws of 1970 ex. sess.

7.e RCW 70.94.152 provides for the inclusion of conditions of operation as are reasonably necessary to assure the maintenance of compliance with the applicable ordinances, resolutions, rules and regulations when issuing an Order of Approval (Air Discharge Permit) for installation and establishment of an air contaminant source.

7.f Washington Administrative Code (WAC) 173-460 "Controls for New Sources of Toxic Air Pollutants" (as in effect February 14, 1994) requires Best Available Control Technology for toxic air pollutants (T-BACT), identification and quantification of emissions of toxic air pollutants and demonstration of protection of human health and safety.

7.g WAC 173-476 "Ambient Air Quality Standards" establishes ambient air quality standards for PM_{10}, $PM_{2.5}$, lead, sulfur dioxide, nitrogen dioxide, ozone, and carbon monoxide in the ambient air, which shall not be exceeded.

7.h SWCAA 400-040 "General Standards for Maximum Emissions" requires all new and existing sources and emission units to meet certain performance standards with respect to Reasonably Available Control Technology (RACT), visible emissions, fallout, fugitive emissions, odors, emissions detrimental to persons or property, sulfur dioxide, concealment and masking, and fugitive dust.

7.i SWCAA 400-040(1) "Visible Emissions" requires that no emission of air contaminate from any emissions unit shall exceed twenty percent opacity for more than three minutes in any one hour at the emission point, or within a reasonable distance of the emission point.

7.j SWCAA 400-060 "Emission Standards for General Process Units" requires that all new and existing sources not emit particulate matter in excess of 0.1 grains per dry standard cubic foot of exhaust gas.

7.k SWCAA 400-110 "New Source Review" requires that an Air Discharge Permit application be filed with SWCAA prior to the establishment of any new source or emission unit or modification and that an Air Discharge Permit be issued prior to establishment of the new source or emission unit.

7.l SWCAA 400-113 "Requirements for New Sources in Attainment or Nonclassifiable Areas" requires that no approval to construct or alter an air contaminant source be granted unless it is evidenced that:

(1) The equipment or technology is designed and will be installed to operate without causing a violation of the applicable emission standards;
(2) Best Available Control Technology will be employed for all air contaminants to be emitted by the proposed equipment;
(3) The proposed equipment will not cause any ambient air quality standard to be exceeded; and
(4) If the proposed equipment or facility will emit any toxic air pollutant regulated under WAC 173-460, the proposed equipment and control measures will meet all the requirements of that Chapter.

The equipment addressed by this permit is located in an area that is in attainment or nonclassifiable, therefore this regulation is applicable to this equipment.

8. RACT/BACT/BART/LAER/PSD/CAM DETERMINATIONS

The proposed equipment and control systems have been evaluated to determine if they meet the requirements of Best Available Control Technology (BACT) and Best Available Control Technology for toxics (T-BACT) for the types and amounts of air contaminants emitted by the processes and equipment as described below:

8.a BACT Determination – Camp Creek and Marble Creek Generator Engines (new). SWCAA expects that the most cost-effective means of emission control for propane-fired generator engines in this size range is to purchase EPA certified engines. The Camp Creek Radio Tower Emergency Generator Engine and the Marble Creek Radio Tower Emergency Generator Engine are EPA certified for prime service and potential emissions are relatively minor (<

0.1 tons per year of all air pollutants, both units combined), therefore SWCAA has determined that no additional controls are necessary to meet the requirements of BACT.

8.b BACT Determination – Woodland Release Ponds Emergency Generator Engine (new). Available control measures for new diesel engines include engine design, the use of ultra-low sulfur fuel and add-on control equipment such as selective catalytic reduction (SCR) units and oxidation catalysts. SWCAA believes that SCR is not feasible for this unit based on a combination of cost and practicality (most operation will be short-term and intermittent). SWCAA has found that an oxidation catalyst is not a cost-effective control for CO, VOC, and PM for new or relatively small emergency engines.

The use of modern diesel-fired engine design meeting the relevant EPA emission standard for the new engine as applicable, the use of ultra-low sulfur diesel fuel ($\leq 0.0015\%$ sulfur by weight), limitation of visible emissions to 5% opacity or less, and limitation of engine operation to maintenance checks, readiness testing, and emergency use has been determined to meet the requirements of BACT for the types and quantities of air contaminants emitted. The use of ultra-low sulfur fuel is also required by 40 CFR 60 Subpart IIII for "new" engines.

8.c BACT Determination – Swift Camp Generator Engine (new). SWCAA expects that the most cost-effective means of emission control for propane-fired generator engines in this size range is to purchase EPA certified engines. The proposed engine is EPA certified for prime service and potential emissions are relatively minor (< 0.1 tons per year of all air pollutants combined), therefore SWCAA has determined that no additional controls are necessary to meet the requirements of BACT.

Historical Determinations

8.d BACT Determination – Radio Tower and Swift Forest Camp Generator Engines (SWCAA 15-3125). SWCAA expects that the most cost-effective means of emission control for propane-fired generator engines in this size range is to purchase EPA certified engines. The Camp Creek Radio Tower Emergency Generator Engine and the Marble Creek Radio Tower Emergency Generator Engine are EPA certified for standby usage and potential emissions are relatively minor, therefore SWCAA has determined that no additional controls are necessary to meet the requirements of BACT. The largest emission from the Swift Camp #1 Generator Engine and the Swift Camp #2 Generator Engine is carbon monoxide emissions. The EPA carbon monoxide emissions requirements for non-emergency engines of this size is approximately 85% lower than the certified emission rate provided for the Swift Camp #1 Generator Engine and the Swift Camp #2 Generator Engine.

The Swift Camp engines are certified for emergency use only. Because CO emissions from these engines are much higher than NO_X emissions (3-5 times more on a molar basis), SWCAA expects that the addition of a 3-way catalyst would only reduce CO marginally. The addition of an oxidation catalyst would require a careful blending of ambient air into the exhaust stream, providing enough oxygen to convert the CO without cooling the exhaust stream below the minimum operating temperature of the oxidation catalyst. This is not a practical alternative both because these engines are relatively small and because they are in a remote location.

For the Swift Camp engines, SWCAA has determined that utilizing engines that are EPA certified for prime service meets the requirements of BACT. The Swift Camp engines are not certified for prime service and do not meet the requirements of BACT.

8.e BACT Determination – Merwin Hatchery Ozone Plant (SWCAA 15-3125). The primary source of uncontrolled emissions is the venting of the headspace over the ozone contactor. The ozone decomposer used to control emissions from this area represents the highest level of control available and therefore meet the requirements of BACT.

The remaining ozone emissions come from stripping residual ozone from the treated water prior to use. The primary method of minimizing these emissions is to maintain the lowest safe level of residual ozone in the water. This facility already monitors the residual ozone and uses these values to regulate the amount of ozone produced.

The residual ozone must be stripped to protect the fish being raised at the hatchery. SWCAA was not able to find any examples of ozone emission control being used on stripping tower exhausts at a hatchery. Commercial/industrial scale ozone destruction units utilize a metal based catalyst that is inactivated by liquid water. For this reason, the gas would need to be heated slightly before contact with the catalyst to assure the relatively humidity is safely below 100%. Enercon's ozone decomposers were reviewed for this application but were eliminated from the analysis because they are not designed for wet gas streams or outside use. The only commercial/industrial scale ozone decomposers SWCAA found reference to are manufactured by Ozone Solutions.

The airflow through the towers is unknown, but assuming a relatively modest stack exhaust velocity of 12 feet per second, SWCAA estimated that this application would require 10 of the largest units (450 cfm capacity at a cost of $11,500 each). Based on EPA's Control Cost Manual (January 2002), the total capital cost of a baghouse system (the most analogous type of control equipment), the total capital investment is expected to be 2.19 times the purchased equipment costs. Assuming that the delivered cost of new units, including sales tax, is $115,000, then the total capital cost would be $251,850. Assuming an 8% cost of capital, a 20-year equipment life, a $10,000 per year maintenance cost, maximum potential emissions, and an aggregate control efficiency of 90%, the cost of control is $38,000 per ton of ozone controlled. Considering the fact that SWCAA is unaware of any other hatchery controlling ozone emissions from water stripping and the relatively high cost of control, SWCAA has determined that no additional controls represent BACT for this source.

8.f <u>BACT Determination – Emergency Generator Engines (diesel-fired SWCAA 10-2939).</u> Available control measures for diesel engines include low sulfur fuel and add-on control equipment such as selective catalytic reduction units. Add-on control equipment is not economically or technically feasible because the engine will be operated only for short periods of time for testing, maintenance, and to provide emergency electricity and will not achieve the stable operating temperature required for operation of add-on control equipment.

Limited hours of operation (300 hr/yr for the two Lewis River Hatchery engines and the Merwin Headquarters engine, and 1,000 hr/yr for the diesel-fired Swift #1 Dam engine) and the use of ultralow-sulfur (≤15 ppmw) diesel fuel has been determined to meet the requirements of BACT for the emergency generator engines for the types and quantities of air contaminants emitted from these engines.

8.g <u>BACT Determination – Emergency Generator Engines (propane-fired SWCAA 10-2939).</u> Limited hours of operation (300 hr/yr) and the use of propane, a low-sulfur fuel (15 gr/100 ft^3 or approximately 180 ppmw), has been determined to meet the requirements of BACT for all of the propane-fired emergency generator engines.

8.h <u>BACT Determination – Emergency Generator Engines (diesel-fired SWCAA 02-2401).</u> Limited hours of operation (2,100 hr/yr) and the use of low-sulfur (≤500 ppmw) diesel fuel was previously determined to meet the requirements of BACT for the Merwin Dam emergency generator engine for the types and quantities of air contaminants emitted from this engine. This determination was established in ADP 02-2401.

8.i <u>Prevention of Significant Deterioration (PSD) Applicability Determination.</u> This permitting action will not result in a potential emissions increase equal to or greater than the applicable PSD thresholds. Therefore, requirements of the PSD program are not applicable to this action.

8.j <u>Compliance Assurance Monitoring (CAM).</u> CAM is not applicable to any emission unit at this facility because the facility is not a major source and is not required to obtain a Part 70 permit.

9. AMBIENT IMPACT ANALYSIS

Incremental increases in toxic air pollutant emissions from the generator engines will not exceed the applicable Small Quantity Emission Rates (SQER) for pollutants listed in WAC 173-460 (as in effect February 14, 1994), therefore toxic impacts are presumed to be below regulatory significance. Emissions of combustion products (nitrogen oxides, carbon monoxide, sulfur oxides, particulate matter, and volatile organic compounds) are all below thresholds that could reasonably be expected to cause a violation of ambient air quality standards.

SWCAA ran the AERSCREEN dispersion model to estimate that maximum ambient impact of ozone emissions from the Merwin Hatchery Ozone Plant. The results of the analysis indicated that the maximum ozone concentrations resulting from operation of the ozone plant are approximately 1/3 of the ambient air quality standards, not including the impact of downwash. The possible impacts of downwash from adjacent trees and buildings could not be determined with the tools available to SWCAA.

Conclusions

9.a Operation of the generator engines and ozone plant as proposed in ADP Applications CO-944 and CO-999 will not cause the ambient air quality requirements of Title 40 Code of Federal Regulations (CFR) Part 50 "National Primary and Secondary Ambient Air Quality Standards" to be violated.

9.b The generator engines and ozone plant proposed in ADP Applications CO-944 and CO-999, can be operated without causing a violation of the applicable emission standards, which include the limits established under SWCAA 400-040 "General Standards for Maximum Emissions."

9.c Operation of the generator engines and ozone plant as proposed in ADP applications CO-944 and CO-999 in accordance with the Air Discharge Permit will not cause the requirements of WAC 173-460 "Controls for New Sources of Toxic Air Pollutants," (in effect February 14, 1994) or WAC 173-476 "Ambient Air Quality Standards" to be violated.

10. DISCUSSION OF APPROVAL CONDITIONS

SWCAA has made a determination to issue Air Discharge Permit 18-3309 in response to ADP Application CO-999. Air Discharge Permit 18-3309 contains approval requirements deemed necessary to assure compliance with applicable regulations and emission standards as discussed below.

10.a <u>General Basis.</u> Approval conditions for equipment affected by this permitting action incorporate the operating schemes proposed by the permittee in the Air Discharge Permit application.

10.b <u>Emission Limits.</u> Annual emission limits for the Camp Creek Radio Tower, Marble Creek Radio Tower, and the Swift Camp Generator Engine were established with the assumption that each engine could operate at maximum load for up to 1,200 hours per year. For the Radio Tower generators, the annual run time in the first year of operation is approximately 700 hours per year each, so the 1,200 hours per year years should be sufficient to account for years with less solar production (primary power comes from a solar system at these locations). For the Swift Camp generator, this is approximately 1/3 of the time that the campground is open (Memorial Day to November 1 each year). Emissions inventory reports indicate that these engines have operated approximately 100 – 600 hours per year in recent years.

Visual emissions from the diesel-fired emergency generator engines were limited to 5% opacity and visual emissions from the propane-fired generator engines were limited to 0% opacity because greater opacity levels would only be expected from a unit in need of servicing. Note that the opacity limit for the diesel engines applies only after the engine has reached normal operating temperature, or after 15 minutes of operation, whichever is sooner.

The permit limits for the Merwin Hatchery Ozone Plant represent BACT and emission levels that are not expected to cause or contribute to a violation of the ambient air quality standards for ozone. At maximum capacity, the ozone decomposer will need to operate at approximately 95% control efficiency to meet the permit limit. Based on SWCAA's experience with ozone decomposers and manufacturer information, this is easily achievable.

10.c Operating Limits and Requirements. The only fuel evaluated for use by the diesel-fired emergency generator engines was road-grade diesel; therefore operation on other, potentially dirtier, fuels was prohibited. As discussed in Section 8, BACT for the diesel engines require the use of ultra low-sulfur ($\leq$ 0.0015% S by weight) diesel. The permit allows the use of "#2 diesel or better." In this case "or better" includes road-grade diesel fuel with lower sulfur content, biodiesel, and mixtures of biodiesel and road-grade diesel that meet the definition of "diesel" and contain no more than 0.0015% sulfur by weight. Because diesel with a fuel sulfur content of 0.0015% or less is widely available and required for the newly permitted diesel engines, this sulfur limitation was extended to the Merwin Dam Emergency Generator Engine so that SWCAA and the permittee do not need to track which diesel fuel was supplied to which diesel engine, and to be consistent with RACT.

To minimize the impact of emissions on ambient air quality, the exhausts from the Merwin Hatchery Ozone plant are required to be exhausted vertically. Any device that obstructs or prevents vertical discharge (such as a traditional rain cap) is prohibited. This is good engineering practice and is required by SWCAA 400-200(1). The new engines do not meet the vertical exhaust configuration required for new emission units however SWCAA has determined that it is not necessary to re-configure the exhausts to protect ambient air quality.

The primary way to control ozone emissions from the stripping towers is to place a reasonable limit on the residual ozone that needs to be stripped from the water. Tacoma Power has indicated that a minimum of 0.17 ppm residual is necessary to assure proper disinfection at their Cowlitz Trout Ozone Plant. Operators at the Merwin Hatchery indicated that 0.17 ppm is an older standard and that they target a residual ozone concentration of 0.04 to 0.08 ppm based on the recommendations from their ozone equipment service contractor. From this information SWCAA has conservatively assumed that targeting an annual average maximum of 0.17 ppm would provide adequate disinfection margin while providing adequate protection of ambient air quality.

10.d Monitoring and Recordkeeping. Sufficient monitoring and recordkeeping was established to document compliance with the annual emission limits and provide for general requirements (e.g. excess emission reporting, annual emission inventory submission). Excess emissions must be reported as soon as possible in order to qualify for relief from monetary penalty in accordance with SWCAA 400-107. In addition, deviations from permit conditions must be reported within 30 days of discovery in accordance with the SWCAA 400-107 requirement for excess emissions.

10.e Emission Monitoring and Testing Requirements. See Section 12.

10.f Reporting. The permit requires reporting of the annual air emissions inventory, and reporting of the data necessary to develop the inventory.

11. START-UP AND SHUTDOWN/ALTERNATIVE OPERATING SCENARIOS/POLLUTION PREVENTION

11.a Start-up and Shutdown Provisions. Pursuant to SWCAA 400-081 "Start-up and Shutdown," technology based emission standards and control technology determinations shall take into consideration the physical and operational ability of a source to comply with the applicable standards during start-up or shutdown. Where it is determined that a source is not capable of achieving continuous compliance with an emission standard during start-up or shutdown, SWCAA shall include appropriate emission limitations, operating parameters, or other criteria to regulate performance of the source during start-up or shutdown.

The diesel engines may exhibit higher than normal opacity during startup. Accordingly, the visual emissions limit for these engines are not applicable during the startup period defined in the permit. The general opacity standards continue to apply.

11.b <u>Alternate Operating Scenarios.</u> SWCAA conducted a review of alternate operating scenarios applicable to equipment affected by this permitting action. Neither SWCAA nor the permittee identified or proposed any applicable alternate operating scenarios. Therefore, none were included in the approval conditions.

11.c <u>Pollution Prevention Measures.</u> SWCAA conducted a review of possible pollution prevention measures for the facility. No pollution prevention measures other than the control measures identified in the permit were identified by either the permittee or SWCAA. Therefore, none were included in the approval conditions.

12. EMISSION MONITORING AND TESTING

Because the emergency generator engines are permitted only for intermittent use, no add-on control devices are required to comply with the emission limits, and total potential emissions are relatively minor, no initial or periodic emission testing was required of the emergency generator engines. Because potential emissions from the Camp Creek Radio Tower, Marble Creek Radio Tower, and the Swift Camp Generator Engines are relatively minor even without add-on control devices, no initial or periodic emission testing was required.

Ozone emissions from the Merwin Hatchery ozone decomposer are expected to be minimal if the catalyst is active. Because the catalyst can be deactivated by liquid water and is located on the roof of the building, it seems reasonable that a test to determine the catalyst activity should be conducted periodically. The permit requires one of these tests to be between October 15th and November 30th of each year to correspond with the time period during which cooling ambient temperatures would be more likely to cause water condensation upstream of the catalyst, thereby deactivating the catalyst, if the catalyst heater failed.

If the measured concentration exceeds 200 ppm, the Permittee must either determine the mass emission rate for comparison with the permitted emission limits, or replace the catalyst. The mass emission rate can be determined by measuring or otherwise determining the exhaust flow rate from the decomposer vent and combining this information with the ozone concentration measurement.

At the design decomposer flow rate of 100 cfm, the ozone concentration that correlates with the permitted emission limit is approximately 139 ppm, and the concentration corresponding to no control at full operating capacity is approximately 2,800 ppm. To allow for a slightly lower gas flow, a trigger concentration of 200 ppm was established. At this concentration the catalyst would need to be operating at 70% to 80% control efficiency even at operating rates more representative of normal operation (17 cfm are at ~14 psig). A catalyst failure is likely to cause the ozone concentration to greatly exceed 200 ppm.

13. FACILITY HISTORY

The facility began limited operation in November 2001 and began actual production in the fall of 2003.

13.a. <u>General History.</u> The two gasoline storage tanks were permitted in 1990. The Merwin Dam emergency generator engine was permitted in 2002. As part of the facility inspection in 2006, it was determined that additional emergency generator engines were installed. After the issuance of Air Discharge Permit 10-2939, the Camp Creek Radio Tower Emergency Generator Engine, the Marble Creek Radio Tower Emergency Generator Engine, and the original two Swift Camp Generator Engine were installed without New Source Review. In 2012 the existence of the Merwin Hatchery Ozone Plant came to SWCAA's attention. Air Discharge Permit application CO-944 was submitted to address these "new" units. The Camp Creek Radio Tower Generator Engine and the Marble Creek Radio Tower Generator Engines were added in 2017 after it was found that there were significant periods of time when the solar electric systems were unable to provide sufficient electricity to run the sites.

13.b. Previous Permitting Actions.

Permit	Application	Date Issued	Description
15-3125	CO-944	3/9/2015	Approval to operate propane-fired generator sets (one at the Camp Creek Radio Tower, one at the Marble Creek Radio Tower, and two at Swift Forest Camp), and an ozone plant at the Merwin Hatchery.
10-2939	CL-1849	7/6/2010	Approval for additional emergency generator engines (Lewis River Hatchery Downstream, Lewis River Hatchery Upstream, Merwin Headquarters, Yale Dam, Swift #1 Dam Ford, Swift #1 Dam Caterpillar, Swift Camp #1, Swift Camp #2, and Yale Microwave).
02-2401	CO-719	4/9/2002	Permitted diesel-fired emergency generator engine at Merwin Dam
90-1204	CO-404	4/30/1990	Permitted gasoline storage tank at Yale Dam
90-1203	CO-403	4/30/1990	Permitted gasoline and diesel storage tanks at Merwin Dam

Bold font indicates that the Order or Air Discharge Permit will have been superseded or will no longer be in effect when Air Discharge Permit 18-3309 becomes effective.

14. PUBLIC INVOLVEMENT

14.a Public Notice for Air Discharge Permit Application CO-999. Public notice for Air Discharge Permit Application CO-944 was published on the SWCAA internet website for a minimum of 15 days beginning on June 12, 2018.

14.b Public/Applicant Comment for Air Discharge Permit Application CO-999. SWCAA did not receive formal comments, a comment period request, or any other inquiry from the public or the applicant regarding this Air Discharge Permit application. Therefore, no public comment period was provided for this permitting action.

14.c State Environmental Policy Act. SWCAA issued Determination of Non-Significance 18-047 on October 18, 2018 for this permitting action.